Oromia Agricultural Research Institute

Jimma Agricultural Engineering Research Center

Annual Research Activities and Center Development Report

For 2015 Ethiopian fiscal year

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1. Introduction (Overview about the center)

Jimma Agricultural Engineering Research Center is one of the 17 research centers operating under the Oromia Agricultural Research Institute (IQQO).The center was established in 1978 E.C as Jimma Rural Technology Promotion Research Center (JRTPC). During BPR 2000 E.C the center name was changed to "Jimma Agricultural Mechanization Research Center" under IQQO then in 2007 E.C with BPR recalibration the name was changed to "Jimma Agricultural Engineering Research Center" under IQQO. Currently the center consists seven (7) research case teams in the core process namely Agricultural Machinery and Farm Power research team, Post-harvest & Agricultural product processing Team, Renewable Energy Engineering Team, Irrigation, Drainage and Water Harvesting Team, Agricultural Engineering Technology Multiplication, Agricultural Extension and Socio-Economics Research Teams. Moreover, under the Agricultural Engineering Research process, the center has one technical workshop (wood and metal) for prototype production and multiplication works.

In this plan year, the center conducts various research and routine activities with OARI budget source. These activities are carried out by the center under the auspices of two research processes, which are divided into six research teams, one supporting work process, and three supporting teams. In total, the Center planned 22 and executed 29 research activities.

Agricultural Engineering Research Process has been reporting different activities done by the teams in 2022/23 season such as field, month and quarter report and summary of projects for directory. Annual report for completed activities was organized here besides other reports by the teams as per format attached from institute on activities funded by IQQO. The report contains completed, ongoing, suspended/discontinued and new research activities. Different activities prototype was manufactured at Jimma Agricultural Engineering workshop and their efficiency was tested at center level and farmers selected site. The machines or technologies that have a good efficiency were recommended for farmers/end users. The technical working principle awareness of different generated technologies was given to the farmers or end users at selected site and by participating on different field days. Different research activities were also published by researchers in different international journals to show research outputs for scientific communities in the world. Moreover, over all works done by the teams are presented in detail under sub-sections of reports.

1.1. Mission

To improve production and productivity of agricultural sector on sustainable bases through generating, adapting and disseminating compatible agricultural engineering technologies for target customers.

To generate information that improves the internal and external efficiency of the research system and to enhance agricultural engineering technology dissemination and adoption through promoting improved agricultural technologies.

1.2. Vision

To see majority of farmers in Oromia using modern agricultural engineering technologies

To see food-security and prosperous farming community in Oromia

1.3. Core Values:

- Innovativeness,
- Commitment
- Accountability
- Transparency,
- Team spirit,
- Participatory,
- Redness for change.

1.4 Services we provide

- ✓ Generating, adapting and transferring the improved agricultural technologies
- ✓ Provide need-based training especially on agricultural technologies and advisory services
- ✓ Facilitate linkage and information sharing among various stakeholders that have contribution to the development of the agricultural sector of the region
- ✓ Ensure the integration of social dimension in agricultural technology generation and transfer
- ✓ Enhance the agricultural engineering technology dissemination and adoption through promoting improved agricultural technologies

2. Annual performance of the Center

2.1. Leader ship activities and roles

The center planned to convene 12 management committee meetings throughout the course of the plan year to evaluate how planned activities were carried out, offer support, and guide the different teams toward the center's and Institute's goals. In addition the committee decided different argent problem as encountered. The staff met on awareness training on professionalism and work ethics three times, as well as twice on service delivery standards.

2.2. Implementation of planned works during the year

Jimma Agricultural engineering Research has a number of research activities like technology generation, demonstration, scaling-up, multiplication and training activities planned, largely in Jimma, Buno Bedelle and Ilubabor Zones. This year we have 15 completed activities out of the 29 research, demonistration and scaling up activities, with the majority currently undergoing data analysis and final write-up.

Table 1. Plan and Implementation of OA RI budgeted trials (according to KIB)

S/N	Team	Annual plan (KIB)	Annual implement ation	executed %
1	Agricultural Machinery and Farm power	4	7	175
2	Post –harvest and Agricultural Product Processing	5	7	140
3	Irrigation, Drainage and Water Harvesting Engineering	3	4	133.3
4	Renewable Energy Engineering	4	4	100
5	Agricultural extension	4	6	150
6	Socio economics	2	1	50
Total		**22**	**29**	**131.8%**

3. Brief summary of the intermediate results from on-going and extended activities performed by teams:

A. Agricultural Machinery and Farm Power Team

Activity 1: Modification and Performance Evaluation of Tractor Operated Maize De-husker Machine

Status of the activity and main findings

- The machine was studied at recommended speed of drum for maize 550 rpm,1100
- The maximum threshing capacity of the machine was 50.93 qt/hr at feeding rate of 15kg and 950 rpm drum speed. The moisture content the Maize was 12.1 %(db.)
- The maximum cleaning efficiency 94.2% was observed when the cylinder was operated at velocity of 950 rpm, at moisture content of 12.1% (db) and at feed rate of 25 kg.
- The minimum cleaning efficiency of 81.8% was observed when the cylinder speed was 750 rpm.
- The maximum dehusking efficiency of the machine was 99% at 550 rpm and 25kg feeding rate.
- The minimum dehusking efficiency of the machine 96.8% at speed of 950 rpm and 15kg feeding rate.
- Generally, the dehusking efficiency tended to decrease with decreasing feed rate while increased with increasing feed rate.

Fig.1: The photos of Maize de-husker machine on farm station

Activity 2: On Farm Evaluation of Fava Bean Thresher for Pulse Crop

Summary of the findings and Current status

- Prototype modified and completed.
- Preliminary test conducted at the center level.
- Data will be collected at Jimma Agricultural research center and Seka Chekorsa district of Jimma zone on mid of this July.

Fig.2: The photos of fava bean thresher for pulse crop prototype

Activity 3: Adaptation and performance evaluation of BAERC model animal drawn ridger

Summary of the findings and current status of activity

- Performance evaluation of machine was done at Omo Nada and Shabe districts of Jimma zone
- Average width of operation is 28.6 cm
- Average depth of operation is 9 cm

Fig.3: The photos of animal drawn ridger on farm station

Activity 4: Adaptation and Evaluation of row Planter and Ridger for Irrigated Wheat

Current status and summary of the findings

- Prototype was manufactured
- Performance evaluation was done at Seka Chekorsa and Omo Nada districts of Jimma zone
- Some improvement works are undertaken

Fig.4: The photos of row planter and ridger for irrigated wheat on farm station

B. Renewable Energy Engineering Research Team

Activity 1: Development and performance evaluation of flywheel self-energy generating system with motor-generator

Current status of the activity

- Prototype manufactured
- A preliminary test was carried out at the center level
- The experiment was conducted using 100 kg of flywheel, 4 hp of AC motor and 7.5 hp of Generator.
- Generally, from these preliminary test 400 voltages was generated through generator /alternator.

Fig 5: The photo taken during prototype production and preliminary test

Activity 2: Adaptation and performance evaluation of retort kiln integrated with stove for biochar production for small scale farmers

- The prototype manufactured

Fig 6: Photo taken during manufacturing

C. Post-harvest and Agricultural processing product Team

Activity 1: On-farm evaluation of engine-operated BAERC integrated inset processing machine

Current status of the activity

- Prototype production completed
- Secondary data were collected

Fig. 7: The integrated inset processing machine prototype

Extended activity

Activity 1: Adaptation and evaluation of imported integrated coffee pulper and demucilager machine.

Current status of the activity

- Prototype production completed
- On station test conducted
- Washing part of the machine modified
- Second time trail test was also conducted

Fig.8: The photo of integrated coffee pulper and demucilager prototype

D. Irrigation, Drainage and Water Harvesting Engineering

Activity 1: Evaluation of Alternative, Fixed and Conventional furrow irrigation systems on yield of onion in south western Oromia

Status of the activity and Summary of the findings

- Onion planting done
- Management and follow up were conducted
- Agronomic data's collected
- Onion yield data collected
- 12311.83kg/ha of onion were obtained as intermediate results
- Data analyzing is underway

Fig.9: Onion during managment

Fig.10: Onion during yield taken

Activity 2: On-farm participatory evaluation of spiral water pump

Status of the activity and Summary of the findings

- Secondary data was collected
- Site selection was done
- Material purchasing was done
- Preliminary test was conducted at the center

E. Agricultural Extension Research Team

1. **Pre-extension demonstration and evaluation of hand operated wet coffee demucilager in Jimma and Buno Bedele zones of Oromia region, Ethiopia.**

Source of fund: OARI

Started year: 2022/23

Expected year of completion: 2023/24

Brief status of the activity

- Prototype of the machine was manufactured in Jimma Agricultural Engineering Research Center (JAERC).
- Potential sites were selected from Mana and Gomma districts of Jimma Zone.
- The machine was demonstrated to the farmers of selected sites of those districts.
- Fifty percent (50%) of necessary data were collected from Jimma zone.

Remaining works

Demonstration in Buno Bedele zone

- Fifty percent (50) of required data collection from Buno Bedele zone
- Demonstration of the machine and provision of training for the farmers of selected sites of the zone
- Data summarize and analysis
- Final report and draft write up

Fig 11. Sample of photo taken at Mana and Goma districts

2. Pre extension demonstration and evaluation of honey extractor in selected districts of Jimma and Iluababor zones of Oromia region, Ethiopia

Source of fund: OARI

Started year: 2022/23

Expected year of completion: 2023/24

Brief status of activity

Prototype was manufactured in Jimma Agricultural Engineering Research Center

Sites were selected from Goma and Gera districts of Jimma zone

The machine was demonstrated the sites of Goma and Gera districts.

Training was provided to the farmers, DA and SMS of selected sites both districts

Half (50%) of required data were collected

Remaining works

Demonstration and training in Buno Bedele zone

Training of the farmers, development agents and subject matter specialists of Buno Bedele zone

Data analysis and interpretation

Final report and draft write up

Fig.12 Sample of photo taken at Goma and Gera districts

F. Socio-Economic Research Team

Activity 1: Assessments on pre and post coffee harvesting technologies in Jimma, Ilu Abba Bora and Bunno Bedelle zone, Southwestern Oromia

Year of started: 2015 E.C

Year of completion: 2016 E.C

Status of the Activity

- The study conducted in the selected districts of southwestern Oromia(Jimma, Ilu Abba Bora and Buno Bedelle zones)
- From each zones, two districts were selected, from Jimma zone (Gomma and Gera) district were selected based on their coffee production potential.
- From Buno Bedelle Zone (Bedelle area and Chora) district were selected based on their coffee production potential.
- From each districts, three PAs were selected based on their accessibility and coffee production potential with collaboration of district agricultural office coffee expert. And

also secondary data was collected from the selected district agricultural office with interviewing coffee experts.

- Site farmers' selection was done with collaboration of DA.
- Focus Group Discussion and Key Informant Interview was done
- Data collection of Jimma and Bunno Bedelle zone was completed

Remaining Works

- Site selection and Data collection of Ilu Abba Bora Zone
- Data encoding and analysis
- Full write up

4. Technology and Information released this year

As indicated under the introduction section, 15 activities were planned to release new technologies or information.

Table 3. Technology and Information released this year from the activities conducted by the OARI Budget

s/n	Team	Annual plan (KIB)	plan and Annual implementation	
			Annual implementation	% (/)
1	Agricultural Machinery and Farm power	2	2	100%
2	Post –harvest and Agricultural Product Processing	2	5	250%
3	Renewable Energy Engineering	2	2	100%
4	Irrigation, Drainage and Water Harvesting Engineering	1	2	200%
5	Agricultural extension	1	4	400%
6	Socio economics	1	-	-
Total		**9**	**15**	**166%**

A. Agricultural Machinery & Farm power Engineering Team

Activity 1: Adaptation and performance evaluation of FARC model animal drawn ground nut planter

Summary of the finding

Agricultural work in Ethiopia is carried out by using manual, animal and mechanical power sources. Animal power contribution in the total power used in agriculture is about 85 percent. 11 million draught animals are used for crop production and transportation purposes. A one-row animal drawn ground nut planter was manufactured at Jimma Agricultural engineering research center and it was evaluated for its performance by conducting lab tests and field trials. The tests comprised of the determination of average weight of seeds discharged, percentage damage of seeds, calibration of a planter, field performance studies and average depth of placement of seeds. The mean field capacity and field efficiency was found to be 0.071 ha/h and 70.29% respectively. The speed of operation was 1.65 km/h. The average depth of seed placement was observed to be 45mm. The average plant population was found to be 22 cm.

Table 4: The summary of the result findings

Length of filed (m)	Width of field (m)	Total area ($\mathbf{m^2}$)	Active time for operation (min)	Turning time (min)	Theoretical filed efficiency (ha/hr)	Actual field capacity (ha/hr)	Filed efficiency %
20 m	10 m	200 m^2	14.2 min	2.6 min	0.101	0.071	70.29

Fig.13: The photos of animal drawn ground nut planter on farm station

Activity 2: On-farm evaluation of animal drawn AAERC model potato digger for ground nut

Summary of the findings

Groundnut (Archis hypogaea L) or peanut is a major oilseed crop which contributes major per cent of total production of oilseed crops. In Ethiopia among the major groundnut growing states, Oromia is the most important one accounting for production area. The animal drawn groundnut digger was manufactured and developed considering various theories related to digger, assembly, agronomical parameters of groundnut, functional requirement and general consideration. The main components such as main frame, digging blade, were developed. The manufactured groundnut digger was able to dig up the groundnut plants with pods and convey them for removing the soil from pods. The experimental results showed the depth of cutoff groundnut digger was found as 30.6 cm, while width of coverage measure as 50 cm and moisture content (d.b) of 20.10%. The theoretical field capacity of digger was 0.161 ha/h while effective field capacity was 0.133ha/h with field efficiency of 81.09 %. The digging efficiency and pod damage percentage were found as 93.18% and 2.37% respectively.

Fig.14: The photos of potato digger for ground nut on farm station

Activity 3: Adaption and performance evaluation of AAERC Wheat harvester for rice crop

Summary of the findings and current status

Prototype was completed the performance of the prototype was checked at farm level many times and identified the part which should be modified. Further modification was done on prototype but we can't reach on final result and satisfied performance due to topography of rice farm. Because of, tackles mentioned above we can't able to get normal forward speed on farm level until now. For the remaining time, we will try to test the machine with wheat farm and for this purpose we prepared seedbed for wheat at center site for performance evaluation of this machine.

Fig.15: The photos of Wheat harvester for rice crop on farm station

B. Renewable Energy Engineering Team

The team was carried out four activities with funds from the OARI budget. Two of the four activities have been completed, while the other two are ongoing, and the outcomes of two to be completed are discussed below.

Activity 1: Adaptation and evaluation of household level wood gas stove

Objective: To adapt the wood gas cook stove and to evaluate the stove using CCT and WBT.

Summary of the findings

Nearly 40% of the world's population uses biomass as their primary energy source. In developing countries, biomass fuels are mainly burned in open fields as waste materials. Traditional stoves result in less energy efficiency and cause environmental air pollution, which leads to climate change. Ethiopia, the second most populated country in Africa, meets 95% of its energy need from biomass, and the majority of this energy goes entirely to injera baking. This study aimed to adapt and evaluate a wood gas cook stove that can drastically reduce fuel consumption, and improve thermal efficiency. The experiment of wood gas cook stove was evaluated stove with and without insulation. The house-level wood gas stove was evaluated by the water boiling test (WBT) and the control cooking test (CCT) method with and without an insulator using 3.5 and 5 liter pots. The feedstock used for the experiment was conifer wood cut into small pieces. The WBT experimental results indicate that for a 3.5 and 5 l pot, the average thermal efficiency with an insulator was 35%, 33%, and

without an insulator was 30%, 28%, respectively. The CCT experimental results indicate that for a 3.5-litre pot with an insulator and without an insulator, the SFC is 310 g/kg and 425 g/kg, respectively, and the cooking time is 22 and 28 minutes, respectively. The CCT experimental results show that the SFC for a 5 l pot with and without an insulator is 328 g/kg, 461 g/kg, and the cooking time is 24, 30 minutes, respectively. Nevertheless, the efficiency of a house-level wood gas stove with insulation is higher than without insulation, and the SFC of the stove with insulation is lower than without insulation.

The house-level wood gas stove was evaluated by the water boiling test (WBT) and the control cooking test (CCT) method with and without an insulator using conifer wood. The study was conducted using 3.5 and 5 litre pots. The WBT experimental results indicate that for a 3.5 and 5 l pot, the average thermal efficiency with an insulator was 35%, 33%, and without an insulator was 30%, 28%, respectively. The CCT experimental results indicate that for a 3.5-litre pot with an insulator and without an insulator, the SFC is 310 g/kg and 425 g/kg, respectively, and the cooking time is 22 and 28 minutes, respectively. The CCT experimental results show that the SFC for a 5 l pot with and without an insulator is 328 g/kg, 461 g/kg, and the cooking time is 24, 30 minutes, respectively.

Fig 16: The pictures taken while the WBT and CCT experiments conducted

Nevertheless, the efficiency of a house-level wood gas stove with insulation is higher than without insulation, and the SFC of the stove with insulation is lower than without insulation.

Activity 2: Technical Assessments of Existing Irrigation Schemes for Micro Hydro Power Generation Potential in Jimma, Buno Beddele, and Ilubabor Zones

Objective: To conduct technical assessments of generating hydroelectric and hydro mechanical power from existing irrigation canals in Jimma, Buno bedele, and Ilubabor zones.

Summary of the findings

The energy created by the force of water can provide a more sustainable, non-polluting alternative to fossil fuels, with other renewable energy sources including wind, solar, tidal, geothermal, and bioenergy. Micro-hydropower, which is hydro energy on a 'small' scale, provides hydro mechanical and hydroelectricity to small communities. The purpose of this study is to conduct technical assessments of the micro-hydropower potential of generating hydroelectric and hydro mechanical power from existing irrigation canals in Southwestern Oromia. From three zones, 14 schemes from Jimma Zone, 14 schemes from Buno Bedele Zone, and 3 schemes from Ilubabor Zone were selected; all of these schemes had the potential for irrigation and were functional, out of 13 woredas, 31 irrigation schemes were assessed. Among the schemes analyzed, the maximum potential for micro-hydropower generation was 5.14 kW at the Guura scheme in the Gechi woreda Buno Bedele zone. The minimum hydropower potential of 0.0008 kW was registered at Urgesa and Xiphacha schemes in the Bedele and Chora woredas, respectively, in the Buno Bedele zone. Therefore, some of the assessed schemes are not sufficient for micro-hydro power generation except the Guura scheme in the Gechi woreda Buno Bedele zone. However, some of them are possible with technical advances.

The study was conducted in three zones, Jimma, Buno Bedele, and Ilubabor zones, which have the potential for irrigation schemes. From three zones, 14 schemes from Jimma Zone, 14 schemes from Buno Bedele Zone, and 3 schemes from Ilubabor Zone were selected out of 13 woreda from three zones, 31 irrigation schemes were assessed. This study was conducted from January 30 to February 30 during the irrigation session.

Fig 17: The photos taken while data was collected

Some of the assessed schemes are not sufficient for micro-hydro power generation. However, some of them are possible with technical advances.

C. Post-harvest & Agricultural product processing Engineering Team

As Post-harvest & Agricultural product processing team, 6 activities were planned to release new technologies or information. But 1 activity was extended due to seasonal crop. Only 5 activities completed and new technology and information released. All of the 5 released technologies were funded by OAR. The information on the released technologies is presented in the next subsection.

Activity 1: Adaptation and evaluation of a power operated grain de-huller

Objective: - To adapt and performance evaluation of a power operated grain de-huller machine

Summary of the finding

De-hulling is a process employed to get rid of the outer pericarp and testa (hull) of most cereal grains, grain legumes, nuts and oil seeds using mechanical means. In some parts of Ethiopia still, de-hulling are accomplished traditionally, by pounding method for de-husking rice grains, by hand de-hulling is time consuming, more labour requirement, high-energy consumption and loss of material. An engine operated grain de-huller (barley, and rice) de-hulling machine was adapted and evaluated at Jimma Agricultural engineering Research Centre. The research was conducted at Jimma Agricultural Engineering Research Center (JAERC), Shabe Sombo and

Dedo districts to evaluate the machine performance in terms of de-hulling efficiency, throughput capacity, breakage efficiency and fuel consumption at different speed of shaft. The output of de-huller was found to be remarkable achievement. The performance of the machine was evaluated using barley and rice with treatments of the engine speed, and feed rate using factorial design with three replications. The highest mean de-hulling capacity of barley and rice (564 kg/hr, 575.62kg/hr), the finest of (less) mean breakage barley and rice (1.01%, 4.62%), the highest de-hulling efficiency of barley and rice (99%, 92.57%). The operation speed was observed to be highly significant among the treatments, at significance level of 0.01. Based on the result obtained the machine has high performance. It is recommended to demonstrate the machine for small to medium farmers.

Fig. 18: The picture of power operated grain de-huller machine

Activity 2: Modification and evaluation of JAERC's multi-crop thresher for feed chopping as an additional purpose

Objective: - To modify and performance evaluation of JAERC's multi-crop thresher for feed chopping

Summary of the finding

Ethiopia’s livestock population is the largest in Africa, however different factors or constraints limit the full exploitation of the agricultural sector in general and the livestock sub sector in particular. In the country, the availability, quality and quantity of feed has always been a challenge in the livestock sector. This process is laborious and takes more. To alleviate this, using maize and sorghum stalk chopper is an important remedy. Therefore the chop machine was developed and evaluated. The research was conducted at Jimma Agricultural Engineering Research Center (JAERC), Omo nada and Kersa districts to evaluate the machine performance in terms of chopping efficiency, throughput capacity, cutting efficiency and fuel consumption at different speed of cutter shaft. The output of chopper was found to be remarkable achievement. The performance of the machine was evaluated using sorghum and maize with treatments of the engine speed, and feed rate using factorial design with three replications. The highest mean chopping capacity of maize and sorghum (840 kg/hr, 855.12kg/hr), the finest of (shortest) mean cut length maize and sorghum (0.67cm, 0.62cm), the highest chopping efficiency of maize and sorghum (97.49% , 98.57%) and the mean lowest fuel consumption of maize and sorghum (0.5733 ,0.53) was recorded. The operation speed was observed to be highly significant among the treatments, at significance level of 0.01. Based on the result obtained the machine has high performance. It is recommended to demonstrate the machine for small scale to medium scale farmers.

Fig. 19: The picture of JAERC's multi-crop thresher for feed chopping

Activity 3: Development and performance evaluation of axially operated animal feed chopper

Objective: - To develop and performance evaluation of axially operated animal feed chopper machine

Summary of the findings

Ethiopia's livestock population is the largest in Africa, however different factors or constraints limit the full exploitation of the agricultural sector in general and the livestock sub sector in particular. In the country, the availability, quality and quantity of feed has always been a challenge in the livestock sector. This process is laborious and takes more. To alleviate this, using maize and sorghum stalk chopper is an important remedy. Therefore the chop machine was developed and evaluated. The research was conducted at Jimma Agricultural Engineering Research Center (JAERC), Saka cokorsa and Omo Nada districts to evaluate the machine performance in terms of chopping efficiency, throughput capacity, cutting efficiency and fuel consumption at different speed of cutter shaft. The output of chopper was found to be remarkable achievement. The performance of the machine was evaluated using sorghum and maize with treatments of the engine speed, and feed rate using factorial design with three replications. The highest mean chopping capacity of maize and sorghum (720 kg/hr, 735.12kg/hr), the finest of (shortest) mean cut length maize and sorghum (0.61cm, 0.68cm), the heights chopping efficiency of maize and sorghum (98.54% , 99.38%) and the mean lowest fuel consumption of maize and sorghum (0.5433 ,0.51) was recorded. The operation speed was observed to be highly significant among the treatments, at significance level of 0.01. Based on the result obtained the machine has high performance. It is recommended to demonstrate the machine for small scale to medium scale farmers.

Fig. 20: The picture of axially operated animal feed chopper machine

Activity 4: Evaluation of soybean grinding machine for pulse splitting

Objective: - To evaluate the performance of soybean grinding machine for pulses splitting

Summary of the finding

In some parts of Ethiopia still, milling and splitting are accomplished traditionally, by grinding the pulse between two stones and this traditional practice of pulse splitting is time consuming, more labor requirement, high-energy consumption and loss of material. An engine operated pulses (faba bean and pea) splitting machine was evaluated at Jimma Agricultural Engineering Research Center. The machine had two emery discs which are fixed and revolving type. Gap between the two disks can be increased or decreased depending on size of pulses by screw mechanism operated by hand wheel. The experimental design conducted in a RCBD having two treatments disc speeds and feeding rates. The performance of the machine was evaluated in terms of splitting capacity, splitting efficiency, cleaning efficiency, percentage of mechanical damage and percentage loss. The evaluated machine was more efficient for pea and faba bean at 500 rpm disc speed and feeding rate of 7kg/min and 6 kg/min, respectively. So during split the machine parameters such as disc speed, clearance, size of disc etc. have vital role to play on dal recovery.

Activity 5: On-farm evaluation of JICA-type milk churner

Objective: - To evaluate the performance of JICA-type milk churner at farm level

Summary of the finding

The study was conducted in four districts of Jimma zone and two districts of Beddele Zone with an objective of demonstrating and on-farm evaluating improved plastic milk churner there by reducing women's workload in churning activity. 9 improved plastic milk churners were distributed and evaluated by participating women farmers grouped in farmer's research groups (FRGs). The results showed a significant difference in time of churning at ($p<0.05$) resulting in 0:39± 0.01hrs for the improved plastic milk churners and 1:05±0.01 hr. for the traditional clay pot churners. However, there was no statistically significant difference on butter yield between the churners in the study areas. Nevertheless, the improved plastic churner were found to be more time saving than the traditional clay pot churners and are recommended for further demonstrate.

Fig. 21: The picture of JICA-type milk churner at farm level

D. Irrigation, Drainage and water harvesting Engineering research team

The irrigation was carried out four activities with funds from the OARI budget. Two of the four activities were to be completed activities, while the other two activities are ongoing.

Activity 1: Adaptation and evaluation of SF1 future pump for irrigation purpose

Objective: - To adapt and evaluate the SF1 future pump for irrigation purpose

Summary of the findings

The SF1 Future pump is of exceptionally robust design for long life and is the most efficient and cost efficient solution to small scale farm irrigation requirements. This system can be a suitable alternative for farmers in the present state of energy crisis in Ethiopia. The activity was evaluated at Jimma Zone Omo Nada woreda on Gibe River at different pressure head. The results of the experiment at different delivery head are as below.

Table 5. The intermediate results of SF1 future pump experiment

Delivery head (m)	Average discharge (L/min)
4 m	25.34
6 m	24.39
8 m	23.71
10 m	23.49

Fig.22: Picture of SF1 future pump during data collection

Activity 2: On farm evaluation of sprinkler irrigation system on yield and water productivity of wheat

Objective: - To evaluate the effects of sprinkler irrigation system on yields and water productivity of wheat

Summary of the findings

Sprinkler enables economical use of water through control over the application rate and uniform application of water. Sprinkler irrigation is an improvement over conventional surface irrigation. It stimulates natural rainfall by spreading water in the form of rain uniformly over the land surface when needed at required quantity in a uniform pattern. This activity was conducted at Jimma zone Omo Nada woreda on the farm of wheat crop. From this activity only partial data was collected due to uncontrollable leakage of pipe fittings, broken of some pipe fittings and unseasonal rainfall interruption that made the technology unfeasible on the yield and yield component of wheat. The resulted obtained with keeping the constraints the sprinkler average discharge was 0.25 L/sec and average time of 360˚rotation was 2 min and 30 seconds.

Fig.22: Picture sprinkler irrigation system on wheat

E. Agricultural Extension Research Team

Activity 1: Pre-extension demonstration and evaluation of double disk wet coffee pulper in potential districts of Jimma and Buno Bedele zone of Oromia region, Ethiopia.

Source of fund: OARI

Started year: 2021/22

Expected year of completion: 2022/23

Brief summary of activity

The study was conducted in Jimma and Buno Bedele Zones of Oromia Regional State, Ethiopia. The objective of the study was to evaluate the machine under farmer's condition, to create farmers awareness on the machine and to get feedback from the farmers. Four potential districts namely Mana and Gomma from Jimma zone whereas Bedele and Gechi districts from Buno

Bedele zone were selected. Four pulping sites were selected used as hosting centers for the demonstration of the technology at Kenteri, Genji, Jisa, and Janjaro sites identified from Mana, Gomma, Bedele and Chora districts respectively. Four FRG, with 60 members by considering gender disaggregation, were established from all sites. Lastly, from each FRG, one-host farmer was identified for the study purpose. The machine was evaluated on 260-rpm speed with 7kg of feeding rate. Evaluation result shows that the machine has 97.10% of pulping efficiency, 550kg/hrs. 1.98 % of un-pulped coffee and 1.2% of mechanical damages. In this study, training and Mini-field day were used as the main methods of capacity building toward the farmers. Totally, 69 and 78 participants were attended on training and mini-field day respectively. Feedback on farmers' opinion was collected from fifty six (56) respondents. Most respondents (87.5%) responded for high pulping capacity of the machine while the rest (12.5%) of respondents ranked it to medium pulping capacity. There is no respondent responded of its low pulping capacity. Concerning its cleaning efficiency, majority (91.1%) of respondent opened that, double disk wet coffee pulpier machine has high cleaning efficiency and rest (8.9%) of them are ranked it to medium cleaning efficiency. Since, there is no respondents responded for its low cleaning efficiency. Regarding its suitability to use, third-fourth (73.2%) of respondents responded that, double disk wet coffee pulpier machine is highly suitable to use by small-scale farmers whereas, 19.5% of respondents responded that the machine has medium suitability to use under small-scale farmers condition and rest (7.2%) of respondents ranked the machine on low suitability to use. From interviewed farmers, about 69.9% of respondents responded that double disc-wet coffee pulper has high affordability to small-scale farmers whereas, 25% of respondents ranked the machine to medium affordability, the rest (5.4%) of them were responded its low affordability to small-scale farmers. Consequently, the farmers' perception show majority of interviewed farmers have positively perceived the machine due to its good performance compared to the local pulping method.

Fig.23: double disk wet coffee pulper

Activity 2: Pre-extension demonstration and evaluation of engine operated Sorghum thrasher in potential districts of Jimma and Buno Bedele zones of Oromia region, Ethiopia.

Source of fund: OARI

Started year: 2021/22

Expected year of completion: 2022/23

Brief summary of the activity

The study was conducted in Jimma and Buno Bedele Zones of Oromia Regional State, Ethiopia. The objectives of the study were to evaluate engine operated sorghum thrasher under farmer condition, to create farmers awareness to ward sorghum thrasher, to get feedback about the machine from the farmers and other stakeholders. Four districts two from each zones (Shabe and Gomma districts from Jimma zone whereas Bedele and Chora districts from Buno Bedele zone) were selected purposely. Four representative kebeles namely Kishe, Limmu Shaye, Chilalu Bidaru and Geda Janjaro were selected purposely from Shabe, Gomma, Cilalu Bidaru and Geda Janjaro respectively for implementation purposes. In turn this, one FRG consisting of fifteen (15) member of farmers were established from each kebeles by considering gender and youth issues, Lastly, from all FRG, four-host farmers were identified for the study purpose. The machine was evaluated on 800-rpm speed with equal feeding rate. Evaluation result shows that the machine has 93.1% of thrashing efficiency, 700.36kg/hrs with less than 1 % of mechanical damages. Training and mini-field day were used for awareness creation techniques for the farmers, development agents and subject matter specialists. Totally, 96 and 87 participants were attended on training and mini-field day respectively. The Feedback during and after demonstration to

analyze farmers' opinion was collected from forty-seven (47) respondents. From total interviewed farmers, majority (87.2%) of respondents responded that engine operated Sorghum thrasher has high threshing capacity whereas, about 8.5% respondents perceived the machine for its medium thrashing capacity. Around 4.3% of respondents responded about the machine for its low capacity.

Concerning its cleaning efficiency, around three-forth (78.7%) of respondents responded that the machine has high cleaning efficiency whereas about 19.1% of respondents responded that, the machine has medium capacity. Rest of them is perceived about the machine for its low capacity.

Regarding affordability of the machine, around three-fourth of respondents opined that, the machine is easily affordable to small and medium scale farmers whereas, about 23.4% of respondents responded that the machine has medium affordability. Around 4.7% of respondents perceived the machine for its low affordability. Generally, perception of the farmers' shows that majority of interviewed farmers have positively perceived the machine due to its good performance compared to the local pulping method.

Fig. 24: Engine operated Sorghum thrasher

Activity 3: Pre-extension demonstration and evaluation of vertical mechanical poultry feed mixer in Jimma zone of Oromia region, Ethiopia.

Source of fund: OARI

Started year: 2021/22

Expected year of completion: 2022/23

Brief summary:

The study was conducted in Jimma and Buno Bedele Zones of Oromia Regional State, Ethiopia. The objective of the study were to evaluate performance of poultry feed mixer under farmers' condition, to create farmers' awareness on poultry feed mixer, to get feedbacks from the farmers and other stakeholders. The study was conducted in two randomly selected districts of Jimma zone namely Kersa and Seka districts. From selected districts two kebeles namely 04 kebele from Kersa and 06 from Seka districts were selected purposely based accessibility for the study. From each kebele, one group of farmers who are organized on poultry raising system were picked up from other existing groups based on accessibility for implementation of the study. The machine was evaluated on 250-rpm speed with three replication, which vary time interval (10 minute, 15 minute, and 20 minute) through applying equal percentage of feed rate of Rice straw (33.3%), Maize powder of (33.3%) and of Wheat bran (33.3%). Evaluation result shows that the machine has 86.82% of mixing efficiency. Different capacity building techniques such as training and Mini-field day were used as by encouraging the involvement of all members of the group, development agent and subject matter specialists. Therefore, 54 and 42 participants were taking part on training and mini-field day respectively. Thirty-four (34) respondents were interviewed about different characteristics of the machine. From interviewed farmers, almost all (91.2%) of responders responded that, poultry feed mixer has high mixing capacity whereas, 8.8% of responders ranked the machine to medium level. There is no responders responded for its low capacity. Concerning its mixing efficiency, almost all (94.1%) of respondents responded that, poultry feed mixer high efficiency whereas 5.9% of responders responded about the machine for its medium mixing efficiency. There is no respondent opined for low mixing efficiency of the machine. Regarding its suitability, almost half (52.9%) of respondents responded that the machine high suitability to use whereas, about 41.1% of respondents responded that, poultry feed mixer has medium suitability to use. Around 6% of respondents ranked the machine to low level of suitability to use. Regarding affordability of the machine, about 55.9% of respondents ranked the machine to high affordability whereas, around 32.4% of respondents responded that, the machine has medium affordability. Around 11.7% of respondents responded that, the machine has low affordability to small and medium scale farmers due to their ability to buy it by low price. Generally, majority of the farmers positively responded to mixing capacity and efficiency of the machine moderately perceived to suitability and affordability of the machine.

Fig. 25: mechanical poultry feed mixer

Activity 4: Pre-scaling of improved Plastic Milk Churner in Jimma and Buno Bedele zones of Oromia region, Ethiopia.

Brief summary of the activity

Popularization of the Churner was conducted in Jimma and Buno Bedele Zones of Oromia Regional State, Ethiopia. The objective of the study was to popularize the churner through scaling up to wider areas, to create awareness of the farmers' about different areas of the churner and to get feedbacks about the churner from the farmers and DAs. Four districts namely, Dedo, and Seka districts from Jimma zone and Gechi and Bedele districts from Buno Bedele zone were selected randomly. From each districts one kebele namely Seka 01 from Seka districts, Dedo 02 from Dedo districts, Gira Mixe from Bedele district and Gixo kebele from Gechi district were selected purposely. Four FReGs, which contain sixty (60) farmers, were established from all sites by considering youth and gender issues. From each FReG members, one host farmer were identified for the purpose of study implementation. Popoluration of the churner to the study areas was undertaken by using different approaches such as, establishing multidisciplinary researcher and technicians, participatory approach, farmer-to-farmers approach, joint planning, joint capacity building, facilitate extension efforts on technology and technology supply, identify potential stakeholder. Further, training and mini-field day were organized at study areas. To this end, 70 and 76 participants were participated on training and mini-field day respectively. Farmers' perception was collected from 53 respondents. From total interviewed farmers, almost all (98.1%) of respondent responded that, plastic milk churner can save time and labor in excellent manner whereas 1.9% of respondents ranked the churner to medium for its reduced

time and labor. None of the farmers responded the churner for its poor saving time and labor. Regarding suitability of the churner, majority (92.5%) of respondents responded that, plastic milk churner has high suitability to use whereas, around 7.5% of respondents ranked the churner for its medium suitability to use. There is no respondents responded for its poor suitability. Concerning portability of the churner, about 96.2% of respondents responded that, the churner can be easily moved from place to place by the users whereas, around 3.6% of respondents ranked the churner for its medium portability. While none of respondents responded for its poor portability. Regarding affordability of the churner, around almost three-fourth (84.9%) of respondents responded that, the churner can be easily affordable to small and medium scale farmers whereas, around 13.2% of respondents responded for medium affordability of the churner. About 1.9% of respondents ranked the churner for its low affordability to small-scale farmers.

Fig.26: Plastic Milk Churner

5. Pre-extension demonstration activities

Table 5.1. Number of technologies demonstrated, FRGs established, FTCs worked on and farms/farmers involved (for all demonstration trials) according to KIB

S/N	**Title of the work**	**Annual plan 2015**	**Annual** implementation	% **(P/L)**	**Reason for low or higher performance**
1	Number of technologies demonstrated	4	5	125%	
2	Agricultural engineering technologies	4	5	125%	
3	Number of FRGs established	8	15	187.5%	
4	Number of farmers involved	134	219	163.4%	
5	Number of FTC on which work	4	9	225%	

	has done				

Table *5.2***.** Type of technologies demonstrated

6. Pre-Scaling up Technology Activities

Table 6.1. Number of technologies scale up, FRGs established, and farmers involved according to prosperity plan in 2016 E.C.

Table 6.2. Type of technology expanded, workplace and farmer participation

s/n	Title of the experiment's demonstrated Technologies	Name of technology/s demonstrated	Annual plan				Annual implementation			
			M	F	M youth	F youth	M	F	M youth	F youth
1	Scaling up of -Pre scale up plastic milk churner through in south western Oromia in Jimma zone & Buno bedele	Milk churner	6	30	4	20	22	54	16	35
	Total		**6**	**30**	**4**	**20**	**22**	**54**	**16**	**35**

s/n	Title of the experiment's demonstrated Technologies	**Name of technology/s demonstrated**	Annual plan				**Annual implementation**			
			M	**F**	**M youth**	**F youth**	**M**	**F**	**M youth**	**F youth**
1	Pre-extension demonstration of Engine Driven Sorghum Thrasher Technology (Fadis Model) in southwestern Oromia	Sorghum Thrasher	20	4	6	0	20	7	6	1
2	2. Pre-extension demonstration Jimma Model Double Disk Engine Operated Wet Coffee Pulpier in South Western Oromia	Wet Coffee Pulpier	14	3	5	2	19	4	5	2
3	3. Pre-extension demonstration Poultry Feed Mixer Machine in South Western Oromia	Poultry Feed Mixer	4	4	6	6	20	11	15	9
4	4. Pre-extension demonstration and evaluation of honey extractor technology.	honey extractor	20	4	6	0	31	16	13	7
5	5. Pre-extension demonstration and evaluation of hand operated wet coffee demuslager machine	hand operated wet coffee demuslager	20	4	4	2	21	4	5	3
	Total		**78**	**19**	**27**	**10**	**111**	**42**	**44**	**22**

7. Technology Multiplication Activities

Table 7.1. Plan and technology multiplication implementation (as per the prosperity plan for technology multiplication 2016 E.C.

S/N	Team	types of technologies	Annual plan	Annual Implementation	% (P/I)	Reason for low or higher performance
1	Agricultural Machinery and Farm power	Ground nut digger , ground nut planter	1	2	200	
2	Post –harvest and Agricultural Product Processing	Grain de-huller , JICA milk churner Axially operated animal feed chopper Multi-crop thresher for feed chopping	1	4	400	
3	Irrigation, Drainage and Water Harvesting Engineering	_	1	-	-	
4	Renewable Energy Engineering	Wood gas stove	1	1	100	
	Total		**4**	**7**	**175%**	

Table 7.2. Plan and implementation of basic technology multiplication Technology

Team	Type/name of multiplied Technology	Unit	Annual plan	Annual Implement Action %	Plan implementation (%)
Technology multiplication	Triddle Pump	No.	5	5	100%
	Maize Sheller(P.T.O)	No.	6	6	100%
	M/C/Thresher)	No.	8	8	100%
	Kocho scraper	No.	30	30	100%
	Kocho squeezer	No.	7	7	0%
	Wheel barrow	No.	15	15	100%
	Animal drawn cart	No.	4	4	100%
	Modern beehive	No.	250	280	112
	Horizontal Modern beehive	No.	30	30	100%
	Nuclie Box	No.	15	15	100%
	Mirt injera stove	No.	10	16	160%
	Potato digger	No.	3	3	100%
	Fruit harvester	No.	8	8	100%
	Overflow pump	No.	4	4	100%
	Wet coffee pulper	No.	5	5	100%
	Total		**400**	**429**	**107.25**

7.3. Distributing Multiplied technologies to users

Multiplied Technology	Unit	Annual plan	Number of technologies distributed	% (P/I)
Modern beehive	pcs	250	260	104%
M/C/Thresher)	pcs	2	3	150%
Tridle pump	pcs	3	3	100%
Maize Sheller(P.T.O)	pcs	3	3	100%
Wheel barrow	pcs	10	2	20%
Mirt injera stove	pcs	26	26	100%
Wet coffee pulper	pcs	3	3	100%
Animal drawn cart	pcs	3	3	100%
		308	**303**	98.8%

8. Training provided to the different community group this year

8.1. Training provide to the farmers and different stakeholders

	Process/Team		Plan and execution		
			plan	Execution	Execution %
1	Extension and Technology promotion team	farmers	67	133	198.5%
2		(SMS)	12	16	133.3%
3		(DA)	21	23	109.5%

8.2. Provided training and topics this year

Team	Topic of the training		Participants (SMS)			Participants (DA)			farmers/ Pastoralist			Over all
		Training days	M	F	Total	M	F	Total	M	F	Total	
Agricultural Extension	Wet coffee demuslager	1	1	1	2	3	1	4	9	3	12	18
	Honey extractor	1	1	2	3	2	2	4	20	9	29	36
	Poultry feed mixer	1	2	0	2	1	1	2	20	7	27	31
	Engine operated Sorghum thresher	1	1	1	2	1	2	3	10	1	11	16
	Plastic Milk churner	1	3	1	4	4	2	6	10	22	32	42
	Double disk wet Coffee pulpier	1	2	1	3	3	1	4	15	7	22	29
	Total	**6**	**10**	**6**	**16**	**14**	**9**	**23**	**9**	**3**	**12**	**172**

8.3. Number of FRG established and members participated on Technology promotion

Team	Titles of activities for which FRG was established/strengthened	Number of FRGs established /strengthened			Total Number of FRG members					Remark
		existing	New	total	Adult Men	Adult Women	Youth men	Youth women	Total	
Agricultural Extension	Wet coffee demucilager	1	1	2	17	8	11	3	**39**	
	Honey extractor		1	1	15	8	7	1	**31**	
	Double disk wet coffee pulper	2	1	3	21	11	9	2	**43**	
	Plastic Milk churner	1	3	4	6	14	4	8	**32**	
	Sorghum thrasher	2	2	4	16	7	13	5	**41**	
	Poultry feed mixer	1	2	3	18	10	13	4	**45**	
	Wet coffee demucilager	1	1	2	17	8	11	3	**39**	

9. Articles published in this plan year by teams

S/N	**Team**	**Published article and its full citation**	**Type of the article**
1	Agricultural Extension Research	Participatory Demonstration of Bako Modified Engine Operated Dry Coffee Dehuller Machine Though FRG In South Western Oromia. *Journal of Multidisciplinary Engineering Science and Technology (JMEST) ISSN: 2458-9403 Vol. 10 Issue 3, March - 2023*	Journal

10. Human Resource and Center Development Works

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 resource development and capacity building:

10.1. Long term training

s/n	Process	Level of Education	Plan and implementation			Reason for underperformance if any
			Annual plan	**Annual** implementation	% **(P/L)**	
1	Agricultural engineering process and agricultural extension team	MSc	-	-		
2	Renewable energy Team	PhD	-	-		
	Total					

10.2. Total number of employees on study leave during this plan year

S/N	Process/Team	Level of education	No of staff started edu in 2014 E.c		No of staff started edu in 2013 E.c		No of staff started edu in 2012 E.c		No of staff started edu in 2011 E.c		Total	
			M	F	M	F	M	F	M	F	M	F
1	Agricultural engineering process and agricultural extension team	MSc	2	1	2	1					4	2
2	Renewable energy Team	PhD	1								1	
	Total		3	1	2	1					5	2

10.3. Total human resource of the center by gender and level of education

Research team/support process	Number														Remark
	PhD		MSc/MVSc/MA		DVM		BSc/BA		Dip		Others		Total		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
Researcher			5				11	2	1				17	2	
Support staff			1				7	12	10	2	20	3	38	17	
flouter											1		1		
Total			**6**				**18**	**14**	**11**	**2**	**21**	**3**	**56**	**19**	**75**

10.4. Center develop activities performed in this plan year

- One 6mx19m old warehouse was repaired by purchasing 69 sheets.

- About 1040 meters of flood dich was cleared.
- More than 20 bulbs replaced by purchasing new bulbs.
- About 25 meters of house gutter was repaired.
- A 3x3m wide guard lookout was constructed.
- About 24 meters fence was constructed with iron sheet.

Warehouse repaired

Constructed Fence

Cleared flood dich

Constructed guard lookout

11. Budget and its utilization

11.1. Capital budget allocation and utilization this year

No	Research team	Plan and utilization level		
		Annual Plan	Annual Utilized	%(P/U)
1	Agricultural Machinery and Farm Power Research Team	932400	931908	99.95
2	Post-Harvest And Agricultural Product Processing Engineering	624200	623893.2	99.95

	Team			
3	Irrigation, Drainage & Water Harvesting Research Team	506100	505306	99.84
4	Renewable Energy Engineering Case Team	563600	563326	99.95
5	Agricultural extension team	478900	478269	99.87
6	Socio economics team	87800	87460	99.61
7	Technology multiplication	2012800	2010349	99.88
	Total	**5205800**	**5200511**	**99.9%**

11.2. Other budget allocation and utilization this year

No	Source of budget	Plan and utilization level		
		Annual Plan	Annual Utilized	%(P/U)
1	Federal budget for irrigation wheat support	410,000	347418.7	84.7
2	Internal income	790794	781449.8	98.8

11.3. Utilization of regular budget utilization from OARI

No	Budget category	Plan and utilization level		
		Annual Plan	Annual Utilized	%(P/U)
1	Salary	7452350	6487969	87.06
2	Running costs	1,802,279	1801796	99.973
	Total	**9254629**	**8289765**	**89.57%**

** Due to retirement and high turnover of the employee, this year the utilization of salary budget is under planned.

Annual Plan	Annual Collection (ETB)	% (P/C)	Reason for under collection of the internal revenue
1,000,000	966714	96.6%	

12. Internal revenue collection

12.1. Implementation of gender mainstreaming, youth participation and HIV/ AIDS

SIN	Planned Activities Plan	Unit	Annual plan	Annual Implementation	% (P/I)
1	Technology demonstration by involving farmers	no			
A	Male	No.	92	155	168.48
B	Female	No.	42	64	152.38
	Total		134	219	163.43
2	Provision of Training for SMS		10	16	160%
A	Male	No.	7	10	142%
B	Female	No.	3	6	200%
3	Provision of Training for DAs		21	29	138%
A	Male	No.	14	20	142%
B	Female	No.	7	9	128%
4	training to create awareness on how to prevent HIV/AIDS to the total staff of the center		65	50	80%
A	Male	No.	50	39	78%
B	Female	No.	15	11	73%
5	Conducted monitoring and evaluation of planned activities by using a checklist	No.	2	2	100%

12.2. Implementation of HIV/ AIDS this year

No.	Planed activities	unit	Annual plan	Annual Implementation	% (P/I)
1	Awareness creation	No.	65	50	77%
2	Financial support for those worker HIV/AIDS victims Families and children	Birr	14560	14560	100%

Table 12.1. Performance of Ethical Promotion Activities of the Center in this year

S/N	**Main activities planned**	**Unit**	**Annual plan**	**Annual Implementation**	**% (P/I)**
1	Collect customer feedback on our services and analyze public	No.	12	15	125

	satisfaction levels				
2	Using the Government Budget for the planed work, do more work with less cost ,spend only on what can bring results	No.	4	4	100
3	Identify Training Needs, Select Training Topic, and Prepare Materials as required.	No.	3	3	100
4	Create and provide training/awareness to the Center's Leaders and Staff	days	2	2	100
		participants	82	58	70
5	Selecting and focusing the Study area in the Center Structure.	No.	1	1	100
6	Evidence Collection, compilation, analysis findings and suggest solutions.	No	14	14	100
7	Perform other duties assigned to the manager or commissioner and provide and receive feedback.	No	12	13	108.33
8	Following the implementation of laws, regulations, guidelines and work plans, no	stage	4	4	100
9	Establish anti-corruption council committee and coalition activities with those who play a key role in preventing corruption and misconduct in the workplace.	No	8	6	75
11	Follow up on internal and external audit reports for correction or action Coordinate the notification and registration of assets by the managers and employees of the office within a specified time frame.	No	4	3	75
12	Follow the Ethical Guidelines developed and implemented by the Office	No	1	1	100
13	Monitoring Employee Ethics: exemplary employees, returned by counselor for ethical deficiencies and disciplinary action taken against them.	No.	8	8	100

13. Job creation activities for unemployed community groups

A. Job Opportunities on Technology Utilization Created for Unemployed Youth

s/n	Planned Works	Unit	Annual plan	Implementation	% (P/I)
1	Created job opportunities Using our technology/ -by purchase /rental/gift	no	120	98	81.6%
2	Rented human resource	no	1	1	100%
	Total		**121**	**99**	**81.8%**

14. Different Volunteering Works performed

Our center and OARI believes that volunteering is a two-way Street that provides benefits to our organization as it is an instrumental force in promoting positive and sustainable growth within communities, while increasing our social connections with the service seekers. In the next paragraph we summarized a list of the main types of volunteer services we provided based on the request from our customers.

- More than 500 quintals of maize was shelled for Omo Nada district farmers with the help of machinery and manpower and delivered on time.
- About 150 quintals of Teff was threshed for the farmers of Badalle district with the support of our expert and Teff thresher machine.
- About 20 quintals of Teff was threshed for the farmers of Sigimo district with the help of our expert and Teff thresher machine
- For Farmers of Gumay and Sigmo Districts, 544 and 78 quintals of wheat was threshed respectively and delivered on time.
- Training was given to small scale micro officers and experts from Jimma, Buno Badallee, Ilu ababora, East Walaga, West Wallaga, Qeelam Wallaga, Horroo Guduru Wallaga, West Shawa and South West Shawa in collaboration with ICIPE-MOYESH NGO. The participants of trainees have gained a good understanding of modern bee hive, horizontal modern bee hive and nuclei box.
- Training was given to fifty (50) development workers from Jimma Zone
- Regarding water pumps, 160 (One hundred and sixty) pumps were repaired by our expert for the farmers in 6 (Six) different districts under Jimma Zone.



Training given to small scale micro enterprise's officers and experts from different Zones

Sample of Wheat threshed at different woreda's

Preparation of wheat thresher machinery

- We have prepared thirteen (13) wheat threshers to solve problems of wheat threshing.
- Among the machines prepared, due to lack of engines, only four (4) machines have been serving our farmers.

Prepared wheat threshers

15. Overall challenges/problems encountered and measures taken

Table 15.1. The major problems encountered during the year as a team

Process/Team experienced challenges	Difficulties encountered	Efforts made to address the problems	Recommended solutions
	➢ Lack of some Lab equipment's	➢ Borrow the lab equipment from Bedelle Research Center	➢ It's better to buy the lab equipment.

As a center	➢ Employees are not happy with their jobs as their salaries and benefits are not in line with inflation.	➢ Work is being continued in consultation with employees as much as possible.	➢ It is believed that this problem would be solved if various salaries and benefits were made available to the employees.
	➢ Shortage of human resources especially shops workers.	➢ Planned activities have been continued with existing staff as much as possible.	➢ Hiring or transfer would be best done through IQQO
	➢ Illegal allocation of center's land to private entity affects the moral of workers and work environment.	➢ Considerable efforts are being made by writing letters to all concerned bodies at various times to make the issue known and stop the issue.	➢ We believe that the issue would be resolved if IQQO paid attention to our land issue and tried to stop the issue.
	➢ High cost of Car maintenance problem especially at company level	➢ We try to maintain at local garage.	➢ IQQO is better to increase the budget for maintenance.

16. Summary of main initiatives scheduled for the upcoming fiscal year

- Prepare the 2015/2016 E.C center activities work plan
- Collecting the remaining data for on-going research activities will continue as per the project plan
- Preparing the prototype for some new activities based on the availability of the raw materials
- Encourage and support all employees to take part in various discussion workshops, have team meeting, meticulously record and document all work and progress data.
- Participating in different volunteering works for the society.
- Participating and giving attention for the center development activities like the planned new building project for our center.

17. List of IQQO funded Jimma Agricultural Engineering Research Center Activities for 2016 E.C

17.1. List of Agricultural Engineering Research Process for 2016 E.C

Research Team	Activities	Status	Exp. History (E.C)	
			year of start	year of completion
	Agricultural Engineering Research center			
	Agricultural Engineering			
	Farm power and agricultural Machinery Team			
Farm power and Agricultural Machinery Team	On-farm Evaluation of a Tractor-Drawn Cultivator with Pulverizing Attachment	New	2016	2017
	Adaptation and Performance Evaluation of Tractor Operated Two-Row Potato Planter	New	2016	2017
	Adaptation and performance evaluation of engine-operated portable coffee planting hole digger	New	2016	2017
	Modification and performance evaluation of JAERC maize dehusker	On going	2015	2016
	On farm evaluation of existing fava bean thresher for pulse crop	on going	2015	2016
	Adaptation and evaluation of tractor drawn integrated ridger and planter for irrigated wheat	on going	2015	2016
	Adaptation and performance evaluation of BAERC animal drawn ridger	on going	2015	2016
	Development and evaluation of technical capacity building training for local private & Public producers to improve decentralized production and Commercial dissemination of selected Agricultural Machineries in Jima, B.Bedele & Ilu Ababor zones.	New	2016	2017
	Adaptation and evaluation of Melkasa Multi crop planter	New	2016	2017
	Development & evaluation of Tractor drawn Spike tooth Harrow	New	2016	2017
	Development and Evaluation of Tractor powered- Chisel Plough for primary tillage purpose	New	2016	2017

	Development of cleaning parts for Jima model Multi crop thresher and evaluation	New	2016	2017
	Irrigation, Drainage and Water Harvesting Team			
Irrigation, Drainage and Water Harvesting Engineering	Evaluation of alternative fixed and conventional furrow irrigation system on the yield of onion	Ongoing	2015	2016
	On farm participatory evaluation of spiral water pump	Ongoing	2015	2016
	Evaluation of alternative and conventional furrow irrigation system on the yield of garlic	New	2016	2017
	Renewable Energy Engineering Team			
Renewable Energy Engineering Research Team	Activity :1 Development and performance evaluation of Flywheel self-Energy Generating System with Motor-Generator	Ogoing	2015	2016
	Activity 2: Adaptation and performance evaluation of retort kiln integrated with cooks stove for biochar production for small scale farmers	On going	2015	2016
	Activity 3: Participatory evaluation of household level husk biomass cook stove	New	2016	2017
	Activity 4: Modification and community level evaluation of compacted coffee husk biomass briquette machine	New	2016	2017
	Activity 5: Adaptation and performance evaluation of BAERC model bread-making biomass oven	New	2016	2017
	Activity 6: Participatory evaluation of household level wood updraft gasifier cook stove	New	2016	2017
	Activity 7 : Community-level participatory evaluation of a low-head Archimedes screw type turbine for rural electrification	New	2016	2017
	PhD Thesis:- Biomass Pyrolysis Process Parameter Optimization: Minimized Polycyclic Aromatic Hydrocarbon content Biochar for Soil amendment	New	2016	

	MSc. Thesis: Design and performance Evaluation of solar thermal baking system using Scheffler reflector integrated with basalt rocks as energy storage for household	New	2016	
	Post-harvest & Agricultural product processing Team			
Post-harvest & Agricultural product processing Team	On farm evaluation of engine operated BAERC integrated enset processing machine	Ongoing	2015	2016
	Adaptation and evaluation of imported integrated coffee pulper and demucilager	Extended	2014	2016
	Adaptation and performance evaluation of power operated AAERC animal feed pelleting machine	New	2016	2017
	Adaptation and performance evaluation of electric operated honey extractor	New	2016	2017
	Adaptation and performance evaluation of electric operated dough mixing machine	New	2016	2017
	On-farm performance evaluation of axially operated animal feed chopper machine	New	2016	2017
	On-farm Performance evaluation of multi-crop thresher machine to Animal feed chopper	New	2016	2017
	Onfarm evaluation of Enset processing technologies (decorticator& fermenter) in Jimma Enset producer woredas	New	2016	2017
	On farm Evaluation of Rice de-huller (Votex?) in rice producer clusters of Jimma Zone	New	2016	2017
	Improving and evaluation of Grain De-huller machine for Rice De-hulling purpose	New	2016	2017

17.2. List of Agricultural Economics and Extension Research Process for 2016 E.C

	Activities	**Status**	**Exp. History (EC)**	
			year of start	**year of completion**

	Agricultural Economics and Extension Directorate			
	Team = Agricultural Economics			
Agricultural Economics Research Team	Assessments on pre and post coffee harvesting technologies in Jimma, Buno Bedele and Ilubabor Zoneas	Ongoing	2015	2016
	Assessments on improved beekeeping technologies in Jimma and Ilubabor Zoneas	New	2016	2017
	Assessments on existing livestock feed conservation and Utilization practice in Jimma and Buno Bedele Zoneas	New	2016	2017
	Team = Agricultural extension			
Agricultural Extension Research Team	Pre extension demonstration and evaluation of Jimma adapted hand operated wet coffee demucileger machine in selected districts of Jimma and Buno Bedele zones	on going	2015	2016
	Pre extension demonstration and evaluation of honey extractor in selected districts of Jimma and Iluababor zones of Oromia region, Ethiopia	on going	2015	2016
	Pre extension demonstration and evaluation of engine operated Maize De-husker in selected districts of Jimma and Buno Bedele zones of Oromia region, Ethiopia.	new	2016	2017
	Pre extension demonstration and evaluation of Engine Operated Teff thresher machine in selected districts of Jimma and Buno Bedele zones of Oromia region, Ethiopia	new	2016	2017
	Pre extension demonstration and evaluation of Solar Powered agricultural pesticide Sprayer for fruit in selected districts of Jimma, Buno Bedele and Iluababor zones of Oromia region, Ethiopia	new	2016	2017
	Pre scaling up of household biomass stove in selected districts of Jimma and Buno Bedele zones of Oromia region, Ethiopia	new	2016	2016
	Pre scaling up of engine operated maize and sorghum stalk chopper in selected of Jimma and Ilu Aba Bora zones of Oromia region, Ethiopia	new	2016	2017

18. List of Non-IQQO funded Jimma Agricultural Engineering Research Center Activities for 2016 E.C

No	**Research process/Teams and Activity Titles**	**Status**	**Year started**	**Year of completion**	**Remark on fund source**
1	**Agricultural Engineering Research Process**	**Total = 3**			
1.1	Participatory popularization and dissemination of engine operated drum replaceable multi-crop thresher in Jimma, Ilu abbabor and Buno Beddele zones of FSRP potential districts	New	2016	2017	FSRP (IQQO)
1.2	Participatory popularization and dissemination of engine operated soybean grinding machine in Jimma, Ilu abbabor and Buno Beddele zones of FSRP potential districts	New	2016	2017	FSRP (IQQO)
1.3	On farm evaluation and popularization of engine operated soybeans grinding machine	New	2016	2017	Agricultural Transformation Institute (ATI)

Report Compiled by:

Name: _____Signature_____Date _____

Approved by:

Name: _____ Signature_____ Date_____