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## Deliverable N.: D1.3.1

**Title:** One (1) detailed proceeding of the regional multi-stakeholders meeting.

Funding source: EU Initiative on Climate-relevant Development Smart Innovation Through Research in Agriculture in developing countries – DeSIRA

Project Acronym: WATDEV

Project Full Title: Climate Smart WATER Management and Sustainable DEVELOPMENT for Food and Agriculture in North-East Africa

CRIS Ref.: FOOD/2021/425-767

Project duration: 48 months

Published by the WATDEV Consortium  
Dissemination Level: Public



This project has received funding from the European Union's DeSIRA Initiative (Development Smart Innovation through Research in Agriculture)

**WATDEV CONSORTIUM**

The project consortium is comprised of:

<b>EGYPT</b>	Heliopolis University (HU)
<b>ETHIOPIA</b>	Water and Land Resources Institute (WLRI)
<b>FINLAND</b>	Finnish Environment Institute (SIKE)
<b>ITALY</b>	Centro Internazionale di Alti Studi Agronomici Mediterranei di Bari (CIHEAM-Bari)
<b>ITALY</b>	Italian Research Council (CNR)
<b>KENYA</b>	Kenya Agricultural & Livestock Research Organization (KALRO)
<b>SUDAN</b>	Water Research Centre (WRC)
<b>THE NETHERLANDS</b>	International Soil Reference Center (ISRIC)
<b>UGANDA</b>	Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA)

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## DOCUMENT INFORMATION

<b>Project number</b>	FOOD/2021/425-767	<b>Acronym</b>	WATDEV
<b>Full title</b>	Climate Smart WATER Management and Sustainable DEVELOPMENT for Food and Agriculture in North-East Africa		
<b>Project URL</b>	<a href="http://www.watdev.eu">www.watdev.eu</a>	<b>Document URL</b>	
<b>Implementation Agency</b>	AICS (Italian Agency for Development Cooperation)		

<b>Deliverable</b>	<b>Number</b>	D1.3.1	<b>Title</b>	One (1) detailed proceedings of the regional multi-stakeholders meeting
<b>Project Activity</b>	<b>Number</b>	A1.3	<b>Title</b>	Organisation of multi-actors regional meetings and brokerage on BMPs and Innovations.

<b>Date of delivery</b>	<b>Contractual</b>	M12	<b>Actual</b>	M16
<b>Status</b>	Version 1.0		final	
<b>Final review</b>	30/04/2023	<b>AICS check</b>	mm.dd.aaaa	
<b>Type of document</b>	<input type="checkbox"/> prototype <input type="checkbox"/> <b>report</b> <input type="checkbox"/> demonstration <input type="checkbox"/> other			
<b>Dissemination level</b>	<input type="checkbox"/> <b>public</b> <input type="checkbox"/> confidential			

<b>Authors (Partner)</b>	ASARECA			
<b>Responsible Authors and contributors</b>	<b>Name</b>	Moses Odeke Enock Warinda	<b>Email</b>	<a href="mailto:m.odeke@asareca.org">m.odeke@asareca.org</a> e.warinda@asareca.org
	<b>Partner</b>	Gaetano Ladisi Sherif Mohammady Tena Alamirew Ahmed Elshaikh Michael Okoti Alice Murage Amare Bantider	<b>Phone</b>	+2(0)1006055887 +251(0)922470113

<b>Abstract (for dissemination)</b>	<p>The WATDEV project organized a Regional Multi-actor (RM) meeting which was held in Nairobi- Kenya from 8<sup>th</sup> -9<sup>th</sup> March 2023. The purpose of the meeting was to share the evaluation outcomes of the local brokerage meetings that were held, with local stakeholders in Egypt, Kenya Sudan, and Ethiopia between September and October 2022. Specifically, the meeting aimed to: (i) select and validate a list of BMPs and Innovations of interest to the local communities; (ii) discuss and share the evaluation outcomes of the BMP local brokerage meetings held in Egypt, Kenya, Sudan and Ethiopia; (iii) present outcomes from the “matching” exercises of a couple of site-specific challenges with BMPs collected; (iv) develop and finalize list of suitable zones in study areas; and (v) hold further discussions on the feasibility of potential research-private-public partnerships to sustain implementation of imported BMPs. Using a combination of methods including expert opinion and Focus Group Discussions (FDGs), data was collected from participants which was summarized to tease out key findings. The key outcomes from the RM meeting indicate that; a total of ten (10) best management practices were selected and validated. These included: (i) three (3) BMPs from Egypt (Composting -Ranked #1, Water Users Association -Ranked #2, and Intercropping trees with crops -Ranked #3); (ii) two (2) BMPs from Sudan (Water Users Association -Ranked #1 and Improved seed- Ranked #2); (iii) 3 BMPs from Ethiopia (Agroforestry- Ranked #1; Crop rotation- Ranked #2 and Water Users Association- Ranked #3); and (iv) two (2) BMPs from Kenya (Water Users</p>
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	<p>Association-Ranked #1 and Agroforestry- Ranked #2). Furthermore, results from the FDGs show that half of the countries (50%) ranked WUAS as the most important BMP (Rank #1) highlighting the important role that WUAS play in water and land management as well as conflict resolution in irrigated agriculture. The selected BMPs and innovations will now be promoted in the countries through various awareness and sensitization activities. The RM meeting also identified the awareness and training in the target areas as well as the target beneficiaries. The participants also mapped out the target areas where the BMPs will be implemented. These include: (i) Belbies district with 13 villages (Egypt); (ii) Gezira Scheme around Tyba Farmers Union (Sudan); (iii) Koga Irrigation Area (Ethiopia); and (iv) Tana River Basin (Kenya). Key recommendations that emerged from the meeting included the following actions: (i) re-package the BMPs in a simpler manner to come up with an outline of the BMPs that could be used by the project team; (ii) implement follow up meetings with the countries to gather more data/information to further clarify on the data requirements to support the modelling process; (iii) follow up on identified Public Private Partnerships (PPPs) to engage with them to support the implementation of the BMPs in the target areas; and (iv) plan for awareness and training sessions for the validated BMPs to develop capacities of the stakeholders to utilize the BMPs.</p>
<b>Keywords</b>	Best Management practices, assessment, validation

## Table of Contents

Executive Summary .....	7
1. Introduction.....	8
1.1 Background.....	8
1.2 Objectives of the Multi-Actor Regional Meeting.....	9
Overall Objective .....	9
Specific Objectives.....	9
2. Methodology .....	10
2.1 Approach .....	10
2.2 Expected Results.....	10
2.3 Participants.....	11
3. Workshop Sessions.....	12
3.1 Opening Session .....	12
3.2 Sharing of Evaluation Outcomes .....	17
3.3 Validation and Selection of Best Management Practices.....	18
3.4 Expected Impacts of the Selected BMPs and Innovations .....	20
3.5 Awareness and Training Needs and Beneficiaries for Selected BMPs and Innovations ...	21
4. Conclusions.....	25
5. Recommendations.....	25
6. Way forward .....	25
7. Annexes .....	26

## Index of Figures

Figure 1 - Flowchart of the process, from A1.2 – A1.3 events and matching work (1, 2) to A1.3 Multi-Actors’ Regional meeting (3) and beyond (4).....	8
Figure 2 - Spider graphs displaying examples of Group evaluation (a) and Needs evaluation (b).....	9
Figure 3 - Irrigation Project Performance (IPP) in Sudan .....	18

## Index of Tables

Table 1 - Feedback from Stakeholders on Evaluation Outcomes from Local Brokerage Meetings .....	17
Table 2 - List of validated and Selected BMPs/Innovations in Egypt. ....	18
Table 3 - List of validated and Selected BMPs/Innovations in Sudan. ....	19
Table 4 - List of validated and Selected BMPs/Innovations in Ethiopia. ....	19
Table 5 - List of validated and Selected BMPs/Innovations in Kenya.....	19
Table 6 - Expected Impacts of Selected BMPs.....	20
Table 7 - Awareness and Training needs and Beneficiaries for validated Selected BMPs and innovations in Egypt.....	21
Table 8 - Awareness and Training needs and Beneficiaries for validated Selected BMPs and innovations in Sudan.....	21
Table 9 - Awareness and Training needs and Beneficiaries for validated Selected BMPs and innovations in Ethiopia.....	21
Table 10 - Awareness and Training needs and Beneficiaries for validated Selected BMPs and innovations in Kenya.....	22
Table 11 - List of Suitable Zones in the Study Areas.....	24

## Acronyms and Abbreviations

AICS	Italian Agency for Development Cooperation
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa, Uganda
AU-EU	Africa-Europe
CIHEAM	Centre International de Hautes Etudes Agronomiques Méditerranéennes, Italy
CNR-	Consiglio Nazionale delle Ricerche, Italy
DG DEVCO	The Commission's Directorate-General for International Cooperation and Development
EARI	Ethiopian Institute of Agricultural Research, Ethiopia
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
HRC	Hydraulics Research Center- Ministry of Water and Irrigation- Gezira, Sudan.
HU	Heliopolis University, Egypt
ISRIC	International Soil Reference Center, The Netherlands
IWUA	Irrigation Water Users Association
KALRO	Kenya Agricultural & Livestock Research Organization, Kenya
KU	Khartoum University, Sudan
NRC	National Research Council, Sudan
R&I	Research and Innovation
WRC	Water Research Centre, Sudan
SACCO	Savings Credit and Cooperative Organizations
STI	Science, Technology and Innovation
SYKE	Finnish Environment Institute, Finland
WATDEV	Climate Smart WATER Management and Sustainable DEVELOPMENT for Food and Agriculture in North and East Africa
WLRC	Water and Land Resources Center, Ethiopia

## Executive Summary

The Climate Smart **WATer** Management and Sustainable **DEVelopment** for Food and Agriculture in East Africa (WATDEV) aims to enhance sustainability of agricultural water management and resilience of agro-ecosystems to climate change in Easter Africa and Egypt. AICS (Agenzia Italiana per la Cooperazione e lo Sviluppo) is the executive agency, CIHEAM-BARI is leading scientific institution working with ASARECA (Strengthening Agricultural Research in Eastern and Central Africa), KALRO (Kenya Agricultural and Livestock Research Organization), WLRC (Water, Land Resources Centre - Ethiopia), WRC (Water Research Centre, Sudan) and HU (Heliopolis University, Egypt). The project aims to develop an in-depth understanding of small to large-scale water and agricultural resource dynamics and management and people's resilience to climate through innovative research, modelling, and capacity building approaches.

The overarching objective of the project is to enhance sustainability of agricultural water management and resilience of agro-ecosystems to climate change in East Africa and Egypt. The specific objectives include: (1) National Ministries and Research Institutions improve their knowledge and management of water in agriculture; and (2) Farmers and local actors, cooperatives and Water User Associations implement innovative/sustainable solutions and skills on water management.

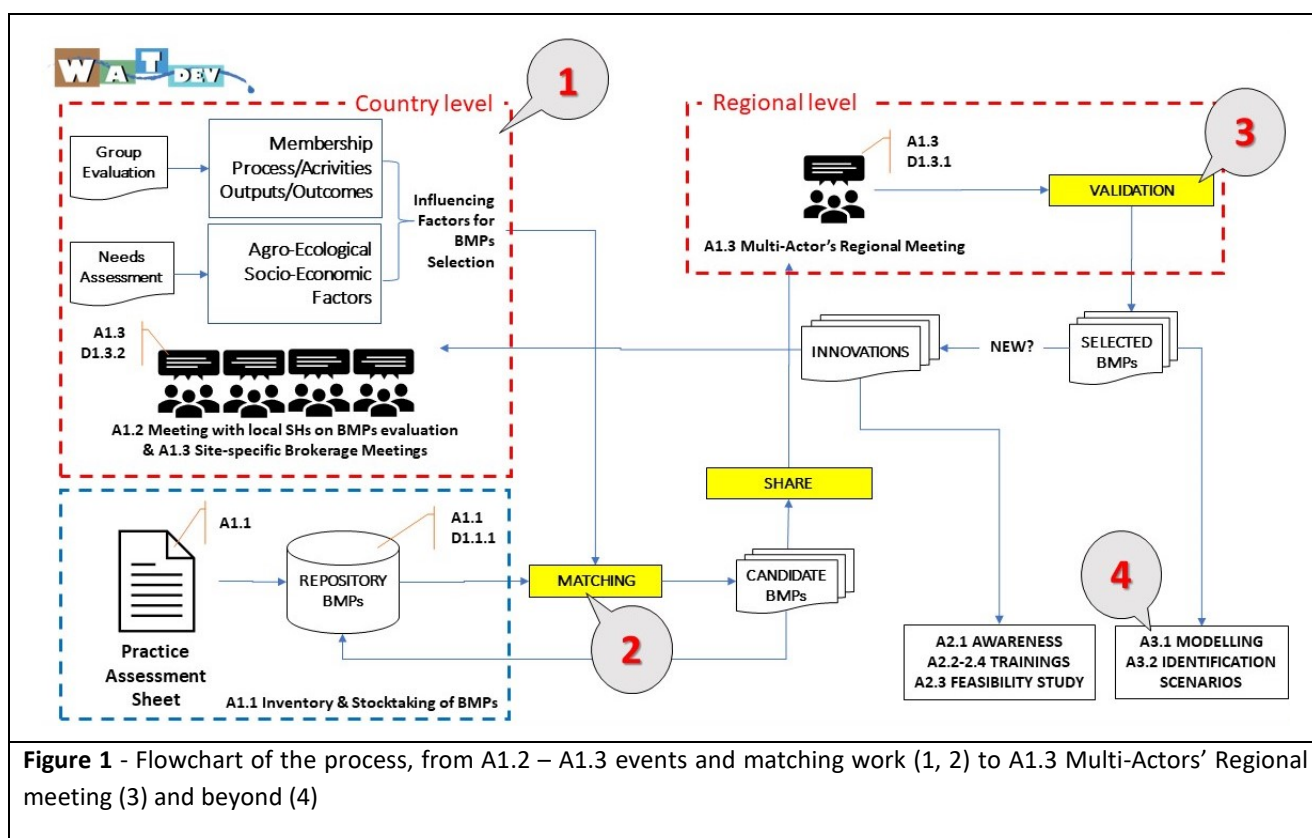
The Regional Multi-Actor (RM) meeting aimed to: (i) provide feedback to stakeholders on the evaluation outcomes of potential BMPs; (ii) validate and select BMPs and (iii) map out suitable zones for the project implementation (study areas). During the meeting feedback was provided to stakeholders in Egypt, Sudan, Ethiopia, and Kenya through the FDGs constituted. BMPs pre-selected following the local stakeholder consultations were validated. This led to final selection of a list of 10 validated BMPs (Egypt-3, Sudan-2, Ethiopia-3 and Kenya-2). The stakeholders undertook mapping of the potential areas for implementation of the BMPs and innovations. This led to identification of suitable zones for the project study areas. The Regional event also identified Public-Private Partnerships (PPP) as well as awareness and training needs required to support the implementation of the BMPs in the target areas.

The deliberations from the RM generated the following recommendations: (i) re-package the BMPs in a simpler manner and come up with an outline of the BMPs that can be easily used by the project team; (ii) implement follow up meetings with the countries to gather more data/information to further clarify on the data requirements to facilitate the modelling process; (iii) follow up on identified Public Private Partnerships (PPPs) to engage with them to support the implementation of the BMPs in the target areas; and (iv) Plan for awareness and training sessions for the validated BMPs to develop capacities of the stakeholders to utilize the BMPs.

# 1. Introduction

## 1.1 Background

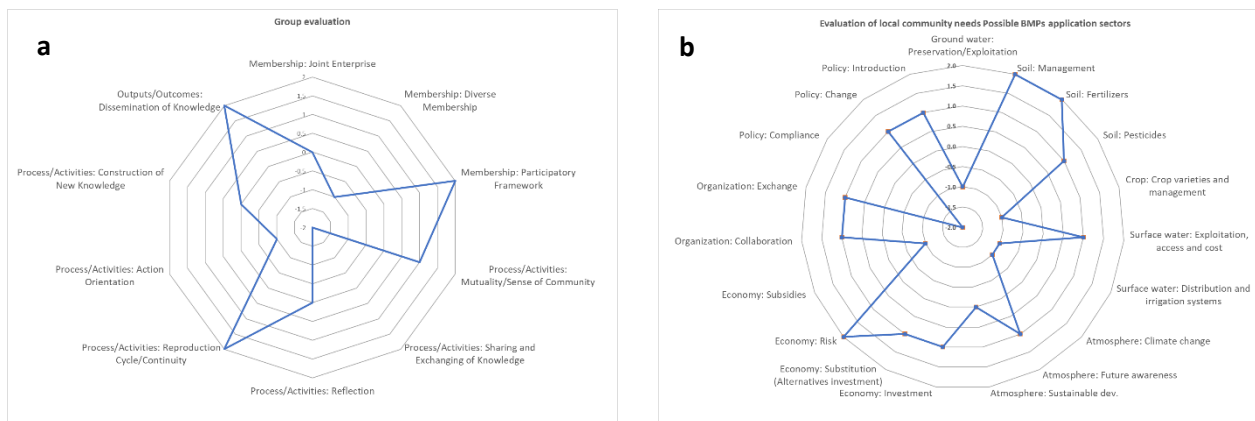
Following the launch of the WATDEV project in May 2022 a series of local brokerage meetings were held, between September and October 2022, with local stakeholders in Egypt, Kenya Sudan, and Ethiopia. These local meetings entailed among other things; community needs assessment with regards to potential BMPs and assessment of local groups, in terms of: (i) the ability of various groups to collaborate and work together and the inclusiveness, (ii) consistency and cohesion of various groups in performing new processes and activities, and (iii) ability of various groups to share individual benefits with the whole community. The outcomes of the evaluation exercise from the countries were then subjected to analysis using spider-graphs to show the overall attitude of the local community with respect to the management practices. Based on the community preferences, a matching exercise was done to identify *candidate practices* in the BMPs repository. The local stakeholder meetings and Multi-Actor Regional Meeting are linked to the activities falling under Result R1 “Best fitting MBPs and innovations in project countries”. Figure 1 shows the various steps for the implementation of planned activities (awareness, training, feasibility, modelling, etc.) in the WATDEV project.



During the local meetings, an assessment and evaluation was performed with the local actors in a participatory manner. The evaluation comprised of group evaluation and evaluation of local community needs. The **group evaluation sought** to: (i) qualitatively assess the abilities of the groups to collaborate and work together; (ii) consistency and cohesion in performing new processes and activities, and (iii) ability of the group to share individual benefits with the whole community. The **evaluation of local community needs aimed to** evaluate the group’s needs, with respect to application of BMPs.



The outcomes of the local meetings, after a scoring procedure, were plotted through spider-graphs (see figure 2) to show the overall attitude of the local communities to put in place management practices. In line with their preferences, a matching exercise was performed to extract candidate” BMPs, from among those practices already collected and available in the BMPs repository.



**Figure 2** - Spider graphs displaying examples of Group evaluation (a) and Needs evaluation (b).

Following the implementation of the local meetings, the Multi-Actors’ Regional Meeting was organized to share the evaluation outcomes from the local brokerage meetings and validate the pre-selected BMPs and innovations.

## 1.2 Objectives of the Multi-ACTOR Regional Meeting

### Overall Objective

The overarching objective of the event is to share with stakeholders the evaluation outcomes of the local meetings that were held in the countries and to carry out a participatory stakeholder validation of the selected BMPs. The validation exercise will lead to selection of BMPs and innovations that will be promoted in the countries through various awareness and sensitization activities.

### Specific Objectives

The specific objectives of the event were to:

- Discuss and share the evaluation outcomes of the BMP local brokerage meetings held in Egypt, Kenya, Sudan and Ethiopia.
- Present outcomes from the “matching” exercises to couple site-specific challenges with BMPs collected.
- Select and validate a list of BMPs and Innovations of interest to the local communities.
- Develop and finalize list of suitable zones in study areas (for A2.3 Feasibility studies); and
- Hold further discussions on the feasibility of potential research-private-public partnerships to sustain implementation of imported BMPs. This will support the implementation of second round of brokerage meetings in the target areas.

## 2. Methodology

### 2.1 Approach

The WATDEV Regional Multi-actor meeting held on 8th March 2023 was attended by both physical and online participants via zoom platform. It comprised of plenary discussions delivered through power point presentations as well as Focus Discussion Group (FDG) meetings to validate the list of BMPs that were previously selected in a participatory manner. The Regional Meeting was facilitated by ASARECA and CIHEAM-BARI.

During the meeting, the **following** key activities are undertaken: (i) stocktaking of previous relevant activities; (ii) Focus Group Discussions; (iii) Validation and Selection of BMPs; and (iv) Mapping.

#### (a) Stocktaking of Previous Relevant Activities

This entailed a **presentation on the evaluation outcomes** of the local meeting in the countries. The purpose of this presentation was to share the outcomes of meetings that were carried out by WATDEV with local communities in Kenya, Egypt, Sudan, and Ethiopia. The main objective of these meetings was to highlight common concerns and challenges of local communities in relation to water, soil, food / agriculture and climate in their areas.

#### (b) Focus Discussion Groups

This entailed conducting Focus Discussion Groups (FDGs) during the meeting.

Participants were sub-divided into 4 Focus Discussion Groups (FDGs), with each FDG representing the target country (Egypt, Ethiopia, Kenya, Sudan). The FDGs were facilitated by a team of experts from CIHEAM-BARI, ASARECA, and KALRO. A provision was made in the agenda for the presentations on the scope of the work to be carried out by each FDG. The discussions within the FDGs aimed to: (i) validate and select the BMPs, those that best match with concerns and challenges raised in project study areas during local meetings; (ii) work out possible improvements (awareness needs) in case BMPs are already applied in the project areas; (iii) define training needs and possible opportunities of building public-private partnerships (PPP) in case BMPs are innovations; and (iv) mapping out suitable zones for BMP implementation.

#### (c) Plenary Session

The presentation of the outcomes from each FDG was then made during the plenary session. Each FDG was given about 15 minutes for both presentation and discussion. The session aimed to share the work done by the FDGs as well as sharing a list of “selected” BMPs which could be retained by WATDEV for further analysis and modelling. The session also aimed to share a list of awareness and training needs as well as a list of suitable zones in the study areas for BMP implementation.

### 2.2 Expected Results

The regional multi-actor meeting will deliver a series of outputs including:

- i. Evaluation outcomes of the local brokerage meetings shared with the actors from the target countries.
- ii. List of validated “selected” BMPs and innovations.
- iii. List of suitable zones in study areas finalized.

## **2.3 Participants**

Stakeholders that participated in the meeting included: (i) Members of Stakeholders' Forum (SHF), (ii) Representative from the Minister of Agriculture, Livestock, and Fisheries (Kenya), (iii) Representatives from the Ministry of Sanitation, Water, and Irrigation (Kenya), (iv) IACs Delegation (IACS- Cairo and IACs- Nairobi), (v) European Partners (CIHEAM-BARI & CNR), (vi) ASARECA, (vii) KALRO, (viii) Heliopolis University, (ix) WRC, (x) WLRC, and (xi) Representatives of DG-INTPA and EU Delegation in Nairobi-Kenya.

## 3. Workshop Sessions

### 3.1 Opening Session

#### (a) Remarks by the Director General KALRO: Dr. Kireger Eliud

The Director General Kenya Agricultural Livestock and Research Organization (KALRO)- Dr. Kireger Eliud; welcomed the participants to the WATDEV Regional Multi-Actors Meeting. He reiterated the fact that participants had gathered in Nairobi- Kenya to attend the Regional Multi-Actors Meeting as well as planning meeting for the for the project “Climate Smart Water Management and Sustainable Development for Food and Agriculture in East Africa (WATDEV). The DG KALRO reminded participants of the goal of the WATDEV project which is to develop an in-depth understanding of small and large-scale water resource use and management while boosting people’s resilience to climate change, through innovative research, modelling, and capacity building. Dr. Kireger noted that the WATDEV project is addressing challenges of limited availability of water resources and climate conditions which severely compromise agricultural production and food security. He observed that the project also addressing issues around limited institutional and individual capacity in the management of water and natural resources.

The DG noted that the project is being implemented in Bura and Hola irrigation schemes in lower eastern Kenya along lower Tana River which were chosen as project sites because of various challenges including fluctuation of water levels and flooding of the river causing damage to cultivated fields close to the bank. Furthermore, there is water scarcity during dry spells and in wet season, flooding water is usually not utilized optimally for beneficial purposes. The land is also seriously encroached by invasive species particularly *prosopis juliflora* (locally known as *mathenge*) while water quality has deteriorated as a result of salinity.

The DG reminded participants that the WATDEV project has adopted multi-actors’ involvement and engagement, whose complementarity will go a long way in helping to achieve targeted objectives. He then noted that the WATDEV consortium consists of various actors whom he listed as follows:

- The Italian Agency for the Development Cooperation (AICS- Cairo)- Overall project executing agency.
- International Centre for Advanced Mediterranean Agronomic Studies - Institute of Bari (CIHEAM Bari) (Italy) - technical and scientific project lead partner.
- The National Council for Scientific Research, Institute for Sustainable Plant Protection- CNR-IPSP (Italy).
- Finnish Environment Institute (SYKE) - Finland.
- International Soil Reference and Information Centre, independent research foundation- (ISRIC)- The Netherlands-.
- Kenya Agricultural & Livestock Research Organization (KALRO) - Kenya.
- Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA).
- Water and Land Resources Centre (WLRC)-Ethiopia.
- HU Heliopolis University (HU)- Egypt.
- WRC Water Research Centre (WRC)- Sudan.

Dr. Kireger noted that, the project is investing in the improvement of knowledge and capacity of national government ministries and research institutions in management of water in agriculture, and also improvement of knowledge and skills of farmers and local actors to implement innovative and sustainable solutions in water management. It is anticipated that these investments will ultimately help in achieving the project objectives.

The DG reiterated the fact that the WATDEV project is working with other relevant stakeholders including National and County Government, farmers' associations, extension services, integrated water resources users' association, and non-Governmental organizations.

He observed that the Regional Multi-Actor Meeting represents a great achievement in the implementation of the first-year project activities, noting that experiences will be shared across the participating countries on best management practices, while discussions will be held on the best options for each region and synergies with the private sector explored, among others. The DG implored all participants to participate actively during the discussions.

He concluded his remarks by thanking the European Union on behalf of the partners, for funding the WATDEV project and wished all participants fruitful deliberations.

**(b) Remarks from Executive Director, ASARECA: Dr. Enock Warinda**

The ED ASARECA started his remarks by welcoming all the participants to Eastern and Central Africa (ECA) and specifically to Kenya which happens to be one of the member countries in ASARECA sub-region. He noted that ASARECA is sub regional not for profit inter-governmental organization established in 1994. ASARECA currently comprises of 14 countries including: Kenya, Burundi, Cameroon, Central Africa Republic, Eritrea, Ethiopia, Madagascar, Rwanda, Republic of Congo, Sudan, South Sudan, Tanzania, and Uganda. Since its establishment, ASARECA has been a key player in the AR4D landscape within the region, supporting implementation of over 100 projects.

Dr. Warinda noted that, through its refreshed mandate, ASARECA is strategically positioned to address emerging AR4D, facilitating AR4D investments, mobilizing collective action and resources to address bottlenecks constraining agricultural research and development in the region. These challenges include (but not limited to): land degradation, climate change, low/poor productivity, transboundary pests and diseases; limited market access and unfavorable policy environment among others.

Furthermore, he noted that the refreshed mandate of ASARECA seeks to: (i) identify regional research priorities and opportunities through credible, authentic and participatory on-going strategic visioning processes; (ii) commission, broker and manage strategic research partnerships to address identified regional priorities in the most effective, efficient and synergetic ways; (iii) nurture pathways for on-time delivery, spill over and scaling up of regional agricultural research results to deliver agricultural outcomes and impact; (iv) mobilize, allocate and manage regional AR4D investments to support generation of regional agricultural research public goods and services; and (v) monitor and evaluate returns on AR4D investment and repackage lessons and best practices to inform decision making processes and action.

The ED noted that ASARECA's mission aims to contribute to increasing agricultural productivity, competitiveness and commercialization of the agricultural sector in the ECA sub region by strengthening, catalyzing, and coordinating AR4D interventions in the sub region. He observed that the mission is well aligned with the overall goal of the Climate Smart WATer Management and Sustainable DEvelopment for Food and Agriculture in East Africa (WATDEV) project that seeks to

enhance sustainable land and water management in Egypt and Eastern Africa; thereby contributing to increased productivity, food, nutrition and water security.

Furthermore, the ED noted that WATDEV project seeks to deliver 5 key result areas (Best fitting BMPs and Innovations in the four (4) project countries selected (R1); Enhanced implementation of BMPs/innovations in study areas (R2); Best Management Practices /Innovations upscale and out scale scenarios performed (R3); A water planning/management toolbox available for Researchers and Institutions (R4); and Strengthened knowledge and capacity building; and established regional “Water Knowledge” Hub (R5) which are aligned with ASARECA’s key investment areas as articulated in its Strategy and Results Framework (ASRF: 2019:2028)

On a lighter note, Dr. Warinda said, ASARECA was happy to co-host the Regional Multi-actor meeting with Kenya Agricultural Research and Livestock Organization (KALRO) in close collaboration with CIHEAM-BARI. This demonstrates the true partnership between ASARECA, CIHEAM-BARI and national partners in the WATDEV program.

Dr. Warinda concluded his remarks by extending an invitation to all delegates to attend ASARECA Agriculture Ministerial Conference (AAMC) scheduled to take place from May 17-19, 2023 in Kampala- Uganda. The AAMC will entail the ASARECA 4th General Assembly (GA), Council of Patron Ministers and Scientific Conference. He noted that ASARECA will host a 14 Ministers of Agriculture who will deliberate on key policy recommendations directly affecting development of the Agricultural Sector in the region. He thanked all participants for attending the meeting as part of their contribution towards transforming the livelihoods of the communities in Eastern and Northern Africa.

#### **(c) Remarks from IACs, Cairo: Dr. Martino Melli**

Dr. Martino Melli appreciated the commitment of the partners in implementing the WATDEV project, highlighting the successes so far achieved during the first year.

He noted that the partners need to work closely with CIHEAM-BARI to address any gaps that may cause delay in implementation of the project. He thanked the delegates for attending the event and wished them fruitful deliberations during the meeting.

#### **(d) Remarks from CIHEAM BARI: Dr. Claudio Bogliotti, Scientific Coordinator- WATDEV Project**

The Scientific Coordinator of the WATDEV project welcomed participants to the meeting and recognized women delegates in the meeting. He noted that March 8, is the day of the women”, and extended special welcome and best wishes to women present in the meeting and those all over world, especially those in the front line of defending women rights.

He also extended special thanks to Martino Melli Director of the Italian Agency for Cooperation in Cairo, and his colleague Jacopo Tavassi for the continuous and kind support to WATDEV project during the past 1 year as well as the guidance provided in the addressing administrative and legal challenges in the WATDEV project.

Dr. Bogliotti thanked Mr. Etienne Coyette from the European Commission for his support as EU project officer of WATDEV and the continuous encouragement and guidance in carrying out the project. The Scientific Coordinator- WATDEV project also thanked the representatives of EU Delegation (Stephen WATHOME and Adolfo CIRES-ALONSO) for participating in the meeting. He noted that their presence and engagement in the workshop discussions would provide valuable contributions.

He thanked KALRO, its director Eliud Kiriger and all the staff for playing a pivotal role in organizing, hosting, and managing the meeting. He specifically recognized the role played by Carolyn Minayo, Alice Murage, Michael Okoti and expressed his sincere appreciation that KALRO had engaged a large team in the event.

Dr. Bogliotti also thanked the European and African partners in the WATDEV project present in the meeting: ISRIC (The Netherlands), SYKE (Finland), CNR (Italy), WRC (Sudan), WRLC (Ethiopia), Heliopolis University (Egypt) and of course KALRO. He extended a special vote of thanks to ASARECA participants especially Moses Odeke and Dr. Enock Warinda for backstopping and supporting Regional Multi-Actor meeting.

Dr. Bogliotti thanked the representatives from the Ministry of Agriculture, Ministry of Water, and Ministry of Research from Kenya. He noted that it was important for them to be part of the WATDEV meeting and discuss possible policy and decision-making prospects in water and agriculture. He reminded them that WATDEV is funded by the EU programme DESIRA which aims at booster research and smart innovation in Water and Agriculture in Africa as well Other Regions. He observed that the presence of the Ministry of Research, together with the Ministry of Agriculture and Ministry of Water was important for WATDEV project in terms of boosting synergies and research capacities for research to be sustainable thereby ensuring overall water and agriculture development and sustainability.

He also thanked and recognized the members of the Stakeholder Forum participating in the meeting especially those from Ethiopia, Egypt, Sudan and Kenya. He thanked them for accepting to play the role of SHF member, noting that, there is still work to be done even after the workshop/event has ended. He observed that “the SHF members are the main actors of the meeting, and their role will be of the utmost importance. He observed that it was important for the SHF members to bless the work carried out by WATDEV Team in the first year by providing further suggestions and recommendations in order to make WATDEV research outcomes more effective and responsive to needs.

He concluded his remarks by wishing all the participants very rich and fruitful discussions and urged participants to reach out to any member of the CIHEAM-Bari Team for any assistance.

#### **(e) Remarks from Permanent Secretary Ministry of Agriculture, Kenya**

The representative of the Permanent Secretary (PS), Ministry of Agriculture- Kenya started his opening remarks by recognizing that WATDEV Project is funded under the EU initiative on DeSIRA (Development Smart Innovation through Research in Agriculture). He noted that the DESIRA initiative aligns well with the objectives of most governments in Africa on improving the level of food and nutrition security.

The PS noted that the project is being implemented in 4 countries (Kenya, Sudan, Ethiopia and Egypt) with leadership from CIHEAM BARI, Italy, and collaborators from Europe (ISRIC-Netherlands, CNR, SYKE- Finland) and Africa (ASARECA- Uganda; KALRO- Kenya, WRLC-Ethiopia, WRC- Sudan, and HU- Ethiopia).

The PS informed participants that Agriculture remains the bedrock of most economies in Africa employing over 60% of the labor force, most of whom are women, accounting for 30 to 40 percent of the Gross Domestic Product (GDP). This underscores its importance in contributing to food and nutrition security, income and employment. Agriculture in Africa (and I believe in other parts of the world) faces myriad of challenges with the current one being the climate change that has adversely affected the productivity, thus undermining food and nutrition security.

Crop production largely depends on water, from rainfall or irrigation. The global effects of climate change have however affected the traditional rainfall patterns that farmers have always depended on, and therefore adversely reduced productivity. The water bodies too that provide water for irrigation have been equally affected by either shortage of water, poor quality (that is too salty) and therefore unfit for farming, or flooding of the river basins. The need to bring interventions in these areas cannot be overemphasized, and this would have profound impact to the economy.

The PS noted that the general objective of this project is to build sustainability of agricultural water management and resilience of agro-ecosystems in the selected areas. The PS was happy to note that the project plans to build capacity of various stakeholders including Water User Associations on Best Management Practices that are applicable in those areas. Kenya focuses on increased agricultural production in specific agro-ecologies including the WATDEV project site i.e. the lower Tana river basin, despite the challenges within the ecosystem. He informed participants the Government of Kenya welcomes the project initiatives focused on attaining the goal of food and nutrition security through implementation of best management practices, and involvement of the local stakeholders that will enhance sustainability beyond the project.

The PS noted that project started last year with a Kick-Off meeting that was held in Italy, and national stakeholder workshops have been held to create awareness in all the implementing countries. He commended the whole team, and especially CIHEAM Bari, ASARECA and KALRO for organizing the regional stakeholders' workshop with participants from all the study countries and the sponsors. He expressed his satisfaction with the WATDEV implementing Team, noting that the group holds a wealth of information and knowledge to deliberate on issues that are shared as a continent and particularly on climate change mitigation and coping strategies. He urged the delegates to share knowledge and expertise, learn from each other, and collaborate to create Best Management Practices that all the project countries can carry home and adapt for the benefit of the stakeholders.

The PS concluded his remarks, by thanking the European Union for funding the WATDEV Program for a period of 5 years, challenging the team to use this period to come up with impactful solutions in Agriculture.

He wished the delegates fruitful deliberations and declared the 1st WATDEV Regional Stakeholders' Workshop Officially opened.



### 3.2 Sharing of Evaluation Outcomes

During the Regional Multi-actor workshop the evaluation outcomes of local brokerage meetings in each country were shared with the stakeholders. The facilitators of the various Focus Discussion Groups (FDGs) made presentations to share the, evaluation outcomes of the meetings carried out by WATDEV with local communities in Kenya, Egypt, Ethiopia and Sudan. These meetings had the objective to highlight common concerns and challenges of local communities in relation to water, soil, food/agriculture, and climate in their areas. The evaluation outcomes were with the actors in the four focus discussion groups for Egypt, Sudan, Ethiopia and Kenya. The evaluation outcomes were well received by the actors who then provided their feedback (as highlighted in the Table 1. below).

**Table 1 - Feedback from Stakeholders on Evaluation Outcomes from Local Brokerage Meetings**

S/n	Country	Feedback from the Regional Multi-Actor Meeting
1	Egypt	<p>Manuring should be renamed as Composting.</p> <p>Agroforestry- growing of trees with crops for purposes of improving water use efficiency, soil fertility and food security.</p> <p>Better to rename <b>Agro-forestry</b> as <b>intercropping trees with crops</b>, because the scope for agro-forestry may be larger than what is happening or will happen at smallholder farmer level.</p> <p>WUA should be considered as a tool, and should focus more on: water governance, equity issues and resilience,</p> <p>Agreed to retain WUA as one of the suggested BMPs (now considered as a tool)</p> <p>The WUA should be based on some concrete action to support operationalization of water and soil management BMPs.</p> <p>The WUA should be functional.</p>
2	Sudan	<p>The proposed 46 best management practices considered too many.</p> <p>The proposed BMPs were summarized into two (2) priority BMPs namely: (i) Water users Association and (ii) Improved seed.</p> <p>Stakeholders noted that the Water Users Association was important and a pre-requisite for addressing challenges related to: crop management, operation and maintenance of hydraulic structures and water management.</p> <p>Stakeholders also agreed that improved seed was necessary to improve productivity and hence food and nutrition security.</p> <p>The performance evaluation of the irrigation project should focus on the following parameters: (i) crop, (ii) soil, (iii) water and (iv) human (Figure 1).</p>
3	Ethiopia	<p>Agro-forestry (upper catchment management: soil and water conservation, agroforestry, multi-tier production system, livelihood enhancement.</p> <p>Soil health (fertility and acidity). There is need to promote integrated soil fertility management (combined use of organic and inorganic fertilizer) to address soil acidity.</p> <p>Governance/Institutional and (IWUAs, Cooperatives, Unions) informed access to markets.</p> <p>Water supply (conjunctive use of groundwater) and demand management (distribution, efficiency)</p>
4	Kenya	<p>Land tenure and administration policy affecting investments for soil and water management in the Tana River basin.</p>

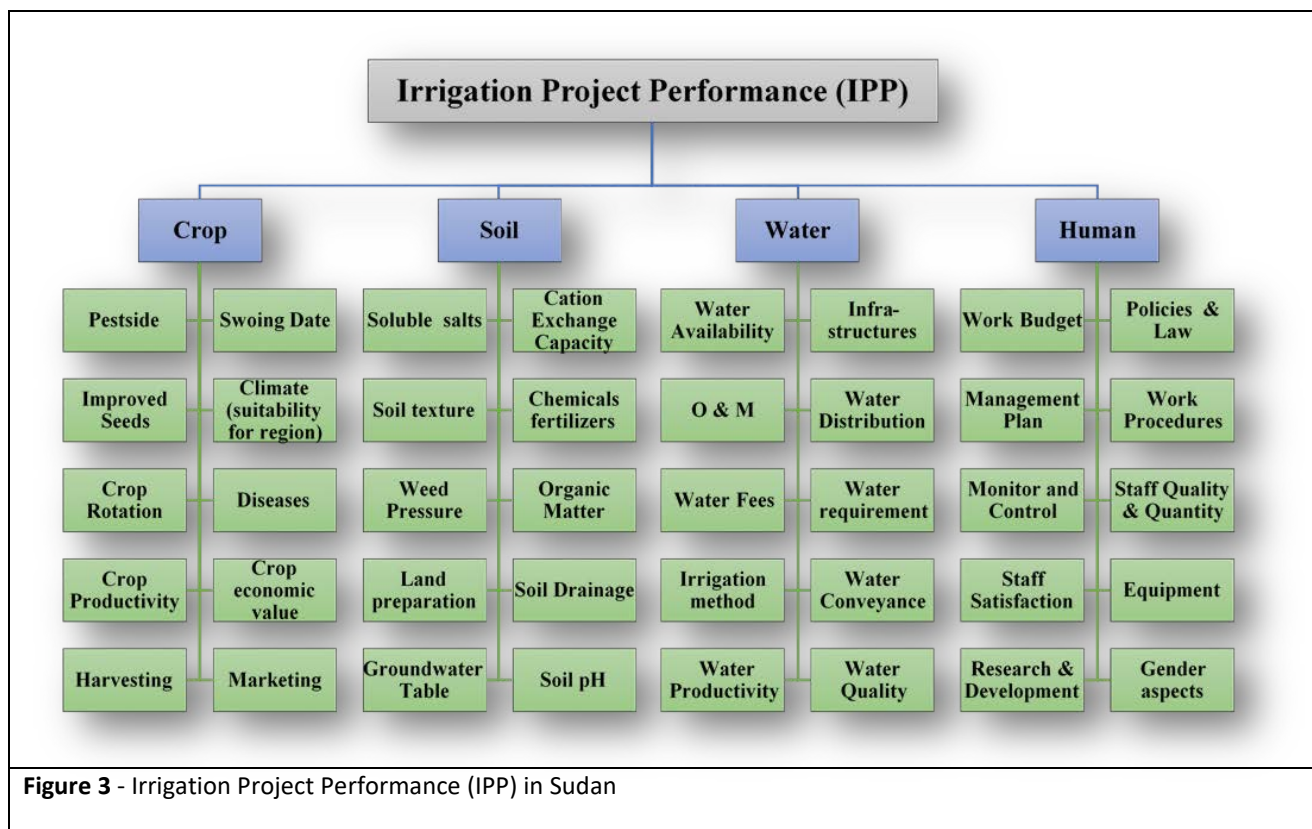


Figure 3 - Irrigation Project Performance (IPP) in Sudan

### 3.3 Validation and Selection of Best Management Practices

Stakeholders participated in the validation and selection of the BMPs to come up with a list of “selected” BMPs which could be retained by WATDEV for further analysis and modelling. The stakeholders assessed and ranked the potential BMPs to come up an agreed list of “selected” BMPs in each of the countries (Egypt, Sudan, Ethiopia and Kenya). It was also noted the validation of BMPs among other things entailed suggesting what: (i) improvements or combination of BMPs to be applied; and (ii) PPPs are needed to support the implementation of the BMPs in the target areas.

The results of the validation exercise conducted by stakeholders are highlighted in Table 2, 3, 4 and 5 below.

Table 2 - List of validated and Selected BMPs/Innovations in Egypt

S/n	Candidate BMPs	Average Score	Rank	Already applied (Yes/No)	Selected (Yes/No)	Reason for the score
1	Composting	1.80	#1	Yes	Yes	Good intervention to improve soil fertility
2	Crop Rotation	0.88	#4	Yes (Trad)	No	
3	Intercropping Trees (with crops)	1.33	#3	No	Yes	Can improve SOM, water use efficiency and productivity
4	Water Users Association	1.44	#2	No	Yes	Will address the problem of water availability

**Table 3 - List of validated and Selected BMPs/Innovations in Sudan**

S/n	Candidate BMPs	Average Score	Rank	Already applied (Yes/No)	Selected (Yes/No)	Reason for the score
1	Water Users Association (GAP and Operation and maintenance of hydraulic equipment)	1.80	#1	Yes	Yes	GAPs- Crop, water and soil management, improve irrigation operations and maintenance of hydraulic infrastructure
2	Improved/certified seed (cotton and wheat)	1.00	#2	Yes	Yes	Need to increase seed production/bulking, access and improve seed policies

**Table 4 - List of validated and Selected BMPs/Innovations in Ethiopia**

S/n	Candidate BMPs	Average Score	Rank	Already applied (Yes/No)	Selected (Yes/No)	Reason for the score
1	Agroforestry (in the catchment area)	n/a	#1	Yes	Yes	-Soil conservation -Water conservation -Reservoir protection/siltation protection -Ecosystem services -Irrigation water availability downstream
2	Crop rotation/soil health	n/a	#2	Yes	Yes	-Organic manure -Need to improve soil fertility -Improve soil water availability
3	Water Users Association (Governance)	n/a	#3	Yes	Yes	-Need to improve maintenance of the irrigation infrastructure. -Ensure equitable water allocation between upstream and downstream farmers -Manage water resource use conflicts -Marketing of farmers’ produce -Operation and maintenance

**Table 5 - List of validated and Selected BMPs/Innovations in Kenya**

S/n	Candidate BMPs	Average Score	Rank	Already applied (Yes/No)	Selected (Yes/No)	Reason for the score
1	Water Users Association: (i) Agronomy and crop management (ii) Tenancy administration and management (iii) Land and water	1.8	#1	Yes	Yes	-Need to improve irrigation services -Strategic water management -Capacity building on operation and maintenance -Streamline roles and responsibilities; -Need to establish/strengthen structures for governance, leadership and financial management

S/n	Candidate BMPs	Average Score	Rank	Already applied (Yes/No)	Selected (Yes/No)	Reason for the score
	management					-Establish/strengthen scheme management committees, with representation from researchers, extension and county executive members and technical teams
2	Agroforestry	1.2	#2	Yes	Yes	-Need to soil run off and improve soil fertility

### 3.4 Expected Impacts of the Selected BMPs and Innovations

The actors noted that combination of BMPs in specific areas was possible. The stakeholders therefore discussed potential impacts from arising from the combination of selected BMPs in the target countries. These are highlighted in Table 6, below:

**Table 6 - Expected Impacts of Selected BMPs**

S/n	Country	Combination of BMPs Selected	Expected Impacts	Assumptions/ Specific conditions
1	Egypt	<ul style="list-style-type: none"> <li>Compositing</li> <li>Intercropping with trees (Agro-forestry)</li> <li>Water Users’ Association</li> </ul>	<ul style="list-style-type: none"> <li>Increased Soil Organic Matter (SOM) attributed to Increased soil fertility in the long term.</li> <li>Increased availability of nutrients.</li> <li>Increased water retention, therefore having a positive impact on ground water storage.</li> <li>Reduced Carbon Emissions.</li> <li>Increased on farm net profitability.</li> </ul>	<ul style="list-style-type: none"> <li>Enhancing performance of irrigation networks and distribution systems.</li> <li>Maintenance of drainage canals.</li> <li>Low-cost quality compost available.</li> <li>WUA functional</li> <li>Local competent authority available to monitor ground water.</li> </ul>
2	Sudan	<ul style="list-style-type: none"> <li>Water Users’ Association</li> <li>Improved seed</li> </ul>	<ul style="list-style-type: none"> <li>Improved yields.</li> <li>Improved water use efficiency.</li> <li>Increased resilience of the irrigation system.</li> <li>Improved incomes.</li> </ul>	<ul style="list-style-type: none"> <li>The maintenance of the irrigation hydraulic system is done timely.</li> <li>The input subsidies provided include improve seed for selected crops.</li> </ul>
3	Ethiopia	<ul style="list-style-type: none"> <li>Water Users Association</li> <li>Agro-forestry</li> <li>Crop rotation</li> </ul>	<ul style="list-style-type: none"> <li>Improved soil fertility.</li> <li>Reduced siltation of the reservoir.</li> <li>Increased access to markets.</li> <li>Water equity and governance.</li> </ul>	<ul style="list-style-type: none"> <li>Governance of the IWUA is improved.</li> <li>Access to markets for smallholder farmers is improved.</li> </ul>
4	Kenya	<ul style="list-style-type: none"> <li>Water Users Association</li> <li>Agro-forestry</li> </ul>	<ul style="list-style-type: none"> <li>Improved soil fertility.</li> <li>Improved water management.</li> <li>Increased availability of nutrients.</li> </ul>	<ul style="list-style-type: none"> <li>Issues related to land tenure are addressed.</li> <li>The WUA addresses water management issues.</li> <li>Reduced soil run off</li> </ul>

### 3.5 Awareness and Training Needs and Beneficiaries for Selected BMPs and Innovations

During the FDGs, the stakeholders identified various awareness and training needs as well as beneficiaries for each of the BMPs. Results from the FDGs are highlighted in Table 7, 8, 9 and 10, below.

**Table 7 - Awareness and Training needs and Beneficiaries for validated Selected BMPs and innovations in Egypt**

S/n	Candidate BMPs	Awareness needs	Training needs	Beneficiaries
1	Composting	Yes	Yes	Yes- SHF, WUA, Researchers
2	Intercropping Trees (with crops)	Yes	Yes	Yes- SHF, WUA, Researchers
3	Water Users Association	Yes	Yes	Yes- SHF, WUA, Researchers

**Table 8 - Awareness and Training needs and Beneficiaries for validated Selected BMPs and innovations in Sudan**

S/n	Candidate BMPs	Awareness needs	Training needs	Beneficiaries
1	Water Users Association	<ul style="list-style-type: none"> <li>▪ Improve control of water structures</li> <li>▪ Automation of irrigation operation</li> <li>▪ Improve drainage system</li> <li>▪ Water governance</li> <li>▪ Water use efficiency</li> <li>▪ Irrigation intervals</li> <li>▪ Crop rotation</li> </ul>		<ul style="list-style-type: none"> <li>▪ Ministry of irrigation and Gezira Board</li> <li>▪ Ministry of irrigation, farmers and Gezira Board</li> <li>▪ Farmers, Gezira Board</li> </ul>
2	Improved Seed	<ul style="list-style-type: none"> <li>▪ Subsidy programs linked to improved seeds.</li> <li>▪ Improved /quality seeds production.</li> <li>▪ Awareness on use improved seeds.</li> <li>▪ Capacity building through with farmers organizations on the use of quality seed</li> </ul>		<ul style="list-style-type: none"> <li>▪ Smallholder Farmers</li> <li>▪ Gezira Board</li> <li>▪ Extension Agents</li> <li>▪ Researchers (ARC)</li> </ul>

**Table 9 - Awareness and Training needs and Beneficiaries for validated Selected BMPs and innovations in Ethiopia**

S/n	Candidate BMPs	Awareness needs	Training needs	Beneficiaries
1	Agroforestry (in the catchment area)	<ul style="list-style-type: none"> <li>▪ Soil conservation</li> <li>▪ Water conservation</li> <li>▪ Reservoir protection/siltation protection</li> <li>▪ Ecosystem service</li> <li>▪ Irrigation water availability downstream</li> </ul>	<ul style="list-style-type: none"> <li>▪ Training watershed management,</li> <li>▪ Agroforestry technologies</li> <li>▪ Nursery management</li> <li>▪ Private Nursery Operators</li> </ul>	<ul style="list-style-type: none"> <li>▪ Smallholder farmers</li> <li>▪ Koga Farmers Union/Cooperative</li> <li>▪ Agronomists/Extension Agents</li> <li>▪ Researchers (EIARI)</li> <li>▪ Extension Agents</li> <li>▪ Model farmers</li> <li>▪ Community Leaders</li> </ul>

S/n	Candidate BMPs	Awareness needs	Training needs	Beneficiaries
		<ul style="list-style-type: none"> <li>Social awareness</li> <li>Integration of local knowledge with scientific knowledge</li> </ul>		<ul style="list-style-type: none"> <li>Scheme managers.</li> <li>Policy &amp; decision makers</li> </ul>
2	Crop rotation/soil health	<ul style="list-style-type: none"> <li>Integration of local knowledge</li> </ul>	<ul style="list-style-type: none"> <li>Agronomy – crop sequencing, soil amendments, water management</li> <li>Crop protection/IPM</li> </ul>	<ul style="list-style-type: none"> <li>Smallholder Farmers</li> <li>Koga Farmers' Cooperative Union</li> <li>Extension Agents</li> <li>Researchers (EIARI)</li> <li>Community leaders</li> <li>Experts and researchers</li> <li>Policy &amp; decision makers</li> </ul>
3	Water Users Association (Governance)	<ul style="list-style-type: none"> <li>Sensitization of community on the project and technical solutions (BMPs)</li> </ul>	<ul style="list-style-type: none"> <li>Irrigation by laws</li> <li>Conflict management</li> <li>Marketing</li> <li>Financial management</li> <li>Group dynamics/management</li> <li>Operation and maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Smallholder Farmers</li> <li>Koga Farmers' Cooperative Union</li> </ul>

**Table 10 - Awareness and Training needs and Beneficiaries for validated Selected BMPs and innovations in Kenya**

S/n	Candidate BMPs	Awareness needs	Training needs	Beneficiaries
1	Agroforestry (in the catchment area)	<ul style="list-style-type: none"> <li>Provision of seedlings</li> <li>Identification of suitable tree seedlings and the crops for the region</li> <li>Identify and demarcate agroforestry areas</li> <li>Training on nursery establishment</li> <li>Capacity development for pastoral communities on pastures and fodder crops</li> </ul>	<ul style="list-style-type: none"> <li>Training for pastoral communities on pastures and fodder crops</li> </ul>	<ul style="list-style-type: none"> <li>NGOs (GAA, CWW, WVI, World Concern)</li> <li>Community Based Organizations,</li> <li>Stakeholders in the forestry sector,</li> <li>Community Based Organizations</li> <li>IWUAS</li> <li>National Irrigation Authority</li> <li>County extension services, environment and climate change,</li> <li>County energy department</li> </ul>
2	Water Users Association:  -Water Management -Agronomy -Land Management	<u>Water Management</u> <ul style="list-style-type: none"> <li>Improve irrigation services</li> <li>Consultative workshops</li> <li>Strategic water management</li> <li>Capacity building on operation and maintenance</li> <li>Streamline roles and responsibilities;</li> </ul>	<ul style="list-style-type: none"> <li>Training of technicians on operation and maintenance of infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>NGOs (GAA, CWW, WVI, World Concern)</li> <li>CIGs,</li> <li>Community Based Organizations,</li> <li>Stakeholders in the forestry sector,</li> <li>Community Based</li> </ul>

		<ul style="list-style-type: none"> <li>▪ Establishment/strengthening of governance, leadership and financial management structures</li> <li>▪ Proper identification of beneficiaries</li> </ul> <p><u>Agronomy</u></p> <ul style="list-style-type: none"> <li>▪ Need for Public, Private Partnership (PPP)</li> <li>▪ Mechanization</li> <li>▪ Crop diversification and intensification</li> <li>▪ Natural Resource Management</li> </ul> <p><u>Land Management</u></p> <ul style="list-style-type: none"> <li>▪ Scheme expansion</li> <li>▪ Allocation of farms</li> <li>▪ Land ownership and utilization</li> </ul>		<p>Organizations</p> <ul style="list-style-type: none"> <li>▪ IWUAS</li> <li>▪ National Irrigation Authority</li> <li>▪ County extension services, environment and climate change,</li> <li>▪ County energy department</li> </ul>
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During the meeting Public-Private-Partnerships to support implementation of the BMPs in the target areas were identified across the 4 countries (Egypt, Sudan, Ethiopia, and Kenya). It's anticipated that the PPPs will address the issue around seed systems, where government agencies could come on board to support implementation of specific activities that relate to seed systems.

### 3.6 Mapping

Using the maps provided to display the case study area (the whole watershed), the stakeholders identified areas where the selected BMPs/innovations can be implemented. The actors also provided additional information that could help in defining where the research (e.g., feasibility studies, modelling) will be carried out.

The details of the mapping exercise conducted by each country through the FDGs is highlighted in the Table 5, below.

**Table 11 - List of Suitable Zones in the Study Areas**

Country	Candidate BMPs	Study Area	Justification	Public-private partnership (PPP)
Egypt	<ul style="list-style-type: none"> <li>▪ Composting</li> <li>▪ Intercropping Trees (with crops)</li> <li>▪ Water Users Association</li> </ul>	Belbies District (13 Villages)	<ul style="list-style-type: none"> <li>- Communities facing water and soil challenges.</li> <li>- Mainly using local/traditional practices.</li> <li>- Could be well positioned to scale out the technical solutions to other nearby areas (like Sekem Farm) that has potential to uptake the BMPs.</li> </ul>	- Work with government authorities to establish functional WUA, competent local authorities to run the WUA, work with other stakeholders on ground (both private sector actors and NGOs/CSOs).
Sudan	<ul style="list-style-type: none"> <li>▪ Water Users Association</li> <li>▪ Improved seed</li> </ul>	Gezira Board/ around Tyba Farmers' Cooperative	n/a	- Work with Government to rehabilitate the Gezira scheme, operationalize the input subsidy system.
Ethiopia	<ul style="list-style-type: none"> <li>▪ Water Users Association</li> <li>▪ Agroforestry</li> <li>▪ Crop rotation</li> </ul>	Koga Irrigation Area	<ul style="list-style-type: none"> <li>- Located within the Koga irrigation catchment-command system.</li> <li>- Strategically located within Bahir-Dar- Addis Ababa highway and is near an international airport.</li> <li>- It's a buffer zone,</li> <li>- Need to reduce siltation.</li> <li>- Livelihood diversification</li> <li>- Existence of a nearby weather station</li> </ul>	n/a
Kenya	<ul style="list-style-type: none"> <li>▪ Water Users Association</li> <li>▪ Agroforestry</li> </ul>	Tana River Basin	<ul style="list-style-type: none"> <li>- Water management will be done in the entire scheme</li> <li>-The corridor between Bahati and Area six can be used for agroforestry</li> <li>-The North of the Bura irrigation scheme where attempts to establish dykes failed can be used for agroforestry development and also to the south of the scheme to combat surface run off</li> </ul>	<ul style="list-style-type: none"> <li>- Work with County Government to formulate favorable land tenure and administrative policies.</li> <li>- Work with private sector to provide credit facilities to farmers</li> </ul>



## 4. Conclusions

The Regional Multi-Actor meeting aimed to: (i) provide feedback to stakeholders on the evaluation outcomes of potential BMPs; (ii) validate and select BMPs and (iii) map out suitable zones for the project implementation (study areas). During the meeting feedback was provided to stakeholders in Egypt, Sudan, Ethiopia, and Kenya through the FDGs constituted. BMPs pre-selected following the local stakeholder consultations were validated.

This led to final selection of a list of 10 validated BMPs (Egypt-3, Sudan-2, Ethiopia-3 and Kenya-2). The stakeholders undertook mapping of the potential areas for implementation of the BMPs and innovations. This led to identification of suitable zones for the project study areas.

The Regional event also identified Public-Private Partnerships (PPP) as well as awareness and training needs required to support the implementation of the BMPs in the target areas.

## 5. Recommendations

Based on the workshop discussions the following recommendations were made:

- (a) Re-package the BMPs in a simpler manner to come up with an outline of the BMPs that could be used by the project team.
- (b) Implement follow up meetings with the countries to gather more data/information to further clarify on the data requirements to support the modelling process.
- (c) Follow up on identified PPPs to engage with them to support the implementation of the BMPs in the target areas.
- (d) Plan for awareness and training sessions for the validated BMPs to develop capacities of the stakeholders to utilize the BMPs.

## 6. Way forward

The following were agreed as the way forward (to do list):

1. Make presentations available to partners (web/cloud)
2. Revise the selected BMPs (by 7th April 2023) and provide to local partners for feedback (ASARECA)
3. Provide the modelling meeting group agenda by the end of March 2023 (ISRIC)
4. Bilateral meetings with local partners to prepare awareness events (April 2023) (CIHEAM BARI + Local Partners + ASARECA)
5. Prepare a TOR for feasibility studies before the start of the awareness events (end of May 2023).
6. Plan for the implementation of awareness sessions in the target countries (June 2023)

## 7. Annexes

### Annex 1: Meeting's Agenda

March 8 <sup>th</sup> , 2023 - Dissemination Event & Multi-Actors' Meeting	
08:30	<ul style="list-style-type: none"> <li>Arrival and registration of participants</li> </ul>
<b>Session 1: Welcome and introduction (30')</b>	
09:00 09:30	<ul style="list-style-type: none"> <li>Welcome address (KALRO, ASARECA, European Commission-DG INTPA Brussels, AICS Cairo, AICS Nairobi, CIHEAM-Bari)</li> </ul>
<b>Session 2: Preparing the ground for discussion (1h)</b>	
09:30 10:15	<ul style="list-style-type: none"> <li>Brief overview of WATDEV and Objectives of the meeting (CIHEAM-Bari, ASARECA)</li> </ul>
10:15 10:30	<ul style="list-style-type: none"> <li>Presentation of participants</li> </ul>
10:30 11:00	<b>Coffee break &amp; Group photo</b>
11:00 11:15	<ul style="list-style-type: none"> <li>The DeSIRA programme: status at present and perspectives (DG-INTPA)</li> </ul>
<b>Session 3 - The Local Stakeholders' Meetings outcomes (30')</b>	
11:15 11:45	<ul style="list-style-type: none"> <li>Stocktaking of previous relevant activities (CIHEAM-Bari)</li> </ul> <p><i>The purpose of the presentation is to share with stakeholders the outcomes of meetings carried out by WATDEV with local communities in Kenya, Egypt, Ethiopia and Sudan. These meetings had the objective to highlight common concerns and challenges of local communities in relation to water, soil, food/agriculture, and climate in their areas.</i></p>
<b>Session 4 – Focus Groups work (2h)</b>	
11:45 13:30	<p><i>Participants will be sub-divided by Country into 4 Focus Discussion Groups (FDGs). The work will be facilitated by 1 Facilitator/FDG (KALRO/ASARECA/CIHEAM Bari)</i></p> <ul style="list-style-type: none"> <li>Presentation of Focus groups' scopes</li> <li>Work on Focus Discussion Groups</li> </ul> <p><i>The agenda foresees the presentation of the scope of work to be carried out by the FDGs. The work aims at i) selecting, among the "candidate" Best Management Practices -BMPs, those that best suit with concerns and challenges raised in past local meetings in project study areas; ii) in case BMPs are already applied, working out possible improvements (awareness needs); iii) in case BMPs are innovations, define training needs and possible opportunities of building public-private partnerships (PPP)</i></p>
13:30 14:30	<b>Lunch (buffet)</b>
<b>Session 5 – Sharing and validation (in plenary) (1,5h)</b>	
14:30 16:00	<ul style="list-style-type: none"> <li>Presentation of FG outcomes: the facilitator of each FG, presents the selected BMPs (15'/group)</li> <li>Common BMPs will be identified. Those represents the "selected BMPs".</li> </ul> <p><i>The session has the objective of sharing the work done by the FDGs and delivery a list of "selected" BMPs which could be retained by WATDEV for further analysis and modelling.</i></p>
<b>Session 6 – Mapping (in groups) (1h)</b>	

March 8 <sup>th</sup> , 2023 - Dissemination Event & Multi-Actors' Meeting	
16:00 17:00	<p>Participants will be sub-divided by country into 4 Focus Discussion Groups (FDGs). The work will be facilitated by 1 Facilitator/FDG (KALRO/ASARECA/CIHEAM Bari)</p> <ul style="list-style-type: none"> <li>On a map displaying the case study area (the whole watershed), participants are asked to identify one or more places where the selected BMPs/innovations can be implemented. They should provide as much information as possible to allow the WATDEV project team define the context where the research (e.g., feasibility studies, modelling) will be carried out.</li> </ul>
17:00 17:30	<ul style="list-style-type: none"> <li>Presentation of FDG outcomes: the facilitator of each FDG present the places where the selected BMPs/innovations will be implemented.</li> <li>Wrap-up and closure (AICS-Cairo, CIHEAM Bari)</li> </ul>
20:00	<ul style="list-style-type: none"> <li>Social dinner</li> </ul>

**Annex 2: Outline of Repackaged BMPs**

**Description of Selected Best Management Practices  
in Egypt, Kenya, Sudan, and Ethiopia**



## INTRODUCTION

The Climate Smart **WATER** Management and Sustainable **DEVELOPMENT** for Food and Agriculture in East Africa (WATDEV) aims to enhance the sustainability of agricultural water management and resilience of agroecosystems to climate change in Eastern Africa and Egypt. AICS (Agenzia Italiana per la Cooperazione e lo Sviluppo) is the executive agency, CIHEAM-BARI is the leading scientific institution working with ASARECA (Strengthening Agricultural Research in Eastern and Central Africa), KALRO (Kenya Agricultural and Livestock Research Organization), WLRC (Water, Land Resources Centre - Ethiopia), WRC (Water Research Centre, Sudan) and HU (Heliopolis University, Egypt). The project aims to develop an in-depth understanding of small to large-scale water and agricultural resource dynamics and management and people's resilience to climate through innovative research, modeling, and capacity-building approaches.

The specific objectives include: **(1)** National Ministries and Research Institutions improve their knowledge and management of water in agriculture; and **(2)** Farmers and local actors, cooperatives, and Water User Associations implement innovative/sustainable solutions and skills in water management.

## MULTI-ACTOR REGIONAL MEETING

Following the launch of the WATDEV project in May 2022 a series of brokerage meetings were held, with local stakeholders in Egypt, Kenya Sudan, and Ethiopia between September and October 2022. These local meetings entailed among other things; community needs assessment with regards to potential BMPs and assessment of local groups.

After the implementation of local meetings, the Multi-Actors Regional Meeting was held in Nairobi, Kenya on the 8<sup>th</sup> and 9<sup>th</sup> of March 2023 to share the outcomes of evaluation in the local meetings and validate the pre-selected BMPs and innovations.



## VALIDATED BEST MANAGEMENT PRACTICES

The outcome of the Focus Discussion Groups (FDGs) shows that the following BMPs were validated and selected:

Country	Main Issues	Potential Solutions	Selected (*) BMPs
Egypt	<ul style="list-style-type: none"> <li>▪ Weak water management and administration</li> <li>▪ Poor investments in soil improvement</li> <li>▪ Lack of crop management practices</li> <li>▪ Weak governance across the board</li> <li>▪ Weak collaboration between farmers</li> <li>▪ Limited dissemination of knowledge</li> <li>▪ Lack of awareness about the impact of the overuse of pesticides and fertilizers</li> <li>▪ Lack of understanding of the benefits brought by BMPs already being used</li> <li>▪ Self-interest driven communities</li> <li>▪ Soil Organic Matter content is low</li> </ul>	<ul style="list-style-type: none"> <li>▪ Improve water availability and use efficiency</li> <li>▪ Conserve soil and improve fertility</li> <li>▪ Improve nutrients use efficiency for crops</li> <li>▪ Improve crop yield</li> <li>▪ Enhance awareness and capacity building from top to down (leadership, governance, and magnitude of the risk resulting from overuse of pesticides and fertilizers)</li> </ul>	<ol style="list-style-type: none"> <li>1. Manuring</li> <li>2. Intercropping Trees with Crops</li> <li>3. Water Users Association</li> </ol>
Kenya	<ul style="list-style-type: none"> <li>▪ Weak water management and administration</li> <li>▪ Low concern about soil management practices</li> <li>▪ Poor investments in land improvement due to the land tenure system</li> <li>▪ Policy conflicts between the County and National Governments on irrigation land administration</li> <li>▪ Lack of knowledge but still concerned about climate change</li> </ul>	<ul style="list-style-type: none"> <li>▪ Conserve soil and improve its fertility</li> <li>▪ Improve water availability and use efficiency</li> <li>▪ Ensure carbon sequestration</li> <li>▪ Reduce Greenhouse gas emissions into the atmosphere</li> <li>▪ Analyze policy to improve agricultural productivity</li> </ul>	<ol style="list-style-type: none"> <li>1. Water Users Association               <ul style="list-style-type: none"> <li>(a) Agronomy and crop management</li> <li>(b) Tenancy administration and management</li> <li>(c) Land and water management</li> </ul> </li> <li>2. Agroforestry</li> </ol>

Country	Main Issues	Potential Solutions	Selected (*) BMPs
Sudan	<ul style="list-style-type: none"> <li>▪ Weak water management and administration</li> <li>▪ Poor crop management and low yield</li> <li>▪ Lack of knowledge but still concerned about climate change</li> <li>▪ Need for more flexibility for farmers to decide and manage their lands on their own and/or improve and update their organization</li> <li>▪ Need for maintenance of the Gezira system and infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>▪ Improve availability and water use efficiency</li> <li>▪ Improve nutrients use efficiency for crops</li> <li>▪ Improve crop yields</li> <li>▪ Ensure carbon sequestration</li> <li>▪ Reduce greenhouse gas emissions into the atmosphere</li> <li>▪ Introduce new cash crops (soya)</li> </ul>	<ol style="list-style-type: none"> <li>1. Water Users Association (Consultancy oriented: <b>(i)</b> Crop management, <b>(ii)</b> Operation and maintenance of hydraulic structures, and <b>(iii)</b> Water management)</li> <li>2. Improved seeds</li> </ol>
Ethiopia	<ul style="list-style-type: none"> <li>▪ Governance problems</li> <li>▪ Unbalanced water resources management and allocation</li> <li>▪ Overall optimization of the system</li> </ul>	<ul style="list-style-type: none"> <li>▪ Improve the water management system</li> <li>▪ Review strategies for the allocation of shared resources</li> <li>▪ Implement controlled strategies for crop rotation according to the market needs</li> </ul>	<ol style="list-style-type: none"> <li>1. Agroforestry</li> <li>2. Crop Rotation</li> <li>3. Water Users Association (Consultancy oriented: <b>(i)</b> Water allocation and distribution-up/downstream; <b>(ii)</b> Larger scale designing; and <b>(iii)</b> Informed access to the market with economic consultancy)</li> </ol>

(\*) These are selected because the previous ones were “candidates”



## BRIEF DESCRIPTION OF THE SELECTED BEST MANAGEMENT PRACTICES





## BEST MANAGEMENT PRACTICES FOR APPLICATION IN EGYPT

### A. EGYPT

#### APPLICATION CATEGORY: SOIL MANAGEMENT

##### 1. COMPOSTING

###### About

Organic manures are defined as natural products used by farmers to enhance sustainable crop production and improve soil health.

Major examples of organic manures include (i) farmyard manure, (ii) green manure, and (iii) compost manure prepared from crop residues and other farm wastes, oil cakes, and other biological wastes.

Composting refers to the process/practice of applying compost organic manures to cropland mainly to: maintain or improve soil organic matter levels, improve soil structure, water infiltration, nutrient, and water holding capacity, and reduce soil erosion.

Green manuring involves growing green manure crops (leguminous plants) and incorporating/plowing them into the soil. The purpose of green manuring is to: (i) improve soil organic matter and soil structure, (ii) provide nitrogen and other nutrients (P&K) for subsequent crops; (iii) recycle nutrients; (iv) provide ground cover to prevent damage to soil structure; and (v) control/smother weeds.

###### Application

The application process involves placing decomposed organic manures on the surface of the soil and then incorporating it into the soil with an implement such as a hand hoe, ox or tractor plough, and rototiller before planting is done. The organic manures can also be placed in bands at the bottom of the plough furrows or spread on top of ploughed soil so that is then worked into the soil with a harrow before planting.

###### Anticipated impacts/benefits

1. Increased soil organic matter
2. Improved soil fertility by releasing nutrients into the soil.
3. Improved soil structure, soil aeration, and water drainage.
4. Improved nutrient and water-holding capacity of the soil.
5. The application of organic manures reduces the acidity of the soil.

###### Scaling up approaches

The potential to scale up the best management practice is high because of its beneficial effects. The BMP can be scaled through on-farm demonstrations, farmer-farmer, exchange visits, farmers' groups/networks, and farmers' water users' associations.

###### Resources

1. Krishan Chandra (2005), Organic Manures, Regional Centre of Organic Farming.



2. Robert Parnes (2013), Soil Fertility, A Guide to Organic and Inorganic Soil Amendments. <http://creativecommons.org/licenses/bynd/3.0>
3. Baritz, R., Wiese, L., Verbeke, I., & Vargas, R. (2018). Voluntary guidelines for sustainable soil management: global action for healthy soils. International yearbook of soil law and policy 2017, 17-36.
4. Triberti, L., Nastri, A., & Baldoni, G. (2016). Long-term effects of crop rotation, manure and mineral fertilisation on carbon sequestration and soil fertility. European Journal of Agronomy, 74, 47-55.



## B. Intercropping Trees with Crops (Agroforestry)

### About

Agroforestry is a land use system in which woody perennials are deliberately integrated with crops on the same land management unit (<http://icraf.cgiar.org>). Examples of agroforestry systems include growing trees with annual crops, growing multi-purpose trees in croplands; improved fallow; growing trees for fuelwood (woodlots); planting trees for soil conservation and land reclamation, planting trees/shrubs on range lands or pastures, and planting forest trees (FAO, 2018).

**Tree-crop intercropping** (intercropping field crops with perennial and/or deciduous trees; and intercropping field crops with other trees) is a component of an agroforestry system used primarily to enhance soil moisture and improve soil fertility. It entails planting productive/fruit trees with crops to give farmers healthier soils and higher yields. Examples of fruit trees commonly intercropped with annual crops include orchards/citrus, avocado, and olive trees.

### Application

The application process involves planting legumes, cereals (maize) between the tree crops (citrus, avocado, olive trees, etc.) at a recommended plant spacing.

### Anticipated impacts/benefits

1. Resilient and sustainable food production (trees reduce soil erosion as their roots bind the soil in place so that it does not wash away,
2. Increased productivity per unit area. Tree crops provide additional harvests that protect the farmer against poor harvests. Appropriate tree-crop/legume combinations can increase food production; fodder production under agroforestry trees can increase milk, and meat production, thereby meeting diverse societal needs.
3. Reduced carbon emissions (in the long term) thereby helping to mitigate against impacts of climate change. Trees intercropped with crops take carbon from the atmosphere and store it safely in the soil.
4. Enhanced nutrient recycling facilitated by the trees leads to improved soil fertility and reduced dependence on chemical fertilizers.
5. Improved soil fertility attributed to nitrogen fixation by leguminous trees.
6. Diversified local economies and on-farm/household incomes. Provide additional income streams for farmers and can potentially increase crop yields per unit area while conserving natural resources.
7. Increased water use efficiency, improved soil moisture, and carbon sequestration
8. Enhanced biodiversity
9. Improves soil quality.
10. The woody roots in agroforestry systems increase water infiltration, add organic carbon to the soil, recycle nutrients, and improve nutrient retention

### Scaling up approaches

The potential for scaling up the best management practice is high. Possible uptake pathways include on-farm demonstrations, farmer-farmer, exchange visits, farmer field schools, farmers' groups/associations, and networks.

## **Resources**

1. Mbow, C., Smith, P., Skole, D., Duguma, L. & Bustamante, M. 2014. Achieving mitigation and adaptation to climate change through sustainable agroforestry practices in Africa. *Current Opinion in Environmental Sustainability*, 6, 8–14.
2. FAO. 2018. Agroforestry. Basic Knowledge, <https://www.fao.org/sustainable-forest-management/toolbox/modules/agroforestry/basic-knowledge/en/>
3. Ramachandran Nair, P. K., Mohan Kumar, B., & Nair, V. D. (2009). Agroforestry as a strategy for carbon sequestration. *Journal of plant nutrition and soil science*, 172(1), 10-23.
4. Palma, J. H. N., Graves, A. R., Bunce, R. G. H., Burgess, P. J., De Filippi, R., Keesman, K. J., ... & Herzog, F. (2007). Modeling environmental benefits of silvoarable agroforestry in Europe. *Agriculture, ecosystems & environment*, 119(3-4), 320-334.
5. Bargués Tobella, A., Reese, H., Almaw, A., Bayala, J., Malmer, A., Laudon, H., & Ilstedt, U. (2014). The effect of trees on preferential flow and soil infiltrability in an agroforestry parkland in semiarid Burkina Faso. *Water resources research*, 50(4), 3342-3354.

## APPLICATION CATEGORY: SOIL, WATER, AND CROP MANAGEMENT

### 3. WATER USERS' ASSOCIATION

#### About

Water User Associations (WUAs) are community-based organizations that share a common interest in well-performing irrigation systems.

WUAs facilitate democratization and empowerment by providing an organized forum for the farmers to address their common concerns and interests (World Bank; 2004) thereby decentralizing and improving irrigation management.

Essentially, the WUA will be used as a tool for enhanced water management (mainly for ground water).

#### Key Application Areas

1. Water Resource Management
2. Water Users' Efficiency
3. Monitoring of Water Resources (used as a tool to enhance overall monitoring of water resources)

#### Objectives

1. Safeguard farmers' rights and interests
2. Enhance farmer's knowledge and skills.
3. Boost the modernization of agriculture, increasing farmers' yield.
4. Improve farmers' livelihoods and develop the rural economy by improving livelihoods.

#### Potential Role of the WUA

1. Monitor water availability.
2. Provide technical assistance in areas such as water, soil, and crop management; livelihood diversification; marketing; finance, and savings.
3. Discuss potential projects and development (including climate change) that may affect water usage.
4. Discuss and maintain a water service or structures.
5. Correct market failure (due to information and transaction costs associated with farming)
6. Coordinate the flow of input supplies and farm products to markets.
7. Deliver missing or inadequate services and enhance bargaining strength with both suppliers and buyers

#### Anticipated Impacts/Benefits

1. Reduced conflict in water resource use allocation.
2. Improved water management systems. WUAs have the potential to advise on seasonal, innovative and culturally sensitive, and conservation-oriented water management practices for smallholder farmers.
3. Improved advocacy on issues around equitable water resource allocation among



smallholder irrigation communities. WUAs could potentially be adaptive forces that advocate for equitable sharing of water resources through inter alia, the recognition of customary rights (Richard, N. 2019).

### **Scaling up approaches**

The potential to scale up the best management practice is high because of its beneficial effects. The BMP can be scaled through on-farm demonstrations, farmer-farmer, exchange visits, farmers' groups/networks, farmers' water users' association

### **Resources**

1. BP Kiteme and J. Gikonyo (2002). Role of the WUAs in preventing and resolving water use conflicts in the Mount Kenya Highland-Lowland system through Water Users' Association.
2. Kabogo, J. E., Anderson, E. P., Hyera, P., & Kajanja, G. (2017). Facilitating public participation in water resources management. *Ecology and Society*, 22(4).



## B. KENYA

### APPLICATION CATEGORY: SOIL, WATER, AND CROP MANAGEMENT

#### 1. WATER USERS' ASSOCIATION

##### About

Water User Associations (WUAs) are community-based organizations that share a common interest in well-performing irrigation systems. WUAs facilitate democratization and empowerment by providing an organized forum for the farmers to address their common concerns and interests (World Bank; 2004) thereby decentralizing and improving irrigation management.

##### Key Application Areas

1. Water Management (scheduling of water and addressing water quality issues)
2. Land, Tenancy, and Administrative Management
3. Agronomy and Crop Management

##### Objectives

1. Better water delivery service (flexible allocation patterns, monitoring of actual services)
2. Better maintenance of the irrigation system (minimize damages, prompter repairs),
3. Reduce irrigation-associated costs (lowering of investment costs, recurrent costs, etc.)
4. Prevent and resolve water use conflicts

##### Potential Role of the WUA

1. Monitor water availability
2. Provide technical assistance in areas such as water, soil, and crop management; livelihood diversification; marketing; finance, and savings.
3. Discuss potential projects and development (including climate change) that may affect water usage
4. Discuss and maintain a water service or structures
5. Correct market failure (due to information and transaction costs associated with farming)
6. Coordinate the flow of input supplies and farm products to markets.
7. Deliver missing or inadequate services and enhance bargaining strength with both suppliers and buyers

##### Anticipated Impacts/Benefits

1. Reduced conflict in water resource use allocation. BP Kiteme and J. Gikonyo (2002) discussed the important role of the WUAs in preventing and resolving water use conflicts in the Mount Kenya Highland-Lowland system through the implementation of the Water Users' Association.
2. Improved water management systems. WUAs have the potential to advise on seasonal, innovative and culturally sensitive, and conservation-oriented water management practices for smallholder farmers (Richard, N. 2019).



### **Scaling up approaches**

There is potential to scale up the best management practice at the watershed level but this should be done considering the available resources and capacities.

### **Resources**

1. World Bank. (2004).  
<http://web.worldbank.org/archive/website00983A/WEB/OTHER/662C94AF.HTM?Opendocument&Start=1&Count=5>
2. KALRO Kenya Climate Smart Agriculture- Cotton Multiplication Project
3. Impact of changing policies on agricultural productivity: The case of Gezira Scheme, Sudan





## APPLICATION CATEGORY: SOIL MANAGEMENT

### 2. AGROFORESTRY

#### About

Agroforestry is a land use system in which woody perennials are deliberately integrated with crops on the same land management unit. Agroforestry is generally practiced to diversify and sustain smallholders' production to increase social, economic, and environmental benefits of the rural community: <http://icraf.cgiar.or>

#### Key Application Areas

1. Land, soil, and water management
2. Climate change adaptation
3. Increasing economic returns/benefits on-farm

#### Objectives

1. Soil moisture enhancement (enhance soil water retention)
2. Improve soil fertility
3. Harness economic benefits from integration with fruit trees
4. Improve carbon sequestration and reduce Green House Gas (GHG) emissions

#### Application

The application process entails planting either fruit trees or nitrogen-fixing trees (*Calliandra* spp, *Cajanus* spp, *Sesbania* spp, etc.) on plot boundaries as hedges as well as on farmer's plots, with crops planted between trees at a recommended plant spacing.

#### Anticipated Impacts/Benefits

1. Improve carbon sequestration on smallholder farmer plots. Agroforestry systems are believed to have a high potential to sequester more Carbon than pastures or field crops)
2. Improved water infiltration.
3. Improved soil fertility.

#### Scaling up approaches

The potential to scale up the best management practice is high because of its beneficial effects. The BMP can be scaled through on-farm demonstrations, farmer-farmer, exchange visits, farmers' groups/networks, and farmers' water users' associations.

#### Resources

1. Report for the KALRO Kenya Climate Smart Agriculture Project- Cotton Multiplication Project
2. Reversing Agro-based land degradation through conservation-based agriculture: Emerging experiences from Zambia's Smallholder Farming Sector.

## C. SUDAN

### APPLICATION CATEGORY: SOIL, WATER, AND CROP MANAGEMENT

#### 1. WATER USERS' ASSOCIATION/FARMERS' ASSOCIATION

##### **About**

Water User Associations (WUAs) are community-based organizations that share a common interest in well-performing irrigation systems.

A farmer organization refers to a formal or informal organization with a defined membership based on collective action (Ceres 2030). Farmers' organizations are set up to assemble and establish organizational structures to support members in pursuing their individual and collective interests.

Some examples of farmer organizations include farmer groups, farmers' associations, farmers' unions, cooperatives, farmers' federations, etc.

##### **Key Application Areas**

1. Agronomy and Crop Management
2. Irrigation Water Management
3. Land and Soil Management

##### **Objectives**

1. Safeguard farmers' rights and interests.
2. Ensure water use efficiency.
3. Boost the modernization of agriculture, improve crop yields.
4. Enhance operational maintenance of irrigation infrastructure.
5. Link farmers to the market.

##### **Potential Role of the WUA/FUA**

1. Monitor water availability.
2. Provide technical assistance in areas such as water, soil, and crop management; livelihood diversification; marketing; finance, and savings.
3. Discuss potential projects and development (including climate change) that may affect water usage.
4. Discuss and maintain a water service or structures.
5. Correct market failure (due to information and transaction costs associated with farming)
6. Coordinate the flow of input supplies and farm products to markets.
7. Deliver missing or inadequate services and enhance bargaining strength with both suppliers and buyers.

##### **Anticipated Impacts/Benefits**

1. Better water management
2. Beneficial impacts on food production and environment. Well-organized and functional





WUA/FUA will have a positive impact on productivity as well as reduce negative impacts on water resources.

3. Improved operation of the irrigation water system.
4. Increased collaboration among farmers to address common water use and crop production challenges.

### **Scaling up approaches**

There is potential to scale up the best management practice to watershed level. This could be done through: engagement with government officials/policy makers to secure buy-in, leveraging on the private sector to support such initiatives; and leveraging on the collective action by farmer organizations to establish the WUA.

### **Resources**

1. World Bank. (2004).  
<http://web.worldbank.org/archive/website00983A/WEB/OTHER/662C94AF.HTM?Opendocument&Start=1&Count=5>
2. KALRO Kenya Climate Smart Agriculture- Cotton Multiplication Project
3. Impact of changing policies on agricultural productivity: The case of Gezira Scheme, Sudan



## APPLICATION CATEGORY: CROP MANAGEMENT

### 2. IMPROVED SEED

#### About

Improved seed refers to the seed of improved cultivars/crop varieties possessing desirable/beneficial attributes (high yielding, pest, and disease tolerance, early maturing or drought tolerance, weed resistance, etc.) and recommended for production and dissemination in specific agroecological areas.

High-quality seed refers to improved and certified seed produced under the terms and conditions specified in the seed law for a given country.

#### Objectives

1. Enhance resilience to climate variability/climate change
2. Enhance distribution of high-quality seeds to improve productivity
3. Identify appropriate seed companies to provide high-quality seed
4. Link input subsidies (high-quality seed) to farmers

#### Anticipated Impacts/Benefits

1. Increased resilience to impacts of climate change
2. Improved crop productivity, food, and nutrition security. Hybrid corn can produce up to a 30% increase in yields per hectare compared to conventional varieties
3. Improved household incomes resulting in increased productivity and production
4. Increased adaption and resilience to climate change as a result of using climate-smart crop varieties
5. Increased access to production inputs

#### Scaling up approaches

The potential to scale up the best management practice is high because of its beneficial effects. The BMP can be scaled through on-farm demonstrations, farmer-farmer, exchange visits, farmers' groups/networks, and farmers' water users' associations.

#### Resources

1. KALRO Kenya Climate Smart Agriculture- Cotton Multiplication Project
2. Impact of changing policies on agricultural productivity: The case of Gezira Scheme, Sudan.
3. G.Abebe and A.Alemu (2017). Role of improved seeds towards improving livelihood and food security at Ethiopia. International Journal of Research. Journal Article. [Vol. 5 No. 2 \(2017\): Volume 5 Issue 2 - February, 2017. DOI: <https://doi.org/10.29121/granthaalayah.v5.i2.2017.1746>](#).
4. Yapa, L. (1993). What are improved seeds? An epistemology of the Green Revolution. Economic geography, 69(3), 254-273.
5. Wimalasekera, R. (2015). Role of seed quality in improving crop yields. Crop production and global environmental issues, 153-168.

## D. ETHIOPIA

### APPLICATION CATEGORY: SOIL MANAGEMENT

#### 1. AGROFORESTRY

##### About

Agroforestry is a land use system in which woody perennials are deliberately integrated with crops on the same land management unit.

Agroforestry is generally practiced diversifying and sustain smallholders' production to increase social, economic, and environmental benefits of the rural community: <http://icraf.cgiar.org>

##### Key Application Areas

1. Crop Management
2. Soil and Land Management

##### Objectives

1. Catchment protection, soil conservation, and reservoir management
2. Enhance ecosystem services.
3. Improve carbon sequestration.
4. Improve water quality and enhance soil water retention.
5. Minimize soil erosion.

##### Anticipated Impacts/Benefits

1. Enhanced ecosystem services including biodiversity.
2. Improved water quality
3. Reduced siltation of the reservoir
4. Improved nutrient recycling, leading to improved soil fertility and reduced dependence on chemical fertilizers
5. Resilient and sustainable food production (trees reduce soil erosion as their roots bind the soil in place so that it does not wash away,
6. Reduced carbon emissions (in the long term) thereby helping to mitigate against impacts of climate change.
7. Improved air quality and carbon sequestration

##### Scaling up approaches

The potential to scale up the best management practice is high because of its beneficial effects. The BMP can be scaled through on-farm demonstrations, farmer-farmer, exchange visits, farmers' groups/networks, farmers' water users' association.

##### Resources

1. Reversing Agro-based land degradation through conservation-based agriculture: Emerging



experiences from Zambia's Smallholder Farming Sector (Zambia).

2. Ramachandran Nair, P. K., Mohan Kumar, B., & Nair, V. D. (2009). Agroforestry as a strategy for carbon sequestration. *Journal of plant nutrition and soil science*, 172(1), 10-23.
3. Palma, J. H. N., Graves, A. R., Bunce, R. G. H., Burgess, P. J., De Filippi, R., Keesman, K. J., ... & Herzog, F. (2007). Modeling environmental benefits of silvoarable agroforestry in Europe. *Agriculture, ecosystems & environment*, 119(3-4), 320-334.
4. Bargués Tobella, A., Reese, H., Almaw, A., Bayala, J., Malmer, A., Laudon, H., & Ilstedt, U. (2014). The effect of trees on preferential flow and soil infiltrability in an agroforestry parkland in semiarid Burkina Faso. *Water resources research*, 50(4), 3342-3354.

## APPLICATION CATEGORY: SOIL AND CROP MANAGEMENT

### 2. CROP ROTATION

#### About

Crop rotation is the process of planting different crops sequentially on the same plot of land to: improve soil health; optimize nutrients in the soil; and combat pests and diseases.

#### Key Application Areas

1. Soil fertility improvement
2. Pest and disease control

#### Objectives

1. Mitigate/reduce soil acidity.
2. Improve soil fertility and water availability.
3. Reduce pests and diseases on farmers' plots.
4. Mitigation of carbon dioxide emissions, both by increasing C input from crop residues as well as carbon sequestration.

#### Anticipated Impacts

1. Increased Soil Organic Matter. Available evidence shows that crop rotations significantly increased the content of stable organic matter and nitrogen in the 0-40cm depth of the soil.
2. Improved nutrient recycling.
3. Improved yield of crops in the rotation.

#### Scaling up approaches

The potential to scale up the best management practice is high because of its beneficial effects.

The BMP can be scaled through on-farm demonstrations, farmer-farmer, exchange visits, farmers' groups/networks, and farmers' water users' associations.

#### Resources

1. Brankatschk, G., & Finkbeiner, M. (2015). Modeling crop rotation in agricultural LCAs—challenges and potential solutions. *Agricultural Systems*, 138, 66-76.
2. Triberti *et al*, 2016
3. Galantini *et al* (2000). Colbach, N., & Debaeke, P. (1998). Integrating crop management and crop rotation effects into models of weed population dynamics: a review. *Weed science*, 46(6), 717-728.

## APPLICATION CATEGORY: SOIL, WATER, AND CROP MANAGEMENT

### 3. WATER USERS' ASSOCIATION/FARMERS' ASSOCIATION

#### **About**

Water User Associations (WUAs) are community-based organizations that share a common interest in well-performing irrigation systems.

A farmer organization refers to a formal or informal organization with a defined membership based on collective action (Ceres 2030). Farmers' organizations are set up to assemble and establish organizational structures to support members in pursuing their individual and collective interests.

Some examples of farmer organizations include farmer groups, farmers' associations, farmers' unions, cooperatives, farmers' federations, etc.

#### **Key Intervention Areas**

1. Governance and Administrative management (water allocation/distribution between downstream and upstream farmers)
2. Large scale planification
3. Market access (informed access to the market with economic consultancy)

#### **Objectives**

1. Equitable water allocation.
2. Address marketing issues (market access).
3. Boost the modernization of agriculture, improve crop yields.
4. Operation and maintenance of infrastructure.
5. Address conflict management.

#### **Potential Role of the WUA**

1. Monitor water availability.
2. Provide technical assistance in areas such as water, soil, and crop management; livelihood diversification; marketing; finance, and savings.
3. Discuss potential projects and development (including climate change) that may affect water usage.
4. Discuss and maintain a water service or structures.
5. Correct market failure (due to information and transaction costs associated with farming).
6. Coordinate the flow of input supplies and farm products to markets.
7. Deliver missing or inadequate services and enhance bargaining strength with both suppliers and buyers.

#### **Anticipated Impacts/Benefits**

1. Increased access to markets by smallholders.
2. Equitable water distribution between upstream and downstream farmers.



3. Enhanced production and productivity.
4. Reduced water resource use conflicts in the Koga Irrigation Scheme.

### **Scaling up approaches**

There is potential to scale up the best management practice at watershed level, but this should be done considering the available resources and capacities.

### **Resources**

1. Lempériere, P.; Hagos, F.; Lefore, N.; Hailelassie, A.; Langan, S. 2014. Establishing and strengthening irrigation water users associations (IWUAs) in Ethiopia: a manual for trainers. Colombo, Sri Lanka: International Water Management Institute (IWMI). 76p. doi:10.5337/2014.232
2. McCornick, P. G., & D. J. Merrey. 2005. Water Users Associations & Their Relevance to Water Governance in Sub-Saharan Africa. In Proceedings of Water District Management & Governance Conference, US Commission on Irrigation & Drainage Conference, San Diego, California. March 29 to April 2, 2005.
3. Sida, Y. G., Simane, B., Assefa, E., & Hailelassie, A. 2022. Polycentric irrigation water governance: Irrigation water users associations service delivery in Ketar subbasin, Ethiopia. African Journal of Agricultural Research, 18(10), 783-791. DOI /<https://doi.org/10.5897/AJAR2022.16153>

### Annex 3: List of Participants

S/n	Name	Surname	Partner Organization	Country	Email
1	Stephen	Wathome	EU Delegation (In Nairobi)	Kenya	<a href="mailto:Stephen.WATHOME@eeas.europa.eu">Stephen.WATHOME@eeas.europa.eu</a>
2	Martino	Melli	AICS CAIRO	Egypt	<a href="mailto:martino.melli@aics.gov.it">martino.melli@aics.gov.it</a>
3	Jacopo	Tavassi	AICS CAIRO	Egypt	<a href="mailto:jacopo.tavassi@aics.gov.it">jacopo.tavassi@aics.gov.it</a>
4	Claudio	Bogliotti	CIHEAM BARI	Belgium	<a href="mailto:bogliotti@iamb.it">bogliotti@iamb.it</a>
5	Gaetano	Ladisa	CIHEAM BARI	Italy	<a href="mailto:ladisa@iamb.it">ladisa@iamb.it</a>
6	Saverio	De Santis	CIHEAM BARI	Italy	<a href="mailto:desantis@iamb.it">desantis@iamb.it</a>
6	Silvia	Lecci	CIHEAM BARI	Italy	<a href="mailto:lecci@iamb.it">lecci@iamb.it</a>
7	Aymen	Sawassi*	CIHEAM BARI	Italy	<a href="mailto:sawassi@iamb.it">sawassi@iamb.it</a>
8	Raffaella	Balestrini*	CNR-IPSP	Italy	<a href="mailto:raffaella.balestrini@ipsp.cnr.it">raffaella.balestrini@ipsp.cnr.it</a>
9	Alice	Calvo	CNR-IPSP	Italy	<a href="mailto:alice.calvo@ipsp.cnr.it">alice.calvo@ipsp.cnr.it</a>
10	Sherif	Salama	HU	Egypt	<a href="mailto:sherif.mohamady@hu.edu.eg">sherif.mohamady@hu.edu.eg</a>
11	Wael Khairy	Khairy	HU	Egypt	<a href="mailto:wael.khairy@hu.edu.eg">wael.khairy@hu.edu.eg</a>
12	Salma	Wael	HU	Egypt	<a href="mailto:Salma.wael@hu.edu.eg">Salma.wael@hu.edu.eg</a>
13	Zhanguo	Bai	ISRIC	The Netherlands	<a href="mailto:zhanguo.bai@wur.nl">zhanguo.bai@wur.nl</a>
14	Luuk	Fleskens	ISRIC	The Netherlands	<a href="mailto:luuk.fleskens@wur.nl">luuk.fleskens@wur.nl</a>
15	Katri	Rankinen	SYKE	Finland	<a href="mailto:katri.rankinen@syke.fi">katri.rankinen@syke.fi</a>
16	Marketta	Juppi	SYKE	Finland	<a href="mailto:marketta.juppi@syke.fi">marketta.juppi@syke.fi</a>
17	Amare Bantider	Dagnew	WLRC	Ethiopia	<a href="mailto:amare.b@wlrc-eth.org">amare.b@wlrc-eth.org</a>
18	Tena	Alamirew	WLRC	Ethiopia	<a href="mailto:tena.a@wlrc-eth.org">tena.a@wlrc-eth.org</a>
19	Andrea	Bozzetto	CIHEAM BARI	Ethiopia	<a href="mailto:bozzetto@iamb.it">bozzetto@iamb.it</a>
20	Ahmed	Elshaikh	WRC	Sudan	<a href="mailto:ahmedhayaty@live.com">ahmedhayaty@live.com</a>
21	Gamal	Abdo	WRC	Sudan	<a href="mailto:gabdo2000@yahoo.com">gabdo2000@yahoo.com</a>
22	Kamal	Abdalla	WRC	Sudan	<a href="mailto:hajeltom@gmail.com">hajeltom@gmail.com</a>
23	Blaise	Amony	ASARECA	Uganda	<a href="mailto:b.amony@asareca.org">b.amony@asareca.org</a>
24	Moses	Odeke	ASARECA	Uganda	<a href="mailto:m.odeke@asareca.org">m.odeke@asareca.org</a>
25	Annet	Wanyana	ASARECA	Uganda	<a href="mailto:a.wanyana@asareca.org">a.wanyana@asareca.org</a>
26	Racheal	Musisi Namuzibwa	ASARECA	Uganda	<a href="mailto:r.namuzibwa@asareca.org">r.namuzibwa@asareca.org</a>
27	Enock	Warinda	ASARECA	Uganda	<a href="mailto:e.warinda@asareca.org">e.warinda@asareca.org</a>
28	Giuseppe	Saracino	CIHEAM BARI	Kenya	<a href="mailto:saracino@iamb.it">saracino@iamb.it</a>
29	Michael	Okoti	KALRO	Kenya	<a href="mailto:michael.okoti@kalro.org">michael.okoti@kalro.org</a>
30	Virginia	Wangari	KALRO	Kenya	<a href="mailto:virginia.ndungu@kalro.org">virginia.ndungu@kalro.org</a>
31	Alice	Murage	KALRO	Kenya	<a href="mailto:Alice.Murage@kalro.org">Alice.Murage@kalro.org</a>
32	Grace	Mbugua	KALRO	Kenya	<a href="mailto:grace.mbugua@kalro.org">grace.mbugua@kalro.org</a>
33	Carolyne	Minayo	KALRO	Kenya	<a href="mailto:carolyne.minayo@kalro.org">carolyne.minayo@kalro.org</a>

