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Pre-Extension Demonstration of In-Situ Moisture Conservation and Management Practices for Sustainable Maize Production in Bale Mid Altitude

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Abstract: Pre extension demonstration of in situ moisture conservation technologies was carried out at Ginnir district of Bale zone using in situ moisture conservation technology (furrow) with farmers practice. The main objective of the study was to demonstrate and evaluate in situ moisture conservation technologies under farmers' condition. The demonstration was under taken on single plot design of 10m x 10m area for each technology with recommended seed and fertilizer rates. Mini-field day was organized at each respective sites on which different stakeholders were participated and experiences were shared. Yield data per plot was recorded and analysed using descriptive statistics, while farmers' preference to the demonstrated technologies was identified using focused group discussion and summarized using simple ranking methods. Participant farmers were enhanced to set their own selection criteria and their criteria were almost similar in all locations. Accordingly, furrow was selected due to its number of head/plant, height of head, seed size, better stem strength, root has got soil, unavailability of unproductive plants and good plant height. Since, all participant farmers selected furrow, it is important to proceed to the task of scaling up/out the technology in all demonstration sites and similar agro-ecologies.

Keywords: Demonstration, Farmers' preference, In situ, Furrow, maize, Selection criteria.

INTRODUCTION

Investments in soil and water conservation (SWC) practices enhance crop production, food security and house hold income (Akalu Teshome, *et.al*, 2014). Recognizing these connections, the government of Ethiopia is promoting SWC technologies for improving agricultural productivity, household food security and rural livelihoods.

In situ water and soil conservation practices are a promising intervention to improve rain water management particularly, in the semi-arid to dry sub humid tropics (Emmanuel et al, 2014). To increase the moisture availability to the agricultural crops, it is necessary to adopt in-situ moisture conservation techniques in addition to the large-scale soil and moisture conservation and water harvesting structures in the watershed (Manjeet Prem et al, 2017). To increase the moisture availability to the agricultural crops in the individual farmer's field and to increase the infiltration and percolation of rain water in to the root profile, the in-situ moisture conservation is recommended (M. Muthamilselvan et al, 2006).

Accordingly, some successes of in-situ moisture conservation have been recorded for moisture conservation and management, improving yield of Maize variety (Malkassa 2 or Malkassa 4) have been conducting at Ginnir and Goro district of Bale zone for the last three years. This experiment was conducted on small plot for evaluation.

The combined analysis result showed that the technology brought yield advantage at Goro Tied rigde 24.94 % and at Ginnir 23.2 % yield advantage under Furrow and ridge at both locations while lower yield recorded under farm practice. Therefore, in order to increase the subsequent Maize crop yield by using the conserved moisture of SWC technologies, it is necessary to popularize the technology in mid and lowlands of Bale zone.

OBJECTIVES

- To evaluate the yield performance of in situ moisture conservation technologies under farmers' condition,
- To create awareness on the importance of in situ moisture conservation technologies,
- To collect farmers' feedbacks on in situ moisture conservation technologies,
- To strengthen the linkage among stakeholders on technology promotion and dissemination.

METHODOLOGY

Description of the Study Area

The research was carried out at Ginnir district of Bale zone, Oromia National Regional State (ONRS), Ethiopia. Bale zone is among the 20 Administrative zones located in south eastern parts of Oromia, Ethiopia. The district was selected purposively based on the potential of maize production.

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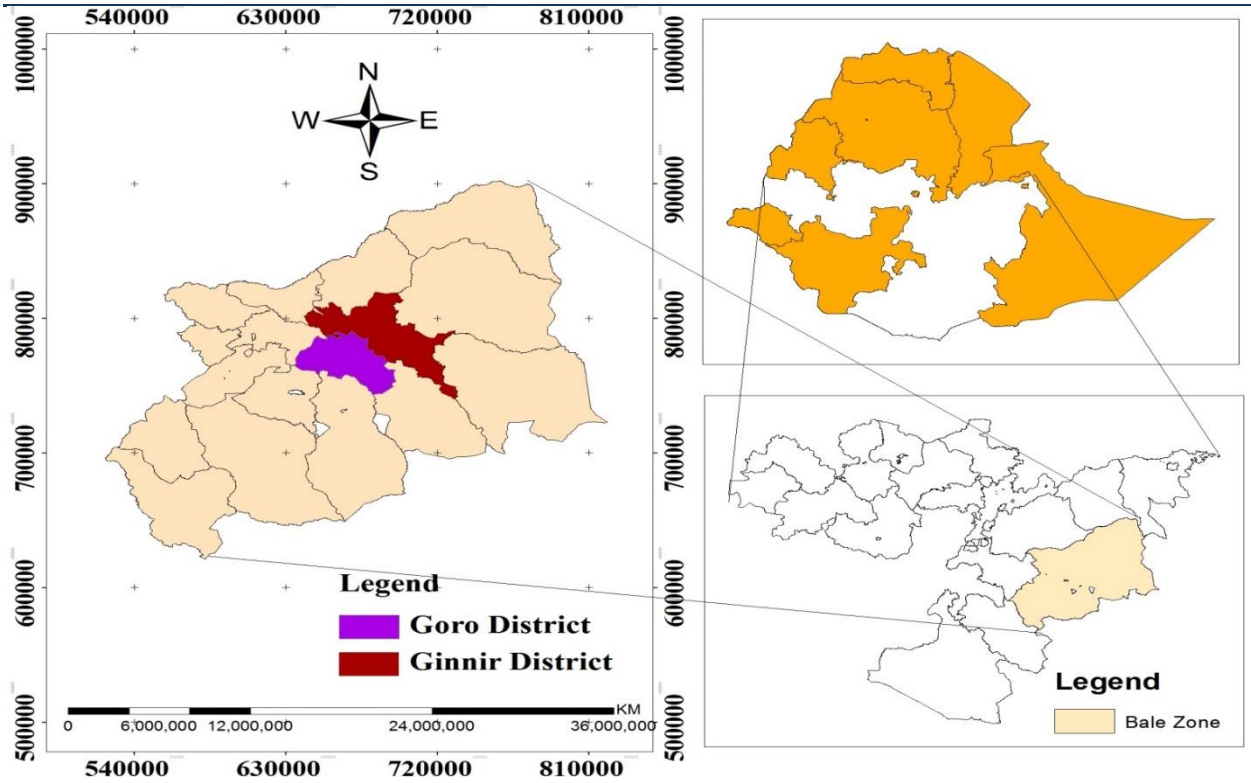

SITE SELECTION

Pre extension demonstration of in situ moisture conservation technology was carried out at Ginnir district of Bale zone. Purposive sampling methods were employed to select two representative kebeles based on their potential for maize production and accessibility of road. A total of five farmers were also selected purposefully based on accessibility and willingness.

Materials Used and Field Design

Improved maize variety (Malkasa-2) and in-situ moisture conservation and management technology (furrow) was demonstrated and compared with farmers' practice. It was treated with full recommended maize production and management package. In addition, twice hand weeding was done on time (i.e. the first weeding one month after planting and the second weeding was done one month later after of the first weeding).

SARC was the source of agricultural inputs (seed, fertilizers and chemicals in case needed). Hosting farmers provided their land. Farm operations (land preparation-ploughing four to five times using oxen plough) were carried out by trial/hosting farmers, whereas land leveling, planting, first and second weeding, follow up and visit, harvesting, threshing were handled and managed by SARC.

Data Collection

Both qualitative and quantitative data were collected using appropriate data collection methods such as direct field observation/measurements, key informant interview and focused group discussion (FGD). Yield data per plot in all locations were recorded. Farmers' preference to the demonstrated technologies was identified.

Data Analysis

Descriptive statistics was used to analyze the yield data. Simple matrix ranking was used to compare traits of demonstrated technologies.

RESULT AND DISCUSSION

Yield Performance of the Demonstrated Technology

The yield obtained from the demonstration sites shows that the mean yield of in situ moisture conservation technology (furrow) and farmers' practice was 80qt/ha and 70.3qt/ha respectively. The in situ moisture conservation (furrow) is high yielder than the farmers' practice all over the location. This shows that the in situ moisture conservation technology give yield improvement on the production of the maize. The demonstration result shows that, it has yield advantage of 14.94% over the farmers' practice. According to the result of cost benefit ratio analysis, furrow and farmers' practice has a benefit cost ratio of 2.77 and 2.56 respectively.

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Table 1: Summary of mean yield of the demonstrated technologies

District	Kebele	Yield obtained(Qt/ha)	
		Furrow	Farmers' practice
Ginnir	Ebisa	73.2	70
	Harawa	88.4	70.6
Overall mean		80.8	70.3

Comparison of Yield Advantage of the Technology

$$\textbf{Yield Advantage \%} = \frac{\textbf{Yield of new technology (qt/ha)-Yield of farmers' practice (qt/ha)}}{\textbf{Yield of farmers' practice} \text{ (qt/ha)}} \times 100$$

Yield of furrow over farmers' practice: $\frac{80.8-70.3}{70.3}$ = **14.94 %**

Table 2: Cost Benefit Ratio Analysis

No	Treatment	Yield obtained (qt/ha)	Sale price (ETB/qt)	Gross Returns (Price X Qt) TR	Total Variable Costs TVC (ETB/ha)	Net Return (GR-TVC)	Benefit cost ratio (NR/TVC)
.	**Furrow**	80.8	800	64640.00	17160.00	47480.00	2.77
	Farmers'	70.3	800	56240.00	15810.00	40430.00	2.56

Farmers' Participatory Evaluation and Selection

Before leading the participant farmers and experts to evaluation, brief orientation was given to the evaluators to develop their own selection criteria. Then evaluators were grouped in to small manageable groups (by selecting one group leader) and encouraged how to carefully assess each plot by considering each criteria, how to organize collected data, how to make group discussion and reach on consensus, and finally report through their respective group leader. Accordingly, the result of farmers' selection criteria was summarized below.

Table 3: Rank of the technologies based on farmers' selection criteria

No	Varieties	Rank	Reasons
1	Furrow	**1st**	Higher number of head/plant, height of head, bigger size of seed, better stem strength, root has got soil, unavailability of unproductive plants, good plant height.
2	Farmer practice	**2nd**	Lower number of head/plant, smaller height of head, smaller size of seed, stem strength is not good, root hasn't got soil, availability of unproductive plant, plant height is not good

CONCLUSIONS AND RECOMMENDATIONS

Pre extension demonstration and evaluation of in-situ moisture conservation and management practices for sustainable maize production was carried out on five (5) representative trial farmers' field. Furrow was demonstrated, evaluated and compared against the farmers practice. The mean yield of the plots was analyzed using simple descriptive statistics. Accordingly, Furrow is the high yielder than farmers practice. Similarly, farmers were enhanced to select the plots of their interest by setting their own selection criteria.

To summarize, the plot of furrow was selected by participant farmers due to its higher number of head/plant, height of head, bigger size of seed, better stem strength, and root has got soil, unavailability of unproductive plants and good plant height. Therefore, the succeeding pre-scaling up/out of in situ moisture conservation should be carried out in areas where it was selected and similar agro ecology.

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