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Large scale demonstration of improved *Sorghum* technology in Sofi district of Harari region

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Abstract

Local *Sorghum* grown in moisture stress areas reduces yield. A large scale demonstration of improved early maturing *Sorghum* technology was conducted to improve the productivity of farmers. The activity was conducted in Kile kebele. A total of 40 farmers are selected based on their interests in producing *Sorghum* in clusters. Farmers are organized into clusters according to their land adjacent to each other. Forty farmers benefited from the technology by keeping a gender balance. 60 and 40% were male and female farmers. The variety is planted on a plot size of 0.25 ha per farmer. 12 kg/ha seed rate was used with a spacing of 75 cm*25 cm between row and plant respectively. Both NPS and Urea fertilizer was applied at a rate of 100 kg/ha. Field days and training were organized to enhance the diffusion of the technology. The average productivity of improved *Sorghum* technology in quintals per hectare was 33.94. The technology delivered to the study area helps farmers to reduce chronic food insecurity. The research center and agriculture and natural resource bureau should work on the sustainability of an improved variety of sorghum technology to boost production and productivity in the study area.

Keywords: Large scale demonstration, *Sorghum*, Technology, Sofi district, Descriptive statistic

INTRODUCTION

Sorghum is the fifth largest produced cereal crop in the world, and one of the staples of the world's poorest in the developing countries of Africa, and South Asia (FAOSTAT, 2018). For developing countries, their global share in *Sorghum* production increased mainly due to a doubling of production in Africa from 12 million t in 1980-1982 to 28 million t in 2014-2016. In 2018, Africa's production further increased to 29.7 (FAOSTAT, 2020). The largest *Sorghum* producer is the USA with total annual grain production of 8.7 million tons from 2.0 million hectares (FAO, 2019). Oromia is the major leading producer of sorghum for the last five years (CSA, 2018). Of the total land allocated for cereal crops in the Oromia, *Sorghum* ranked fourth by covering 14.8% of the total area (CSA, 2019). The region's *Sorghum* productivity is 28.56 quintals per hectare, which is higher than the national average of 27.36 quintals per hectare.

According to (Christina T, et al., 2016), *Sorghum* is familiar with different climatic conditions and sustains across various climatic zones. It can adapt commonly more than any other crops, where there is moisture stress. *Sorghum* is the crop of the future due to the changing global climatic trends (Temesgen B, 2021). It is important in providing food security in many developing countries (Mundia CW, et al., 2019). It is a staple food crop in the drier parts of Africa, China, and India (Ajeigbe HA, et al., 2018; Mrema E, et al., 2020). In Ethiopia, drought and striga weeds are the most constrained (Rebeka G, et al., 2014). This problem is improved by developing technology that is well-adapted to moisture-stress areas. Improved *Sorghum* variety is an important drought-tolerant technology. Moisture stress and infertile soils are the major problems in the reduction of *Sorghum* productivity (Gebreyesus BT, 2012).

The farmers grow local varieties, which take more than seven months to mature. Local sorghum varieties which are easily affected by drought and striga weeds are under production resulting in low sorghum productivity. To minimize the problems, the evaluation of improved early maturing *Sorghum* variety is undertaken by Fedis agricultural research center. The variety performed better and had a yield advantage over the local variety under farmers' conditions. Farmers have selected improved lowland *Sorghum* varieties using different criteria such as maturity period, yield, disease tolerance, adaptability, and drought tolerance. Therefore, this activity was undertaken to disseminate the Misikir variety in the study areas through large-scale demonstrations to increase household income and alleviate food shortage.

Specific objectives

- To evaluate the productivity and profitability of the technologies under farmers' condition

- To create awareness among different key stakeholders on the improved sorghum production.

- To enhance farmers' knowledge and skills on early maturing sorghum production and management techniques.

MATERIALS AND METHODS

Area description

The activity is conducted in the Agricultural Growth Program-II implementation district of the Harari region. The region is located at a distance of 526 km from the capital city Finfinne to the Eastern part. It is bordered by the Oromia region in all directions. Ecologically the region is classified as highland, midland, and lowland. The study site is characterized by a moisture-stress area.

Site and farmers' selection

Sofi district from the Harari region and Kile kebele from the Sofi district were selected purposively based on the potentiality of *Sorghum* production. Farmers were selected based on their interest in *Sorghum* production. Farmers were organized into clusters according to their land adjacent with the members considering gender issues. A total of 40 farmers were benefited from the technology.

Technology promotion approach

It is important to conduct cluster-based large-scale demonstration activities to bring the impact of the technology. According to their land adjacent to each other farmers were organized into clusters. Farmers producing similar crops like improved *Sorghum* were selected. Producing in clusters is very important in enhancing access to market information. Farmers and organizations are linked through information to work with key stakeholders to enhance technology diffusion.

Implementation procedures

Misikir variety was provided to farmers with full packages. The variety is sown on a plot size of 0.25 ha/farmer. The seed rate of 12 kg/ha with spacing between row and plant was 75 cm*25 cm respectively. NPS and Urea are applied at a rate of 100 kg/ha. Misikir was planted on 40 farmers' land. Field supervision is carried out by researchers and development agents regularly.

Capacity building and experience sharing

Theoretical and practical training is given by researchers for farmers, development agents, and experts on agronomic practices and post-harvest handling. The field day was organized to evaluate the performance and outcome of the variety and share the lessons with relevant stakeholders. Farmers, development agents, experts, and other key stakeholders attended the field day.

Data to be collected

Farmers benefited from the technology by age and sex, land covered in ha, amount of fertilizer, and seed provided as well as yield data were collected using a checklist. The cost-benefit ratio was used to evaluate the profitability of the technology. Knowledge of participant farmers regarding improved *Sorghum* production technologies was measured before and after implementation.

Methods of data collection

Quantitative data are collected through individual interviews while qualitative data are collected through personal field observation and focus group discussion by using a checklist.

Data analysis

Quantitative data are analyzed using a statistical package for social science. Descriptive statistics such as frequency, percentage, mean, standard deviation, minimum, and maximum were used. The profitability of the technology was analyzed using cost-benefit analysis. The knowledge level of beneficiary farmers was analyzed using a paired-sample t-test.

RESULTS AND DISCUSSION

Descriptive statistics results

Farm household characteristics: Of the total 40 direct beneficiaries of the technologies, 60% (24) of the farmers were male while 40% (16) were female farmers. The mean age of the farmers who benefited from the technology is 42.13 in a year. The maximum and minimum age of the farm household is 55 and 29 in a year respectively. The above explanation is summarized in the following Table 1.

Table 1: Demographic characteristics of the farmers directly benefited from the technologies.

Age of farmers in a year			Sex of farmers			
Mean	Maximum	Minimum	Male		Female	
42.13	55	29	Frequency 24	Percentage 60	Frequency 16	Percentage 40

The descriptive result on capacity building for different stakeholders

A total of 25 farmers, 3 development agents, and 3 experts participated in the training. Likewise, a total of 30 male and 20 female farmers participated in the field day. Three experts from the district and 3 development agents participated in the field day organized. The above explanation is summarized hereunder in Table 2.

Table 2: The descriptive result on capacity building for different stakeholders.

S. n	Participants on training	Sex of participants in training			Participants on field day	Sex of participants		
		Male	Female	Total		Male	Female	Total
1	Farmers	15	10	25	Farmers	30	20	50
2	DAs	2	1	3	DAs	2	1	3
3	Experts	2	1	3	Experts	2	1	3

Descriptive result for *Sorghum* productivity at Kile Kebele

The *Sorghum* covered a plot size of 10 hectares. The mean yield obtained per hectare was 33.94 and 15 in quintals for improved and local sorghum respectively (Tables 3-5).

Table 3: *Sorghum* production and productivity in Sofi district.

No	Variety	Yield in quintal per ha
1	Misikir	33.94
2	Local	15

Table 4: Pair-wise ranking results based on a variety of traits as to their importance.

No	Variety traits	A	B	C	D	E	F	Total score	Rank
1	A							3	3rd
2	B	A						2	4th
3	C	A	B					0	6th
4	D	A	B	D				1	5th
5	E	E	E	E	E			4	2nd
6	F	F	F	F	F	F		5	1st
Note: A=Adaptability; B=Disease tolerant; C=Plant height; D=Early maturing; E=Drought tolerant; F=Yield									

Table 5: Farmers' varietal selection criteria.

No	Varieties	Rank	Selection criteria
1	Misikir	1	High yielder, more disease tolerant, early maturing, more adaptable with the existing environment, and more drought tolerant.
2	Local sorghum	2	Less disease tolerant, low yielder, and low drought tolerant late maturing, less adaptable to the existing environment, and higher plant height

Results of the knowledge test

Knowledge test items were prepared based on package practices or agronomic practices. The knowledge level of participant farmers regarding improved early maturing *Sorghum* production technologies was measured before and after the implementation. 1 point is given for the right answer while 0 for the wrong answer (Tables 6 and 7).

Table 6: Percentage of respondents for each knowledge test item before and after intervention.

No	Test items	Respondents percentage			
		Before technology		After technology	
		Right	Wrong	Right	Wrong
1	Name at least one improved sorghum variety	48	52	72	28
2	Amount of sorghum seed required per hectare?	52	48	68	32
3	Fertilizer rate per hectare	68	32	84	16
4	Recommended space between rows?	40	60	64	36
5	Recommended space between plants?	36	64	72	28
6	What is the potential productivity (yield/ha) of the variety?	40	60	52	48

7	The maximum sorghum plant population per hectare?	0	100	12	88
8	Yield losses due to biotic and abiotic constraints	64	36	68	32
9	Yield losses due to misuse of recommended agronomic practices	44	56	48	52
10	Economic yield losses	28	72	64	36

Table 7: Paired-sample t-test results for knowledge before and after the technology intervention.

Knowledge score	Mean	St.dev	t-value
Total score after	6.6	1.68	7.006***
Total score before	4.46	1.35	

Note: *** refers to the significance l at 1%.

There is a significant mean difference between the knowledge of farmers before and after technology intervention at a 1% significance level. This implies awareness of the farmers regarding improved sorghum production techniques after technology intervention was improved.

CONCLUSION

The improved technology contributes to improving the production and productivity of farmers. The improved sorghum technology introduced to the study area helps farmers to reduce chronic food insecurity status in the study area. The cost-benefit ratio indicated that the improved *Sorghum* technology was greater than 1 as compared to the locally produced sorghum. The agriculture and natural resource bureau and agricultural research center should work on the sustainability of an improved variety of *Sorghum* technologies. The paired-sample t-test indicated that there is an improvement in farmers' knowledge regarding the improved *Sorghum* production technologies due to intervention done on the beneficiary farmers. Therefore, it is better if all the concerned body focuses on capacity building to enhance awareness and knowledge of the farmers towards the newly introduced technologies.

REFERENCES

FAOSTAT (2018). Crops and livestock products. Food and Agriculture Organization of the United Nations.

FAOSTAT (2020). Crops and livestock products. Food and Agriculture Organization of the United Nations.

FAO (2019). FAO Statistical Database. Food and Agricultural Organization of the United Nations. Rome, Italy.

CSA (2018). Agricultural Sample Survey 2018/2019: Area and production of major crops, Central Statistical Agency. Addis Ababa, Ethiopia.

CSA (2019). The federal democratic republic of Ethiopia's central statistical agency. Agricultural sample survey 2018/19. Report on area and production of major crops, June 2019. Addis Ababa, Ethiopia.

Tonitto C, Ricker-Gilbert JE (2016). Nutrient management in African sorghum cropping systems: Applying meta-analysis to assess yield and profitability. Agron Sustain Dev. 36(1):10.

Mundia CW, Secchi S, Akamani K, Wang G (2019). A regional comparison of factors affecting global *Sorghum* production: The case of North America, Asia and Africa's Sahel. Sustain. 11(7):2135.

Temesgen B (2021). Role of *Sorghum* genetic diversity in tackling drought effect in Ethiopia. Int J Adv Res Biol Sci. 6(8):1–5.

Ajeigbe HA, Akinseye FM, Jonah J, Kunihya A (2018). *Sorghum* yield and water use under K fertilization applications in the Sudan Savanna of Nigeria. Glob Adv Res J Agric Sci. 7(8):245–257.

Mrema E, Shimelis H, Laing M, Mwadzingeni L (2020). Integrated Management of 'Striga hermonthica' and 'S. Asiatic in *Sorghum*: A Review. Aust J Crop Sci. 14(1):36–45.

Rebeka G, Shimelis H, Laing MD, Tongoona P, Mandefero N (2014). A diagnostic appraisal of the sorghum farming system and breeding priorities in striga-infested agroecology of Ethiopia. Agric Syst. 123:54-61.

Gebreyesus BT (2012). Effect of Tillage and Fertilizer Practices on *Sorghum* Production in Abergele Area, Northern Ethiopia. J Sci. 4:52-69.