Oromia Agricultural Research Institute

# NEKEMTE SOIL RESEARCH CENTER

# ANNUAL RESEARCH REPORT FOR 2014/2015 FISCAL YEAR


**NSRC, August, 2023**

**Nekemte**

## Message from Center Director

The Nekemte Soil Research Center is one of seventeen research centers affiliated with the Oromia Agricultural Research Institute. The Center was founded to serve five different Western zones of the Oromia National Regional State, namely East Wollega, West Wollega, Kellem Wollega, Horro Gudru Wollega, and West Shewa, on soil test crop response based fertilizer recommendation to map the soil nutrient status around the area, expand fertilizer usage, and soil test for farmers, investors, students, and various government and non-government organizations/institutions. Since its inception, the center has generated/developed and shown many soil fertility improvement research activities to the community. Priorities include improving soil fertility, using organic fertilizers, and selecting crop response fertilizers based on soil test results. The center, as is widely known, is located among areas of severe soil erosion, enough rainfall, considerable agricultural, and difficult topography.

Accordingly, it has increased its research efforts and, in collaboration with numerous research benefactors, has begun to multiply and distribute diverse agricultural technologies. He has also taken on many government efforts, such as the irrigated wheat project and acid soil reclamation programs, which have yielded numerous benefits. He has received numerous awards and recognitions. However, this achieved with few logistics, low/small budget and little, manpower. If the silent problem can be solved, Western Ethiopia, which has a vast range of agricultural fields designed to generate adequate agricultural products for the entire Oromia people, is one of the few locations that can play the lion's role. A lot is currently expected of us in order to meet the ever-increasing need for agricultural technologies as a result of climate change and population pressure.

As a result, if it is possible to capacitate the center in order to effect the required adjustments, solve existing problems, and modernize research. Agriculture can only be modernized if the soil is healthy and fertile. Let us make plans and do everything we can to combat poverty. Let us work hard to transform the image of the country in general and our region in particular.

**Chalsissa Takele Sori**

**August, 2023**

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# I. Introduction

Nekemte soil research center was established in 1994 E.C under Oromia Agricultural Bureau with three experts. In 1995 E.C the manpower status of the center increased to 13 staff members, including driver, accountant, janitors, guards, store keeper, secretary. This year, the center began operating in accordance with its mission and vision.

From 1994 E.C up to November, 1997 E.C the center was under Oromia Agricultural bureau. From December, 1997 E.C to June, 1999 E.C the center was under the Oromia Institute of Agricultural Research. The center's staff grew to 21 people in 1998. It is the year that the center hired two additional soil researchers in addition to the associate researcher present before. From July, 1999 E.C to November, 2003 the center was under Oromia Agricultural Bureau. In 1999 E.C the number of staff member of the center came to its maximum. From 2000 E.C to present four staff members release the center.

From November, 2003 E.C. to present the center is under Oromia institute of Agricultural research. From the beginning, the national soil testing laboratory have been supporting the center starting from installation of equipments, giving training, technical advice, and the like. Currently, NSRC is operating under Oromia Agricultural Research Institute (OARI) and engaging in full-time research on soil fertility improvement, soil resource survey, soil testing and analysis service, multiplication of natural resource technology (focusing on biofertilizer bacteria), socio-economic and extension research and advisory services. It was then reorganized and given the new name Nekemte Soil Research Center (NSRC) after operating as Nekemte Soil Testing Center from 2004 till now by offering farmers soil analysis services, assessing the soil fertility status and mapping, advising fertilizer based on the results of soil tests, and validating soil test fertilizer recommendations for major crops through demonstrations at farmers' fields.

With funding from IQQO and Non-IQQO budget sources, the center carries out a variety of research projects and regular operations during this fiscal plan year. The Center manages two research processes, one soil testing team and one technology multiplication processes that are composed of six teams and three (3) supporting teams and provide the basis for these operations. The center established Natural Resource Multiplication team which is the proud of the center to produce natural fertilizers like rhizobia bio fertilizer and vermin compost. With the fund from

OARI, team is conducting 3 activities namely Rhizoabia bacteria strain maintenance and Production of Rhizobia strain bio fertilizer, multiplication of vermin worm and production of vermin compost in the center and vermin worm multiplication and vermin compost production at farmers level. The Center planned and carried out a total of 22 research activities at various farmers' field.

Research Activities have been carried out on 121 ha in various farmers' fields as part of demonstration and scale-ups of improved technologies and knowledge sharing. The field day was held at the zonal level with many stakeholders, and experiences were openly discussed and exchanged. For 20015/2016 E.C cropping season, 49 regular personnel with various levels of education and employment participated in carrying out the scheduled research activities. There were 16 women and 33 males. However, only 11 of these employees were researchers, and their jobs and levels of expertise were remarkably comparable. This report provides details on the successes of research trials, operations for technology multiplication and center development, numerous trainings, efforts for the development of human resources, and campaigns to combat corruption. The report also examines cross-cutting issues, developing implementation and research capacity, budget usage, and other issues. The overall performance from July 2014 to June 2015 E.C. was covered by the report, which includes the average actions planned and carried out throughout this fiscal year.

### 1.1.Objective

The overall objective the center is to make soil test based fertilizer calibration study for major food crops mainly cereals maize, teff, and wheat, in diversified agro-ecologies; to give soil analysis services, especially for acid soil reclamation program through lime application of the right fertilizer types rates where soil nutrients are deficient, to provide technical advises on soil related problems and finally to increase production and productivity of crops based on specific crop nutrient requirement and recommendation according to agro-ecology of the area.

- To Characterize, classify and map soil resource and soil fertility map.
- Giving recommendation to problematic soils depending on soil analysis data’s.
- To know the soil fertility status of the mandate area.
- Fertilizer type and rate recommendation.

- ❖ Soil analysis service (for acid soil reclamation program and others).
- ❖ To multiply and distribute rhizobium bacteria (biofertilizer).
- ❖ To increase production and productivity of crops based on specific crop nutrient requirement and recommendation according to agro-ecology of the area.

## 1.2.Mission, Vision and Core Values

### Mission

Through improving innovativeness and knowledge, NSRC delivers technologies that increase production and productivity of agriculture and boosts raw material supply for industry and contribute for the improvement of overall livelihood of society in Oromia in sustainable basis. Thus, to adapt, generate and transfer scientific knowledge and technologies for farming and pastoral communities for sustainable agricultural development.

### Vision

By increasing agricultural technologies, in 2025 E.C. brings basic/ fundamental changes in agricultural productivity at farm level.

**Core Values**: In its day-to-day operation, the NSRC binds itself to the following core values:

- Innovativeness, Commitment
- Accountability, Transparency,
- Team spirit, Participatory,
- Redness for change, Confidentiality and Impartiality

**Services we provides**

- ✓ Boosting agricultural technologies through adopting, generating, multiplying, and disseminating
- ✓ Deliver training and advice based on the needs of various stakeholders.
- ✓ Providing farmers and other stakeholders with soil testing services.
- ✓ Multiplying and distributing biofertilizers (Rhizobium bacteria).
- ✓ Developing agricultural research guides and materials

## II. Annual Performance of the Center

### 2.1. Leadership activities and roles

The center planned to convene 12 management committee meetings throughout the course of the plan year to assess how planned activities were carried out, offer support, and direct the team members toward the center and institute's goals. Ten of the twelve management meetings that were scheduled may have really been held, and because choices were made to address any issues, they were successful in accomplishing their objectives. One of the problems was that different teams and the employees did not regularly evaluate the work plans. The management committee of the center became involved, and issue was successfully resolved as a result. For instance, the delayed service delivery was rectified, and careful work was done to guarantee that the service operation complies with the primary requirements.

The Anti-corruption prevention council, which met every three months with the aim of bolstering work and property management in a range of sectors where shortcomings are visible and to perform rigorous monitoring, was greatly influenced by the leadership. The property use and protection processes' problems have significantly improved, according to the early June study on corruption prevention. The management committee members and representatives of numerous teams were present when orders were given to concentrate on upcoming events. Additionally, the crew was trained on professionalism, work ethics, and standards for providing services. Although group chats among the different team members should be held once a week, the administration of the center assessed the circumstances and chose to hold discussions once a month because the nature of our study prevents us from analyzing results on a weekly basis. In accordance with the minimal service delivery standard, each employee has since created their own monthly, quarterly, and annual work plans and is knowledgeable about the responsibilities of their roles. The performance of the personnel was assessed twice every six months, in addition to planning for the evaluation procedure the following year.

Strong promises and dialogues about preventing work disruptions due to a shortage of resources were made with team leaders and the entire staff, which enabled the uninterrupted performance of all research activities and other operations.

## 2.2. Implementation of Planned Works in 2014/2015 Ethiopian Fiscal Year

A total of 17 research activities were organized and executed by the Center at various farmer fields. The intended study activities were completed on farmer's sites satisfactorily, and they were assessed in several research review forums. In addition to additional projects that were still undergoing data analysis, interpretation, and final write-up, the Center published 26 research technologies financed by IQQO. In addition, a variety of experts and farmers with various degrees of experience have been given access to several research trainings.

Nekemte soil research center has working a number of research activities with financial support of Oromia Agricultural research institute and other governmental and nongovernmental organization such as Agricultural growth Program , GIZ, ATA, ATO, AECFRP, CALM, Finland and AGRA. These activities were conducted under Natural Resource research technology generation process; Soil fertility improvement and problematic soil team, Soil surveying team, Multiplication of natural resource technology team and Laboratory soil testing team. The soil fertility improvement and problematic soil making a lot of efforts to address numerous research activities regarding improving soil productivity through soil fertility improvement and amending problematic soil especially soil acidity. The team had planned and implemented 7 activities of these 7 research activities; 6 activities/ demonstration had been completed in this year.

The development plan of the present administration specifically highlights the need to showcase or scale up agricultural innovations for farming communities. Therefore, as part of the AGP-II project's assistance for the demonstration, scaling-up, and information exchange of enhanced technologies, our research activities were conducted on various farmers' fields. Many stakeholders participated in the field day that was hosted at the district level, where experiences were openly discussed and shared. The technologies were advertised through various official and non-government media (such as OBN, Fana, ETV Afan Oromo, Walta and Addis TV) as well as other social media. This report combines and analyzes the results of all experiments, trainings, demonstrations, and scaling-up that the Center and its staff members conducted throughout this fiscal year, as well as details on how much budget was used and what advisory services were offered.

**Table 1**: Summarizes the plan and accomplishment of the IQQO funded Research Activities for 2014/2015 EFY (KIB)

| S/N | Research Team | Annual Plan (KIB) | Annual Plan | Annual Implemented | Percentage of (P/I) | Percentage as (KIP) | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | SFI & PS | 4 | 7 | 7 | 100 | >100 | |
| 2 | Soil Resource Survey | 1 | 3 | 2 | 100 | >100 | |
| 3 | Agr. Extension | | 5 | 5 | 100 | >100 | |
| Total | | 5 | 15 | 14 | 93.33 | >100 | |

**Table 2**: Summarizes the plan and accomplishment of the Non-IQQO funded Research Activities for 2014/2015 EFY

| S/N | Research Team | Source of Budget | Annual Plan | Annual Implemented | % (P/I) | % (KIP) |
|---|---|---|---|---|---|---|
| **1** | SFI & PS | GIZ | 3 | 2 | 67 | - |
| **2** | | CALM | 5 | 4 | 100 | 100 |
| **3** | | Irrigation | | 2 | >100 | >100 |
| Total | | **3** | **8** | **6** | **100** | **100** |

Table 3: Five year plan of Soil samples analysis of Soil Testing Team of Nekemte Soil Research Center from 2023 to 2027

| Year | Center and Customer Soil samples | Acid soil Reclamation Soil samples | Total Soil sample |
|---|---|---|---|
| 2015/2023 | 2016 | 4631 | 6647 |
| 2016/2024 | 2036 | 4831 | 6867 |
| 2017/2025 | 2056 | 5105 | 7161 |
| 2018/2026 | 2098 | 5360 | 7458 |
| 2019/2027 | 2119 | 5628 | 7747 |

Table 4: Plan and achievement of Soil Samples analysis in 2015/2023 year

| Customers supply | Plan of Soil Samples analysis in 2015 | | | | | Achievement plan of Soil samples analysis in 2015 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Annual | Q1 | Q 2 | Q3 | Q4 | Q 1 | | Q 2 | | Q 3 | | Q 4 | | Achievement of plan in year | |
| | | | | | | Soil samples analysis | % | Soil samples analysis | % | Soil samples analysis | % | Soil samples analysis | % | Soil samples analysis | % |
| Center and Customers samples | 2016 | 252 | 504 | 756 | 504 | 147 | 58 | 131 | 26 | 294 | 39 | 642 | 127 | 1214 | 60 |
| Acidic soil reclamation program soil samples analysis | 4631 | - | 1500 | 3131 | - | - | - | 64 | 4 | 472 | 15 | 217 | 100 | 753 | 16.30 |
| Total soil samples | 6647 | 252 | 2004 | 3887 | 504 | 147 | 58 | 195 | 9.73 | 766 | 19.70 | 864 | 171.42 | 1967 | 29.59 |

# III. A Brief Summary of the Technology and Baseline Information Released by Research Processes and Teams in the 2014/2015 EFY

## 3.1. Soil testing team worked in 2015

### 3.1.1. Soil samples test service provide

Nekemte soil research center provide technology of soil test based crop response and calibration of plant nutrients to farmers at mandated area. Soil testing laboratory is the basic service provide for several stalk holders; farmers, researcher, MSc students, Agricultural sector and private investments. The government agricultural sector and Nekemte soil testing laboratory intended soil acid reclamation programmed for five zones from 1998 since to 2015 year E.C. concerning the only soil acidity reclamation Programmed, the center has been analyzed **29,958** soil samples for the farmers of five zones namely East Wollega, West Wollega, Kellem Wollega, Horo Guduru Wollega and West Shewa (Table 3). From the total samples analyzed, 21558 soil samples were with pH ($H_2O$) <5.5 (71.96 %) which means severally affected by acidity. In 2015 E.C the center has planned 4631 soil samples to analyzed; but due to security problem only **753** samples was brought to our laboratory from the zonal and district agricultural office of our mandate area as indicated the trend of soil analysis (Figure 2).

**Table 5**: Soil samples analysis of acidity 1998 since to 2015 in Western Oromia region at NSRC

| Years | No of Districts participated | Total No of Soil samples | Samples with pH(H2O) >5.5 | Samples with pH(H2O) <5.5 | Acid Severity at pH<5.5 |
|---|---|---|---|---|---|
| 1998 | 30 | 2694 | 637 | 2057 | 76.35 |
| 2004 | 9 | 483 | 208 | 275 | 85.49 |
| 2005 | 12 | 771 | 137 | 634 | 82.23 |
| 2006 | 11 | 876 | 183 | 693 | 79.11 |
| 2007 | 9 | 752 | 125 | 627 | 83.38 |
| 2008 | 14 | 1157 | 256 | 901 | 77.87 |
| 2009 | 33 | 2221 | 704 | 1517 | 68.3 |
| 2010 | 65 | 4384 | 1228 | 3156 | 71.99 |
| 2011 | 52 | 3644 | 1390 | 2254 | 61.86 |
| 2012 | 62 | 5009 | 1343 | 3666 | 73.19 |
| 2013 | 64 | 6431 | 2012 | 4419 | 68.71 |
| 2014 | 15 | 783 | 81 | 702 | 89.65 |
| 2015 | 15 | 753 | 97 | 656 | 87.12 |
| **Total** | **376** | **29958** | **8401** | **21556** | **71.96** |

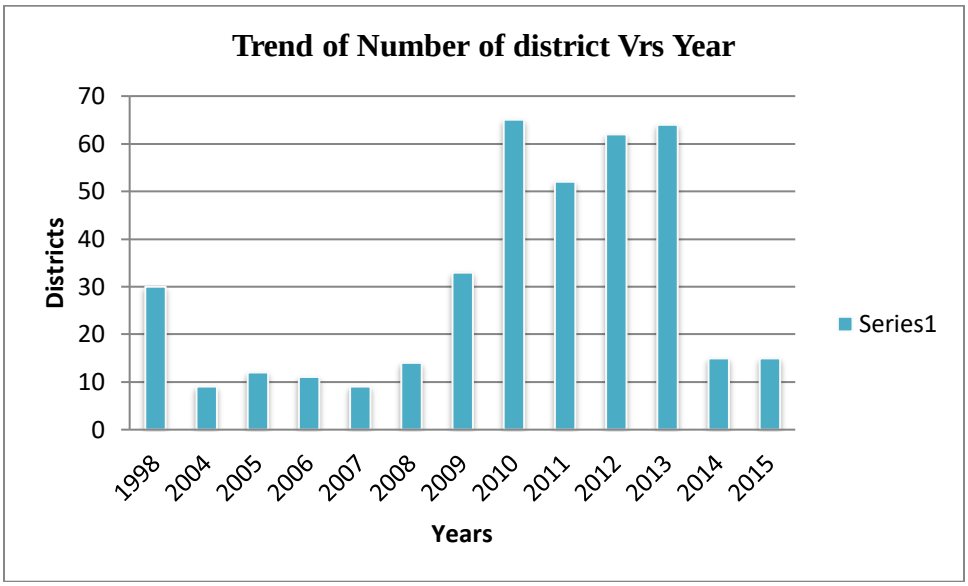



**Figure 1**: Trend of participated on Soil acidity reclamation program on western Oromia region

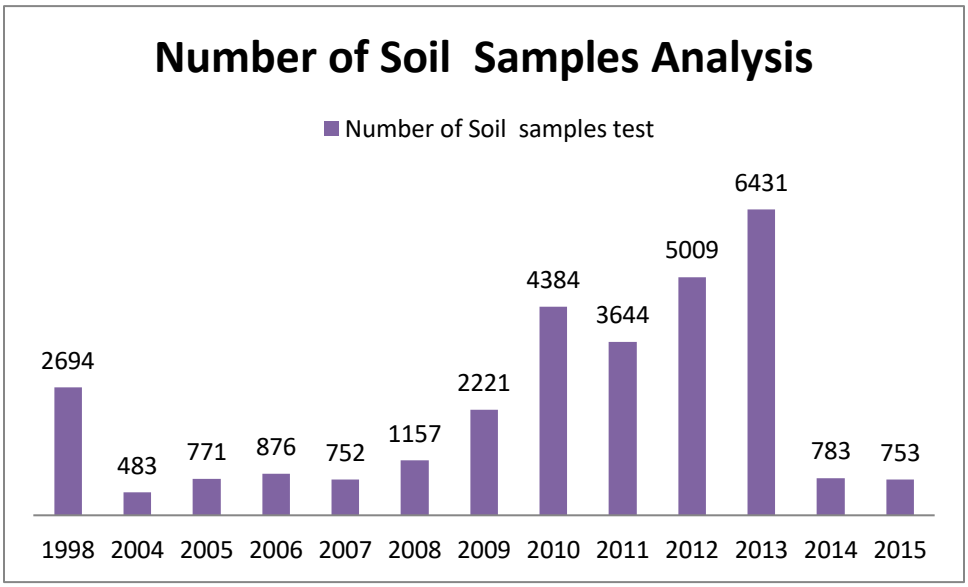



Figure 2: Trend of soil samples test under NSRC 1998 since 2015 E.C year

**Table 6**: Soil Test Services Provided for Students, Government and Non Governments Organization Starting From 2020/12-2022/14

| S.No. | Total Customer | Total soil test sample | Year |
|---|---|---|---|
| 1 | 30 | 459 | 2020/2012 |
| 2 | 17 | 141 | 2021/2013 |
| 3 | 28 | 373 | 2022/2014 |
| 4 | 39 | 941 | 2023/2015 |
| Total | **114** | **1914** | |

The center has been analyzed 1914 soil samples to delivered soil physical and chemical properties testing starting from 2020 since to 2023, but in 2023 G.C the center soil samples analyzed 941and 39 customers service provide (Table 4 and Figure 3, 4).

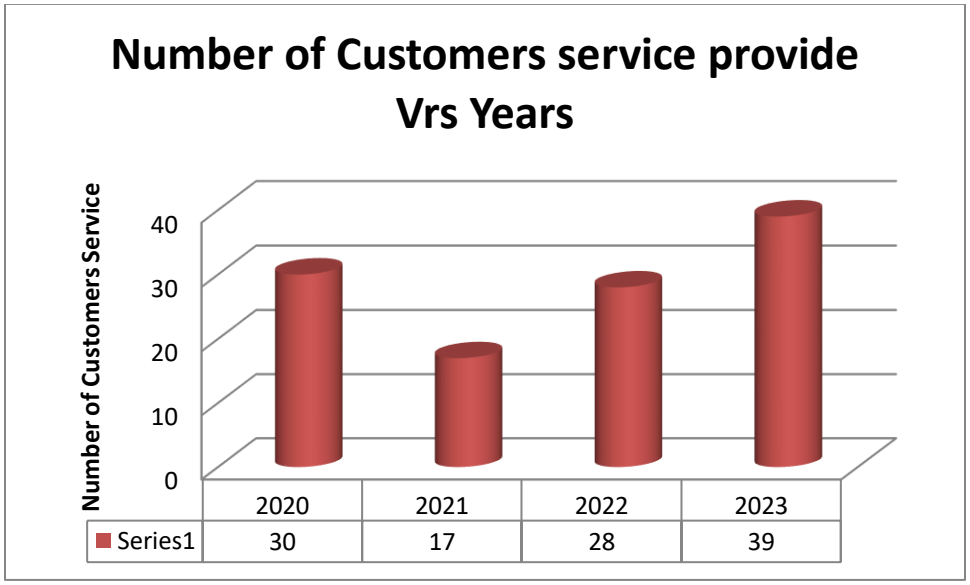



**Figure 3**: NSRC soil test service provide 2020 since to 2023 year for different customers

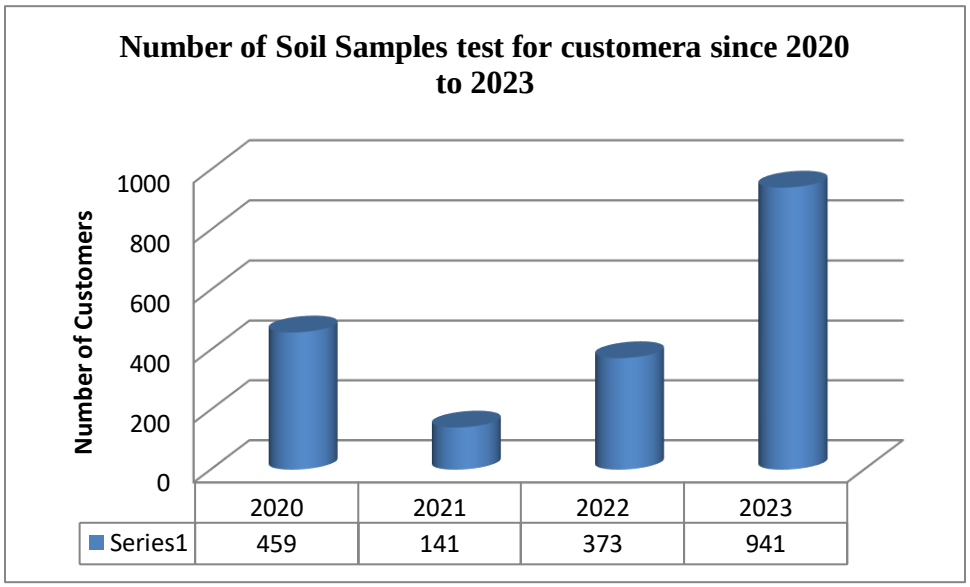



**Figure 4**: Number of soil samples test for Customer 2020 since to 2023 year

### 3.1.2. Challenge of Service Giving

An effective soil testing program gives accurate information about the soil's current fertility condition as well as sound recommendations for regulating fertility to get the best possible

yields. To maintain fertility effectively, it's crucial to keep accurate records of soil test results, fertilizer, lime, and manure applications. Establishing a soil information database, carrying out site-specific fertilizer trials, recommending fertilizer packages (type, rate, method, and time of application), testing soils every three to five years, and improving fertilizer recommendation packages are all steps in the soil diagnosis process based on geo-reference. Due to a number of issues, the soil testing laboratory's potential hasn't been fully realized. Thus perform below outlook. Government-funded agriculture as well as non-governmental agriculture should help this crucial production with resources and moral advice.

The center currently has insufficient funding to buy consumables and reagents, because the soil testing laboratory team did not have a recurring funding allocation. The center is currently under pressure to find a donation organization or support group for lab equipment, particularly the items and reagents listed below. The NSRC will take into account any organizations that support the soil testing laboratory.

The following are a few important constraints which hinder in Nekemte Soil testing laboratory;

- Standard Laboratory Instruments;
    - Digital Flame photometry; Digital UV/Vis spectrophotometer; Digital pH Meter
    - Electrical Conductivity Meter; Fume hood ; Sample Grinder
    - Absence or shortage of spares
    - Hydrometer; Texture mixer and Deionizer distiller; Ventilator; Computer
- Lack of Soil testing Room
    - Shortage of instrument reading rooms.
    - Lack of soil testing space room and office
- Shortage of reagents and material
    - Potassium Chloride ; Sodium Hydroxide ; Ferrous Sulphate; Potassium Dichromate; Sodium Bicarbonate ; Sulfuric acid, Ortho phosphoric acid; Ethanol; Hydrogen Peroxide & Ammonium Acetate, Filter paper 150 &180 diameter

## 3.2. Soil Fertility and Problematic Soil Management Team

Soil Fertility Improvement Study, soil test crop response based fertilizer recommendation, mineral rich fertilizers (Multi-Nutrient Blended Fertilizer) are used, and problem soils (Eg Soil Acidity) are being addressed. In addition, research is being conducted on the use of Integrated

soil Fertility Management and natural fertilizers (manure, vermin-composting, ‘’Bio-fertilizer’’ is being investigated. In improving problematic soils to increase yield and productivity for example, for acid soils, the use of lime, manure, vermicompost and blended fertilizer is being used to increase crop yield and productivity. Acidic soil that has already refused to produce crops, it is beneficial to return to productive land/soil.

### 3.2.1. Planned and Achievements of the team in 2014/2015EC Fiscal

The soil fertility improvement and problematic soil research team making a lot of efforts to address numerous research activities. The team planned and implemented a total of thirteen research activities at various farmers' sites and in the center. Of these activities 5 research activities had been completed in this year. The team published 22 research technologies supported by IQQO, in addition to other projects where in data analysis, interpretation, and final write-up were still being undertaken.

The financial sources of these works were Oromia Agricultural research institute, and other governmental and nongovernmental organization such as AGP-II, GIZ/ISFM, CALM and irrigation. Many farmers and other stakeholders addressed through host farmer, training, advisory services and participated in the field day that was hosted at the district level, where experiences were openly discussed and shared. The technologies were advertised through various official and non-government media (such as OBN, Fana, and Addis TV) as well as other social media such as Face book.

### 3.2.2. A Brief Summary of the Technology and Information Released in 2014/2015 EFY

#### 3.2.2.1. Technology and Information Released in this Year funded IQQO and CALM

As the soil fertility improvement and problematic soil research team five research activities were planned to complete and release a new technology and all planed activities were completed and technology/information were released from them. Out of the total 5 activities 2 activities were funded by IQQO while the other three activities were sponsored by other partners (CALM and irrigation).

**Activity title 1: Effect of Integrated Vermicompost and Chemical NPS Fertilizer on Productivity of Wheat on Acidic Soils in Horo District under Limed Condition**

The study was conducted for two years on six (6) farmers' fields in (2020/22- 2022/23) at Horo district to integrated vermicompost and inorganic fertilizer for bread wheat production in the study area. The experimental design was a randomized complete block design (RCBD) with three replications. The treatments consist of without fertilizer (Control); recommended chemical fertilizer (Rec. N + Rec.P2O5); 100%N equivalent Vermicompost + Rec.P2O5; 75%N equivalent Vermicompost + 25% rec. N + Rec.P2O5; 50% equivalent vermicompost +50%rec.N + Rec.P2O5 and 25% equivalent Vermicompost +75%rec.N + Rec.P2O5. Dendea seed variety with a rate of 150 kg $ha^{-1}$was used for the trial. Soil and vermicompost samples before planting and soil samples after harvesting from each treatment were collected and analyzed for important parameters. Soil reaction pH (H2O) of all the sites ranged from 5.03 to 5.46 and available P ranges from 7.32 to 9.95ppm. Soil acidity of the experimental sites was amended with lime. Nitrogen content of vermicompost was 1.18 and 1.53% for the first and second trial. ANOVA showed that the treatments were significantly influenced all collected yield and yield related parameters of the crop. Relatively the highest crop yield and yield related triats were obtained from T2(Recommended chemical fertilizer)while the lowest were from control(without fertilizer).The highest net income (66107.4 birr /ha) was obtained from 25% eq. VC +75% rec.N + Rec.P2O5 with acceptable (>100%.) MRR. To have more confidence on the technology; it should be Verified at the same area with the same management procedure

**Activity title 2: Evaluation of Response of Field pean (*Pisum sativum L.*) to the strain of Rhizobium Biofertilizer (*Rhizobium leguminosarum bv. Viciae*) at Jima Arjo district, East Wollega Zone, ororomia**

The study was conducted for one year on eight farmland in (2022//23) at Jima Arjo district to To Evaluate the effect of Rhizobium strain) FP- EAL 302) inoculation on nodulation, Plant height, Dry biomass and yield performance of field pea in the study area. The experimental design was a randomized complete block design (RCBD) with three replications. The treatments consist of Control (without any fertilizer), Positive control (50 Kg NPS/ha), 50Kg/ha Urea + 50 Kg NPS/ha and 0.5Kg/ha bio fertilizer ( FP-302) + 50 Kg NPS/ha. Wayitu variety of field pea was used for the trial. Analysis of variance showed that plant height (196.87), biomass yield (6406). and grain

yield (2491), nodule number(17.53),seed per pod (6.31), pod per plant (17.17) and hundred seed weight (21.55) of field pea were highly and significantly affected by the treatment and obtained from the treatment of 0.5Kg/ha bio fertilizer ( FP-302) + 50 Kg NPS/ha. Depending on the obtained results using the organic, bio fertilizer 0.5Kg/ha FP-302) with 50Kg/ha NPS can significantly enhances the yield of field pea. Therefore the researcher recommended that the technology of using biofertilizer (*Strain FP-302)+50Kg NPS/ha*) has to be pre scaled, the rhizobium strains called *FP-302* has to be multiplied and its biofertilizer has to be produced in large numbers of sachets.

**Activity title 3: Socio-economic characterization, identification and prioritization of major constraints and potentials in Tufa watershed**

Survey questionnaires data were collected by interview data collection method. 135 respondents were selected based on Yamanes formula from total population of Tufa watershed. From those 14 are women respondents and 121 are men respondents. Some part of those data was encoded. However, in case of our research center have not social data analysis software trained professional, the collected survey questionnaire data was not fully analyzed. Also, we try to invite social data analysis software trained. Professional from other research center, but we did not get due to overlapping the work and they were busy at that time. Therefore, to identify the major potentials and constraints at Tufa watershed the collected data will be analyzed by support of trained professionals from somewhere for full write up of the activity.

Table 7: Number of stakeholders (Farmers, DAs, SMSs, Researchers, and Zonal and District level agricultural office) Participated on Field day

| **Different stakeholders participated on field days** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Farmers | | Das | | SMSs | | Others | | Total |
| M | F | M | F | M | F | M | F | |
| 101 | 9 | 21 | 7 | 26 | 10 | 27 | 4 | **205** |

**Activity title 4: Adaptation trial for fifty bread wheat varieties for irrigated bread wheat production under irrigation in Wayu Tuka district**

The implementation was conducted in 2022/23 off season (during January 11, 2022 – February 01, 2023) Improved bread wheat seed variety of ‘’kingbird ‘’ was broadcasted at a rate of 150 kg/ha for the large scale production. Seed bed and furrow making and seed covering done by using oxen. 100 kg/ ha NPS was uniformly applied to all experimental plot except zero plot. The experiment was laid out in RCBD design with three replications. Plot size was 3m × 5m. Factorial combined three levels of seed rates (125, 150 and 175) and Five levels of N fertilizers

rates (0, 50, 100, 150, and 200 kg ha-1 Urea) were used as treatment studied. Representative composite soil samples were before and after sowing. The interaction effects of Nitrogen fertilizer and seed rates were significantly influenced the mean grain yield of bread wheat. The maximum yields and yield related parameters were recorded from the application of 23 kg/ha N with a seed rates of 150 kg/ha. Based on the results of agronomic data analyzed; application of 23 kg N fertilizer with a seed rates of 150 kg each per hectare were led to the maximum yields of bread wheat production in study area. Therefore, farmers might be advised to use 23 kg/ha N fertilizer rates with King bird seed rate of 150 kg/ha to increase productivity of irrigated bread wheat production in Jato traditional irrigation schemes found in W/Tuka district

It was done in Aba Kinati traditional irrigation schemes found in W/Tuka district. The specific experimental site is situated at an altitude of 1750 masl. It was done to identify high yielding and best adapted bread wheat varieties for midland irrigated areas. 15 varieties including the standard check were used as treatment. Seed rate was 120 kg/ha. Chemical fertilizers: UREA@ 150 kg/ha and NPS @100kg/ha were applied uniformly. Urea application was split basis; 1/3 at sowing and the remaining was 21 days after planting. As it is observed analysis, bread wheat variety showed significant effect on most of yield and yield related parameters collected. Comparison of means among bread wheat varieties showed that the highest grain yield (40.96 qt/ha) was recorded from balcha varieties while the lowest was from obora varieties was the minimum. Thus, variety Balcha can be recommended for bread wheat production in Aba kinati traditional irrigation schemes found in W/tuka district and areas with similar agro-ecological conditions.

### 3.3. Agricultural Economics, Extension and Gender Process Team

#### 3.3.1. Annual Research Report in 2015 cropping season five (5) Activities were funding by IQQO

**Activity title 1: Pre-extension demonstration of Soil Test Crop Response Based Phosphorous Calibration Study for Maize (Zea mays L.) at Sibu Sire District, Western Oromia, Ethiopia**

Pre extension demonstration activity was conducted in sibu sire district during 2022/23 cropping season to demonstrate research finding obtained from p fertilizer calibration study on maize. Four FRG were established in purposively selected kebeles and training was provided on the topic of soil test based crop response fertilizer recommendation for farmers, development agent, experts and stakeholders in the district. The highest mean maize grain yield of 6200 kg $ha^{-1}$ was obtained from soil test based phosphorus fertilizer recommendation with an extra yield advantage of 58% over farmers practice. Therefore, further popularization of the recommended soil test based crop response fertilizer rate is of paramount importance.

**Activity title 2: Pre-Extension demonstration of soil test crop response based NPS Fertilizer Rate recommendation on Phosphorus Calibration Study for Bread Wheat (*Triticum Aestivum*L.) production at Jima Arjo District, Western Oromia, Ethiopia**

Depletion of soil fertility leads to declining crop yields and raise the number of food insecure people. Thus, in order to improve soil fertility and subsequently increase crop yields more attention has been given to external inputs to the soil through site specific soil test based crop response fertilizer recommendation. Pre-Extension demonstration of soil test crop response based NPS fertilizer recommendation was conducted in Jima Arjo district. Four FRG were established in purposively selected kebeles and training was provided. The results of the demonstrated study was a significant increase in yield and yield components of the test crops due to the application of recommended NPS fertilizer with liming acidic soil over blanket fertilizer recommendation. In general the study indicated that soil test based crop response phosphorus fertilizer recommendation is superior to the blanket fertilizer recommendation in terms of yield, and yield component. Therefore, the scaling up/out of soil test crop response based recommended NPS-fertilizers should be carried out for further wheat production in the study area.

**Activity title 3: Pre-extension demonstration of Soil Test Crop Response Based Phosphorous Calibration Study for Maize (*Zea mays L.*) at Abay Choman District, Western Oromia, Ethiopia**

Maize (*Zea mays* L.) is one of the most important cereals broadly adapted worldwide (Christian et al., 2012). Globally, maize is known as queen of cereals because it has the highest genetic yield potential among the cereals. It is one of the most important cereal crops used in the human diet in large parts of the world and it is an important feed component for livestock. It is also used as industrial raw material for oil & glucose production (MARD, 2014). Maize grain has greater nutritional value as it contains 72% starch, 10% protein, 4.8% oil, 8.5% fiber, 3.0% sugar and 1.7% ash. Maize is the single most important crop in terms of both number of farmers engaged in cultivation and crop yield (Shahidur *et al.*, 2010).

Low soil fertility is one among the major factors limiting maize production and productivity in western Oromia, Ethiopia (Wakene *et al*., 2005). In most of maize producing areas in the world, inorganic fertilizers are relied upon to improve crop yields and maintain soil fertility. Excess and insufficient uses of fertilizers result in severe nutrient depletion of soils and reduce the production and productivity of maize.

Soil test based fertilizer recommendation plays a vital role in ensuring balanced nutrition to crops. It is widely believed that economic optimum fertilizer application can only be achieved by developing appropriate fertilizer recommendation that takes into consideration the nutrient status of individual field. Currently there are no site-specific fertilizer recommendations for the different soil-crop climatic conditions. Soil test based phosphorus calibration study will be conduct at Abay Choman District on Maize by Nekemte soil research center for three years. Under research circumstances once new technologies are released and verified, the next step is conducting pilot test/demonstration on a small number of farmer's field.

**Objective**

- ♥ To create awareness on the importance of soil test based crop response fertilizer recommendation rate for maize production in the study area
- ♥ To create wider demand on the profitability and economic feasibility of optimum N recommended rate for maize production.
- ♥ To assess farmers and other stakeholders feedback for further technology development

**Current status**

Pre-Extension demonstration of soil test crop response based NPS fertilizer recommendation was conducted in Jima Arjo district on 4 farmers' fields. During implementation of the activity, farmers were organized under farmers research group FRGs. A total of 4 FRG units which are having 52 male and 10 female members were established. A mini field day was organized and many farmers with in and around the kebele were participated and the technology were promoted through different media and televisions.

**Extended for one year**

**Reason of extension**

- Due to series Security problem all necessary data were not collected. Therefore, it will be continued as soon as the security issue of the study area become secured for the implementation of the research

**Activity title 4: Pre scaling up of Soil Test Crop Response Fertilizer rate Recommendation Based Phosphorus Calibration Study for Teff (*Erogoritis teff)* production at Guduru District, Western Oromia Region, and Ethiopia**

Teff [Eragrostistef (Zucc.) Trotter] is an annual C4 grass that belongs to the family Poaceae (Kebede *et al.,* 1989).It is an indigenous cereal crop in Ethiopia. Ethiopia is the origin and the first domesticator of this unique crop (Vavilov, 1951).The straw of teff is used as a very important source of animal feed, especially during the dry season (Seyfu, 1997). Highland soils of Ethiopia indicated that phosphorus is potentially limiting element in crop production (Desta, 1982; Tekalign and Haque, 1987).

An accurate soil test interpretation requires knowledge of relationship between the amount of a nutrient extracted by a given soil test and the number of plant nutrient that should be added to achieve optimum yield for each crop (Sono and Zhang. 2008). Hence, calibration is a vital tool to attain the objective while calibrations are specific for each crop type and they may also different by soil type, climate, and the crop variety. That means, fertilizer recommendations on soil test basis for economic crop production should be both location and situation specific and can be modified with changes in soil test value as well as input output ratios. Soil test based fertilizer recommendation plays a crucial role in ensuring balanced nutrition to crops. Therefore, fertilizer

application schedules should be based on the magnitude of crop response to applied nutrients at different soil fertility levels (santhi et.al.2002). As in all other regions of country, fertilizer recommendations in Guduru district is also not based on soil test results.

Soil test based phosphorus calibration study and verification of soil test based phosphorus recommendation on teff crop was conducted in Guduru district having different P and N levels and promising result was obtained. The finding of soil test based crop response phosphorus calibration study was verified along with farmer practice and the control on farmers holding. Partial budget analysis indicated that soil test based phosphorus fertilizer recommendation is economically feasible for Teff production in the district.

**Objective**

- To popularize soil test based fertilizer recommendation for Teff in the study area.
- To create wider demand on the importance of site specific crop response fertilizer recommendation through farmer pre scaling up approach.
- To strength linkage among stakeholders.

**Current status**

The experiment was conducted in Guduru district on 3 farmer's field during 2022/23 cropping season. During implementation of the activity, farmers were organized under farmers research extension group (FREGs). A total of 2 FREG units which are having 27 male and 5 female members were established. Training was provided for the beneficiary (participant) farmers. A total of 26 farmers participants were trained.

**Extended for one year**

**Reason of extension**

Due to series Security problem extension events were not organized and all necessary data were not collected. Therefore, it will be continued as soon as the security issue of the study area becomes secured for the implementation of the research.

**Activity title 5: Pre scaling up of NPS Fertilizer Rate Recommendation Based on Phosphorus Calibration Study for Bread wheat (Triticum Aestivum L.) production at Horo District, Western Oromia Region, Ethiopia**

Bread wheat (*Triticum Aestivum L.*) is one of the most staple food crops in the world and it is one of the most important cereals cultivated in Ethiopia. It stands fourth in both area coverage and total annual production, and second in yield per hectare next to maize (CSA, 2017). Bread wheat grain is used for making bread, porridge, soup, and consumed as roasted and boiled forms. Moreover, the straw of bread wheat is an important feed for livestock, thatching roofs, and bedding (Behera, 1998; Bekele *et al.,* 2017).

In spite of its tremendous importance, its production in Ethiopia as well as in Oromia region has faced immense production constraints affecting both its yield potential and industrial quality. Among these constraints mainly farmers are using low yielding local varieties and declining soil fertility (Jemmal, 1994). Continuous cropping and applications of suboptimal rates of mineral fertilizers have aggravated the decline in soil fertility and crop yield (Zeleke, G., G *et al.* 2010).

An accurate soil test interpretation requires knowledge of relationship between the amount of a nutrient extracted by a given soil test and the number of plant nutrient that should be added to achieve optimum yield for each crop (Sono and Zhang. 2008). Hence, calibration is a vital tool to attain the objective while calibrations are specific for each crop type and they may also different by soil type, climate, and the crop variety. That means, fertilizer recommendations on soil test basis for economic crop production should be both location and situation specific and can be modified with changes in soil test value as well as input output ratios. Soil test based fertilizer recommendation plays a crucial role in ensuring balanced nutrition to crops. Therefore, fertilizer application schedules should be based on the magnitude of crop response to applied nutrients at different soil fertility levels (santhi et.al.2002). As in all other regions of country, fertilizer recommendations in Horo district is also not based on soil test results.

Soil test based phosphorus calibration study and verification of soil test based phosphorus recommendation on bread wheat crop was conducted in Horo district having different P and N levels and promising result was obtained. The finding of soil test based crop response phosphorus calibration study was verified along with farmer practice and the control on farmers holding.

**Objective**

- To popularize soil test based p-fertilizer recommendation technology for bread wheat.
- To create wider demand on the importance of site specific crop response fertilizer recommendation through Pre scaling up approach.
- To strengthen the linkage among concerned stakeholders.

**Current status**

The experiment was conducted at Horo district on 5 farmer's fields during 2022/23 cropping season. Farmers were organized under farmers research extension group (FREGs). A total of 3 FREG units which are having 28 male and 11 female members were established

**Extended for one year**

**Reason of extension**

Due to series security problem extension events were not organized and all necessary data were not collected. Therefore, it will be continued as soon as the security issue of the study area becomes secured for the implementation of the research activity.

**Major problem meet during the implementation the activity**

- Security problem
- Man power
- Logistic
- Shortage of budget

### 3.4. Natural Resource Technology Multiplication Activities

**Activity title 1: Bio fertilizer and vermin compost production and distribution Funded by IQQO)**

Biofertilizer**s** are preparation of containing living or latent cells of efficient strains of microorganism that helps crop plant uptake of nutrients by their interaction in the Rhizosphere when applied through seed, to the soil or to the root of the plants. Under OARI, NSRC is the only biofertilizer producing center. Nekemte soil research center (NSRC) started production of biofertilizer with the aid of AGRA project in 2017 for different legume crops. However, the number of biofertilizer sachets produced in NSRC will not fulfill the demand of biofertilizer in the region because of the low production. The work plan activities at the center will be prepared for the 2023/24 crop season. For bio fertilizer production, to purchase the necessary material on a time and start the production in late March. For vermin worm multiplication and production of vermin compost, harvesting the compost what is now under production and composting other new material for the second term at the center. To start up multiplication of the vermin worm and produce the compost at farmers' level.

Table 8: The total biofertilizer produced last year 2015 E.C

| No. | Crop type | Plan to be produced | Amount of bio fertilizer produced in 2015 E.C | Amount of sachet distributed |
|---|---|---|---|---|
| **1** | Soya bean | 1000 | **50** | 20 farmers |
| **2** | Faba bean | 1000 | **50** | |
| **3** | Field pea | 1000 | **-** | |
| **4** | Haricot bean | 500 | **-** | |
| **5** | Lentil | 500 | **-** | |
| **Total** | | **4200** | **100** | |

**Challenges Encountered During Biofertilizer Production**

- Shortage of material like yellow plastic, hazard polyethylene plastic
- Shortage of human resource
- Shortage of lignite crusher

**Activity title 2: Establishment and demonstration of small scale vermi culture and production of vermi compost in Tufa Watershed, Leka Dulecha district, western Oromia, Ethiopia Non IQQO Funding by CALM P4 R**

The experiments were conducted in Tufa watershed, Lekadulech district on three (3) farmers. There criteria that used to selected site/farmer the experiments were; should be easily approachable for inspection. It should be near to cattle shed to get cow dung easily and to the sou rce of water. The site should be where the raw materials are available. Farmer has to be interested to produce vermin compost and give care to the vermin worm.The experiments were c onducted in Tufa watershed, Leka dulecha district on three (3) farmers.There criteria that used to select site/farmer the experiment were; Should be easily approachable for inspection.

The material used in the preparation of the vermicompost were; water Wooden box, slury of cow dung, plant residue (barley straw,green leaves of, Qobbo, Rejji and makanisa), Earthworms (Esa nia Foetida). Vermi compost shade has been constructed in the garden of the farmers. To prepare the vermi compost, wooden box of length 1.5m, width 0.6m and 0.5m height has been constructed. Bedding materials like barley straw have been collected and prepared. Different plants leaves such as Qobbo, Rejji and makanisa have been prepared being chopped and stayed for 20 days. Cow dung slurry has been prepared. The finally the prepared materials are buried with vermin worms and its vermin compost is produced and used by the farmers. The Natural Resource Technology Multiplication team has been building vermin compost shade. The shade has three rooms and six (6) vermi box has been constructed and start working.

Figure 5: Vermin compost produced in the watershed

Figure 6: Vermicompost Shade and Verm Cast

**Activity title 3: Cluster Based Large Scale Irrigated Bread wheat Seed Multiplication at Wayu Tuka District**

One of the key strategies for promoting technology, producing certified seed, and increasing productivity is cluster-based large-scale demonstration. In order to achieve this, the Oromia Agricultural Research Institute (IQQO) supported the large-scale cluster-based demonstration of successful bread wheat multiplication with irrigated wheat with advance of government innovations. At Wayu Tuka district the center were established two cluster in two kebele. At Wayu Tuka district Cluster based large scale demonstration of irrigated wheat seed multiplication was covered 50 ha in two kebeles. Additionally, the district arranged the farmers' field day at two kebeles. All locations performed admirably, and this is the best lesson for our center, the stakeholders, and the farmers. Such a large-scale seed multiplication will partially address the dearth of enhanced seeds since the majority of the multiplied seeds are basic. The donor partners, implementation hubs, our practitioner researchers, various support staff, Woreda office of Agriculture, the Development Agent, and farmers are all deserving of our gratitude.

**Table 9**: Number of farmers and Area Cultivated in 2023 year at Wayu Tuka District

| **District** | **Kebele** | **Cluster** | **Area planted (ha)** | **Participants** | | | **Av. grain yield (qt/ha)** | **Beneficieries** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Male** | **Female** | **Total** | | **Male** | **Female** | **Total** |
| **W/Tuka** | G/badiya | Aba Kinati | 27 | 47 | 18 | 65 | **26** | 136 | 204 | 340 |
| **W/Tuka** | G/Abalo | Wara muka | 23 | 59 | 9 | 68 | **32** | 88 | 132 | 220 |
| **Over all total** | | | **50** | **106** | **27** | **133** | **27** | **224** | **336** | **560** |

**Table 10**: Number of stakeholders (Farmers, DAs, SMSs, Researchers, and Zonal and District level agricultural office) Participated on Field day

| **Agricultural experts (SMS)** | | | **Extension agents (DA)** | | | **Farmers** | | |
|---|---|---|---|---|---|---|---|---|
| **Male** | Female | Total | Male | Female | Total | Male | Female | Total |
| **2** | - | 2 | 5 | 2 | 7 | **88** | **6** | **94** |
| **Over all Total = 103 participants** | | | | | | | | |

**Table 11**: Yield obtained from the Cluster based irrigated activities

| District | Crop type | Variety | Max yield (qt/ha) | Min Yield (qt/ha) | Average Yield (qt/ha) |
|---|---|---|---|---|---|
| **Wayu Tuka** | Wheat | Kingbird | 35 | 18 | 27 |

**Figure 7**: Picture of order of irrigated wheat seed multiplication at Wayu Tuka District in 2015

**Figure 8**: Photography taken during field day at Irrigated Wheat Seed multiplication Site

### 3.5. Soil Resource Survey Team

**Activity title1: Characterization, Classification and Mapping of Major Soil groups in different agro ecological zones of Gobu Sayo District, East Wollega zone, Western Oromia**

Slope Map Slope map of the district were generated and classified; accordingly, six slope classes with their area coverage were identified. **The slope classes are:-**

- ✓ Flat to very gently land,
- ✓ Undulating/gently sloping land,
- ✓ Sloping land,
- ✓ Strongly sloping land and

- ✓ Moderately steep land with the slope gradient

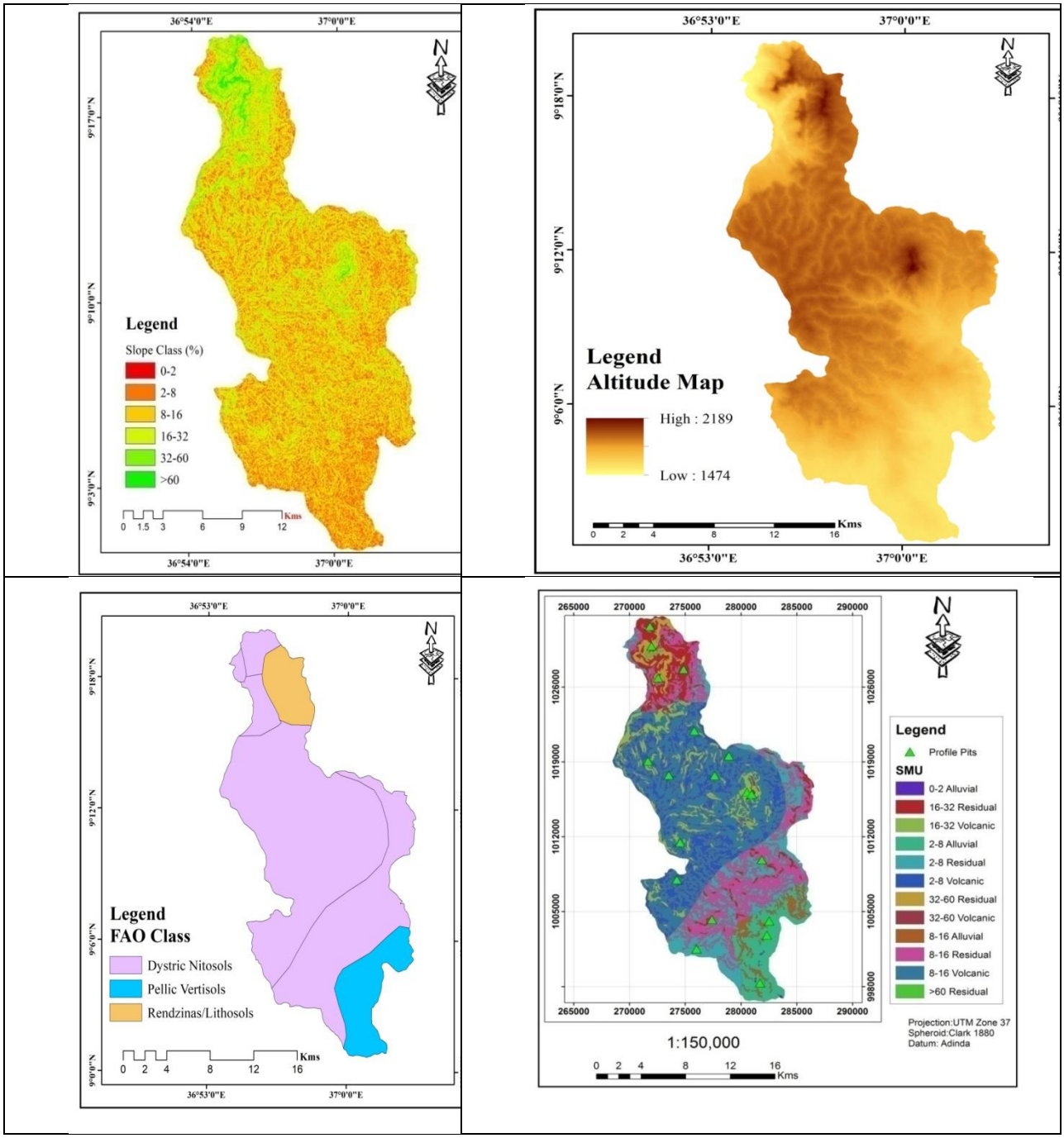
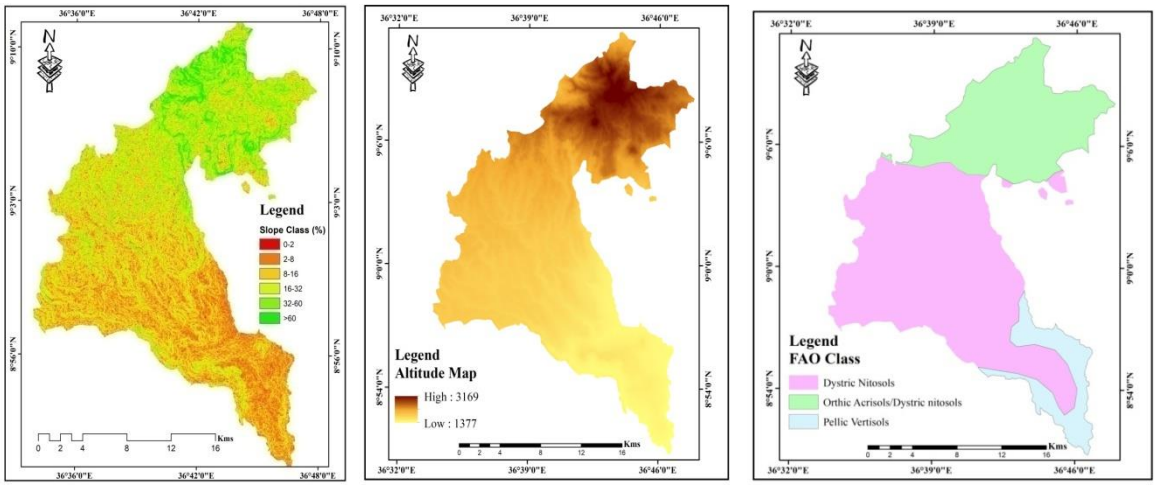



Figure 9: Slope; Altitude; soil type and Soil map unit maps of Gobu Sayo

**Reason of Extension**; we have tried to conduct the research as much as possible by communicating with the District administration but, due to the Security problem around the study area we can't move as we want in the District.

**Activity title 2: Characterization, Classification and Mapping of Major Soil groups in different agro ecological zones of Wayu Tuka District, East Wollega zone, Western Oromia**

The activity current status different factor maps like Slope, Altitude and Soil maps were done at office for field surveying using ArcGIS and Global mapper Software's. The slope of the study area was calculated from DEM (30*30m resolution) used in the ArcGIS environment as a thematic map. Finally, slopes were reclassified and calculated in the GIS environment. Accordingly, the District was classified in to six slope classes. A base map was created for field work activities using the overlays of the produced image interpretation maps and slope class maps. Slope map of the Jimma Arjo district were generated and classified; accordingly, six slope classes with their area coverage and percentage were identified. The slope map of the Wayu Tuka district were generated and classified; accordingly, six slope classes with their area coverage were identified. Altitude plays an important role in agricultural activities in general, and specifically for crop production. The altitude of the study area ranges between 1377m to 3,169m.a.s.l. The soil type the previous soil group of the study were Dystric Nitisols, Orthic Acrisols/Dystric Nitosols and Pelvic Vertisols (Source FAO).




**Activity title 3: Fertilizer Requirement mapping for Bread Wheat at Jimma Arjo District, East Wollega Zone Oromia**

The activity current status different factor maps like Slope, Altitude and Soil maps were done at office for field surveying using ArcGIS and Global mapper Software's. The slope of the study area was calculated from DEM (30*30m resolution) used in the ArcGIS environment as a thematic map. Finally, slopes were reclassified and calculated in the GIS environment.

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Altitude plays an important role in agricultural activities in general, and specifically for crop production. The altitude of the study area ranges between 1377m to 3,169m a.m.a.s.l. Soil types of the previous soil group of the study were Dystric Nitisols, Dystric Nitosols /Orthic Acrisols and Pellic Vertisols (Source FAO).

**Table 12**: Slope classes area coverage in hectare and percentage

| S/N | Slope class | Area (ha) | Area (%) |
|---|---|---|---|
| 1 | 0-2 | 204559.56 | 78.94 |
| 2 | 2-8 | 24871.11 | 9.60 |
| 3 | 8-16 | 15739.29 | 6.07 |
| 4 | 16-32 | 8900.4 | 3.43 |
| 5 | 32-60 | 4068.25 | 1.57 |
| 6 | >60 | 1006.6 | 0.39 |
| Total | | **259145.21** | **100** |

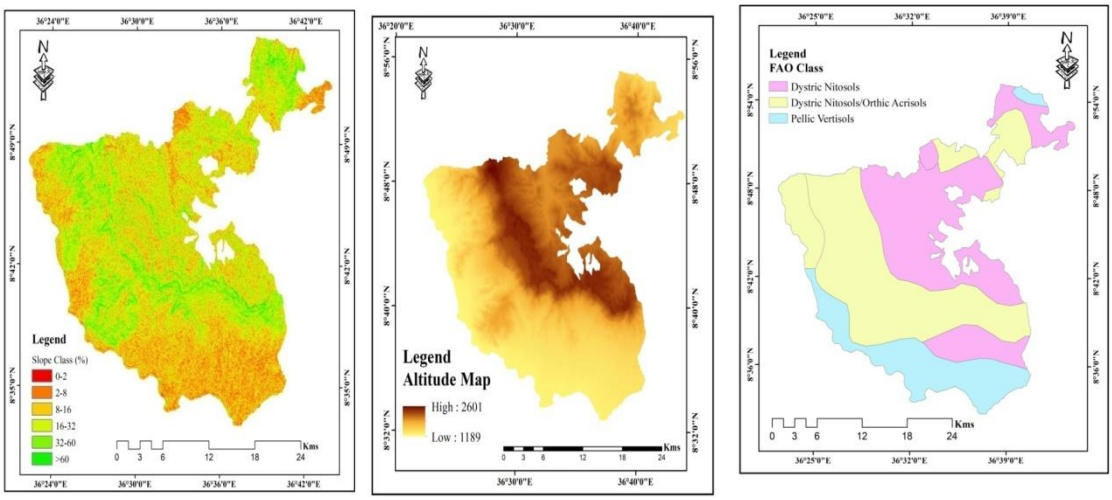


**Figure 10**: Slope; Altitude and Soil Types map of Jimma Arjo

## IV. Establishments of FRG/FREG at districts for Technology mobilize

The importance of FRG and FREG is to mobilize technology and create awareness. FRG and FREG play a crucial role in driving technological advancements and fostering widespread knowledge about emerging innovations FRG and FREG play a crucial role in mobilizing technology by facilitating research and development efforts, fostering innovation, and driving technological advancements. On six activities, 15 FRGs and FREGs were established. There are 176 male and 45 female members in six districts, for a total of 221. These FRGs and FREGs were created to promote community engagement and support among the residents of each district. The establishment of these groups aimed to provide a platform for members to actively participate in decision-making processes and address local concerns effectively. These FRGs and FREGs were formed to support and engage the local communities in various initiatives. The diverse membership of 221 individuals, consisting of 176 males and 45 females, ensured a well-rounded representation of perspectives and skills within these groups. These FRGs and FREGs were formed to support and engage the local communities in various initiatives.

**Table: Summers of established FRG/FREG at different activities**

| No | Activity Title | Woreda | FRGs/FREGs Established | FRGs/FREGs members | | Total |
|---|---|---|---|---|---|---|
| | | | | Male | Female | |
| 1 | PED of STCRB Phosphorous Calibration Study for Maize (Zea mays L.) at Sibu sire District, | Sibu sire | 4 | 48 | 10 | 58 |
| 2 | PED of STCRB Phosphorous Calibration Study for Maize (Zea mays L.) at Abay Choman District, | Abay Choman | 2 | 21 | 9 | 30 |
| 3 | PED of NPS Fertilizer Rates Based on Phosphorus Calibration Study for Bread Wheat production at Jima Arjo District | Jima Arjo | 4 | 52 | 10 | 62 |
| 4 | Pre scaling up of NPS Fertilizer Rate Recommendation Based on Phosphorus Calibration Study for Bread wheat (Triticum Aestivum L.) production at Horo District | Horo | 3 | 28 | 11 | 39 |
| 5 | Pre scaling up of NPS Fertilizer Rate Recommendation Based on Phosphorus Calibration Study for Teff (erogoritis teff) production at Guduru District | Guduru | 2 | 27 | 5 | 32 |
| 6 | Total | | 15 | 176 | 45 | 221 |

## V. Training

The training is given based on the requirements of activities and objects to mobilize the technology for stakeholders. The training program focuses on enhancing farmers' knowledge and skills in sustainable farming practices based on the activities required. At the center level, the training was given in six districts to 145 male and 25 female participants of Das, Farmers and experts. The training provided at the center level was aimed at enhancing the skills and knowledge of participants from five districts. Out of the total 170 participants, 145 were male and 25 were female, ensuring a diverse representation in the training program. The training aimed to enhance the participants' leadership skills and promote gender equality in the districts. The center-level training focused on the achievements of activities and objects.

**Table 13**: Summers training give to districts and participants

| No | Districts | Kebele | Participants | Male | Female | Total |
|---|---|---|---|---|---|---|
| 1 | Guduru | Gobu | Farmers | 26 | - | 26 |
| 2 | Abay Choman | Achane and Jare | Farmers | 20 | 11 | 31 |
| | | | DA | 1 | - | 1 |
| | | | Expert | 1 | - | 1 |
| | | | Total A/Choman | 22 | 11 | 33 |
| 3 | Sibu Sire | Bikila and F/Yubdo | Farmers | 19 | 6 | 25 |
| | | | Total S/Sire | 19 | 6 | 25 |
| 4 | Jima Arjo | Lalo and Hine | Farmers | 25 | 8 | 33 |
| | | | DAs | 2 | - | 2 |
| | | | Expert | 7 | - | 7 |
| | | | Total | 34 | 8 | 42 |
| 5 | W/Tuka | G/Abalo | On irrigated bread wheat seed multiplication | 44 | - | 44 |
| Grand Total number of participants on training | | | | 145 | 25 | 170 |

Figure 11: Photo taken during training

## VI. Job Opportunities Creation for Community Groups

The center participated in job creation to surround area of community; for those without jobs, work has been created on a day jobs. As the following table presented;

Table 14: Job opportunities Creation for community at mandated research activities area

| No | Type of job creation | Annual plan | Performed | Performed % |
|---|---|---|---|---|
| | Daily labor | 70 | 153 | >100 |

## VII. Community service provided

Supporting 26 impoverished students for the past two years has been one of the key community services provided by our center. Additionally, various research and institutional activities are **being carried** out to support the poor **farmers in our mandate areas**. The main achievement of

this year was specifically luring many donors/projects to supply agricultural inputs and technologies to **poor** farmers.

Figure 12: Students are assisted by NSRC personnel.

## VIII. Center Development Activities

The center has completed various center development projects/activities this year, including the construction of the fence, the development of the vermiculture, and the planting of trees. The center's soil laboratory is also undergoing renovations.

Figure 13: Design and construction of the front fence

Figure 14: Construction of vermiculture center

## IX. Human Resource

It is fundamental and necessary for an organization to improve the competency of its personnel in order to completely carry out plans and targets aimed at accomplishing its goals and objectives. Any firm, in particular, must have a professional and educated workforce. The center, on the other hand, is doing an excellent job with such a little staff. A researcher and laboratory technicians, in particular, are in short supply in terms of number, education level, and training to serve in the five zones of our mandate. The center employs 49 people in total, but only 10 of them are researchers.

**Table 15:** Total number of employees on study leave during this plan year

| S/N | Process/Team | Level of education | No of staff started education in 2015 E.C | | No of staff started education in 2010 E.C | | Total | |
|---|---|---|---|---|---|---|---|---|
| | | | Dhi. | Dub. | Dhi. | Dub. | Dhi | Dub |
| 1 | SFI and PSM | PhD | - | - | 1 | - | 1 | - |
| 2 | " | MSc | 2 | - | - | - | 2 | - |
| Grand Total | | | | | | | 3 | |

Table 16: Total human resource of the center by gender and level of education

| S/N | Team | 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 | Technical | - | - | 6 | 1 | - | - | - | - | 5 | - | 5 | 2 | 1 | 3 | - | - | **17** | **5** |
| 2 | Supportive | - | - | - | - | - | - | - | - | 4 | 7 | 3 | 1 | 3 | 1 | 6 | 2 | **10** | **11** |
| | Total | | | 5 | 1 | | | | | 9 | 6 | 8 | 3 | 4 | 4 | 6 | 2 | **33** | **16** |
| | | | | | | | | | | | | | | | | | | **49** | |

# X. Budget and its utilization

### Utilization of capital budget OARI

| S/N | Team | Annual Budget | Annual Utilization | % (P/U) |
|---|---|---|---|---|
| **1** | Soil Fertility Improvement &PS | 745000 | 738,270 | 99.09 |
| **2** | Soil Resource survey | 185000 | 184,960 | 99.97 |
| **3** | Agricultural Extension | 331,200 | 331,000 | 99.93 |
| **4** | Teknology Multplication | 150,000 | 149,800 | 99.86 |
| | Total | **1411200** | **1,404,030** | **99.49** |

## Utilization of capital budget utilization from non-OARI sources

| S/N | Team | Budget Source | Annual Plan | Utilization | % Achievement |
|---|---|---|---|---|---|
| **1** | SF and PSM | GIZ | 300,000 | 299,987.87 | |
| **2** | | CALMP4R | 1,350,000 | 1,146,715 | |
| **3** | | IWP | 5,046,732.38 | 4,786,097.38 | |
| | **Total** | | **6,696,732** | **6,232,800.25** | |

## Utilization of Recurrent Budget

| S/N | Annual Plan | Utilization | % (P/U) |
|---|---|---|---|
| **1** | 6,635,899 | 6,631,242.89 | 99.92 |

**Major Problems Encountered in this fiscal year**

| SN | Problems encountered | Efforts made to address the problems | Recommended solution must give by Institute |
|---|---|---|---|
| **1** | Lack of Human power | Working overtime, on weekends, and performing additional work; | Employing fresh hires from the market appropriately. |
| **2** | Shortage of Budget | Saving money and effectively using | Budget allocation should consider |
| **3** | Security problem | Handle carefully and with caution | Budget allocation should be centered on and take each activity's workload into account (especially soil research related activities) |
| **4** | Lack of Logistic | Merging/combining various teams and using an export vehicle | |
| **5** | Outdated lab equipments and installation | They use it elsewhere and in other research centers. | Allocating appropriate funds for maintenance and the purchase of new lab furnishings and equipment |

## XI. Summary of Main Initiatives Scheduled for Upcoming Fiscal year

- ✓ Work plan activities at the center will be prepared for the 2014/15 E.C. crop season.
- ✓ For ongoing research activities, various data collecting and recording will continue in accordance with the project plan.
- ✓ According to the project proposals and budget, experimental setups, site selection, urea treatment, weed control, sowing, data collection, and recording will start for new activities and projects.
- ✓ The scheduled times will be followed for monitoring and evaluation.
- ✓ Inspire and assist all staff to participate in various discussion workshops, hold team meetings, and meticulously record and document all working
- ✓ Compile information on the project's completed activities, the use that information to create scholarly articles and suggest exploitations the outcomes.
- ✓ Support and strengthen existing FRG groups and create new ones to carry out technology demonstrations and scale ups in various research mandate areas.
- ✓ ¸Develop new project concept notes and ideas based on the unique problems in soil research.

## XII. IQQO and Non-IQQO funded Agricultural research activities for 2016 EC

The research activities involves conducting field surveys to identify agricultural challenges and opportunities, collaborating with local farmers and experts to develop innovative solutions, implementing pilot projects, organizing training workshops, and establishing demonstration farms. It also involves a literature review to identify gaps in current research, organizing workshops with farmers and experts, developing research proposals, and establishing partnerships with local organizations. The goal is to improve agricultural productivity, sustainability, and resilience while fostering a more sustainable agricultural landscape.

Table 17: List of IQQO funded Agricultural research activities for 2016 EC

| No | Teams and Activity titles | Status | Year started | Year of completion | **Remark on fund source** |
|---|---|---|---|---|---|
| 1 | Soil Fertility Improvement and Problematic Soil Management | To be= 1 Ong=2, New=3, Total=6 | | | |
| 1.1 | Vermicompost Preparation from Locally Available Materials and Characterization for its major Nutrient Contents at Nekemte Soil Research Center | to be completed | 2015 | 2016 | **OARI** |
| 1.2 | Soil Test Crop Response Based Phosphorus Calibration Study on Maize(zea maize) at Guto Gida District of East Wollega Zone, Oromia Region | Ongoing | 2015 | 2018 | **OARI** |
| 1.3 | Soil Test Crop Response Based Phosphorus Calibration Study on Food Barley(Hordeum vulgare L.) in Jima Arjo District of East Wollega Zone, Oromia | Ongoing | 2015 | 2018 | **OARI** |
| 1.4 | Evaluation of Maize-Intercropped with Climbing Bean under Different Planting Patterns for crop productivity and Soil Fertility improvement in Sibu Sire District, Western Oromia Region | New | 2015 | 2016 | **OARI** |
| 1.5 | Verification of Soil Test Crop Response Based Phosphorus Calibration study on Bread Wheat (Triticum Aestivum L.)at Leka Dulacha District, East Wellega Zone, Western Oromia Region | New | 2015 | 2016 | **OARI** |
| 1.6 | The Effects of Rhizobial Biofertilizer (Rhizobium Luguminosarum) Integrated with Vermicompost to Improve Yield Productivity of Fababean at Horo District, Horo Guduro Wollega Zone, Oromia, Ethiopia | New | 2015 | 2016 | **OARI** |

Table 18: List of Non-IQQO funded Agricultural research activities for 2016 EC

| No | Teams and Activity titles | Status | Year started | Year of completion | **Remark on fund source** |
|---|---|---|---|---|---|
| **1.** | Soil Fertility and Problematic Soil Management/ Extension | **To be= 0<br>Ong= 4<br>New=14<br>Total=18** | | | |
| 1.1.1 | Generating more data on the economic maximum rates of N and P fertilizers for maizeat Wayu Tuka District, East Wollega Zone, Western Oromia Region, Ethiopia | New | 2015 | 2016 | AECFRP |
| 1.1.2 | Generating more data on the economic maximum rates of N and P fertilizers for Bread wheatat Jima Arjo District, East Wollega Zone, Western Oromia Region, Ethiopia | New | 2015 | 2016 | AECFRP |
| 1.1.3 | Generating more data on the economic maximum rates of N and P fertilizers for teffat Jima Arjo District, East Wollega Zone, Western Oromia Region, Ethiopia | New | 2015 | 2016 | AECFRP |
| 1.1.4 | Participatory evaluation and demonstrate of integrated biophysical measures for gully rehabilitation at Tufa micro watershed | ongoing | 2014 | 2017 | CALM P4R |
| 1.1.5 | Participatory evaluation and demonstration of integrated physical and biological soil and water conservation measures for degraded area rehabilitation at Tufa community watershed, Leka Dulecha District, East Wollega Zone, Western Oromia Region | ongoing | 2014 | 2017 | CALM P4R |
| 1.1.6 | Establishment and demonstration of small scale vermi culture and production of vermi compost In tufa watershed, leka dulecha district, western oromia, ethiopia. | ongoing | 2014 | 2017 | CALM P4R |
| 1.1.7 | Monitoring and examining the discharge, sediment yield and nutrient flow at Tufa community watershed, Leka Dulecha District, East Wollega Zone, Western Oromia Region | ongoing | 2014 | 2017 | CALM P4R |
| 1.1.8 | Introduction and plantation of multipurpose tree species in Tufa micro watershed, Leka Dulecha District, East Wollega Zone, Western Oromia Region, Ethiopia | ongoing | 2014 | 2017 | CALM P4R |

| | | | | | |
|---|---|---|---|---|---|
| 1.1.9 | Cluster-Based Large Scale Demonstration of Acid Soil Management for Improving soil Fertility and Increasing maize Productivity at Tufa Micro Watershed, Leka Dulecha District, Western Oromia | New | 2015 | 2016 | CALM P4R |
| 1.2.1 | Pre-extension demonstration and evaluation of maize-soybean int ercropping for promotion of sustainable agriculture in tufa waters hed, leka dulecha district, east wollega zone, ethiopia. | New | 2015 | 2016 | CALM P4R |
| 1.2.2 | Pre-extension demonstration and evaluation of The effect of rhizo bium bio fertilizer (rhizobium leguminosarum) to fababean (vicia faba l.) in Tufa watershed, Leka Dulecha district, East Wollega zone, Ethiopia. | New | 2015 | 2016 | CALM P4R |
| 1.2.3 | Demonstration and Promotion of Homegarden Agroforestry Technologies in Tufa Micro Watershed, Leka Dulecha District, East Wollega, Oromia | New | 2015 | 2017 | CALM P4R |
| 1.2.4 | Cluster-Based Large-Scale Demonstration of Acidic Soil Management and Soil Test Based Fertilizer Recommendation for Bread Wheat (Triticum aestivum L.) in Jima Arjo District, Western Oromia Region, Ethiopia | New | 2015 | 2016 | ATI |
| 1.2.5 | Maintenance of Rhizobial bacteria strains and production of biofertilizer | New | 2015 | 2016 | ATI |
| 1.2.6 | popularization & demonstration of Rhizobium Bio Fertilizer for soybean production | New | 2015 | 2016 | ATI |
| 1.2.7 | Large Scale up Demonstration of NPS Fertilizer Rate Recommendation Based on Phosphorus Calibration Study for Bread Wheat *(Triticum Aestivum L*.) production at Horo District, Western Oromia, Ethiopia | New | 2015 | 2016 | FSRP |
| 1.2.8 | Per-extension and Demonstration of the Effect of (Brhadirhizobium Japonicum) biofertilizer on Soybean (Glycine Max L.) Production at Sibu Sire and Diga Districts, East Wollega Zone, Ethiopia | New | 2015 | 2016 | FSRP |

| | | | | | |
|---|---|---|---|---|---|
| 1.1.2 | Pre-extension Demonstration and Evaluation of the Effects of Green Manure on Grain Yield and Yield Component Maize (Zeal Mays L) and Soil fertility at Gobu Sayo District, East Wollega Zone Oromia , Ethiopia | New | 2015 | 2016 | GIZ/ISFM+ |
| 1.1.2 | Multiplication of "Walala" Sweet Lupin (Lupinus spp.L.) Seed Variety Production on Acid soils at Gobu Sayo Districts, Western Oromia, Ethiopia | New | 2015 | 2016 | GIZ/ISFM+ |

**Table 19**: Soil Resource Survey Team activities for 2016 E.C

| No | Teams and Activity titles | Status | Year started | Year of completion | Remark on fund source |
|---|---|---|---|---|---|
| 3 | Soil Resource Survey | New=3<br>Total =3 | | | **OARI** |
| 3.1 | Characterization, Classification and Mapping of Major Soil groups in different agro ecological zones of Guto Gida District, East Wollega zone, Western Oromia | New | 2014 E.C | 2015 E.C | **OARI** |
| 3.2 | Characterization, Classification and Mapping of Major Soil groups in different agro ecological zones of Sibu Sire District, East Wollega zone, Western Oromia | New | 2014 E.C | 2015 E.C | **OARI** |
| 3.3 | GIS based land suitability analysis for surface irrigation using AHP method in east Wollaga Zone Oromia, Ethiopia | New | 2014 E.C | 2016 E.C | **OARI** |

Table 20: List of Socio-economic and agricultural Extension and gender Research Process Activities for 2016 EC

| No | Teams and Activity titles | Status | Year started | Year of completion | Remark on fund source |
|---|---|---|---|---|---|
| 2 | Agricultural extension | To be=2<br>Ong=3<br>New=3<br>Total =8 | | | **OARI** |
| 2.1 | Pre-Extension demonstration of NPS Fertilizer Rates Based on Phosphorus Calibration Study for Bread Wheat (Triticum AestivumL.) production at Jima Arjo District, Western Oromia, Ethiopia | To be completed | 2014 E.C | 2015 E.C | **OARI** |
| 2.2 | Pre-extension demonstration of Soil Test Crop Response Based Phosphorous Calibration Study for Maize (Zea mays L.) at Sibu sire District, Western Oromia, Ethiopia | To be completed | 2014 E.C | 2015 E.C | **OARI** |
| 2.3 | Pre-extension demonstration of Soil Test Crop Response Based Phosphorous Calibration Study for Maize (Zea mays L.) at Abay Choman District, Western Oromia, Ethiopia. | Ongoing | 2014 E.C | 2016 E.C | **OARI** |
| 2.4 | Pre scaling up of Soil Test Crop Response Fertilizer rate Recommendation Based Phosphorus Calibration Study for Teff (erogoritis teff) production at Guduru District, Western Oromia Region, and Ethiopia | Ongoing | 2014 E.C | 2016 E.C | **OARI** |
| 2.5 | Pre scaling up of NPS Fertilizer Rate Recommendation Based on Phosphorus Calibration Study for Bread wheat (Triticum Aestivum L.) production at Horo District, Western Oromia Region, Ethiopia | Ongoing | 2014 E.C | 2016 E.C | **OARI** |
| 2.6 | Pre-Extension Demonstration and Evaluation of Rhizobial Bio-fertilizer for production of Faba Bean (Vicia faba L.) at Jima Arjo District, East Wolega Zone, Oromia Region, Ethiopia | New | 2016 E.C | 2018 E.C | **OARI** |
| 2.7 | Pre scaling up of NPS Fertilizer Rates Based on Phosphorus Calibration Study for Bread Wheat (*Triticum Aestivum L.)* production at Jima Arjo District, Western Oromia, Ethiopia | New | 2016 E.C | 2018 E.C | **OARI** |
| 2.8 | Pre-scaling up of Soil Test Crop Response Based Phosphorous fertilizer recommendation for Maize (*Zea mays L.*) production at Sibu Sire District of Eastern Wollega Zone, Oromia Region, Ethiopia | New | 2016 E.C | 2018 E.C | **OARI** |

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**Compiled by**_____ **Approved by**_____

**Date:**_____ **Date:**_____

**Sign :**_____ **Sign :**_____