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Pre-extension Demonstration and Evaluation of Soybean Technologies in Fedis District of East Hararghe Zone, Oromia, Ethiopia

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ABSTRACT

The study was conducted in the Fedis district of East Hararghe Zone an area of major food insecure due to the influence of shortage and uneven distribution of rainfall patterns. Introducing improved technology is an option and has great advantages for the producers to minimize risks associated with it and maximize their benefits. The varieties were new to the area and promoted to diversify the crop under farmer conditions. Soybean varieties were introduced and demonstrated among farmers' research groups. The result indicated that demonstrations of improved soybean varieties of korme and ethio-eugoslavia recorded similar grain yield (19.56 qt/ha) and (19.27 qt/ha) respectively. Both improved varieties were well performed. Awareness of soybean technology for farmers was increased through the promotion of this technology. The result indicated that using improved varieties of Korme and ethio-eugoslavia varieties was more advantageous for farmers in diversifying the crop varieties. Therefore, both varieties were recommended for more promotion in the area and other similar agroecological situations to reduce the problem of food malnutrition.

KEYWORDS: *Soybean, Improved Varieties, Demonstration, Korme and Ethio-eugoslavia*

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INTRODUCTION

Ethiopia's economy is highly dependent on agriculture (Asfaw *et al*., 2019). The average contribution of agriculture to GDP, employment, and foreign exchange was 34%, 75%, and 85%, respectively (Eshetu and Mehare, 2020). In Ethiopia, soybean grows over wider agroecologies that have moderate annual rainfall (500-1500mm) (Besufikad, 2019). In the 2017/18 production season in Ethiopia, a total of 8,646.79 tons of soybean was produced from 38072.70 ha. The National average yield was 2.27 t/ha during the 2017/18 cropping seasons (CSA, 2018). The most important nutritional problems in most developing countries, including Ethiopia, are protein, energy malnutrition, and micronutrient deficiencies (Biabani, 2011). Potential areas for soybean production are the Southern Nations Nationalities People region, Oromia region, Benshangul Gumuz region, Amhara region, and Tigray region (Miruts, 2016).

Globally soybean oil is the second important cooking oil after palm oil with an average protein content of 40% and is more protein-rich than any other common vegetable or animal food source and contains about 20% oil on a dry weight of grain basis, of which 85% are unsaturated and cholesterol free(Voora *et al*.,2020). Soybean is an elective protein source for rural families and can be utilized at home in different structures and the surplus can be sold to different buyers, producers, and manufacturers for money (Urgessa, 2014). Soybean is an internationally known important pulse crop that is used for different purposes. Since the oil content is high (23% and above) it is used for edible oil production. The by-product is cheap and an important source of protein for both human consumption and animal feed. It can also be used as soy meat and soy milk (Dixit *et al*, 2011). Soya-based foods are considered to be nutritious and healthy based on their nutrient composition (UNCTAD, 2016).

Low soybean yields in SSA to poor yielding varieties, limited application of fertilizers, and limited utilization of rhizobia inoculants in soils with no

history of soybean production (Woomer *et al*., 2012).To solve this problem Fedis Agricultural Research Centre conducted adaptation trial in some districts of the East Hararghe zone. The main aim of this technology is to demonstrate and evaluate the technology under farmers' conditions.

Objectives

- To evaluate the productivity and profitability of Soybean technologies under farmers' conditions.
- To create awareness regarding the improved technologies
- To collect farmers' and other stakeholders' feedback regarding the attributes of the technologies

Materials and methods

Description of the study area

Fedis district has a latitude between 8°22' and 9°14' North and a longitude between 42°02' and 42°19' East, in middle and low land areas. Altitude range is from 1200 – 1600m.a.s.l meters. The area receives an average annual rainfall of 400 - 804 mm. The minimum and maximum temperature of the area is 20 – 25ºC and 30 – 35ºC, respectively. The population's livelihood mainly consists of agriculture, husbandry, and small-scale trade. The farm units are small family holdings with an average agricultural land area of less than one hectare.

Agriculture is mainly rain-fed. The cropping system is classified as intensive with cereal mono-cropping mainly sorghum and maize. Similar to areas in the Horn of Africa, two rainy seasons characterize the Fedis district's climate: the first, named Belg, is the shortest one and takes place between March and May, while the second and most important, named Meher, is between July and October. The rainfall distribution during the year is then bi-modal, with a dry spell period during the months of June and July, depending on its duration, which may affect crop growth. The *Meher* (Main) season is the most important one; when the intensity of farm practices and production increase.

Site and farmers' selection

The activity was conducted in the Fedis district of East Hararghe Zone for two years of the cropping season. The district was selected based on the potentiality of pulse and oil crop production and accessibility for close monitoring. Two representative potential kebeles were selected purposively in collaboration with experts and development agents of the Agriculture Office based on accessibility and potentiality for oil and pulse production. From each kebele, 1 FRG (Farmers Research Group) member considering gender and youth consisting of 15 farmers was established. Farmers were selected based on their interest in technology, and cost sharing like land provision and labor work. In Each FRG member; three representative trial farmers were selected. Moreover, 1 FTC in each kebele was involved in technology promotion.

Table 1: Summary of selected site and farmers with area coverage of the experiment

District	Kebele	No. of trial farmers	FTCs	Area covered
Fedis	Umer Kule	3	1	10mx10m for each experiment plot
	Belina Arba	3	1	
Total		6	2	

Source: Own computation

Technology evaluation and demonstration methods

The demonstration was implemented in farmers' fields as well as FTC to create awareness about soybean technologies. The activity was jointly monitored by FRGs, researchers, experts, and development agents. Frequent visiting, monitoring, and provision of technical advice were done.

Research design

Two improved Soybean (Korme and ethio-eugoslavia) varieties were planted on a plot size of 10mx10m for each site. The spacing of 40 cm between rows and 20 cm between plants. Seed rates of 85 kg/ha were used by drilling in the prepared rows. Shallow planting of 2-4 cm depth was used in the presence of ample soil moisture. A fertilizer rate of 85 kg NPS /ha and 85 kg Urea /ha was applied. Urea is half at sowing and half at the stem elongation stage. Two effective weeding were applied; one month after sowing and two months after sowing.

Data collected

Both quantitative and qualitative data were collected through personal field observation, individual interviews, and focus group discussion using a checklist and datasheet. The quantitative data were the number of farmers who participated in FRG, yield data, and the number of stakeholders who participated in training and mini-field days while qualitative data were farmers' perception towards the new technology, awareness created, and farmers' technology selection criteria.

Data analysis

Quantitative data was summarized using simple descriptive statistics such as mean, frequency, and Percentage while the qualitative data collected was analyzed using narrative explanation and argument. Data from different sources were triangulated to get reliable information on the research activity.

Results and discussion

Training of farmers and other stakeholders

Training is the most important component of the extension approach. During this stage, stakeholders are developing knowledge and skills to adapt new practices. Multidisciplinary researchers from the Fedis Agricultural Research Center participated in the training-delivery program. The team members involved during the training were research extension, socio-economic research team, and crop agronomy. The training was given on improved soybean production, market information, knowledge, skill, experience sharing, and technology transfer approaches. Accordingly, a total of 30 farmers (22 males and 8 females), 4 DAs, and 2 experts participated in the training organized in the target areas.

The mini-field day was organized at the maturity stage of the crop when a clear difference was observed between the varieties. Different stakeholders participated and reacted to what they observed as the fruit of the technology in the target areas. A total of 60 individuals participated with different backgrounds. Among these, 53 farmers (43 males and 10 females), 4 Development Agents (4 males), and 3 Experts (3 Male) were participated. For those individuals, 30 leaflets and 15 small manuals on the technology that were written in Afan Oromo and English languages were distributed. During the mini-field day and farm visit, different questions, opinions, and suggestions were raised and reacted to by the concerned bodies. Most farmers showed high interest in improved Soybean technology production because of better grain yield. Generally, all farmers were interested in having the technology for their future production.

Table 2: Participants during mini field days

No.	Participants	Fedis district		
		Male	Female	Total
1	Farmers	43	10	53
2	DAs	4	0	4
3	District experts	3	0	3
	Total	50	10	60

Source: Own computation

Yield performance

The performances of the soybean varieties during their growing season together with their total yields were collected and analyzed. The result showed that the grain yield of Soybean (qt/ha) ranges from 18.22 to 21.46. The yield performance of both Soybean varieties is similar (Korme 19.56 qt/ha and ethio-eugoslavia 19.27 qt/ha). Both improved varieties used for the experiment showed better mean grain yield at FTCs than on farm plots in both kebeles. However, farmers are aware of soybean production due to their involvement in this activity.

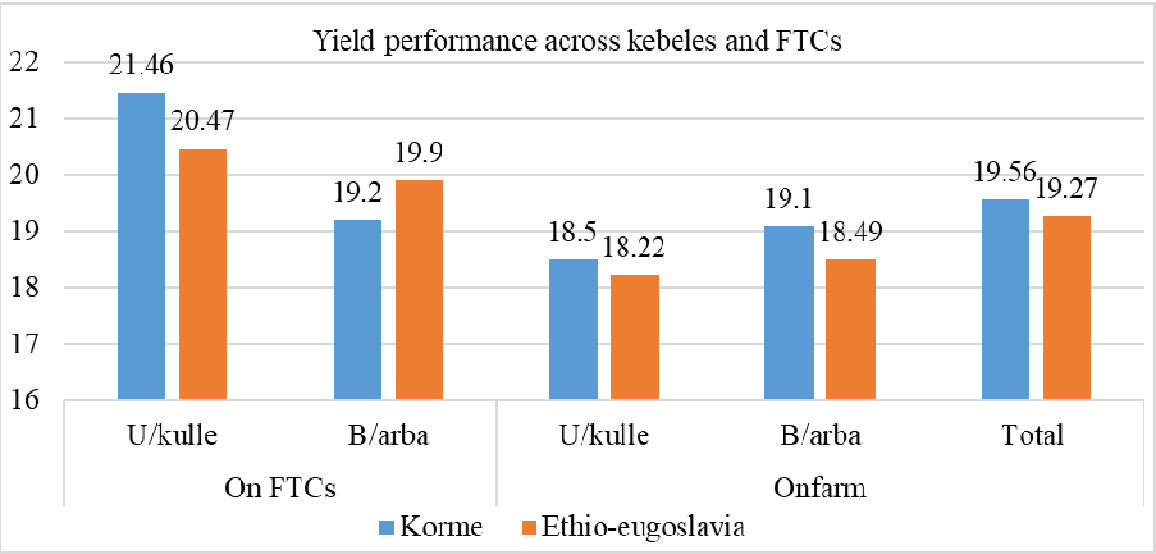

Fig. 1: Yield performance of Soybean varieties across kebeles.

Table 3. Cost-benefit analysis

No	Variables	Korme	ethio-eugoslavia
1	Yield (in qtl/ha)	19.56	19.27
2	Price (ETB/quintal)	8,000	8,000
3	Gross returns(1*2)	156,480	154,160
4	Seed purchase(ETB/ha	7,000	7,000
5	Fertilizers purchase(NPS &Urea /ha)	6000	6000
6	Labor for wedding	4000	4000
7	Land preparation(ETB/ha)	4000	4000
8	Total variable cost(∑4-7) for ETB/ha	21,000	21,000
9	Fixed costs(Costs of land) in ETB/ha	7,000	7,000
10	Total cost(∑8+9) ETB/ha	28,000	28,000
11	Net return(3-10)	128,480	126,160
12	Benefit-cost ratio(11/8)	6.12	6.01

Source: Own computation

As shown from the above table, the productivity of the technologies was profitable. The cost-benefit ratio was greater than one.

Participatory evaluation of farmers' varieties preference

Farmers selected the best-performing improved soybean varieties by using their criteria. The opinion of those farmers on varietal preference was collected from participating in varieties demonstration. The major criteria used by farmers were maturity, grain yield, disease, seed size, variety performance throughout the growing stage, and biomass. Based on the above criteria; farmers evaluated the varieties and ranked the first korme followed by ethio-eugoslavia varieties. Farmers identified that both improved varieties have good performance. Therefore, most farmers selected both improved varieties to use on their farms in the future.

Table 4. Ranks of the varieties based on farmers' selection criteria

Crop varieties	Farmers rank	Reasons
Korme	1st	Early maturity, Very good in yield, Disease tolerance, Very good seed size, Very good performance throughout growing stage, Very good in biomass
Ethio-eugoslavia	2nd	Early maturity, Good in yield, Relative to disease tolerance, Good seed size, Good performance throughout growing stage, Good in biomass

Source: Own computation

Table 5. Pair-wise ranking matrix results in ranking a variety of traits

Code no.	Traits	Early maturity	Overall yield	Disease tolerance	Seed size	Performance at the growing stage	Biomass
1	Early maturity		2	3	1	1	1
2	Overall yield			2	2	2	2
3	Disease tolerance				3	3	3
5	Seed size					5	5
7	Performance at the growing stage						7
8	Biomass						

Source: Own computation

Table.6.Summary of Matrix Ranking of Farmers' Selection Criteria

S. no.	Traits	Frequency	Percentage (%)	Rank
1.	Early maturity	3	20	3rd
2.	Overall yield	5	33.33	1st

3.	Disease tolerance	4	26.67	2nd
4.	Seed size	2	13.33	4th
5.	Performance at growing stage	1	6.67	5th
6.	Biomass yield	0	0	6th
Total		15	100	

Source: Own computation

Conclusion and Recommendation

Soybean varieties are new to the area and its also at the demonstration stage. The performances of the soybean varieties during their growing season together with their total yields were collected and analyzed. The result showed that the grain yield of Soybean (qt/ha) ranges from 18.22 to 21.46. Farmers selected the improved varieties (korme and ethio-eugoslavia) based on the current climate response like early maturity, grain yield, disease tolerance, and adaptation to the environment with the existing situation. The promoted varieties created an opportunity for the farmers to observe and judge the best practices for productivity. Awareness of the advantages of improved soybean varieties of farmers was enhanced through the promotion of this technology. Moreover, pre-scaling up and its utilization should be made for the popularization of the crop. Therefore, the research center and district agriculture should work in collaboration for further popularization of the technologies in the study area and similar agro-ecologies.

References

[1] Besufikad Enideg Getnet.2019. Soybean (Glycine Max L. Merill) Genetic Improvement. In Ethiopia: A Review. International Journal of Research - Granthaalayah, 7(3), 189-199. https://doi.org/10.5281/zenodo.2631356.

[2] Biabani A. 2011. "Effects of seed deterioration and inoculation with mesorhizobium ciceri on yield and plant performance of chickpea". Australian Journal of Crop Science 5.1: 66-70.

[3] CSA (Central Statistical Authority of Ethiopia) 2017/2018.Area and production of crops volume I statistical Bullet. Central Statistics Authority, Addis Ababa, Ethiopia (2018)

[4] F. Eshetu and A.Mehare.2019.Determinants of Ethiopian agricultural exports: a dynamic panel data analysis," Review of Market Integration, vol. 12, no. 1-2, pp. 70–94, 2020.

[5] M. Asfaw, E. Geta, and F. Mitiku, "Economic efficiency of smallholder farmers in wheat production: the case of Abuna Gindeberet district, western Ethiopia," Review of Agricultural and Applied Economics, vol. 22, no. 1, pp. 65–75.

[6] Miruts Fitsum .2016. "Analysis of the Factors Affecting Adoption of Soybean Production Technology in Pawe District, Metekele Zone of Benshangul Gumuz Regional State, Ethiopia." World Scientific News 53(3): 122-137.

[7] T. Sirany and E. Tadele, "Economics of sesame and its use dynamics in Ethiopia," The Scientific World Journal, vol. 2022:13.

[8] UNCTAD. 2016. Soybeans. www.herbeoofficinali.org.

[9] Urgessa T. 2014. "Empirical Review of Production, Productivity and Marketability of Soya Bean in Ethiopia "at Oromia Agricultural Research Institute

[10] V. Voora, C. Larrea, and S. Bermudez, Global Market Report: Soybeans, JSTOR, 2020