OROMIA AGRICULTURAL RESEARCH INSTITUTE

MECHARA AGRICULTURAL RESEARCH CENTER

ANNUAL RESEARCH REPORT OF 2022/23

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Mechara

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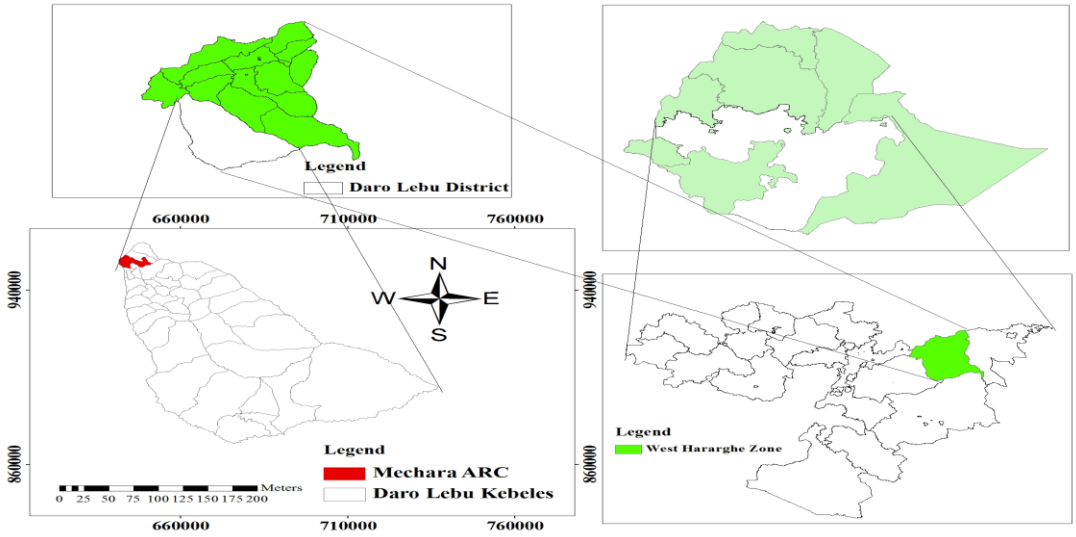
Introduction

Machara Agricultural Research Center was established in 1997 E.C. on 45 ha of land only with primary objective to conduct research on different agricultural commodities to improve livelihood of farming community in mandate area of West, East Hararghe and Arsi zone of Oromia. The center is located 434 km to the east of Addis Ababa in Daro Labu District of West Hararghe Zone in Oromia Regional National State. It is 115 km from Ciro town (Zonal Capital) to the south on a gravel road that connects to Arsi and Bale Zones. Its latitudinal and longitudinal positions are 40^{0}19.114 North and 08^{0}35.589 East respectively. Its altitude is 1760 masl with annual average temperature and rainfall 16^{0}C and 963 mm in the same order. The major soil type of the center is sandy loam clay which is reddish in color. The center have four research subsite namely at Hunde Lafto, Bedeno, Micata and Hawi Gudina to conduct over location research.

Map 1: Mechara Agricultural Research Center Location



Agricultural research has great role in improving production and productivity of the sector hence Mechara Agricultural Research Center is playing its role of generating, adapting and disseminating of improved agricultural technologies and information under six main research processes; coffee & tea, crop, livestock, natural resources, Crop protection, agricultural engineering and socio-economics & agricultural extension. Under those research process the center have been conducting a total of 118 research activities of which 22 activities were funded from different collaborators like EIAR, PASDIP, CALMP4R, Jima ARC, Pioneer Hi-bred maize and BAYER project. On the other hand, technology multiplication and seed research also play

greater role through multiplication of proved agricultural technologies then disseminate for farmers and other stakeholders who are working on agriculture. To accomplish research activities, seed multiplication and other work a total of 74 permanent workers were devote their effort in respect to pre-planned. Generally, this report covers work performance from July 2022 to June 2023 fiscal year.

Table 1: Summary of the experiments conducted across teams in 2022/23 cropping season (IQQO & Others)

SN	Process/Team	Experiment/activities					
		Completed	Suspended/ discontinued	On-going	Modified	Extended	New for 2023 E.C
1	**Crop**	**12**	**1**	**11**	**0**	**7**	**13**
1.1	Cereal	3	0	4	0	1	2
1.2	Horticulture	7	0	2	0	1	6
1.3	Pulse & oils	2	1	5	0	5	5
2	**Crop Protection**	**0**	**0**	**4**	**0**	**2**	**4**
3	**Coffee & Tea**	**3**	**0**	**21**	**1**	**1**	**6**
3.1.	Coffee & tea improvement	2	0	14	1	1	2
3.2.	Coffee & Tea Mgmt & protection	1	0	7	0	0	4
4	**Livestock**	**3**	**0**	**4**	**0**	**0**	**7**
4.1	Animal feeds	3	0	2	0	0	6
4.2	Apiculture	0	0	2	0	0	1
5	**Natural Resource**	**2**	**1**	**9**	**0**	**0**	**1**
5.1	Agro forestry	0	1	6	0	0	0
5.2	Soil FI	1	0	3	0	0	0
5.3.	SWC & Water shade Mgnt	1	0	1	0	0	1
6	**Agri. Engineering**	**1**	**1**	**0**	**0**	**1**	**1**
7	**Socio & Agri. Extension**	**8**	**0**	**4**	**0**	**1**	**8**
7.1	Socio-economics	2	0	1	0	0	4
7.2	Agri. Extension	6	0	3	0	1	4
Sub-total		**29**	**2**	**48**	**1**	**15**	**43**

Table 2: Summary of the experiments conducted across teams in 2022/23 cropping season by others organization (Non IQQO Funded)

No	Teams	Completed	Ongoing	Modified	Suspended	Discontinued	Extended	Total
1	Cereal	2	-	-	-	-	-	2
2	Irrigation	3	1	-	-	-	-	5
3	Agroforestry	-	**9**	-	-	-	-	
4	Agri. Extension	2	-	-	-	-	-	2
5	Coffee protection	1	-	-	-	-	-	1
Total		**8**	**10**	**-**	**-**	**-**	**-**	**18**

1. MAJOR RESEARCH ACHIEVEMENTS BY PROCESS in 2022/23 CROPPING SEASON

1.1. Crop Research Process

INTRODUCTION

Crop process is one of research process under Mechara ARC and has three research teams namely Horticulture, Cereal, and Pulse & Oil crop research team. The general objective of the process is to develop and promote improved technologies of Horticultural and spice, Cereal and Pulse and oil crop for sustainable production and improved productivity thereby contribute to food security through maintaining sustainable use in West Hararghe Zone. To achieve its objective, crop research process has been accomplished different research activities under each team in a multi-disciplinary program. A total of thirty one (31) activities of which Twelve (12) completed, Eleven(11) ongoing, One(1) suspended, Seven(7) extended and four breeder and three basic seed and six adapted varieties maintenance has been conducted under crop research process.

Table 3: Number of activities funded by IQQO

No	Teams	Completed	Ongoing	Modified	Suspended	Discontinued	Extended	Total
1	Cereal	3	4	-	-	-	1	8
2	Pulse	7	2	-	1	-	1	10
3	Horticulture	2	5	-	-	-	5	12
	Total	**12**	**11**	**-**	**1**	**-**	**7**	**31**

Table 4: Funded by other organization

No	Teams	Completed	Ongoing	Modified	Suspended	Discontinued	Extended	Total
1	Cereal	2	-	-	-	-	-	2
2	Pulse	-	-	-	-	-	-	-
3	Horticulture	-	-	-	-	-	-	-
	Total	**2**	**-**	**-**	**-**	**-**	**-**	**2**

1.1.1. Cereal Research Team

Completed Research Activities

Title: Finger Millet *[Eleusine coracana* (L.) Nursery Observation Trial at Mechara

Summary of the Result

Finger millet is one of the important small cereal crop grown in most parts of Ethiopia, specifically the eastern parts of west and Eastern Hararghe. An experiment was conducted at mechara on station at Mechara on station in 2022 cropping season. Evaluation of 387 finger millet genotypes with an objective of selecting of the best genotypes for grain yield and tolerant/resistant major diseases or insect pests. An experiment was designed in Augmented with three standard checks. In this regard about 81 finger millet genotypes were showed the highest grain yield potential ranging from 4825-10000kg/ha more better than those standard checks Maba 4625kg/ha. Therefore, based on potential yield and other character, 306 genotypes were showed low performance for grain yield and remain unviable at early stage of emergence. Therefore, 80 genotypes which are best performed were promoted for the next breeding stage.

Title: Effect of N and NPSB blended fertilizer Rates on yield and Yield Components of Sorghum in west Hararghe

Summary of the Result

This study was conducted in West Hararghe Zone in Daro Lebu Woreda (Mechara on station) and Boke district's in 2021 to 2022 cropping season. It was executed under rain fed condition to determine the optimum rate of N and NPSB fertilizers application and its economically feasible cost for the maximization of the production and productivity of Elemo sorghum variety. The experiment was laid out as a randomized complete block design with three replications and

treatments consisting of the combined application of four levels each for NPSB and three level of nitrogen (urea). The highest mean grain yield 4590kg/ha was obtained from plots that received 50/100kg/ha of N and NPSB fertilizer combination while the lowest mean grain yield of 3152kg/ha of was recorded for treatments received Zero level. Hence, to obtain optimum economic return from sorghum production in the study area, it is recommended that treatments showed with better net benefit and low variable cost could be selected as farmers prefers low cost of investing for production and obtaining maximum profit.

Ongoing Research Activities

Title: Sorghum Regional Variety Trial at Mechara and Tulo districts of W/Hararghe zone

Summary of the Result

The experiment was planned in two locations Mechara on station and Tulo districts on Haramaya University sub site 2021 cropping season. The phenological and grain yield and yield components data of the trial at Mechara and Tulo (HU subsite) werecollected in the season were days 50% flowering, maturity date, plant height, grain yield, head weight , thousand seed weight, leaf blight were entered and analyzed using R software and the result were presented as follows.
The statistical analysis revealed that sorghum landraces were significantly affected ($P \leq 0.05$) for traits like days 50% flowering, maturity, plant height, head weight and grain yield kg/ha.The trial performance is somewhat expressed less potential this was due to late in planting time of the trial due to late onset and offset of the rain fall the area. However, with current challenge in which the trial was executedthere is a hopeful expectation potential landraces of sorghum that can assure our objective of attaining at least one candidate to be selected for VVT stage at the end of 2023 cropping calendar. So the trial will be extended for the coming cropping season.

Title: Food Barley Regional Variety Trial at Mechara, Chiro and H/Gudina districts of west hararghe zone

Summary of the Result

The experiment was conducted in three districts of west Hararghe Zone at Mechara on station, Chiro(A/rakate OBU subsite) and Hawi Gudina(Daro Gudo FTC) districts in 2022 cropping

season. Thirteen Food barley genotypes were planted with one standard check (Adoshe) in RCBD were used for the experiment. The necessary operation starting from site securing, land preparation and trial planting were almost done as much as possible in accordance of the schedule of the trial execution period except some challenges of climate change with regard to rainfall lacking and insufficient moisture condition across all location. Though we were serving under such challenge this experiment was successfully executed in all location and all the important data of the trial in the season were collected and analyzed as shown in the table 3.The trial data result shows better performance of the trial were seen differently across location. As whole, the result observed from the trial is good and it will be repeated for the coming cropping calendar of 2023.

Title: Teff Regional Variety Trial at Mechara, Habro and O/bultum districts of west hararghe zone

Summary of the Result

The experiment was planned in three locations Mechara on station, Habro (bareda FTC) and O/bultum(on farm) districts of west hararghe zone in 2022 cropping season the necessary land preparation and planting was done on time but the trial was unable to emerge in O/bultum location due insufficient moisture in the soil at planting and prolonged dry spell period of rain fall after then also that in location as result the trial was failed. About 13 teff genotypes with one standard check Dursi were planted in RCBD with three replications. The phonological and grain yield and yield components data was collected at Mechara and bareda FTC. The trial performance is somewhat expressed less potential this was due to uneven distribution of rainfall of the area. However, with current challenge in which the trial was executed there is hopeful expectation potential teff genotypes that can assure our objectives. So the trial will be repeated for the coming cropping season.

Title: Effect of Row Spacing and NPSB Fertilizer rates on Yield and Yield components of Hybrid maize Varieties in West Hararghe Zone

Summary of the Result

The trial was planted in two location Mechara on station and Habro on farmers field in 2022 cropping season and MH-140 maize variety was planted in RCBD in with three replication NPSB fertilizer rate and row spacing were applied as treatment combination. Maize planting

was done on optimal planting time under all location during the season. All the necessary management practices like weeding, hoeing and fertilization were timely accomplished. The short summary of the data analysis result shows significance ($P<0.05$) variation among treatments of due to NPSB fertilizer rates and Inter row spacing for grain yield hundred seed weight, ear height, ear length, days to %50 silking and no significance for 90% physiological maturity days. The highest mean grain yield was recorded for treatment combination of 150kg/ha NPSB X40cm inter row spacing with record of 9741kg/ha while the lowest mean grain yield record of 4038kg/ha for the control plot. The trial is well and will be repeated for the coming season.

Extended Research Activities

Title: Evaluation of Improved Bread Wheat (*Triticum aestivum* L.) Varieties for their adaptability in West Hararghe Zone

Reason of Extension

The experiment was planned at three location (Habro(onfarm,O/bultum(onfarm) and Tulo(HU subsite) for two consecutive years and planted was done at all site as per planned. However, at O/bultum (on Farm) and Habro(on farm) the trial was poor performance due to shortage of rain fall during planting time as well as at emergence time. Therefore, to complete this experiment it needs one additional year and continues with the methodology.

COLLABORATIVE WORKS

1. National Maize Variety Trial

About sixteen (16) maize genotypes were brought from Bayer Life Science private maize seed producer Company and evaluated at Mechara on station in 2021 cropping season. The necessary data of the trial in the season were collected and submitted to the collaborative organization responsible to take the data through Oromia Agricultural Research Institute Crop Directorate authorization.

2. National Maize Variety Verification Trial

This trial was also conducted with collaboration with Bayer Life Science private maize seed producer Company. This trial was executed to verify new maize variety at national level and evaluation of the trial performance on the field at farmer's level and Mechara on station were held by national variety verification committee and finally the release and registration of the new maize variety was approved on May 2023.

3. Pioneer Maize National Variety Trial

This trial was also conducted with collaboration with Pioneer hybrid maize seed producer Company. This trial was executed to verify new maize variety at national level and evaluation of the trial performance on the field at farmer's level and Mechara on station were held by national variety verification committee and finally the release and registration of the new maize variety was approved on May 2022.

1.1.2. Pulse and Oil Research Team

Completed Research Activities

Title: Small Seed Red Common Bean Variety Verification Trial (VVT)

Summary of the Result

One promising small seed red common bean candidate variety with two recent standard check were planted 10meter length by 10meter width each variety at Mechara on station, Bareda subsite as well as two farmers field at each respective locations in 2015/22 cropping season. National technical variety released committee was evaluated the candidate variety. Based farmers preference, agronomic traits and high yield advantage 24.73% over standard check national variety released committee decided to release for west Hararghe and similar agro ecologies.

Photo: National technical variety released committee evaluating candidate

Title: Adaptation Trial of Released Faba bean (*Vicia faba* L.)Varieties in Mid and High land of Western Hararghe Zone

Summary of the Result

Seven recent released Faba bean and one standard check varieties were brought form SARC & KARC and planted at McARC on station, Arbarakate site and Gara Qufa FTC for two consecutive years. The treatments were laid out in Randomized complete block design (RCBD) with three replications. From the two year combined yield and some desired agronomic data Didea variety was scored the maximum yield 4101.8 kg/ha among tested varieties as well as 11.68% yield advantage over standard check (Hachalu) variety. Therefore, Didea is recommended for further demonstration and multiplication.

Photo: Adaptation trial of Fababean

Title: Small White Bean Reginal Variety Trial

Summary of the Result

Thirty three (33) white small bean genotypes including three standard checks were evaluated at Mechara on station in simple lattice design. Ten (10) genotypes were significantly high yield advantage over standard check as a result those ten superior genotypes were promoted to next breeding stage (RVT).

Title: Sesame Regional Variety Trial

Summary of the Result

Sixteen (16) sesame genotypes were evaluated with two standard checks (Bha Zeyit and Bha Necho).The trial was planted at McARC on station, FARC on station, Ibsa FTC and Milkaye FTC for two consecutive years RCBD with three replications. From combined mean result Obsa * EW023 (2)-2-1-1 genotype was scored superior grain yield 926.07 kg/ha with 42.64% yield advantage over standard check. Therefore, Obsa*EW023 (2)-2-1-1 genotype was promoted to next breeding stage (VVT) in terms of yield and importance agronomic traits and disease reaction. The combined mean result data was reported to National Variety Released Committee.

Photo: Sesame RVT

Title: Ground nut Preliminary Yield Trial

Summary of the Result

Twenty two (22) ground nut genotypes were evaluated with three standard checks including three standard checks were evaluated at Mechara on station in simple lattice design. Thirteen (13) genotypes were significantly high yield advantage over standard check as a result those thirteen superior genotypes were promoted to next breeding stage (RVT).

Photo: Ground nut Preliminary Yield Trial

Title: Early Maturing Soybean Observation Nursery

Summary of the Result

One hundred eight (108) soybean genotypes with three standard cheeks brought from Jimma Agricultural Research Center and were tested Mechara Agricultural Research Center on station in augment design. About twenty (22) genotypes were high yield advantage disease resistance; early mature than standard check (Pawe-2, GEZELE and Nova). Therefore, twenty (22) genotypes were promoted to next breeding stage (PYT).

Title: Kabuli Type Chick Pea Preliminary Yield Trial

Summary of the Result

Twenty two (22) Kabuli type chick pea genotypes were evaluated with three standard checks (Habru, Hora and dhera) Bareda on subsite in simple lattice design. Fourteen (14) genotypes were significantly high yield advantage over standard check(Habru, Hora and dhera) and resistance to fusarium wilt. as a result those fourteen superior genotypes were promoted to next b

Photo: Kabuli Type Chick Pea Regional Variety Trial

Ongoing Research Activities

Title: Desi Type Chick Pea Regional Variety Trial

Brief Status of the Activity

The experiment was conducted Habro district (Bereda sub site), Tulo district (Kira kufis FTC) and Oda bultum (Oda Baso FTC). Fourteen (14) Desi type chick pea genotypes that promoted from PYT were used for planting material in RCBD with three replications. Based on first year data about 13 promising genotypes were scored maximum yield than standard check. The trial will be conducted for next year cropping season at all location as the same methodology.

Title: Response of Haricot Bean Variety to Blended NPSB Fertilizer in West Hararghe Zone

Brief Status of the Activity

The experiment was conducted on McARC station and Bareda subsite in RCBD factorial arrangement with combinations of six rates of blended NPSB fertilizer (0kg, 25kg, 50kg, 75kg, 100kg, and 125kg) and one variety of common beans Awash-2. All important first year yield, agronomic and soil data were analyzed. The trial will be conducted next year cropping season at all location as the same methodology.

Title: Effect of Groundnut Varieties on Productivity of Maize-Groundnut Intercropping System in West Hararghe Zone

Brief Status of the Activity

The experiment was proposed at two locations (McARC on station and Milkaye FTC) for two consecutive years. The experiment was planted at McARC as per planed in both 2014 and 2015 cropping season but at Milkaye due to shortage of rain fall during 2014 the experiment not planted. Therefore, to complete this experiment it needs one additional year data.

Extended Experiment

Title: Effect of Groundnut Varieties on Productivity of Maize-Groundnut Intercropping System in West Hararghe Zone

Reason for Extension

The experiment was planned at two locations (McARC and Milkaye FTC) for two consecutive years and planted at McARC as per planned, but low yield performance while at Milkaye FTC didn’t planted, due to shortage of rain fall during in 2021 cropping season. Therefore, to complete this experiment it needs one additional year.

Suspended Research Activity

Title: Mung Bean Observation nursery

The experiment was proposed for 2015 cropping season, even though due to lack of genotypes the team decided this activity is suspended.

1.1.3. Horticulture and Spice Research Team

Completed Research Activities

Title: Black cumin Preliminary yield Trial (PYT)

Summary of the Result

The experiment was conducted at Carcar FTC in Habro district in 2015. About 23 genotypes and 2 standard checks (Eden & Dirshaye) were used for the experiment. Design was Simple Lattice and Plot size 1.2m x 2m. All recommended management practices were uniformly applied for each experimental plot. From analysis result, significance deference were observed ($P \leq 0.05$) on yield among genotypes (table 1). From these genotypes, a total of 12 Black cumin genotypes were selected and will be promoted to next breeding stage (RVT). The observed difference among genotypes and standard check varieties may be due to genetic difference and environmental conditions that permit for breeders to improve black cumin through selection. Therefore, 12 genotypes were promoted to the next breeding stage (RVT).

Title: Adaptation trial of Papaya (*Carica Papaya* L.) varieties in West Hararghe zone

Summary of the Result

The initial round of data analysis results (2014), a significant difference (P0.05) was revealed among varieties. The results showed that Meki-HL1 variety had a large fruit diameter (38.14cm) and the longest fruit yield (21.52cm), whereas the narrow MK078 variety had the least fruit diameter and length but the highest fruit numbers per plant (24.2). In generally, from the first round data, Meki-HL1 had the highest mean fruit yield 190.43 qu ha^{-1}.

Ongoing Research Activities

Title: Orange Fleshed Sweet potato Regional Variety Trial (RVT

Brief Status of the Activity

About 9 sweet potato genotypes with two standard checks (Kabode and Alamura) were evaluated at three locations, Mechara on station, Habro and Sakina FTC in 2022. An experiment was design RCBD in with three replications. All growth and yield data were collected, analyzed. The trial was smoothly going.From analyzed result shown that significance difference was revealed ($P<0.005$) on yield related traits at three sites.

Title: Fenugreek Regional Variety Trial (RVT)

Brief Status of the Activity

The Experiment was conducted at Mechara on station in West Hararghe. A total of ten fenugreek genotypes were used with the two newly released varieties Burqa and Bishoftu were used. Design RCBD with three replications was used. The result of analysis of variance (ANOVA) showed the presence of significant ($P<0.05$) variation between genotypes for number of pod per plant, thousand seed weight and total yield (Table 2). Out of ten tested genotypes, nine genotypes were significantly total yields advantage over both standard checks. Whereas seven genotypes were highest marketable and total yields over all standard checks, The observed difference among genotypes and standard check varieties may be due to genetic difference and environmental condition that permit for breeders to improve fenugreek crop. The trial will be repeated in this years at the same location.

Title: Effects of blended NPSB and N fertilizer rates on yield and yield related traits of Onion (*Allium cepa* L.) in West Hararghe Zone

Brief Status of the Activity

The experiment was conducted at both locations (Habro and Gemechis districts) in 2022. The onion variety namely Bombay red will be used for this study. Bombay Red variety was as test crop. Fertilizer, Urea (46% N) and blended NPSB (19% N, 38% P2O5, 7% S and 01% B) were according to treatment rate (treatment level). All other cultural practices will be uniformly applied to each of the plots as per the recommendations. Already the trial will be repeated for second year. Therefore combined analyzed result will be presented in the next year

Title: The effect of compost and blended NPSB fertilizer rate on yield and yield related traits of Banana (*musa spp*.) at West Hararghe Zone

Brief Status of the Activity

An experiment was conducted in two locations, Mechara onstation and Odalalaba kebele in Daro lebu district. The Treatment was applied as planned at both locations, except treatment, other agronomic practices were uniformly applied to the plots as per recommendations. In this year first flowering date and yield data were collected from Oda lalaba. In generally, the experiment is going accordingly.

Title: Adaptation Trial of Improved hybrid Tomato (*Lycopersicon esculentum Mill.)* Varieties for growth and Yield Components under irrigation in West Hararghe Zone

Brief Status of the Activity

Total of four hybrid tomato varieties **(Venise, Birget 40, Shante and Galilea**) were transplanted on field in Habro and Gemechis districts. Design (RCBD) with four replications was used. All proposed data collection is under way. All management practices were applied as per crop recommendation.

Extended Research Activities

Title: Sweet potato Variety Verification Trial (VVT)

The experiment was conducted in Daro Labu and Habro districts, in 2022 cropping season. About One candidate (CN-1754-8) and one recent released Sweet potato variety (Hawasa-09) were used for the experiment. From each districts, three farmers and one FTC were selected accordingly. Then, the vines were planted.

Reason for extension…

However, in this year, the rainfall was late at planting and short duration at early growth stage, so, this condition is not favor for sweet potato at early growth stage. Then, the vines were stunted and not well performed. Therefore, we decided to repeat these activities for one year.

Title: Effects of Intra row spacing and ridge height on yield and yield traits of Sweet potato (*Ipomea batatas* L.) in West Hararghe Zone

Brief Status of the Activity

The treatment was conducted at both locations, Mechara on station and Habro district with Design of RCBD in factorial arrangement with three replications In this year, at Habro an experiment was not well performed due to shortage of moisture. Therefore, data was not collected in this cropping season.

Reason for extension

In last year, this activity was well performed in Habro, however root yield was harvested by other person (DAs). However, in this year, shortage of moisture was faced at early growth stage in Habro district and vines were poor growth performance. Therefore, it was not used for data Due to these above reasons, this trial is not enough to complete with one site data and decided to repeat this activities for one year.

Title: Effect of different type of mulching materials and thickness on growth and yield component of Banana in West Hararghe Zone

Status of the Activities

The experiment was conducted at both locations (Habro district and McARC onstation). All agronomic practices were applied uniformly to the exp'tal plots, All growth and Yield related data collection are underway in all location.

Reason for extension

The trial well preformed at Habro district but at Mechara on station, first round data was started in this year, data collection is under way. Therefore, with this first round data, trial is not enough for complete, therefore, we need one additional year for complete this activity.

Title: Small pod Hot Pepper Regional Variety Trial (RVT)

Status of the Activities

Total of 10 genotypes and 2 standard checks (Dame and Dansire) were evaluated at Mechara on station, Milikaye and Boke district with Design of RCBD with three replications. Accordingly,

the trial was stated at all proposed locations. All management practice were applied as per crop recommendation

Reason for extension

The trial was started according to the planned location, At Milkaye site, all data was collected, analyzed and presented. However, the trial was not well performed in Boke district and on station due to shortage of moisture faced at the flowering stage. **Therefore, due to above reason, we decided to extend this activity for one year.**

Title: Large pod Hot Pepper Regional Variety Trial (RVT)

Status of the Activities

Total of 11 genotypes and one standard checks (Marekofana) were evaluated at on station, Milikaye FTC and Boke district Design= RCBD with three replications was used. Accordingly, the seed was sown at all proposed locations. All management practices were applied as per crop recommendation. However performance of the trial was poor at Boke district and Mechara onstation, i.e due to shortage of moisture.

Reason for extension

In addition to, M & E committee of the center was taken direction and the collected data was not used for the experiment, **therefore, we decided to extend this activity for one year.**

Suspended Research Activities

Title: Sweet potato (*Ipomoea batatas* L.) Observation Nursery Trial

Reason for suspension

The experiment was planned to get 110 genotypes from Haramaya University and to be conducted on station, in 2014. As usual, in variety improvement, securing genotype for the research is mandatory. In the same way, we communicated and agreed with Haramaya University for acquisition of genotypes. However, at planting time we didn't have enough genotypes for the trial. Therefore, we decided to suspend this activity until we got the genotypes.

1.2. Crop Protection Research Process

Introduction

Crop protection Research Process consists of multidisciplinary members from Plant pathology, Agricultural Entomology and Weed Science. The objectives of Crop protection Research Process are to generate, release and popularize IPM and Crop Protection technologies for the end users. Furthermore, it gives service in capacity building in creating awareness to accelerate the technology on plant protection for stakeholders. This report presents all activities carried out during 2022/23 cropping season. For 2022/23 cropping season Crop protection Research Process conducting four ongoing activities and two extended activities. Generally, the process have been planned to conduct six activities which are funded by IQQO.

Table 5: Number of activities funded by IQQO

No	Teams	Completed	Ongoing	Modified	Suspended	Discontinued	Extended	Total
1	Pathology	-	2	-	-	-	1	3
2	Weed	-	1	-	-	-	-	1
3	Entomology	-	1	-	-	-	1	2
	Total	**-**	**4**	**-**	**-**	**-**	**2**	**6**

Ongoing Research Activities

Title: Screening of Chickpea varieties for Fusarium wilt Resistance under field condition in W/ Hararghe, Oromia, Ethiopia

Brief Activity Status

The experiment was conducted in West Hararghe Zone Habro district Oda Bultum University site in 2021/22 cropping season. Twelve Chickpea varieties were brought from Debra Zeit Agricultural Research Center and planted with two standard checks **Arerti** and **Habru** in RCBD with three replication on a plot area of $6m^2$ (3m x 2m) length and width at row spacing of 0.75m and 0.3m between plants as well as 0.5m between plot and 1m among blocks were used. The necessary operation starting from seed collection, site securing, land preparation and trial planting were almost done as much as possible in accordance of the schedule of the trial. The disease, phonological, grain yield and yield components data of the trial at Bareda site was

collected in the season were disease severity at seedling and flowering stage, Days 50% flowering, maturity date, plant height, grain yield, Number of pod per plant and stand count at harvest were entered and analyzed using Descriptive statistical and the result were presented as follows; Disease incidence data were taken at seedling and pod setting stage during 10 days interval and analyzed. About 12 evaluated varieties the highest percentage of DI (51.69%) was recorded from Natoli variety but, the lowest percentage of DI (24.47%) was recorded from Arerti variety at seedling stage respectively. However, all variety shows non-significant disease incidence at flowering stage. In the present screening test, 12 varieties were executed; one variety is moderately resistant, three were moderately susceptible, five were susceptible and three were highly susceptible to fusarium wilt. So the trial will be repeated for one year for completion of the activity.

Title: Screening of Chickpea Genotypes to Fusarium wilt under field condition in west Hararghe, Oromia, Eastern Ethiopia

Brief Activity Status

The experiment was conducted in West Hararghe Zone Habro district Oda Bultum University site in 2021/22 cropping season. One hundred Chickpea genotypes were brought from Debra Zeit Agricultural Research Center and planted with two standard checks Arerti and Habru in Augmented Block Design without replication on a plot area of $3m^2$ (1.5m x 2m)length and width at row spacing of 0.75m and 0.3m between plants as well as 0.5m between plot and 1m among blocks were used. The necessary operation starting from seed collection, site securing, land preparation and trial planting were almost done as much as possible in accordance of the schedule of the trial. The disease, phonological, grain yield and yield components data of the trial at Bareda site was collected in the season were disease severity at seedling and flowering stage, Days 50% flowering, maturity date, plant height, grain yield, Number of pod per plant and stand count at harvest were entered and analyzed using Descriptive statistical and the result were presented as follows; Disease incidence data were taken at seedling and pod setting stage during 10 days interval and analyzed. About 50 evaluated genotypes the highest %DI (60%) was recorded from Acc#ICC-3279 But, the lowest %DI (24.3%) was recorded from Acc#DZ-2012-Ck-0007 at seedling stage respectively. According to ICRISAT Grading scale (0-10% Mortality; R, 10.1-20; MR, 20.1-30; MS, 30.1-50; S and ≥50.1 HS), 17 Genotypes were Moderately Resistance, 12 genotypes were moderately susceptible, 10 genotypes were Resistance, 9 Genotypes were susceptible and 1 genotype was also grouped under Highly susceptible to the fusarium wilt at seedling stage.

Title: Evaluation of released Sorghum varieties to shoot fly under field condition in west Hararghe,

Brief Activity Status

The trial was conducted at Mechara on station and D/Lebu district in Sakina kebele in 2022 cropping season. About 6 (six) recently released sorghum varieties with two standard check Bonsa and Teshale were planted in RCBD with three replication on a plot area of $7.5m^2$ (3m x 2.5m) length and width with row spacing of 0.55m and 0.25m between plant within the row as well as 1m x 0.75m was used between block and plot respectively. Seeding of the sorghum was done manually by hand at recommended seed rate of 12.5kg/ha by drilling of the seeds into the furrow that were made during land preparation and field layout setting. Normal plant population of the sorghum landraces were maintained by thinning of the seedlings that were densely emerged at early stages or one week after emergence. The crop management practices of fertilizer application, urea and NPSB was applied at recommended rate of 100/100kg/ha once at planting for NPSB and half at sowing and the remaining was applied after 25 days of the sorghum seedling growth for urea fertilizer application was done. Once the crop was established hoeing of seedling two to three times and hand weeding more than three times were accomplished for the success full growth of the trials in uniform manner in all growing period of the crop. The trial data of Insect pest (Oviposition percentage, Dead heart percentage, Average number of effective tiller, Number of plants with dead hearts, Leaf feeding scale) , phonological, grain yield and yield components (Days 50% flowering, maturity date, plant height, grain yield, thousand seed weight, stand count at harvest) were collect and analyzed. The statistical results of the data on the combined mean of two locations were showed significant. However, these varieties were showed numerical variation than statistical between parameters for Oviposition percentage, dead heart percentage, and Average number of effective tiller per plant and Yield traits. At both locations the highest Oviposition percentage (20.95%) and Grain yield 3484.1Kg/ha were observed on Elemo and the lowest Oviposition (11.9%) and Grain yield 2034.1Kg/ha were observed at Teshale. This trial is repeated for one year at both location and final recommendation will be drawn then after for the coming cropping calendar.

Title: Effect of Hoeing and weeding frequency on weeds and yields of Sorghum (Sorghum bicolor (L.) Moench) in West Hararghe Zone, Eastern Ethiopia

Brief Activity Status

The trial was conducted at Mechara on station and Habro district in Gadisa kebele in 2022 cropping season. Melkam sorghum variety were planted as experimental material in RCBD design in three replication on plot area of 8.1m^2 (3m x 2.7m) having six rows with 45cm and 25cm a row-to-row spacing and between plants respectively was used. The experiment was consisted twelve treatments of three hand weeding(one times hand weeding, two times hand weeding and three times hand weeding) combined with three hoeing plus weed free and weed check. All the trial management practice starting from land preparation, planting, weeding and fertilizer application were done as per planed. The necessary data for the trial at Mechara (On-station) and Gadisa kebele (Habro district) was collected.

The trial data of Weed Density, Weed Dry Weight ,Plant height , Head weight ,Grain yield , Tillers number, Weed control efficiency ,SY=stover yield, Relative yield loss and Thousand seed weight were collected and analyzed .The statistical result of the data on the combined mean of two location were showed significant. However, the treatment application was showed numerical variation than statistical between treatments for Plant height traits. At both location the highest Weed control efficiency (81.7%) and Grain yield 3484.1Kg/ha were observed at HW3+ three hoeing and the lowest Weed control efficiency (11.9%) and Grain yield 2034.1Kg/ha were observed at HW1 .However, the lowest mean of Weed control efficiency and Grain yield were observed at weed check and the highest mean of Weed control efficiency and Grain yield were observed at weed free. This trial is repeated for one year at both location and final recommendation will be drawn then after for the coming cropping calendar.

Extended Research Activities

Title: Evaluation of Groundnut (Arachis hypogea) genotypes their resistance to fusarium wilt disease in West Hararghe Zone, Eastern Ethiopia

Reason for Extension

The trial was scheduled to be conducted in 2021/2023 under the title '**Groundnut genotype screening for Fusarium wilt disease in West Hararghe, Eastern Ethiopia**'. We had requested by letter to obtain input seeds for this experiment from Ethiopia Biodiversity Institute and Haramaya University. Ethiopia Biodiversity Institute agreed and made an appointment for us. We have been following up on our requirements by phone and in person at various times. However; later he refused to deliver the genotype for us' saying that he could not prepare the seeds for you due to lack of time. In general, the trial has not started for the reasons mentioned above. So it will take another year to continue this experiment.

Title: Preliminary Screening of Sorghum genotypes their resistance to shoot flies under field condition in West Hararghe, Eastern Ethiopia

Reason of Extension

The trial was scheduled to be conducted in 2021/2023 under the title **'Preliminary Screening of Sorghum genotypes their resistance to shoot flies under field condition in West Hararghe, Eastern Ethiopia'**. We had requested by letter to obtain input seeds for this experiment from Ethiopia Biodiversity Institute. They agreed and made an appointment for us. We have been following up on our requirements by phone and in person at various times. However; later he refused to accept the seeds saying that he could not prepare the seeds for you due to lack of time. In general, the trial has not started for the reasons mentioned above. So it will take another year to continue this experiment.

1.3. Coffee and Tea Research Process

Introduction

Coffee is widely grown in the east and southeast of the country and have suitable climate for coffee production. Hararghe coffee is grown in the highland and midland areas of Eastern Ethiopia. It is well recognized specialty and exemplified category coffee which is grown mostly without shade. Bale and Arsi coffee is grown in the southeast of the country and grown mostly under shade. Hararghe coffee is characterized by medium sized beans with greenish yellow color, medium acidity and full body and a distinctive mocha flavor. Even though the country has produced coffee in large hectare of land, the production is still below the world average. There are a number of productions limiting factor still holding the coffee sector back from reaching its full potential. Poor management practices, use of low-yielding varieties, and climate change are some of the constraints. To overcome these production constraints, coffee and tea research of Mechara Agricultural research centre have been conducted several coffee research experiments for eastern and southeastern of the country. The general objective is to generate and promote improved coffee technologies for sustainable production and improved productivity. To achieve its objective coffee and tea research process have been accomplished coffee research experiments under two research team and different multi-displinery program. A total of 32 research experiments have been conducted under coffee and tea research process; of these 3 completed, 21 ongoing, 1 extended, 1 modified and 6 new activities. Status of each research activities under the team are given in subsequent section.

Table 6: Number of activities funded by IQQO

No	Teams	Completed	Ongoing	Modified	Discontinued	Extended	Total
1	Coffee Improvement	2	16	-	-	-	18
2	Coffee Protection	1	7	-	-	-	8
Grand Total		**3**	**23**	**-**	**-**	**-**	**26**

1.3.1. Coffee and Tea Improvement Research Team

Completed Research Activities

Title: Evaluation and Maintenance of 1998 and 2002 Hararghe Coffee Collections

Summary of the activity

A total of 81 and 54 coffee accessions from 1998 and 2002 Hararghe coffee collection were field planted along with three and four released varieties in augmented design at Mechara in July 2012 and 2013, respectively. All appropriate management practices has been applied. Four & three year's yield and disease data was recorded from 1998 & 2002 collections and analyzed, respectively. About four coffee genotypes from batch of 1998 were performed better in clean coffee yield as compared to checks. H-61/98, H-763/98, H-740/98, H-776/98 have yielding potential of 15.27, 14.7, 14.54, 14.33 $Qtha^{-1}$, respectively than checks. Mean of clean coffee yield of 16 top performing coffee genotypes of 1998 Hararghe collections ranging from 12.44 $Qtha^{-1}$ to 15.22 $Qtha^{-1}$. Ten coffee genotypes from batch of 2002 were performed better in clean coffee yield as compared to standard checks. Ranging from 9.6 $Qtha^{-1}$ to 12.36 $Qtha^{-1}$.Characterization of these top performing genotypes was done. About eight (8) top performing genotypes from 1998 batch collection and two (2) from 2002 batch collection were promoted variety trial.

Title: Evaluation and screening of Raya Azebo /Tigray Local Coffee Landraces selection for various desirable traits

Summary of the activity

Ten (10) coffee landrace selections collected from Raya Azabo district of Tigray were field planted in April 2016 along with two standard checks (Mocha & Mechara-1) in RCBD of 3 replications with 6 trees per plot. All recommended field management was applied as per recommendation. Three years yield data, Growth Quality test and disease parameters were collected and analyzed. Analysis of variance revealed that there was significant different between the genotype for yield, quality, disease and growth parameters. Five Raya Azebo coffee landrace showed better performance for yield and CLR reaction than checks. Genotype RA-09/04, RA-10/04, RA-09/04 & RA-10/04 have mocha typicity & have acceptable range of overall quality. Genotype RA-09/04 & RA-10/04 were showed better in mean yield

performance, quality and disease. Therefore, RA-09/04 & RA-10/04 were selected as the top preforming genotypes to be evaluated in variety trial.

Ongoing Research Activities

Title: Hybrid Coffee Variety Development for Hararghe Specialty Coffee Growing Areas

Status of the activity

About 13 coffee genotypes of F1 hybrids including parental lines were evaluated at Mechara, Michata & Bedano sub site using RCBD with 3 replications of 6 trees per plot. All appropriate coffee management practices have been applied uniformly. Currently the trial is in good growth performance at Mechara on-station and Michata sub-site. However, poor performance at Bedano sub-site. Four years yield, growth and disease data were collected. From the intermediate results of four years clean coffee yield and disease two F1 hybrids were recorded the highest clean coffee yield than their parent and other crosses.

Title: Coordinated Variety and Verification Trial of Hararghe Coffee Selections

Status of the activity

A total of 20 promising genotypes from the batch of 1998, 2002 & 2004 Hararghe coffee collections were planted in RCBD with three replications. Currently the trail is in good growth performance at Mechara on station and Michata sub-site. However, poorly perform at Bedeno sub site and it is not used for data. First cop yield data was collected at Mechara on station. However, Michata site planting is two year let than Mechara site. All appropriate management practices has been applied uniformly.

Title: Coordinated Variety and Verification Trial of Arsi coffee Landrace

Status of the activity

About 13 Arsi coffee landraces were field planted along with two Hararghe coffee varieties using Randomized Complete Block Design (RCBD) at Mechara on station, Arbagu and Lafto Rifenso in July 2020. Currently the trials are performing well at all locations. All recommended field management was applied as per recommendation.

Title: Evaluation and Maintenance of 1998 Hararghe Coffee collection returned from Awada

Current status of the activity

A total of 46 accessions which is returned from Awada along with three checks (Mocha, Mechara-1 and Bultum) were planted in augmented design at Mechara on station. All recommended field management was applied as per recommendation. Currently the trial is in good growth performance.

Title: Collection, Characterization, Evaluation and Maintenance of Arsi coffee Landraces

Status of the activity

About 125 Arsi coffee landraces collection were field planted in augmented design at Mechara on station and Arsi Gololcha Arbagugu farm along with four released Hararghe coffee varieties in July 2021. Currently the seedling is well managed and in good growth performance.

Title: Collection, Characterization, Evaluation and Maintenance of 2021 Hararghe coffee Landraces

Status of the activity

A total of 40 Hararghe coffee landrace collections were field planted in augmented design at Mechara on station in August 2022. Currently the seedlings are in good growth performance.

Title: Development of Hybrid Coffee variety for Hararghe Coffee Growing Areas

Status of the activity

Crossing was done successfully. Currently the crossed parental lines is well managed and in good growth performance.

Title: Testing Arabica coffee varieties of diverse origins for broader adaptation and better quality across different coffee growing environments in Ethiopia

Status of the activity

A total of 22 coffee varieties collected from diverse origin were field planted in August 2021 along with three Hararghe coffee varieties in RCBD of three replications with 6 trees per plot. Currently the seedlings are on good growth stage on field.

Title: Establishment of crossing block orchard for top promising Hararghe coffee selections

Status of the activity

A total of 22 promising Hararghe coffee selections including four released varieties were planted in August 2009 E.C**.** All appropriate field management practices have been applied**.** Currently the orchard is performing well.

Title: Establishment of crossing Block Orchard for Arsi coffee selections

Current status of the activity

A total of 28 promising Arsi coffee collections genotypes were field planted at Mechara on station in August 2022. Currently the seedlings were in good growth stage. All appropriate field management practices have been applied.

Title: Establishment of Breeder Seed Orchard for Recently Released Hararghe Coffee Varieties

Current status of the activity

In August 2021 seedlings of four Hararghe coffee varieties were field planted at Mechara on station. A total of 70 seedlings were planted per each variety. Currently the seedlings are well survived and performed.

Title: Multiplication of released coffee varieties through production of breeder and pre-basic seed

Status of the activity

A total of 300 kg of pre-basic and 17 kg of breeder seeds was prepared from four improved coffee varieties & 150kg was distributed for West Hararghe, 50kg for East Hararghe, 100kg for coffee & Tea authority (for EU-café district) & 10kg for Bale. About 30,000 coffee seedlings were raised and distributed for farmers.

Title: Evaluation of Released Hararghe Coffee Varieties under Supplementary Irrigation and Coffee Shade

Status of the activity

Currently seeds of four released Hararghe coffee varieties were raised on coffee nursery site & The seedlings are performing well and the seedling is ready for field transplanting.

Title: Maintenance and conservation of Arsi coffee landraces, 1998, 2002 and 2004 Hararghe Coffee collections

Status of the activity

A total of 384 coffee genotype that comes from the already accomplished experiment of Arsi coffee landrace collection, 2002, 2004 and 2005 Hararghe coffee collections were maintained and conserved at Mechara and Arbagugu farm in order to use them as future breeding stock. All appropriate coffee management and agronomic practices have been applied uniformly as per its recommendation.

Modified Research Activity

Title: Variety Trial of Hararghe Coffee Genotypes

Status of the activity

A total of 14 coffee genotypes seed were raised on coffee nursery site (8 from 1998, 2 from 2002 batch collection & 2 from Raya Azebo coffee) including two standard check. Currently the seedlings are performing well and the seedling is ready for field transplanting.

Extended Research Activity

Title: Coordinated Variety and Verification Trial of Bale Coffee Selections

Status of the activity

About 12 promising Bale coffee selections promoted from 2004 Bale coffee landrace collections were planted along with 3 checks in Randomized Complete Block Design (RCBD) with three replications. Two years yield data, and growth parameters were collected. This year no yield data was collected due to different factors. Overbearing of last year (at D/Menna & H/Buluk), prolonged moisture stress at flowering stage (Barbare), researcher turnover. Quality & disease data was not collected. At all locations the trial was affected by prolonged moisture stress & all the recommended agronomic practice was not fully applied.. Shewe site is the only site which is relatively good performance than the two sites. The organized team from IQQO, JARC, McARC & SARC were monitor & evaluate the trial in all sites and direction was given as this activity to be completed in the coming year with all application of agronomic practice recommended for

coffee & All important data (yield, disease and quality) have to be taken for next cropping season.

1.3.2. Coffee and Tea Management and Protection Research Team

Completed Research Activities

Title: Strip cropping of coffee with ground nut in west Hararghe coffee growing area

Summary of the activity

Arusa coffee variety was planted in July 2016 in RCBD design with three replications. Recommended management practices have been uniformly applied. Three years coffee yield and five year groundnut yield data was collected and analyzed. Analysis of variance showed that there was significant difference among the treatments for coffee yield and groundnut. The highest coffee and groundnut yield was recorded from the treatment 1:3 coffee to groundnut ratio. Final recommendation will be done after conducting land equivalent ratio.

Ongoing Research Activity

Title: Evaluation and Screening of promising Hararghe coffee selections for Coffee Leaf Rust (CLR) in lowland coffee growing areas of Hararghe

Status of the Activity

A total of 25 Hararghe coffee selections were field planted in simple lattice design 5 x 5 at Boke in August 2018. The trial is in good growth stage on field. First yield data was collected and coffee leaf rust disease data collection is under way. All appropriate & recommended field management practices have been applied.

Title: Screening of Selected Arsi Coffee Genotypes against Coffee Leaf Rust Disease for Arsi coffee Growing areas

A total of 36 Arsi coffee genotypes of seeds were raised at coffee nursery site. All recommended nursery management practices have been applied. Currently the seedlings are performing well and the seedling is ready for field transplanting.

Title: Effect of Integrated Management of Coffee Branch Dieback in West Hararghe, Oromia, Ethiopia

Status of the activity

Mocha variety seed was raised at coffee nursery site. All recommended nursery management practices have been uniformly applied. Currently the seedlings are performing well and the seedling is ready for field transplanting.

Title: Effect of different spacing and intercropping on coffee yield and yield components in Eastern part of Oromia

Status of the activity

Arusa coffee variety was field planted in RCBD of 3 replications in August 2018. All appropriate & recommended field management practices have been applied. Currently, the trail is going smoothly. First year coffee yield was collected and three years yield data of intercropping components were collected and analyzed. From the intermediate results the highest yield of intercropping components was recorded from treatment 2m x4m (intercropping) of 16qt/ha for Haricot bean and 10 qt/ha for tef.

Title: Effect of hole size and hole re-filling practices on yield and yield components of coffee in Eastern of Oromia, Ethiopia

Status of the activity

Mocha coffee variety was field planted in Completely Randomized Block Design (RCBD) in factorial arrangement of hole size and hole refilling method with three replications at Mechara on station. All appropriate & recommended field management practices have been applied. Currently the trial is on good growth stage at field & two years yield data was collected and analyzed. From the intermediate results the highest yield was recorded from 70 X 70 cm Hole size X 4kg compost treatment.

Title: Effect of spacing and Coffee-Banana Intercropping on coffee yield and quality in Arsi zone

Status of the activity

The experiment was established at Arba gugu farm in Completely Randomized Block Design (RCBD) with three replications of 24 coffee trees per plots. Mechar-1 coffee variety and Robusta Banana variety was used as testing materials. All appropriate & recommended field management practices have

been applied. Currently both intercropping coffee and banana are in good growth performance at field. Banana yield data collection is under way.

Title: Evaluation of stumping time and height on coffee yield and yield components in western Hararghe Zone

Status of the activity

The experiment was conducted on established Bultum coffee variety and RCBD design with three replications in factorial arrangement was used. All agronomic practices other than treatments were uniformly applied as per recommendation. Currently the stumped coffee trees are performing well.

1.4. Livestock Research Process

Introduction

Agricultural research has a great role in improving production and productivity of agriculture resource in such a way that our center is working in adapting, generating and disseminating different agricultural technologies that suit to West Hararghe Zone and its mandate area with different research process. Among the research process, livestock process is one of the research process that conducting a number of research activities regarding to animal feed and apiculture general. In our mandate area, livestock keeping is practiced as a secondary source of income next to crop cultivation. However, productivity of livestock is still marginalized due to a number of factors, like land shortage, lack of improved forage technologies, poor extension services and so on. So, to overcome this problem and improve production and productivity of the livestock, livestock process has focused and conducting in different research activities there by adapting, generating and disseminating different animal forage and bees technologies.

Table 7: Number of activities funded by IQQO

No	Teams	Completed	Ongoing	Modified	Suspended	Discontinued	Extended	Total
1	Animal Feed	3	2	-	-	-	-	5
2	Apiculture	0	2	-	-	-	-	2
	Total	**3**	**4**	**-**	**-**	**-**	**-**	**7**

1.4.1. Animal Feed and Range land Management

Completed Research Activities

Title: Adaptation Trial of Lupines albus L. in West Hararghe Zone, Oromia, Ethiopia

Summary of the result

Numerically, the highest combined mean of fresh biomass yield **(20.43 t/ha)** and **(19.970 t/ha)** was recorded from **Propor and Walala** variety respectively. So, Propor and Walala varieties were recommended

Title: Nursery observation trial of Rhodes Grass (Chloris gayana) genotypes

Summary of the result

46 genotypes of Rhodes grass were evaluated and 24 genotypes with the superior biomass and dry matter yield and early mature candidate genotypes were selected and promoted to the next breeding stage (PVY)

Title: Variety Verification Trial of Intermediate Maturing Type of Cowpea Genotypes

Summary of the result

This genotype ILRI-25368 was verified by NVRC. This genotypes was released for the study area as new varieties for the country

Title: Variety Verification Trial of Late Maturing Type of Cowpea Genotypes

Summary of the result

This activity was verified by NVRC. But, standing committee was rejected the activity. So, it was rejected.

Ongoing Research Activities

Title:Adaptation Trial of Pigeon Pea (Cajanus Cajun) Varieties in Western Hararghe Zone

Brief status of the activity

This activity was conducted with the objective of to identify and recommend best adaptive, high yielder and disease tolerant pigeon pea varieties for fodder production to sustaining livestock production in the region. This activity was performed with multi location on station, Mieso Gorbo FTC and Lenca Wedesa FTC were used. A total of eight (8) Varieties: Degagsa,

Belabas, Arfasa, Kibrat, Local, Dursa, Ashenafi and Tsigas varieties arranged by RCBD design in 2022 cropping season using plot size 4*3m. All first year agronomic data were collected and analyzed.

Title: Determination of Optimum Seed and Fertilizer Rate of Newly Released Oat (Bareda) Variety in West Hararghe Zone, Oromia, Ethiopia

Brief status of the activity

This activity was conducted with the objective of to determine the optimum seed rate of Oat (Bareda) variety for herbage and grain production and to determine the optimum fertilizer level of Oat (Bareda) variety for herbage and grain production. A total of twelve (12) treatments were used. Three locations (On station, Bareda and A/Rakate FTC) were used. All first year agronomic data were collected and analyzed. Nutritional Quality and ***soil data*** were prepared

1.4.2. Apiculture Research Team

Ongoing Research Activities

Ttitle: Nectar secretion dynamics and honey production potentials of some major honey plants in west Hararghe Zone, Oromia

Current status of the activity

Site selection was done based on the potentiality of the area on the selected plants. The selected plants were orange, mango and zaytuna. Data were collected from orange and zaytuna, but zaytuna has no liquid nectar, which may be due to the humidity of the area. So, we omitted it. For mango we are waiting for the active season.

Ttitle: Performance Evaluation of Selected Native Woody Perennial Bee Forage in West Hararghe Zone

Current status of the activity

The activity was conducting at Machera On station with the **objective** to evaluate and screen the well performing tree/shrubs for honey bees

Materials used

- Casimiroa edulis
- *Anona senegalesis*
- *Parkinsonia aculeata*
- *Psidium guajava*

1.5. Natural Resource Process

Introduction

Natural Resources Management Research Process is one of research process in Mechara agricultural research center. The process has three Research team (Agroforestry, Soil Fertility Improvement & Soil problematic, Soil Water Conservation and watershed Management). Each team has its own mission to support the agricultural development in west Hararghe Zone through adapting, generating, multiplying, and disseminating appropriate natural resource technologies. So far, a number of natural resource research recommendations, technologies and information were generated and disseminated to the farming communities. Accordingly, a total of 2 research experiments have been conducted under SFI & SP; of these 2 ongoing, Whereas, 7 activities have been conducted under Agroforestry research team of these, 3 ongoing,1 suspended and Status of each research activities under the team are given in subsequent section. Status of each research activities under the team are given in subsequent section.

Table 8: Number of activities funded by IQQO

No	Teams	Completed	Ongoing	Modified	Suspended	Discontinued	Extended	Total
1	Soil Fertililty	1	0	-	-	1	1	3
2	SWC & W/sha	1	1	-	-	-	-	2
3	Agro. Forestry	0	3		-	1	2	6
	Total	**2**	**4**	**-**	**-**	**2**	**3**	**11**

1.5.1. Soil fertility improvement & Soil problematic Research Team

Completed Research Activities

Title: Soil Test Crop Response Based P Calibration Study on early Mature Maize in Daro Lebudistrict, West Hararghe Zone, East Oromia.

Summary of Research Activities

On-farm study was conducted in Daro lebu District of west Hararghe Zone of Oromia, during the main cropping seasons of 2017/18-2022 GC. The aim of the study was to determine phosphorus critical level and requirement factor for phosphorus recommendation of the early mature maize variety (melkassa -2) for the district. The experiment was laid out in RCBD and factorial

combination with three replications using (five) 5 level of nitrogen were used for only first year.(0,23,46, 69 and 92 kg/ha) of nitrogen and (six) 6 level of Phosphorous (P = 0, 10, 20, 30, 40, 50 kg/ha) in the first year to determine N were studied . Moreover, single factor of six levels of P (0, 10, 20, 30,40, and 50 P/ha) and 69 kg N/ha in the second and third years to determine phosphorus critical level and requirement factor were laid out in Soil samples were collected from surface soil of the experimental plots (0-20cm depth) before and after planting for laboratory analysis of selected physico-chemical properties of soils. The maximum mean grain yield (**7157 kg ha^{-1})** was recorded from the application of 69 kg N ha^{-1}, whereas the lowest **(4916 kg ha^{-1}**) was recorded from the control plot. Therefore, **69 kg N ha^{-1}** was selected as N fertilizer recommended for the area. The study also showed that P-critical value (**14ppm)** and P-requirement factor **(4.70)** were determined for phosphorus fertilizer recommended in the area. Economic analysis was performed to compare treatments advantages. The validity of treatments and economic evaluation showed that soil test based crop response phosphorus rate benefited **15.5** Ethiopian birr for every birr invested. Thus, farmers in the area may be advised to use soil test based crop response fertilizer recommendation to increase the productivity of maize in the district.

Title: Characterization, classification and mapping of salinity on irrigated land and irrigation water of West Hararghe

Summary of Research Activities

In Ethiopia, there is very limited information about the status of salt affected soils particularly, in west Hararghe zone current information indicating the status of salt affected soils is lacking. This would call the need for investigating status of soil salinity to monitor and possibly reclaim salt affected soils to ensure sustainable agricultural production. Three Districts were selected from west Hararghe zone based on irrigation potential namely;Gumbi Bordode, Daro lebu and Oda Bultum, Locations and altitudes were recorded for each selected sites From each locations soil samples were collected from a depth 0-20cm using the Auger and soil profile was open by FAO standard Water samples were collected from different sources(ground water, river and natural spring) which found at the area water samples were collected from the source, main canal and farm area(inlet) Collected soil samples will be air dried and sent to Laboratory for analysis.

Discontinued Research Activity

Title: Effect of Adapted Grass Cultivars as Forage Production on Soil Physico-Chemical Properties selected Districts of West Hararghe Zone.

Current status of the activity

The activity was conducted at Habro District DAP fertilizer was obtained from Badessa Farmers Union & TSP fertilizer was obtained from Fiche Agriculture research center and IQQO. Seven (7) sites were randomly selected Locations and altitudes were recorded for each selected site .Pre sowing soil samples were collected from all sites. Land preparation was took place as per action plan and Elemo variety was sown.

Reason of discontinued: According to proposed plan, this activity was planned for two year, but in first year it cannot be under taken due to lack human power &TSP. But, this year nitrogen fertilizer recommended, Thus, since the activity is very important, it need two extension years for to determine P fertilizer requirement for sorghum based on soil test crop response & to develop phosphorus fertilizer recommendation guideline for sorghum.

1.5.2. Agroforestry Research Team

Ongoing Research Activities

Title: Effect of Coffee Shade Tree Spacing on Coffee Growth, Yield and Bean Quality in West Hararghe

Brief Status of the activity

This activity, in this year, with progressive condition has been implemented as per plan. Over all 576 Mechara-1 coffee variety and 3 kinds of Coffee shade trees have been already planted at experimental area based on its methodology. Then the experiment has been maintaining and the expected data will be taken forwards.

Title: Evaluation on Adaptation and Growth Performance of Different Exotic High Land Bamboo Species, at Gemechis District, West Harerghe Zone, Ethiopia

Brief Status of the activity

Eight varieties of bamboo were planted with three replication and three plants were planted on per plot from each variety last year at Gemechis District. In this year the experiment has been maintaining very well. At the end of this year, expected data will be taken**.**

Title: Adaptation and Evaluation of Multipurpose Trees/Shrubs for Restoration of Degraded Lands in Lowland Areas of Daro Lebu District, West Hararghe Zone

Brief Status of the activity

In this year, six type of seedlings (smiciuse mole, Bamboo, neem tree, Camarendus Indica, Gravilia and acacia saligna) had been planted in Haroresa Qile PA, with three replication. For experimental purpose over al 162 seedlings were already planted. Without experiment that about 1500 seedlings were planted around the experimental site. Then the experiment has been maintaining and the expected data will be taken forwards. Pre soil data was collected and analysed in laboratory.

Title: Assessment, Characterizations and Mapping of Dindin, Jello Muktar and Hades Forest in West Hararghe Zone, East Oromia, Ethiopia

Brief status of the activity

Already identification of the study areas/three Natural forests in three districts (Dindin, Hades and Jullo muktar) and Mapping of study forests were done. Trend of study forests for 30 years back to be analyzed with GIS expert of IQQO next year will be taken for all the study areas.

However; within the shortage of budget; in this year what was had been doing is Characterization of Tree and Shrub Species Diversity. Survey on driving force of Natural forest deforestation data was collected in Hades Natural Forest only. The remaining study areas will be taken next year if we have budget.

Title: Characterization of Tree and Shrub Species Diversity in Dindin, Jello Muktar and Hades Natural Forest in West Harerghe Zone, East Oromia, Ethiopia

Brief status of the activity

In this year, this activity already had been conducted on Characterization of Tree and Shrub Species Diversity. Survey on driving force of Natural forest deforestation data collection at Hades Natural Forest only due to budget shortage. The remaining study areas will be taken next.

Discontinued Research Activities

Title: Evaluation on Mechanical Rejuvenation of Junipers procera at Dindin forest, West Harerghe Zone, Eastern Ethiopia

Reason of Discontinued;

In this year, site and inventory of experimental trees were selection and identified, respectively at forest and wild life enterprise of Hararghe districts. But forest and wildlife enterprise decision was high to pay for an experimental trees' fee. So the Center decided to discontinue this activity

1.5.3. Soil Water Conservation and Water shade Management

Completed Research Activities

Title: Evaluation of integrated soil bund with push pull technologies on insect pests, soil loss and maize production in Daro Lebu district, Western Hararghe Zone, Oromia, Ethiopia.

Summary of Research Activities

The study conducted for the last three years and the result shows significant difference on yield (kg/ha), while there is no sig. difference on other parameters on the first year. The highest yield and the lowest insect score were found on Vet + bund+desmodium. On Table 2, the result of ANOVA result shows significant difference on yield (kg/ha), while there is no sig. difference on other parameters on the 2nd year again. The lowest soil loss founded on Vet + bund + Desmodium while the highest soil loss founded on farmers practice.

Ongoing Research Activities

Title: Effect of Integrated soil moisture conservation and nutrient management on yield and bean quality of coffee in Daro Lebu and Boke disrict, W/Hararghe

Brief status of the activity

- The activity is conducted at McARC on station and Boke district starting from this summer
- Coffee "Bultum variety" seedling is prepared under nursery
- The SMC prepared according to the standard dimension at both location
- vermi compost and mulching is applied to pit.
- The coffee will be transplanted on prepared structures this month(july) So, this activity is on good progress
-

1.6. Agricultural Engineering Research Process

Introduction

Agricultural Engineering process is, one of the Research Process found under Mechara Agricultural Research Center (McARC), which is the younger research process. There is only one research case team under this process and the team has different experimental research. Starting from previous the team has been achieving with different irrigation water management activity and soil and water conservation research activities. Different experimental activities were done for the last five years under this process in selected districts of West Hararghe zone.

1.6.1. Irrigation, Water harvesting and Drainage Engineering Research Team

Completed Research Activities

Title: Determination and Validation of Crop Water Requirement for Selected Vegetable Crop Production under irrigation practices in West Hararghe

Summary of Research Activity

Water is the major limiting factor for crop diversification and production with more than 80% of water resources have been exploited for agricultural irrigation. The activity is planned to determine and generate base line information for crop water requirements for selected vegetable production irrigation scheduling for selected Vegetable crops for end users. It is done in selected districts of west Hararghe zone for two year in Oda Bultum and Daro lebu districts. For the first year climate data and soil data were taken and analysis for estimation of crop water requirement (CWR) of tomato, onion and pepper using cropwat8 model. At the next year, the estimation crop water requirement was applied on field to convince the actual and the estimation crop water requirements for the selected vegetable crop (tomato, onion and pepper) to study area. Full write up of the activity is under way.

Extended Research Activity

Title: Evaluation of Irrigation Water Levels with organic & inorganic fertilizer on Growth & Yield of tomato under Furrow Irrigation in Oda Bultum district, West Hararghe Zone.

Reason of Extension

The activity was conducted as per planned last year in Oda Bultum at Gola hora kebele and at Daro Lebu district at Chafe Hara Kebele on selected adapted vegetable crop (tomato, onion and pepper). The necessary data of irrigation (Amount of applied water, irrigation interval, irrigation frequency) and crop agronomic data (plant height, branch per plant, fruit per plant, yield per plant and total yield) were taken and analysis for determination of intermediate results.

Discontinued Research Activity

Title: Determination of Irrigation Regime, Yield, and Yield components of Hot pepper Under drip Irrigation in Daro Lebu Mechara on Station, Oromia Ethiopia

Reason: Due to luck of irrigation (untimely accomplishment of center irrigation project) the activity was discontinued.

1.7. Socio Economics and Agricultural Extension Research Process

Introduction

Socio-economics and Agricultural Extension Research Process has been reporting different activities done within the process in 2022/23 fiscal year through different report of field, month, quarter and directory. Annual report was organized here besides other reports by the process as per format of institute on activities funded by IQQO and non-IQQO. The report contains completed, ongoing and new research activities. In addition, capacity building/training and field day were prepared and organized for farmers, DAs and SMS on different topics and commodities to improve knowledge and skills as well as create awareness for the participants. Extension materials such as leaflets, banners, manuals and certifications were distributed to the participants on the programs. Social media like TV and Radio of OBN as well as Facebook and Telegram were used to transmit information about technologies for wider disseminations and impacts creation. Different research activities were also published by researchers on international journals to show research outputs for scientific communities in the world. Moreover, over all

works done within the process are presented in detail under sub-sections of reports in addition with main challenges faced a process in a year.

Table 9: Number of activities funded by IQQO

No	Teams	Completed	Ongoing	Modified	Suspended	Discontinued	Extended	Total
1	Socio E	6	4	-	-	-	-	**10**
2	Agri Extension	2	1	-	-	-	-	**3**
	Total	**8**	**5**	**-**	**-**	-	-	**13**

Table 10: Number of activities funded by others

No	Teams	Completed	Ongoing	Modified	Suspended	Discontinued	Extended	Total
1	Socio E	-	0	-	-	-	-	0
2	Agri Extension	-	2	-	-	-	-	2
	Total	-	**2**	-	-	-	-	**2**

1.7.1. Socio Economics Research Team

Completed Research Activities

Title: Factors Affecting Adoption of Improved Modern Beehive Technologies in West Hararghe Zone, Oromia National Regional State, Ethiopia

Summary of Research Result

This activity was conducted in 6 kebeles of three districts: Oda Bultum (Bekenisa & Kara *kebeles*), Tulo (Hunde Lafto & Kira Kufis *kebeles*) and Gemechis (L/L/Madera & G/G/Dingete *kebeles*) districts with the objectives of assessing the adoption status of improved modern beehives and analyzing factors affecting adoption decision and intensity of modern beehive in West Hararghe zone. Both qualitative and quantitative data were utilized which employed from primary and secondary data sources. Primary data were collected using semi-structured questionnaire through interview schedule from 180 beekeepers among 52 were adopters and 128 were non-adopters. Secondary data sources were includes published and unpublished documents of districts and zonal agricultural offices. The collected data was analyzed through heckman two step model using STATA software. The t-test result indicated that among the nine discrete and

continuous variables, the five significant variables were education level, livestock owned, distance from FTC, land owned and frequency of extension contact. While, chi-square result indicated among the eight dummy/ categorical variables four variables (Membership for beekeeping association, access to accessory, participation on demonstration and access to training) were significant at 1% and 5% significance level. The first step (probit) heckman model result examined that among the 13 explanatory variables six variables (age of household head, education level, marital status, livestock owned (tlu), number of extension contact and access to credit) were significantly affect the household decision to adopt modern bee hive. The second step of heckman model result indicated that among the 13 explanatory variables five variables (distance from FTC, access to accessory, livestock owned, access to training and number of extension contact) were significantly affect adoption intensity of modern bee hive. Therefore, concerning body should give attention for these significant variables.

Title: Value Chain Analysis of Hot Pepper in West Hararghe zone, Oromia National Regional State, Ethiopia.

Summary of Research Result

This activity was conducted in 6 kebeles of three districts: Hawi Gudina (Ibsa & Tao *kebeles*), Daro Lebu (Mardida & Milkaye *kebeles*) and Boke (Tokuma & Cabi *kebeles*) districts with the objectives of identifying and map actors and their functions along the value chain, estimate the distribution of benefits among the actors and analyzing factors affecting the supply of hot pepper to the market in the study area. Both qualitative and quantitative data were utilized which employed from primary and secondary data sources. Primary data were collected using semi-structured questionnaire through interview schedule from 172 hot pepper producers, 44 traders, 11 input suppliers and 32 consumers. Focus group discussions were also conducted to support the qualitative data. Secondary data sources were includes published and unpublished documents. The collected data were coded and entered into computer. The collected data was analyzed using STATA software. Data full report writing is on the way.

Ongoing Research Activities

Activity: Adoption of Improved Chickpea Varieties in West Hararghe Zone, Oromia National Regional State, Ethiopia

Brief Research Status

Secondary data was taken from West Hararghe Agriculture Office related to chickpea production. Based on an obtained secondary data representative districts which have potential in chickpea production and using improved chickpea varieties were selected. Accordingly, Tulo, Habro and Oda bultum districts were targeted for primary data collections. From each district 2 *kebeles* were selected: Bereda & Haro Chercher *kebeles* from Habro; Bedesa Guda & Kolu *kebeles* from Oda Bultum and Kufan Ziq & Oda Nega *kebeles* from Tulo district. Questionnaires were prepared. Primary data collections, analyzing and full report writing is the remained tasks for next budget year.

1.7.2. Agricultural Extension Research Team

Completed Research Activities

Title: Pre Extension Demonstration and Evaluation of Improved Finger Millet Technologies in West Hararghe Zone.

Summary of the Result

The experiment was conducted at Daro Lebu and Habro within 4 kebeles (Kotora and Galma Jaju from Daro lebu; and Garbi Goba and Busoytu from Habro) in 2022 cropping season. 12 trial farmers and 1 FTC were involved in an experiment. Ikhulule variety was evaluated with standard check (Kumsa variety) on 10m*10m plot size. Agronomic practices like 12kg/ha seed rate, 40cm row spacing, 100kg/ha NPSB and 50kg/ha urea were applied. On this technology, training and field day were used to create awareness for different stakeholders. On training, 10 farmers, 2 DAs and 6 SMs were participated. In addition, 103 farmers, 5 extension worker, 7 SMs and 23 other stakeholders were also participated on field day that conducted at Garbi Goba kebele and 98 leaflets were distributed for the participants. Study results showed that 45.03 $Qtha^{-1}$ and $39Qtha^{-1}$ mean grain yield were recorded from Inkulule and Kumsa variety, respectively.

Inkulule variety has 15.46 yield advantages over the Kumsa. In additions, farmers also selected Inkulule variety by plant height, early flowering, early maturity, and number of finger, number of tiller, disease tolerance and drought tolerance during demonstrations. Thus, Inkulule variety was recommended for pre scaling up.

Title: Promotion and popularization of Grafted Mango Technology at Daro Lebu District of West Hararghe Zone

Summary of the Result

The experiment was conducted in Daro Lebu district of West Hararghe Zone at Haroressa Kile, Haro Adi and Galma Jaju kebeles. It conducted near 25 farmers per kebele; totally near 75 farmers and 4 grafted (Tommy Atkins) mango variety delivered for each farmer (total of 300 seedlings). Among the planted grafted mango (300 seedlings) due to drought and late time of planting only 113 mango were survived which account 37.66%. To create awareness for different stakeholders, field day was organized at Haro Adi kebele; and 36 farmers, 3 DAs, 3 SMSs and 9 other stakeholders were participated. In addition, 42 leaflets were distributed during field day. When Grafted mango compared with local one; and most of farmers were selected grafted mango in land saving, fruit size, fruit price, disease tolerance, fruit per tree, easy to harvest, easy to spray and early to bear. Due to this most of farmers appreciate the technology and rise interest to take it. Therefore, the variety was recommended for further scaling out by NGO & respective agricultural office.

Title: Pre-extension Demonstration and Evaluation of Sorghum Technologies at Tulo and Daro Lebu districts of West Hararghe zone

Summary of the Result

The activity was conducted in Daro Lebu and Tulo district of West Hararghe in 2022 cropping season. Two kebeles from each district; totally 4 kebeles were selected for implementations based on potential of sorghum productions and agro-ecology. 6 farmers and 1 FTC from D/lebu and 5 farmers and 1 FTC from Tulo were selected. Aynage variety was evaluated with standard check (Bonsa) on 10m*10m plot size, 12 kg/ha seed rate, 55cm*25cm plant spacing, 100kg/ha NPSB and 50kg/ha Urea were applied. 35.8Qtha^{-1} and 45.1Qtha^{-1} were recorded from Aynage and Bonsa variety, respectively. Yield of Aynage variety reduced due to it attacked by birds. During field day farmers selected Aynage Variety by early flowering, early maturity, sweetness

and biomass criteria'. Therefore, based on yield Bonsa variety was recommended for pre scaling up.

Title: Pre scaling up of Improved Sorghum Technologies in Midland of Daro Lebu and Habro Districts of West Hararghe Zone

Summary of the Result

The activity was planned to be conducted in Daro Lebu and Habro districts of West Hararghe Zone. Unfortunately the experiment couldn't be conducted in Habro district due to the reluctance of SMSs and DAs to select the required farmers land. It conducted only in Daro Lebu district at three kebeles (Maldisa, H/kile and Sakina). Elemo variety was sowed on 0.25ha/farmer. 75 cm*25 cm plant spacing, 12kg/ha seed rate, 100kg/ha NPSB and urea were used. Yield was collected from Maldisa kebele because at Sakina and Haroresa Kile kebeles farmers intercropped with other sorghum. 92 farmers, 1 extension worker, 5 SMs and 11 others; totally 113 stakeholders were participated on field day that organized and conducted at Maldisa kebele and 80 leaflets were distributed. At Maldisa kebele 1.1 hectare was cultivated and 34.6 $Qtha^{-1}$ mean grain yield was collected. Therefore, Elemo variety was recommended for further scaling out by NGO & respective agricultural office.

Title: Participatory Demonstration and Evaluation of In-situ Water Harvesting Technology with Sorghum Production in Hawi Gudina & Daro Lebu Districts of West Hararghe Zone

Summary of the Result

The activity was conducted in two districts of West Hararghe zone: Daro Lebu (Haroresa kile kebele) and Hawi Gudina (Ibsa kebele) from 2021 to 2022 year. Totally, 7 farmers have been participated on an experiment. In-situ WHT (structure) was evaluated compared with without structure (local control) using Melkam sorghum variety on 10m*10m plot area. 30cm depth, 30cm width and tied ridge at 3m interval was used for the structure and seed was planted at 15cm (center). To create awareness, training was organized and given for 13 farmers, 3 DAs and 6 SMs. And also field day was conducted. On demonstration's 51 farmers, 2 extension workers, 3 SMs and 11 other stakeholders were participated. 50 leaflets also distributed for participants'. 47 Qt and 45 Qt mean grain yield were recorded by sorghum with structure and non-structure, respectively. Sorghum planted with structure has 4% yield advantage over non-structure. In addition trail that has structure was selected by farmers during field day by stay green, drought

tolerance, and disease tolerance, stay moist and head size. Therefore, In-situ WHT with Melkam sorghum variety was recommended for pre scaling up.

Title: Pre-scaling up of Haricot bean technologies in Daro lebu and Habro District of West Hararghe

Summary of the Result

The activity was conducted in Daro Lebu and Habro district of West Hararghe Zone in 2022 cropping seasons. Gadisa kebele from Habro and Haro Adi and Haroresa kile kebeles from Daro Lebu were selected based on potential of sorghum productions and agro-ecology. Awash-2 variety was sowed on 0.25ha land/farmer. It was carried out by employing recommended agronomic practices: 90kg/ha seed rate, 100kg/ha NPSB and 40 cm row spacing. But due to drought, the activity conducted at Habro was failed and yield data was collected only from D/lebu (H/kile and H/Adi kebeles). 12 $Qtha^{-1}$ and 10.5$Qtha^{-1}$ mean grain yield was recorded on Haroresa kile and Haro Adi kebeles, respectively. Therefore, Awash-2 variety was recommended for further scaling out by NGO & respective agricultural office.

Ongoing Research Activities (support with pictures)

No	Title of the activity	Name of the technologies demonstrated	Location (district, PAs and FTCs)	Plot size (ha) per farmer used for the trial	Quantity/ amount of the technology distributed	Number of participant farmers/pastoralists					Benefits obtained (productivity/income gain)
						AM	AW	YM	YW	Tot	
1	Pre extension Demonstration of Finger millet technology	Inkulule	Daro lebu (Kotora), Habro (Garbi Goba kebele)	10*10m	1.44	12				12	
2	Pre extension demonstration of Sorghum technology	Hayinage	Daro lebu (Kotora), Tulo (Terkanfeta kebele)	10*10m	1.32	11				11	
3	Pre extension demonstration of In-situ WHT technology	Structure	Hawi Gudina (Ibsa kebele) and Daro Lebu (H/Kile kebele)	10*10m	0.86kg	5	2			7	
4	Pre extension demonstration of Plantain banana technology	Nijiru and cardaba	Daro Lebu (Sororo and Kotora) kebeles	$6.25m^2$	56 seedlings	5	2			7	

NB: AM = Adult men; AW = Adult women; YM = Youth men; YW = Youth women and Tot = Total

Figure 1: Pictures of different pre extension demonstration activities of 2022/23 fiscal year

Ongoing Pre-scaling up activities (support with pictures)

No	Title of the activity	Name of the technologies Scaled up/out	Location (district, PAs and FTCs)	Plot size (ha) per farmer used for the trial	Amount of technology distributed (specify the unit)	Number of participant farmers/pastoralists					Average productivity (in qt/ha) due to use of the technology
						AM	AW	YM	YW	Tot	
1	Pre scale up of improved Mung Bean	NLV-1	Daro Lebu (Hamsiso), H/ Gudina (Ibsa)	0.25	1.2	20	4			24	
2	Promotion and popularization of Grafted Mango	Tommy atkin	Daro lebu (G/Jaju, H/Adi and H/ Kile) kebeles\	3m*3m	127 plants	54				54	
3	Pre scale up of Groundnut technology	Milkaye	Daro lebu (H/Kile kebele)	0.146	0.788	6				6	
4	Pre scale up of Sesame technology	BaHa-zeyit	Daro Lebu (Hamsiso), H/Gudina (Ibsa)	0.25	0.375	30				30	
5	Pre scale up of haricot bean technology	Awash-2	Darolebu (H/kile & Haro Adi)	0.25	14.68Qt	60	5			65	
6	Pre scaling up of Improved Sorghum	Elemo	Daro lebu(H/kile,H/Adi and Maldhisa)	0.25	2.96 Qt	85	5			90	

NB: - AM = Adult men; AW = Adult women; YM = Youth men; YW = Youth women and Tot = Total

Figure 2: Pictures of different pre scale up activities of 2022/23 fiscal year

2. Technology Multiplication and Distribution

This year, different improved seeds of various crops, coffee and forages were multiplied and distributed through different stakeholders like District Agricultural office, Carcar Oda Bultum Union, Burka Galeti Union and Oda Bultum University in West Hararghe. A total of 18.18 hectare of land was covered with different crops for seed production in this cropping season.

Table 11: Summary of seed produced in the year

Crop	Variety	**Annual plan**		**Annual Achievement**		Seed class
		Area/ha	Yield/ha	Area/ha	Yield in Qt	
Sorghum	Melkam	2	68	2	13	Basic
	Elemo	2	80	1.5	23	Pre Basic
Maize	Melkasa-2	2.5	105	2.5	32	Basic
H/Bean	Awash-2	2	60	2.3	30.5	Basic
Groundnut	Milkaye	1	18	1	5.5	Pre-basic
M/ bean	Rasa-2	1	15	1.5	1.5	Certified I
Oat	Bareda	0.5	4	0.5	4	Pre-basic
Coffee	Aruza	0.91	2	0.91	1	Pre-basic
	Mocha	0.7	1	0.7	1.1	Pre-basic
	Mechara-1	0.71	1.5	0.71	0.8	Pre-basic
	Bultum	0.71	1.5	0.71	1	Pre-basic
	Cultivar	2.18	40	2.18	35	-
Total		**18.18**	**432.5**	**18.68**	**146.9**	

Reason for below performance

- Rainfall Shortage during Sowing & maturity
- Drought problem at H/Gudina Subsite: **Planned seed multiplication was not sown totally**
- Untimely sowing of some crop due to late on set of rainfall like Groundnut, F/Millet & Sorghum w/c makes yield redaction
- Soil fertility decline from time to time at Mechara on station.

Table 12: Summary of other technologies multiplied in the year

SN	Name of team	Multiplied technology	Obtained yield (kg)
1	Cereal	Elemo variety (breeder seed)	60
		Ayinage variety (breeder seed)	80
		Ikhulule variety(breeder seed)	100
2	Pulse and Oil	Milkaye variety (breeder seed)	44
		Bha Nacho variety (Pre basic)	15
		Bha Zayit variety (Pre basic)	17
		Awash-2 variety (pre basic)	62
3	Horticulture	Giant Cavendish & William I, Nijiru fi Kardaba,	8950
		Awasa-83	15,000 cutting
		Dirshaaye variety(pre basic)	16kg
4	Coffee Improvement	Mechara-1, Aruza, Moca,Bultum	317 kg
5	Animal Feed	Rhodes grass, Vetch, Oats, Cowpea(Bole)	298kg
		Elephant grass	50,000 Cutting
		Desho grass, Bracharia	2 ,000 Root Split
6	Apiculture	Black buck wheat, White buck wheat,	14.5 kg
7	Coffee	Coffee seedling (Mechara-1 and Moka)	30,000 Multiplied & distributed for farmers
8	Q/Bosonaa	Bambo & d/ft agroforestry seedling	2,500 Multiplied & distributed for farmers

Table 13: Summary of seed distributed in the year

S/N	Technologies distributed	Measurement	Amount distributed	Stakeholder
1	Forage seed (Oat, Cowpea, Lablab, Rhodes grass & Phanicum)	Kg	67	Oda Bultum University, Carca Oda Bultum Union, Doba district and farmers
2	Desho grass	Roots	25,500	
3	Bracharia Grass	Roots	19,400	
4	Elephant grass	Cutting	40,000	
5	Banana Sucker	No.	480	Farmers of D/Labu & Habro
6	Sweet potato	Cutting	2,500	D/Labu Farmers
7	Coffee Seed (Moka, Bultum, Aruza & Mechara-1)	Kg	317	Tulo, Shanan Kolu, Habro & Daro Lebu district
8	Coffee seedling (Moka, Bultum, Aruza & Mechara-1)	No.	30,000	Daro Lebu district farmers
9	Finger Millet seed(Tesama)	Kun	7	Daro Lebu & Habro district farmers
10	Black Cumin(Dirshaye)	Kg	9	Tulo & Gemechis district farmers
11	Seedlings of different multipurpose trees	No.	15,000	Daro Lebu, district farmers, daro Lebu Hospital and church
12	Grafted Mango	No.	300	Mieso, Gamachis & Doba district farmers
13	Maize(Melkasa-2)	Kun	5	Daro Lebu, district farmers
14	Haricot Bean(Awash-2)	Kun	14.63	Daro Lebu, district farmers
15	Sorghum(Melkam & Elemo)	Kun	4.25	Daro Lebu, district farmers
16	Maashoo(NLV-1)	Kun	1.4	Daro Lebu, district farmers
17	Saliixa(BaHa-Zayit)	Kun	0.5	Daro Lebu, district farmers
18	Loozii(Milkaye)	Kun	0.7	Daro Lebu, district farmers
19	Sanyii shunkurtaa(seedling)	No.	40,000	Gemechis district farmers
20	Sanyii timaatimaa(seedling)	No.	80,000	Gemechis and Doba district farmers

3. Training for (farmers, experts, DAs, researchers, supportive staff)

3.1. Training for (farmers, experts, DAs)

Training is one of the extension services delivered for the farmers to improve their knowledge, skill and attitudes on different technologies. The training was given to the farmers and other relevant stakeholders before the implementation of the demonstration on farmers' field and other trials

Table 14: List of training Participants

No.	Name of Team	Field of training/workshop	No of participants			Duration
			Farmers	DAs	Experts	
1	Cereal	Sorghum and f/millet production and management	5	2	1	2 day
2	Pulse & Oil	H/bean and Sesame prod. Technology	7	3	1	2 day
3	Horticulture & Spice.	Sweet potato & Hot pepper prod.tech	5	4	2	2 day
4	Crop protection	Sorghum disease management	0	2	3	
4	Coffee & Tea Improvement	Quality coffee seed preparation method	34	3	3	2 day
5	Coffee & Tea Management	Improved agronomic practices. & protect.pract.	28	3	3	2 day
6	Animal Feed	Grass utilization system & its benefits	5	4	1	2 day
7	Apiculture	Honey bee plants and bee production aspect	1	3	3	2 day
8	Irrigation	Irrigation application and efficient use of water	2	6	0	2 day
9	Agroforestry	Agro forestry practices and multipurpose tree use	15	2	4	2 day
10	Soil FI	Compost preparation and method of application	18	7	2	2 day
11	SWC & Water shade mgmt.	Soil and water conservation practices	61	5	8	3days
12	Agri. Extension	General training on production of Alfafa Technology, Sorghum & finger millet technology, In-situ WHT, farmer's research group.	43	26	17	2 day
Total			**219**	**50**	**60**	

Picture: Field day organized for different stakeholders

3.2. Professional advice (technical support for stake holders)

Staff members deliver technical support to different organizations this year through its research teams.

Table 16: Professional advice delivered

No.	Research Team	Training Topic	No. Participants
1	Crop protection	Training on help desk	1(Researcher)
		Aflatoxin Mitigation and its strategies	2(Researchers)
2	Pulse & Oil	Breeding Strategy	1(Researcher)
3	Animal Feed	Forage breeding strategy	1(Researcher)
4	Agroforestry	GIS application(Trend analysis)	2(Researchers)
		Climate change & meteorology forecast	2(Researchers)

4. Field day Organized in the years

The centre organized field days on certain technologies in order to evaluate and popularize the technologies by different end users especially, farmers in the area where the activities undertaken.

Table 17: Summary of Field day Organized and participants

No	Technologies which field day was organized	Location (district and Kebele)	**Number of participants**							
			Farmers/pastoralists					DA	SMS	Total
			AM	AW	YM	YW	Total			
1	Grafted Mango	D/Labu **(**Haro adikebele)	22	14	0	0	36	3	12	51
2	PED of F/millet (Inkulule) technology	**Habro (**G/Gooba kebele) & D/Labu(Kotora)	87	16	0	0	103	12	23	138
3	PED of Sorghum(Ayinage) Technology	D/Labu (Kotora kebele)	40	5	0	0	45	3	10	58
4	Pre scaling up of Sorghum(Elemo)	D/Labu (Madhisa)	59	33	0	0	92	6	13	101
5	Pre scaling up of Sesame(BaHa Zayit)	D/labu(Hamsiso)	66	95	0	0	161	5	12	178
6	Pre scaling up of Coffee (Moka)	Sh/Kolu(L/Rifenso)	49	5	0	0	54	14	14	82
Grand total			**323**	**168**	**0**	**0**	**491**	**44**	**84**	**619**

Note: AM = Adult men; AW= Adult women; YM=young men; YW=young women

Picture: Training given for farmers, DA s & SMS

5. Extension Material Produced and Distributed in the year

Extension materials accelerate popularization and dissemination of agricultural technologies and boost adoption the technologies toward end users. Hence, our center prepared different materials (training manuals, Leaflet, poster and banner) and distribute for stakeholders during training and field day organized on farmer`s fields.

Table 17: Extension materials Prepared & distributed

No	Research Team	Prepared material	Amount prepared	Amount distributed for	
				Farmers	SMS & DAs
1	Cereal	Manual	3	-	3
2	Pulse and Oil	Manual	3	-	3
3	Horticulture & Spices	Manual	3	-	3
4	Animal Feed	Manual	13	-	13
5	Apiculture	Manual	13	-	13
6	Soil Improvement	Manual	12	-	12
7	SWC & Water shade	Leaflat	40	30	10
		Manual	7	-	7
8	Agro forestry	Manual	9	-	9
9	Agri. Extension	leaflet	358	312	46
		Manual	9	-	9
Total			**470**	**351**	**119**

6. Research Articles published in the Year

Table 18: List of publication

Research Team	Tiltle	Publication type
Pulse & Oil	Effects of Inter and Intra Row Spacing on Yield and Yield Components of Erect type Groundnut (Arachis Hypogeal L.) in West Hararghe Zone, Eastern Ethiopia	Journal
	Release and Registration of Milkaye (PI-158850) Groundnut (Arachis hypogaea L.) Variety	Journal
Horticulture	Genotype by environment interaction and stability analysis of sweet potato (Ipomoea batatas L.) genotypes in West Hararghe zone, Eastern Ethiopia.Res. Agric. Livest. Fish. 10(1): 43-52.	Journal
Coffee & tea Management & protection	Integrated Coffee Nutrient Management Study in West Hararghe	Journal
	Assessment of Major Coffee Pests in Arsi Coffee Growing Areas, Oromia, Ethiopia	Journal
Animal Feed	Performance Evaluation of Alfalfa (Medicago sativa) in Selected districts of West Hararghe Zone, Oromia, Ethiopia. Journal of Animal and Veterinary Sciences	Journal
Apiculture	Adaptation Trial of Improved Bee Forages in West Hararghe Zone of Oromia Region, Ethiopia, International Journal of Applied Agricultural Sciences. Volume 8, Issue 2, March 2022 , pp. 76-79. doi: 10.11648/j.ijaas.20220802.13	Journal
Agroforestry	Effect of Indigenous Tree Species Component in Homegarden Agroforestry System on Selected Soil Physicochemical Properties in Habro District, Oromia Regional State, Ethiopia. 7(3). https://doi.org/10.22158/se.v7n3p56	Journal
Irrigation	Evaluation of In Situ Rain Water Harvesting for Coffee Production in Daro Lebu District, West Hararghe, Oromia, Ethiopia	Journal
	Evaluation of Mulching and Tied Ridges on Soil Moisture and Yield of Maize at Daro Lebu District, Western Hararghe Zone, Oromia, Ethiopia	Journal
SWE & Water shade mngmt	Evaluation of tied ridge with mulch on soil moisture, yield and yield component of maize in Daro Lebu district, West Hararghe, Oromia	

	Evaluation of In situ Rain Water Harvesting as an adaptation strategy to climate change for coffee production in Daro Lebu district, West Hararghe, Oromia, Ethiopia	Journal
Socio Economics	Determinants of Smallholder Farmers Adoption for Improved Finger Millet Varieties in West Hararghe Zone, Oromia National Regional State, Ethiopia. Journal of Agricultural Economics, Extension and Rural Development, 11(5):10-22.	Journal
	Factors Affecting Market Participation Decision and Intensity of Participation of Cow Milk Producers in Gemechis District, Ethiopia. Journal of Marketing and Consumer Research, 89(2): 12-21.	Journal
	Economic Efficiency of Smallholder Farmers in Maize Production in West Harerghe Zone, Oromia National Regional State, Ethiopia. Journal of World Economic Research. 11(2): 98-104.	Journal
	Assessing the Impacts of Productive Safety Net Programme on Smallholder Farmers Expenditure in West Hararghe Zone, Oromia Region, Ethiopia. Economics. 11(4): 190-199.	Journal

7. Human Resource of the Center in the year

It is inherent and imperative for an organization to enhance the capability of its workforce in order to fully carry-out plans and targets towards achieving its goals and objectives. After all, the most important asset of any organization is its human resource. Like any organization, our center performed the following major activities under human resorce development and capacity building:

Table 19: Total number of employees on study leave during this plan year

No.	Process/Team	Level of education	started edu in 2015 E.c		started edu in 2014 E.c		started edu in 2013 E.c		Total	
			Dhi.	Dub.	Dhi.	Dub.	Dhi	Dub	Dhi	Dub
1	Cereal	MSc	-	-	1	-	1	-	**1**	-
2	Socio Economics	MSc	-	-	1	-	-	-	**1**	-
3	Apiculture	MSc	-	-	1	-	-	-	**1**	-
4	Pulse and Oil	MSc	-	-	-	-	1	-	**1**	-
5	Coffee improvement	MSc	-	-	1	-	-	-	**1**	-
6	Soil Improvement	MSc	-	-	-	-	1	-	**1**	-
7	Irrigation	MSc	-	-	-	-	1	-	**1**	
Total					**4**		**3**		**7**	**-**

Table 20: Human Resource Status

S/N.	Process	PhD		MSc/MA		MVSC		DVM		BSc/BA		Diploma/level		Certificate		Others		**Total**	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1	Research	-	-	13	1	-	-	-	-	21	0	2	1	5	1	-	-	41	3
2	Supportive	-	-	-	-	-	-	-	-	5	4	1	3	15	2			21	9
Ida`ama				**13**	**1**					**26**	**4**	**3**	**4**	**20**	**3**			**62**	**12**

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Other activities carried out related to human resource development

- Research and supportive promotion have been done
- Recruitment of guard was done
- Workers and center evaluation was done two times in the year.

8. Budget Utilization

8.1. Capital budget for research activities by IQQO

Table 21: Capital budget utilization

S/N	**Research Team**	**Allocated Budget**	**Utilized**	**Utilization (%)**	**Remark**
1	Cereal	597,100	595,734.65	99.77	
2	Pulse and Oil	728,840	725,777.75	99.58	
3	Horticulture & Spices	752,200	738,904.23	98.23	
4	Crop protection	341,100	341,049.50	99.99	
5	Coffee & Tea Process	2,571,340	2,553,302.47	99.30	
6	Apiculture	302,100	286,677.80	94.90	
7	Animal Feed	424,400	424,214.03	99.96	
8	Soil Fertility Improvement	368,000	364,355.59	99.01	
9	Agri Engineering	175,000	174,372.76	99.64	
10	Agroforestry	390,600	389,062.33	99.61	
11	Technology Multiplication	1,450,300	1,449,544.65	99.95	
12	Agri Extension	747,295	737,074.10	98.63	
13	Socio Economics	326,000	320,873.68	98.43	
Total		**9,174,275**	**9,100,943.54**	**99.20**	

8.2. Recurrent Budget

Table 22: Recurrent budget and internal revenue Utilization

S/N	**Mechara ARC**	**Allocated Budget**	**Utilized**	**Utilization (%)**	**Remark**
1	Recurrent Budget	11,499,728	11,383,759.03	98.9	
2	Internal Revenue	613,547	492,320	80.2	
Total		**12,113,275**	**11,876,079**	**98**	

Table 23: Internal Revenue Collection Performance

S/N	**Mechara ARC**	**Annual Plan**	**Utilized**	**Utilization (%)**	**Remark**
1	Internal revenue collection	954,325	569,116.5	59.6	

Reason for below performance: Due to drought happened at planting time yield potential of crop was declined which directly influence our internal revenue performance.

8.3. Capital budget for research activities by other organization

Table 24: Budget utilization funded by others

S/N	**Research Team**	**Source of Fund**	**Allocated Budget**	**Utilized**	**Utilization (%)**
1	Cereal	Pioneer	293,364.72	165,155.9	56.3
		GL-CRSP	188,835.81	116,535.9	61.7
2	Coffee & Tea	AGP-2	380,000	224,012.5	57.6
		EIAR	348,796	347,489	99.6
		Ashagire PLc	7,157.55	2,000	27.9
3	Soil Fertility Improvement	AEFRP	90,288.86	73,521.42	81.4
4	Agroforestry	CALMP4R	1,260,021.83	850,288.8	67.5
5	Agri Engineering	PASIDP	1,091,037.7	850,706.4	77.9
6		Irrigated wheat	260,000	258,424.4	99.4
Total			3,919,502	2,888,134	73.6

9. Other Works Accomplished in the year

In addition to research activities accomplished in the year other works like center development, job creation for jobless communities, ethical promotion, gender mainstreaming, youth participation and HIV AIDS prevention were executed in this year. Center development activity is one of the activity in which leveling of office surrounding, maintaining the office and construction of main get were undertaken.

Photo: Center development activity done in the year

Table 25: Performance of job creation activities of the year

No.	Planned activities	Unit	Annual Plan	Achievement	Achievement (%)
1	**Crop Process**				
1.1	Banana sucker multiplication	No	30	28	94
1.2	Different crop seed production	No	3000	2850	95
1.3	Different crop research management	No	200	193	96.5
2	**Coffee & Tea process**				
2.1	Coffee seedling Multiplication & Management	No	180	175	97
2.2	Mother coffee tree management	No	250	240	96
3	**Livestock process**				
3.1	Different forage seed production	No.	35	35	100
3.2	Different animal feed & Apiculture research management	No	65	63	96.9
Total			**3,760**	**3,584**	**95.1**

Table 26: Performance of Ethical Promotion Activities of the Center

S/N	**Main activities planned**	**Unit**	**Annual plan**	**Achievement**	**Achievement %**
1	Collect customer feedback on our services and analyze public satisfaction levels	Quarter	4	2	50
2	Monitoring the use of the government's budget to ensure that it is put to good use and produces the desired outcomes	Quarter	4	4	100
3	Observing how center staff use government equipment and materials to ensure that they are solely used for office tasks	Quarter	4	4	100
4	Assess any potential ethical dilemmas or difficulties at work, and respond right away if they arise	Quarter	4	0	0

5	Support the ethics and anti-corruption councils of the centers; establish a schedule for debating any ethical issues and processes for resolving them if they arise	Quarter	4	4	100
6	Monitor precence and application of important laws, rules, and regulations	No of monitored documents	4	4	100
7	Conduct studies on practices that leave room for fraud and misconduct	No	2	0	0
8	Collaborate with various groups to encourage moral conduct and a sense of responsibility at all levels in the center.	Quarter	4	4	100
9	Employee ethics, those who set an example at work, those whose disciplinary infractions have been advised and who have received disciplinary punishment	Good model	5	0	0
		Adivised	10	5	50
		Punished	3	1	25
10	Receive and give feedback	Quarter	4	0	0

Table 26: Performance gender & youth mainstreaming and HIV Prevention Activities of the Center

No	Planned activities	Unit	Annual plan	Annual Achievement	Annual Achievement (%)
1	Support HIV AIDS Career.	No.	12	12	100
2	Providing training for staff	No.	0	0	0
3	Providing training for farmers on HIV AIDS	No.	0	0	0
4	Participants of technology demonstration (Male farmers)	No.	50	46	92
5	Participants of technology demonstration (Female farmers)	No.	5	4	80
6	Participants of technology pre scaling up (Male farmers)	No.	300	247	80
7	Participants of technology pre scaling up (Female farmers))	No.	50	35	70

10. Problem encountered in the Year

- Lack of Service bus for staff movement
- Lack of subsite at midland & highland area to conduct over location research
- Absence of promotions and long term training for supportive staffs
- Pool system problem
- Shortage of daily laborers and low rate payment
- Shortage of laboratories and laboratory equipment
- Marginalizing extension research work activities at Kebele level
- High rate of inflation
- Shortage of human resource both researchers and supportive staff
- Lack of access to genotype for breeding research activities