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Second report on knowledge sharing events within the FFRUs

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LIST OF PROJECT BENEFICIARIES

Università degli Studi di Sassari	UNISS	Italy
Fondazione Acra	ACRA	Italy
Cranfield University	CRAN	United Kingdom
Institut de Recherche pour le Developpement	IRD	France
Aristotelio Panepistimio Thessalonikis	AUTH	Greece
Université Nazi Boni	UNB	Burkina Faso
Institut de l'environnement et de Recherches Agricoles	INERA	Burkina Faso
The University of Makeni	UNIMAK	Sierra Leone
Council for Scientific and Industrial Research - Savanna Agricultural Research Institute	CSIR-SARI	Ghana
Kundok Development Consult limited	KDC	Ghana
Kenya Agricultural and Livestock Research Organisation	KALRO	Kenya
University Of Nairobi	UoN	Kenya
The Nelson Mandela African Institution of Science and Technology	NM-AIST	Tanzania (United Republic of)
Tanzania Agricultural Research Institute	TARI	Tanzania (United Republic of)
Hawassa University	HU	Ethiopia
Jimma University	JU	Ethiopia
International Centre for Research in Agroforestry	ICRAF	Kenya /Tanzania
Stmicroelectronics Srl	ST-I	Italy
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EXECUTIVE SUMMARY

Knowledge-sharing events are fundamental to increase the dialogue among farmers, scientists, technicians, and policy makers within the FFRUs.

Knowledge sharing and transfer days are the place to discuss obstacles, solutions and replicable changes provided by the technologies tested in each area.

This report provides an overview of the main activities carried out within the EWA-BELT Project from the 1st of January 2022 to the 30th of November 2022 with the aim of outlining a theory of change for promising technologies and practices, to build guidelines by involving the same stakeholders who bring the relevant change.

The theory of change is based on an approach that integrates both visions, knowledge, and perspectives of different actors around a common theme, in this case, the technological innovation tested in each FFRU. Each technology aims to increase yields while preserving natural resources and providing ecosystem services (Adekunle e Fatunbi, 2014).

The impact of the technologies is analysed within the project by taking into consideration the different environmental, social and economic "dimensions" linked to the technological innovation tested on different spatial scales (field, farm, household, and landscape).

In this report, we will focus on analysing the impacts from the point of view of the actors who use or benefit from the tested technologies at the various stages of the production chain.

1. Training and knowledge sharing events from month 16 to month 26

From month 16 until month 26, more than 20[1] training/knowledge sharing events were held in each African country at FFRUs scale.

Table 1. List of knowledge sharing events from month 16 to month 26

Country	Partner Organisation	Date	Location	Technology package/Activity	Target crop(s)
Ethiopia	Jimma University	November 2022	Waro-kolobo	On farm varietal assessment (processing and cooking demonstration)	Anchote
Ethiopia	Hawassa University	September 2022	Bati Lejano Kebele	Pest management (biopesticide…)	Pepper
Kenya	University of Nairobi	March 2022	Nyakach and Karachuonyo	Agronomic practices for pest management (and yield increase)	Groundnuts
Kenya	KALRO	May 2022	Bungoma, Busia, Kakamega Counties	Pest management (Aflasafe application)	Finger millet, Sorghum, Maize
Kenya	KALRO	July and August 2022	Bungoma, Busia, Kakamega Counties	Soil and pest management	Finger millet, Sorghum, Maize
Kenya	KALRO	June 2022, August and September 2022	Bungoma, Busia, Kakamega Counties	Pest management (pre and post-harvest) - Value chain mapping	Finger millet, Sorghum, Maize
Burkina Faso	ACRA	March 2022	Guiè	Sharing of water and soil management - locally adapted strategies	/
Burkina Faso	ACRA	August 2022	Yallé	Training events on traditional pest management strategies	Cowpea
Burkina Faso	ACRA	September 2022	Zorgho and Mogtédo	Participatory varietal assessment	Cowpea
Burkina Faso	UNB and INERA	September - October	Bokuy, Soukuy, Kari	Soil management strategies	Sorghum, Maize,

[1] Most of the events consisted of several days of activities, as they were repeated in the different case study areas within the FFRUs.

		2022	and Bondokuy		Cowpea, Cotton
Tanzania	NM-AIST	March 2022 and August 2022	Lendikinya, Lekamba and Ngarenanyuki	Soil erosion control and soil management	
Tanzania	TARI		Arusha District	Varietal selection, soil management strategies, pest management strategies	
Tanzania	TARI	February 2022	Meru District	Soil management strategies	
Tanzania	TARI	February - March 2022	Monduli District	Varietal selection, soil management strategies, water harvesting techniques	Maize
Ghana	KDC	November 2022	Nabdam, Talensi, West Mamprusi and Saverugu Districts	Sharing of protocols and the results for each technology: (i) Stone bunding to conserve water and soil; (ii) Organic and inorganic fertilizers (ISFM); (iii) Intercropping for soil fertility management; (iv) Fonio varietal testing for high yields; (v) Use of bio-pesticides to control pests on the field	Maize, Fonio, Groundnut, Soybean and Cowpea
Ghana	CSIR-SARI	September 2022	Nakpanzoo	Post-harvest management	Maize
Ghana	CSIR-SARI	September 2022	Nagondi	Post-harvest management	Maize
Kenya	EWA-Belt Consortium	October 2022	Nairobi and Kisumu	Capacity Building Workshop on WP3	

2. Overview of the main events from month 16 to month 26

Ethiopia

Jimma University (JU)

On-farm evaluation and cooking demonstration of Anchote tubers

On 9 November 2022, in the Waro-Kolobo study area, Jimma University organized an on-farm evaluation of Anchote *(Coccinia abyssinica)* with the participation of 23 farmers (at least 7 women), Development Agents (DAs) and technicians. The aim of the Field Day was to explain the nutritional qualities of the tuber, followed by food preparation, tasting and ranking. Food preparation exclusively involved women, since they are the ones responsible for preparing food for the family. Both men and women participated in the ranking and tasting (pictures in the Annex). No significant differences were found between men and women during the ranking.

From the observations gathered during the field days held in 2021, it emerged that one of the 'bottlenecks' for the adoption of the technology was related to the processing and cooking process, which, according to traditional practice, required too much energy. For this reason, during the knowledge exchange day, discussions were held on how to treat the periderm (skin) before cooking in order to speed up the process. After experimenting with it, farmers expressed interest in reintegrating Anchote into their food system this year.

Figure 1. Demonstrating peeling and slicing of Anchote tubers before cooking to the women

Participatory evaluation of three Anchote varieties was carried out involving one improved variety called “Desta 01”, and two not-codified local varieties, considering yield and quality (fiber content and taste) as variables to assess.

The improved variety showed the best yields. However, the local varieties showed a higher overall taste and lower fiber content (especially local variety 2). When discussing the choice between taste and yield, the farmers preferred the local varieties despite their relatively low yield.

Nevertheless, the DAs suggested using the improved variety because of the consistent yield in all the fields. In this regard, JU is planning analyses of the nutritional composition (raw and cooked samples, including leaves) in order to provide more information about the nutritional traits and help choosing the variety with the best trade-off between food quality and yield.

The main challenge is the propagation of genetic material. To overcome this problem, JU provided simple guidelines for propagation, that is leaving a few plants unharvested and waiting for fruit set as the only way to collect seeds. In addition, it is advisable to have seed bank plants (plants that serve only as a seed source and not for tubers) close to the farmers' houses.

Hawassa University (HU)

On-farm demonstration of improved pepper production with emphasis on integrated pest management

On 17 September 2022, HU managed a demonstration day in Bati Lejano Kebele (PA-East Meskan District), that saw the participation of 3 researchers, 23 District of Agriculture Office representatives and 60 farmers. The field day aimed to improve the production and productivity of peppers grown by small farmers through efficient and sustainable pest and disease management through:

- creating awareness and motivation over the demonstration of integrated pest/disease control methods (seed treatment with native and commercial *Trichoderma spp*.);
- promoting the exchange of information and transfer of technology between the different stakeholders involved in improving pest and disease management.

The technology had been selected following a preliminary survey in 2021 involving 20 farmers reporting that pepper cultivation in the Meskan district was limited by the disease. In addition, the District Office of Agriculture pointed out the problem.

This issue, as well as the strategy to control it (promoted by HU researchers) was the subject of the field day discussion where 60 farmers (55 men and 5 women) and 23 representatives of the District Agriculture Office participated.

Figure 2. On-farm demonstration day in Meskan district

Stakeholders highlighted as the main obstacle the accessibility/availability of biocontrol agents for the management of pepper wilt and chemical products against insects/aphids.

Unfortunately, at least for the foreseeable future, it will not be possible to have local farmers reproducing and maintaining these biological entities due to the need for clean/aseptic conditions and a

cool environment. Therefore, researchers are working to develop local capacities at HU. The latter will also be responsible for distributing the bioagents to farmers and training them on their application in the field as seed treatment.

Kenya

University of Nairobi (UoN)

On-farm practical demonstration of the main agronomic techniques for pest management and yield increase

Throughout the month of March 2022, UoN managed several field days in the FFRUs of Nyakach and Karachuonyo areas, with the participation of farmers from such areas and their representatives (sub-chiefs) as well as a representative of a Food and Beverage company. The site-specific trainings involve about 80 stakeholders (five UoN researchers, one or two technicians of local private companies) and farmers, of whom 45 women and 35 men on average.

The objective of the training days, organized in each district, was to demonstrate the following agronomic practices: the importance of row planting on peanut crops to enable proper mechanization, reduce the incidence of pathogens, and increase yields.

Farmers mainly observed an increase in production per hectare.
The main difficulties encountered are mainly related to the purchase of machinery. Farmers propose to use their CBO (Community-Based Organization) to ask for money to facilitate mechanization.

Figure 3. Trial plots set-up

Kenya Agricultural and Livestock Research Organisation (KALRO)

KALRO conducted on-farm events in all study areas within the FFRU. In all events: the participants involved came from all the 15 farmer groups in the case study areas in western Kenya (overall 232 farmers – 70 males and 162 females), extension agents, and KALRO researchers.

1. Pest management - Aflasafe application (long rains trials 2022)

During the end of March 2022 and beginning of April 2022 KALRO managed several field trials in the FFRUs of the Musanda, Shianda, Nambale, Mateka (Bumula) areas, with the participation of 60 farmers (19 males and 41 women) from the different case study areas in the FFRU.

Discussions were held on the protocol and procedures to be followed for the application of Aflasafe KE01 on finger millet, sorghum, and maize, and in general, on the technical aspects of the technologies applied in the EWA-BELT project.

A key element in encouraging its adoption is to ensure the availability of Aflasafe KE01 close to farmers. Currently, Aflasafe is produced by KALRO in Eastern Kenya and is distributed by agricultural retailers according to demand. It is a relatively new product in western Kenya.

2. Soil and pest management (crop rotation and Aflasafe application) (long rains trials 2022)

Throughout the month of May 2022 KALRO managed several field days in the FFRUs of the Musanda, Shianda, Nambale, Mateka (Bumula) areas.

The main topics discussed with the 13 farmers involved (8 women, 5 men) were crop maturity indices, the protocol to be followed for harvesting procedures, and post-harvest management (farmers were advised to use the post-harvest technologies they were trained on in November 2021). The main crops were millet, sorghum and maize.
Soil fertility and Aflasafe tests were conducted, and data collected, and crop samples were taken for further laboratory analysis.
Next steps for the second planting season (short rains) were discussed as well: to respect crop rotations, groundnuts will be planted in all trials. Therefore, technologies will be applied to legumes as well.

The main observations made by the farmers were made by comparing with neighbouring fields and technologies. The farmers are beginning to appreciate the importance of the technologies from the visual assessment of the crops on the farm at harvest time. Farmers were eager to receive feedback on the yields of their plots and the results of laboratory analysis of harvested samples.

Figure 4. Data collection during harvesting of sorghum and maize in Western Kenya case study area

3. Value chain mapping

The activity entailed interviewing traders, aggregators and processors of finger millet, groundnut, sorghum, and maize to understand their operation costs and the challenges and opportunities in their businesses. This entailed conducting Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis and Gross Margins Analysis of the value chains. A total of 25 traders, 5 processors, and 6 aggregators trading in sorghum, groundnuts, maize, and finger millet were interviewed. Annual production data for the case study areas were obtained from the Agriculture Extension offices of the Ministry of Agriculture in the case study areas.

The activity was carried out in two phases: the first involved focused group discussions (FGDs) with farmers, in which production data was collected and validated during the FGD. The second phase involved interviewing traders, aggregators, and processors.

Results were analyzed and shared with the farmers but not yet with interviewed stakeholders.
A total of 187 farmers were involved in the process, of which 112 were women, 75 men.

Burkina Faso

ACRA Foundation

1. Exchange of knowledge on main locally adapted water and soil management techniques

On 24 March 2022, a knowledge exchange visit took place at the Guiè pilot farm of the Zoram-Naataba Association in the municipality of Dapélogo. The technician and 4 representatives per cooperative from each study area participated in the initiative (16 farmers, 8 women and 8 men).

The day was held with the objective of creating a framework for sharing experiences on agro-ecological practices with producers from the Farmer Field Research Units (FFRUs); strengthening producers' knowledge on means and techniques for resilience in the face of climate change; and identifying the best locally adapted water and soil management practices that can be transferred within the FFRUs. Indeed, during the events carried out in 2021 the main issues detected were: difficulties related to the increasingly short rainy season, difficulties in obtaining starter for compost (free and uncontrolled grazing of animals), and difficulties in obtaining organic matter during the dry season.

The main techniques discussed were water harvesting techniques and soil management techniques (composting).

In particular, the following were detailed:
- the Zai water harvesting technique, which was then implemented in May 2022 within the FFRU in Léo;
- agri-livestock integration (on-site cattle rearing techniques) for fertilizer/composting starter collection (how to feed cattle in the off-season);
- propagation of the main local species (local species propagation techniques were deepened) for composting organic matter

2. Training events on traditional pest management strategies

To tackle the main pathogens (*Callosobruchus maculatus*) of cowpea ACRA organized two training events on traditional pest management techniques in two FFRUs. ACRA provided the equipment as well to repeat the phytosanitary treatment.

The biopesticide was extracted from *Azadirachta indica* (Neem) and *Cassia nigricans* leaves.

16 farmers (8 women, 8 men) were trained on the techniques for the proper preparation of the two treatments in all their various phases: preparation of the plant material, extraction technique of the active ingredients (hot, cold extraction, etc.), correct methods of administration (in this case, for foliar administration, use of vegetable soap to improve persistence and adhesiveness).

Figure 5. Crushing the leaves of Cassia nigricans during the sharing event

3. Participatory varietal assessment

In two moments of the season (25th August 2022, 30th September 2022), a participatory evaluation was carried out between 4 improved varieties and 2 local cowpea varieties in the Léo area. In particular, germination rate, flowering period and pathogen resistance were assessed.

On 10th and 11th November, a participatory evaluation analysis was carried out between 3 improved varieties and 2 local varieties of pearl millet and of the intercropping technology (pearl millet intercropped with cowpea) in Zhorgo area, with the participation of 12 farmers (11 women, 1 man).

In particular, the participating farmers had the opportunity to discuss the characteristics of the varieties with the COASP (Comité Ouest Africain des Semences Paysannes) technicians and the INERA

researcher (the seeds tested came from their germplasm banks). The ACRA technician facilitated the two-day dialogue.

First, a qualitative-quantitative evaluation of the intercropping experiment was made.

All the participants observed that, at morphological level, the ears of millet cultivated as sole plots were very small compared to those of the crop intercropped. The INERA researcher found the result of this experiment, carried out in the peasant-environment, very satisfactory in terms of formed ears and grain-filled ears. Indeed, in their research station it's impossible to harvest millet without the use of insect netting to protect the millet from birds. The producers found this variety very interesting in terms of ear production and production cycle, which is adapted to the context of climate change. The COASP technicians were interested in experimenting with this millet variety in their areas.

Each plot was visited and assessed: the target growers in the fields provided the advantages and constraints they encountered in the production of each variety. The farmers preferred the local variety, as the shape of the ears of this variety according to them could produce better than the improved ones. COASP technicians emphasised the agronomic techniques to obtain better yields, considering the cropping cycle. From the farmers' observations it seems that the local variety is tastier than the improved ones (from the beginning of fructification birds move from improved variety to the local one). ACRA is planning further assessment to verify it and to seed more plots during the season 2023 (thanks to the COASP cooperation).

The participants selected the best varieties for family consumption and more resistant to pest and climate conditions as well.

University of Nazi Boni (UNB) and Institut de l'environnement et de Recherches Agricoles (INERA)

Sharing events on soil management strategies

From the 25th September to the 10th October, 2022, field exchange days were organised with farmers at each of the six EWA-BELT project sites. The farmers visited the experimental sites with UNB and INERA researchers and PhD students, technicians from the Ministry of Agriculture and of the cotton company SOFITEX.

This plurality of actors made it possible to deepen the issues related to each technology package tested by the farmers, both from a technical point of view (thanks to the presence of researchers and technicians) and from an experiential point of view (there was an exchange between farmers from all FFRUs). It was also an opportunity to establish together the next steps for the next agricultural year 2023-2024.

In particular, the following technology packages, related to soil management, were explored:

a. Effects of fertilisation on sorghum and maize yield in cotton-cereal farming systems;

b. Effects of biochar and co-compost on soil carbon content in cotton-growing systems;

c. Effects of compost and intercropping on soil properties and productivity of sorghum and cowpea;

d. Evaluation of the effects of minimum tillage and recycling of crop residues (processed through compost) on soil nutrient balance and crop productivity in cotton- and cereal-based cropping systems.

During the field days, most of the farmers observed and appreciated the effects of the treatments on the vegetative growth of the crops (sorghum, maize, cowpea, cotton).

The main difficulty mentioned by the farmers was the low availability of biomass for compost production, the low production of compost at the household level and the low nutrient content of the compost produced at the household level.

To overcome these problems, farmers were instructed on how to manage crop residues in their farming systems for intensive organic manure production.

In addition, the technicians who were present decided to develop a capacity-building program to train farmers in organic manure production and the integration of agriculture and animal livestock.

Figure 6. Farmers from Dohoun visiting trial 1 - Effects of fertilization on sorghum and maize yield in cotton-cereals-based farming systems

Tanzania

Nelson Mandela African Institution of Science and Technology (NM-AIST)

Demonstration field day on combating soil erosion

NM-AIST organised a first field day (March 2022) to set up experimental plots to combat erosion within the FFRUs. Erosion control strategies (cover crop, grass strips) were discussed between 10 farmers (4 women and 6 men), 3 researchers and 4 extension agents.

A second day was organised in August 2022 to evaluate the strategies applied and the problems encountered. The main difficulties encountered by farmers are related to the challenge of growing cover crops, whose growth is hampered by increasingly scarce rainfall and animal grazing. Through discussions with participants, a few possible solutions emerged: the use of species locally adapted and available as well as fencing to prevent grazing.

Figure 7. Soil erosion control plot in Monduli District

The list of species was already identified during an "initial sharing event" held in 2021 (*Pennisetum purpureum* (local available), *Lablab purpureus*, *Desmodium uncinatum*, and *Canavalia ensiformis*). However, considering the main issues encountered during the last season, farmers have identified resistance to abiotic stresses and rapid growth as the most important traits. One season was not enough for a clear assessment of the species; a second assessment, with the involvement of farmers, will be carried out during the current short rainy season.

Tanzania Agricultural Research Institute (TARI)

During 2022, TARI held six knowledge-sharing and exchange events on different topics.

1. Soil and pest management strategies training - Arusha District

In the Arusha district, two training days were held to learn more about the different technologies applied: soil management strategies (production of compost, vermicompost, organic mulch), pest management strategies (production of natural biopesticides), use of improved seeds.

In May, researchers from the TARI science team and some farmers made an exchange visit to ECHO's (East Africa Impact Center) office to learn how to produce organic manure and to plan agroforestry systems.

During the demonstration day, composted fertilizers and bio-preparations based on effective pest control species were prepared (drying techniques and subsequent grinding into powder). Afterward, efficacy rates were compared.

During the second day, on-farm, the participants of the first day transferred the knowledge they had learned to a larger group of farmers, technicians, and researchers with special focus on horticultural crops. In particular, the group discussed the importance of organic farming for human health by using drought-resistant seeds to increase yields.

2. Soil management strategies training - Meru District

From 24th to 27th February, 2022, TARI researchers in Selian conducted practical training to 12 farmers in the Kwaugoro group (5 women and 7 men) in Meru district on soil management strategies (use of cow manure and NPK for fertilizer).

In particular, the following were explored:

- how to layout the farm before starting the trial;
- advantages of using certified seed to increase crop yield;
- how to plant maize using the recommended spacing of 75 cm x 30 cm.

3. Soil management strategies and water harvesting techniques training - Monduli District

From 28th February to 3rd March 2022, TARI researchers conducted training for 12 farmers (6 women and 6 men) from Kwaugoro in Monduli district on soil management strategies (cow manure, demonstration of the effects of integrating cow manure and inorganic fertilisers, tillage techniques), water harvesting techniques (for soil moisture conservation), and the use of improved seeds.

Figure 8. A researcher training farmer at Monduli

In particular, the following were explored:

- how to layout the farm before starting the trial;
- advantages of using certified and drought tolerant maize seeds to increase crop yield;
- how to plant maize using the recommended spacing of 75 cm x 30 cm;
- advantages of supplementing organic manure with inorganic fertilizers on maize production;
- advantages of adopting soil water conservation techniques such as “chololo pits” and tied tethered ridges versus no-till practice.

Ghana

Kundok Develpoment Consult (KDC)

Sharing of protocols and the results for each technology

The protocols for carrying out each technology trials were shared with the Ministry of Agriculture (MoFA) staff (who supervise the day-to-day field activities with farmers at the FFRU) and Farmer Based Organizations (FBO) executives. The trials implemented in 2022 were:

a) The effect of stone-bunding and non-bunding on the yield of maize;
b) Effect of organic and inorganic fertilization (ISFM) on the yield of maize;
c) The intercropping of fonio with Legumes (groundnuts, soya bean and cowpea) on the yield of fonio;
d) Fonio varietal trials to select high yielding variety for production by farmers;
e) The use of biopesticides to control pests on cowpea on the field.

In addition to the individual training events carried out in November 2022, the implementation of the protocols included a series of step-by-step activities to be carried out in the field with the farmers, starting with: soil preparation methods, planting spaces for each of the crops used (both single-crop and intercropping), timely agronomic activities (e.g. timely weed control after sowing, timely application of fertilizers, in the right quantities, and with the right application method), and pest and disease management. The data collection phase, as well as data collection, were also included.

After the final collection of data on yield and other traits for each of the technologies, these were statistically analyzed to assess the effects of the treatments on the crops. The KDC then organized a series of forums in each of the 4 FFRU districts to share the knowledge gained from the results of each trial with MoFA staff (3 or 4 for each event) and farmers (20 total, roughly 50% women, 50% men).

Figure 9. Organic on the right and half dose organic and half dose inorganic fertilizer on the left

Together with the stakeholders, the main positive changes brought about by technology were identified:

a) and b) Maize crops were more vigorous and developed more rapidly on (i) organic and inorganic fields compared to organic-only or inorganic-only fields and (ii) on bunded versus non-bundled fields;

c) Among the legumes intercropped, fonio performed better in fonio/cowpea on the field than with the other legumes;

d) Regarding fonio varieties, the earliest varieties were selected as the most drought resistant. Fonio earliest varieties have been selected for drought resistance/escape, which means that they are able to ripen and be harvested before the onset of drought. Further studies will be set up in the future to try to identify drought-tolerant characteristics in fonio.

e) Neem seed oil is more effective in controlling the main insects (aphids and *Maruca Vitrata*) than *Securidaca* treatment of bean plots.

In the case of some technologies, some obstacles were identified:

- (technology a) An unreliable rainfall pattern, for which drought-tolerant maize varieties were used.
- (technology b) Difficulties in obtaining organic fertilizers for ISFM tests, for which it was necessary to:

i. Firstly, KDC had to identify farmers with enough cattle producing extra manure to provide to those who did not have any but wanted to participate in the trial in each district.
ii. Secondly, KDC instructed the farmers that did not have sufficient manure on how to set up the farming system to integrate the crops with the cattle in order to obtain sufficient and better manure later. One of the key best practices was to provide livestock with enough residues during the dry season to continue producing manure.
iii. The third approach, which is currently being implemented, is to start linking FBOs to organic fertilizer production companies (this is because the number of companies producing fertilizer commercially for farmers in the country is increasing).

Council for Scientific and Industrial Research - Savanna Agricultural Research Institute (CSIR-SARI)

1. Post-harvest management - Participatory assessment of different storage systems [Savelugu district]

On 28 September 2022 in Nakpanzoo, Savelugu district, a demonstration day was held on the storage of Maize. The objective of this demonstration was to show the effects of different storage techniques and protective treatments on the shelf life of maize. 118 farmers took part in this activity, of which 30% approximately were women.

During the day, after picking up the threads of the project with the participants, the roles and responsibilities of each person, the various storage technologies and treatments, the practical and participatory assessment of insect damage in all treatments, and concluding remarks were shared.

The sharing of good post-harvest practices among participants was facilitated by the presence of a facilitator. The latter steered the discussion by guiding them towards defining good storage practices including: drying the grains to the right moisture content, using proper storage containers, and maintaining good storage hygiene practices.

The main bottlenecks that emerged from field observations are related to the tools available to farmers. In fact, farmers do not have moisture meters to determine the appropriate moisture content. They usually measure it by the feel of their hand, by the sound of crackling and by biting with their teeth.
Furthermore, cereals are largely stored in jute sacks without chemical treatment and hermetic storage is not common among farmers.

2. Post-harvest management - Participatory demonstration of best post-harvest methods to minimize food losses [Nabdam district]

On 28 September 2022, a learning session for farmers was organised in Nagondi to demonstrate the best post-harvest methods to minimise food losses to 116 farmers from five communities in the Nabdam district.

Preliminary results of storage trials conducted in November 2021 in Savelugu and Nabdam districts were shared. Maize grain was stored in hermetic or airtight storage methods, i.e. (polybags, PICS bags, plastic drums and metal silos). The grain was treated with and without commercial neem seed oil in November 2021 prior to storage.

A CSIR-SARI researcher, together with two agricultural extension agents, facilitated the discussion among farmers by guiding them in defining good post-harvest practices to improve grain quality, including the reduction of aflatoxins (mycotoxins).

In particular, the following practices were deepened:

- how to treat their grain with safe agro-chemicals, safety precautions and issues relating wrong use of agro-chemicals (the correct management of the crop during the cropping season is strongly related to the post-harvest quality);
- steps to good harvesting and drying of grain;
- steps in good shelling and winnowing practices to obtain clean grain;
- the types of storage vessels to use and their advantages using air-tight or hermetic vessels;
- steps to reduce aflatoxin levels in grain.

Figure 10. On September 28-2022, a farmer learning session was organized at Nagondi to exhibit the good storage practices to 115 farmers from five communities in the Nabdam District

Sierra Leone

No updates from UNIMAK were received.

Capacity building workshop on WP3

In addition to the training and knowledge sharing events held in each African case study area, a "Capacity building workshop" on WP3 technologies was organized in Kenya from the 25th until the 28th of October 2022 (Task 6.4)

The 'Capacity building workshop' focused mainly on technologies being tested to improve crops and food protection, promoting techniques to tackle pathogens during the growing season, and increasing the quality and healthiness of food in the storage and distribution phase.

In particular, the following technologies were explored:

a) Use of the Planthead Platform for Phyto-pathological diagnostics and food security support for farmers (both with a presentation at University of Nairobi and a practical session during the FFRU visit);
b) Use of storage bags with slow-release preservatives for the control of spoilage moulds and mycotoxins in different commodities;
c) Detection of mycotoxigenic species in plant samples with the portable qPCR Q3 device.

The WS was attended by 30 consortium members and 13 external stakeholders. External stakeholders were selected from those organizations that are not officially members of the Consortium but who collaborate with partners on the field within the FFRUs in WP3 activities on pest management and diagnosis and post-harvest issues.
These stakeholders are either researchers from other universities or research institutes outside the consortium or representatives of agricultural extension services that collaborate in various roles within the FFRUs.

Further details will be included in Deliverable 6.7.

3. Conclusions

All the activities mentioned so far show a consistent engagement of all stakeholders (farmers, researchers, extension agencies staff, traders and other actors involved in the value chain of target crops, etc.) in FFRUs activities and knowledge sharing.

Farmers have been actively involved in all different phases. They shared their traditional practices, participated in the planning of farming activities, took care of their fields according to the directions given by the EWA-Belt project representatives and took part in many meetings to share and comment results, propose improvements, receive further training, etc.

Those who had already participated in knowledge sharing events organized by the EWA-Belt project partners in 2021 found answers and follow-ups to their observations in the 2022 meetings (e.g.: Jimma University on the processing of Anchote, KALRO on post-harvest management procedures).

The proactive attitude shown (e.g. at TARI's events) allowed us to see participants of a first training session spread the knowledge they had just acquired to others, amplifying the effort made by the project staff. Also, more than one partner reported the interest of producers from neighbouring farms, drawn by the good results they saw in the project fields (e.g.: KALRO). In some cases, the difference between the project fields and the traditionally cultivated fields, which could also be considered as "control", is striking. This openness to experiment with new techniques is remarkable.

The events conducted in the second year of the project allowed us to identify three common approaches considering the different technologies: the involvement of farmers in (1) varietal assessment and selection, (2) soil management strategies and (3) pest management strategies.

1. **Varietal assessment and selection**

All the partners who are working on varietal selection (ACRA, JU, KDC) implemented sharing events to evaluate with farmers the traits related to the environment in which each crop is growing. Indeed, to ensure that a variety developed in a plant-breeding program is then used to involve farmers in each step (seed selection, cultivation, as well as post-harvest phase).

Indeed, a variety may be the best in terms of yield but may present problems in processing and cooking, or it might simply not have adequate nutritional value. Yield is one of the most important traits, but it could be influenced by soil characteristics, agronomic techniques, as well as biotic and abiotic stresses of each site. All these factors have to be taken into account in the evaluation process, which is why the synergy between researchers, technicians, and farmers ensures that it is not the lack of techniques that influences the choice.

2. **Soil Management strategies**

The partners who are working on innovating soil management strategies (ACRA, KDC, INERA, NM-AIST, TARI, UNB, UoN) organised sharing events to understand the effects of the strategies adopted (intercropping, on-farm compost, fertilizers…) and the main bottleneck encountered. The common difficulties faced were: the difficulty of having organic matter for the self-production of soil improvers and fertilisers (especially in counter-season) and the difficulty of mechanisation in the case of intercropping. Some possible solutions originated from the participants of the events themselves (selection of local species with high carbon content, agri-livestock integration), it will be important to define common protocols as well as locally adapted solutions to overcome these problems in 2023.

3. **Pest Management strategies**

Pest management strategies used both during the cropping season and during the post-harvest phase required specific training in most cases (ACRA, CSIR-SARI, HU, KALRO, TARI).

The training had the dual objective of training farmers to reproduce the techniques independently and obtain feedback on the effectiveness of the treatments.

In general, the proposed techniques are improving crop health and yield and will continue to be used by farmers. In the case of some products in commercial use, further steps are needed to improve access and availability.

For all adopted technologies, knowledge sharing events organized by the EWA-Belt project left farmers and other stakeholders with a new set of tools to face future challenges. These tools, in the form of knowledge, equipment and skills to use in order to be more and more independent, face some limits. Most of those are related to the difficulty to find necessary resources on the market.

Making the access to the required material easier or finding ways to self-produce what is needed will have to be a goal for the project moving forward, to make the technologies tested within the FFRUs truly sustainable and allow farmers to go on implementing them beyond the (space and time) frame of the EWA-Belt project.

All of this suggests that technology can be adopted more easily when it is adapted and known in its context. Therefore, it is crucial to continue to give farmers a central role in the implementation of activities, to ensure the upscaling of technologies.

ANNEX

Supplementary pictures

Ethiopia

JU

Figure 11. Both women and men conducting a hedonic taste of cooked Anchote followed by ranking

HU

Figure 12. On-farm demonstration day in Meskan district

Kenya

UoN

Figure 13. Planning 2022 techniques

KALRO

Figure 14. Farmers participating in layout and planting of field experiments

Figure 15. Aflasafe application by broadcasting

Figure 16. Data collection during harvesting of sorghum and maize in Western Kenya case study area

Burkina Faso

ACRA

Figure 17. Training on biopesticide (self-production)

Figure 18. Participatory assessment of pearl millet (men)

Figure 19. Participatory assessment and harvest of pearl millet (women)

Figure 20. Participants to the on-farm evaluation day

INERA and UNB

Figure 21. Effects of compost and intercropping on soil properties, sorghum and cowpea productivity

Tanzania

NM-AIST

Figure 22. Soil erosion control plot in Monduli district

TARI

Figure 23. Buckets of filtrate from hot pepper, Sodom apple, Neem, pawpaw leaves and moringa leaves as homemade bio-pesticides to control field pests on vegetables

Figure 24. Farmers participated in Trial layout in Meru District

Figure 25. A researcher training farmers in Monduli

Figure 26. Soil sampling for fluoride analysis in cultivated and uncultivated land in Ngarenanyuki

Ghana

KDC

Figure 27. Fonio-cowpea intercropping

Figure 28. Making of stone bunds

CSIR-SARI

Figure 29. Opening of the stored maize from the various storage materials for participatory assessment

Figure 30. Women Participants assessing the quality of maize grains from the storage containers