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Promotion of Highland Maize Varieties to the Selected Districts' of Arsi Zone Oromia, Ethiopia

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Abstract
Promotion of hybrid and OPV highland Maize varieties were conducted to highly monocropping system of wheat belt of districts of Arsi zone.The study was carried out from for two years (2016 &2017) with active participation of farmers in collaboration with district bureau of agriculture. A total of 92 farmers from six major maize potential districts namely Hetosa, Arsi-negele, Chole, Guna, Arsi-robe, Aminga & Seru were trained and a plot of land,0.25 ha was used for each farmer and supplied with two varieties (Kolba and Jibat) in the first year and another two varieties(Hora &Jibat) in the second year. The analysis result indicated that Kolba variety has given the highest average grain yield (62.92Qt) followed by Jibat variety (58.78Qt) and Hora variety (53.1Qt) scored third in average grain yield. Crop technology demonstration has given a good impact over the farming community as they were motivated by recommended technology in that case the full package (68.28Qt/ha) out produce 17% more than the farmers' practice which is 56.65Qt/ha and farmers also could produce greater than 28% as to the national average, which is 39Qt/ha .The acceptance of these varieties was huge during the study seasons which clearly suggests the positive impact of demonstration over farmer's practices and highland maize in Arsi zone is found to be one of the best technologies and recommended to more scale out activity with best performed highland maize varieties in areas where it is not introduced.
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INTRODUCTION

Maize is one of the oldest human-domesticated crops. Its origins are believed to date back to 7000 years ago when it was grown in the form of a wild grass called teosinte in Central Mexico(Abbassian, 2008). It is one of the most versatile crops having wider adaptability under varied agro-climatic conditions. In most part of the world , maize is known as queen of cereals because it has the highest genetic yield potential among the cereals.(Firoz Hossain 2016; Mekureyaw, 2016).

An estimated 208 million people in sub-Saharan Africa depend on maize as a source of food security and economic wellbeing. Maize occupies more than 33 million ha of sub-Saharan Africa's estimated 200 million ha of cultivated land. Due to the low average maize grain yields that are still shown in farmers' fields, satisfying the projected increase demand for maize grain in Africa presents a challenge(Harold Macauley, 2015).

Regarding the production of maize among the cereals , it is the third largest planted crop after wheat and rice and has made it staple food and feed, and with wide range of industrial use as well (Abbassian, 2008) which is consumed by people with varying food preferences and socio-economic backgrounds in sub-Saharan Africa. Its importance can be viewed in its contribution to the highest calorie intake where 16 out of 22 countries are African besides to accounting half of calorie and protein intake in Eastern and southern Africa and one-fifth to West Africans (Zeng et al., 2018).

In Ethiopia, Maize is a strategic food crop grown in 13 agro-ecological zones covering 90% of the country (Dawit Alemu et al., 2008).It is largely produced in Western, Central, Southern and Eastern parts of Ethiopia. Maize accounts for 22 percent of the total area covered by cereal and around 30 percent of the total cereal production. Besides this it is the highest total production per year and the highest yield per hectare. In the case of Ethiopia the lion's share of maize production comes from three regions, namely the Oromia region (61%), Amhara (20%) and SNNPR (12%). Subsistence and small landholder farmers produce 95 percent of total maize production and commercial farms produce the rest 5 percent(Tefera, 2013) which according to CSA (2017) the maize production was around 8.4 tones which is 54.8 percent higher than wheat ,about 75 percent higher than barley and 38 percent higher than teff. Up to now the national crop improvement program managed to release over 52 improved maize varieties this shows the relative success of the research system. In addition, the national extension program has played a crucial role in bringing improved maize varieties with associated crop management practices to smallholder farmers (Chilot Yirga et al., 2016).

According to Tsedeke Abate et al. (2015) more than 9 million smallholder house-holds involved in maize production in the country. And regarding all the disparities, currently there are efforts made by NGOs, Government, and communities to promote and outreach research technologies. Nevertheless, the effort to cope up the recurring wheat mono crop production system in Arsi Zone is not sufficiently addressed and when it

comes to highland maize these effort is too minimal.

Despite the effort made so far, average maize yield in Ethiopia is low on account of insect pest damage, lack of high yielding cultivars and poor crop management practices. Another problem expressed by the farmers is lack of appropriate seed varieties at planting time. To minimize this Kulumsa Agricultural Research Center in collaboration with Ambo Agricultural Research Center working on adaptation and development of maize Varieties which are suitable for highland ecology and there by promoting a proven varieties on farmers field to demonstrate and evaluate the performance of different varieties on farmers field. Based on, farmers and expert evaluation result to recommend best practice for further scaling up work.

In this regard this promotion activity was initiated in conformity with the objectives of demonstrating highland maize variety with its management practices under farmer's level and to document and further recommend best practices in scaling up efforts.

MATERIALS AND METHODS

Descriptions of the Test Environment

The study was conducted in Arsi Administrative zone; it is located in the south eastern part of the country situated between 6˚45'N to 8˚58'N latitude and38˚32'E to 40˚50'E longitude. It has a surface area of about 23,881 km^2 and characterized by mixed farming system. The variation in its altitude enables Arsi zone to have different agro-ecological zones. In general, the mean annual temperature of the Zone ranges between 20˚C - 25˚C in the low land and 10˚C -15˚C in the central high land. It is also known for its surplus production and knows as wheat-belt of Ethiopia (Gebiso, 2015).

Method of Technology Implementation at Field Level

In 2016/17 cropping season Highland maize demonstration was conducted in six districts (Hetosa, Arsi-negele, Chole, Guna, Arsi-robe, Aminga & Seru) with active participation of farmer's in collaboration of wereda bureau of agriculture in 12 major highland maize potential kebeles namely Odda Jilla , Boru Lencha, Shaki sherera , Seru aneketo, Addaba Tita , Koloba bolo , Shabo Shule ,Weragu jawe, Ree Amba ,Guna Genete, Asendabo and Abo Ali under 60 demonstration plots.

Demonstration was conducted in 2017 (Table 3) on six major maize potential districts and 12 kebeles in the same year 60 farmers were selected and 32 of them grow Kolba and 28 of them grow Jibat variety. Training was organized and provided for those of who do demonstration activity and also continuous follow up 2 times per each district also done according to the plan.

In 2018 two varieties namely Jibat & Hora were demonstrated in two districts on 32 farmers each of them planted on 0.25ha of land.Among the host farmers 20 of them planted a variety called Hora and the other 12 of them planted a variety called Jibat training also organized on improved maize variety production and agronomic practice. A team of researchers in collaboration with district agricultural expert 3 times field visit (follw up) done per districts.

Seeds of highland maize variety (Jibat and Kolba) were supplied by Ambo Agricultural Research Center (AARC).These varieties were selected based on yield potential and wide adaptability. An amount of 6.25 kg of seed were given for individual farmers Planted on 100x25m (0.25ha) plot of land with a spacing of 25 cm between plant and 75 cm b/n row. With research recommended fertilizer rate (DAP 150kg/ha & UREA 200kg/ha).

Data collection

Data on Yield and yield component with social attributes were collected (Table 1) regarding the actual grain yield, scope of promotion and package comparison

Data analysis

The collected data (quantitative data) were analyzed by using average and frequency distribution while qualitative data were analyzed using descriptive statistics ("IBM SPSS Stastics 20,")

RESULTS AND DISCUSSION

Comparison between the research practice (full package) and farmer's practices was done and it was observed that the research package /practices significantly out produce in terms of grain yield gain and yield related attributes than famers' practice (.Figure 1 Yield comparison of full packages and farmers' practice to national average yield 32

Table 1 comparison between demonstrated package and existing farmers' practice of Maize production of six districts of Arsi Zone

Sr. No.	Interventions made	Demonstrated Packages	Farmers Practice
1	Farming Situation	Rainfed	Both belg season and rainfed
2	Varieties	(Improved) kolba,jibat & hora Varieties	local
3	Seed treatment	Seed treated with pro seed plus 63 WS 250gm/Qt	Nil
4	Time of sowing	Onset of Belg* rain (5th to 15th of april)	May 15th to early June
5	Method of Sowing	Row planting with a space of 75 b/n rows and 25 b/n plants	Broad casting
6	Seed rate	25kg/ha	>30kg/ha
7	Fertilizer dose	DAP 150 and 200 urea kg/ha	Blanket recommendation
8	Weed management	Pre-emergency herbicide (premagram 2.5Lt/ha)+ 3-4 times hand weeding 2 seeds per hill and later tin to 1 seedling	Three hand weeding in three phases (early,mid and late stage of the crop)
9	Pest management	Karate	Nill

***Belg is (spring season) - March, April and May are the belg season with occasional showers**

The result (Figure 1) indicated that in full package utilization of input by the research recommendation showed that a yield scored an average yield of 68.28 Qt/Ha and 56.62Qt/Ha respectively of full packages and and Farmers' practice.

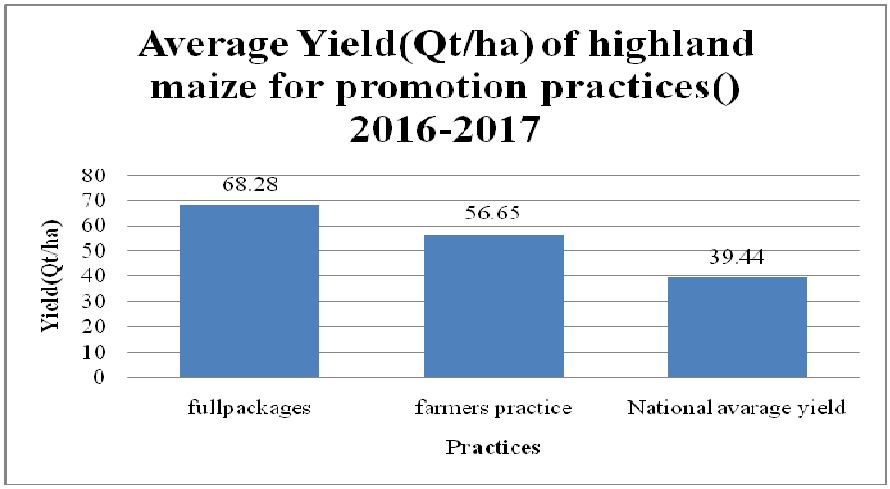

Figure 1 Yield comparison of full packages and farmers' practice to national average yield

Different levels of Field days have been organized by Kulumsa agricultural research center in collaboration with district level experts and maize growing farmers (host farmers) and several informal farmers to farmers and Researchers group visit were conducted. To raise farmers awareness on the performance of the highland maize, two village level field days were organized at Hetosa district at Seru aneketo kebele for two consecutive years by these field days, a toatal of 131 farmers, experts and researches were invited and awareness were raised (table 2 below).

The farmers expressed their perception by observing how maize performing in their agro -ecology and demand were created to adopt the farming system and to incorporate highland maize in their traditional food preparation and improve their household nutrition, income and feeding livestock.

The overall Results of 92 demonstration plots, conducted on farmer's field on 23 ha of land of selected district(Table 2) which indicated that use of high yielding variety (kolba,jibat & hora Varieties, balanced

Table 2 Field day participants of 2016 & 2017

Years	Participants									Grand total
	Experts			Farmers			researchers			
	Male	Female	Sub-Total	Male	Female	Sub-Total	Male	Female	Sub-Total	
2016	15	3	18	31	0	31	3	0	3	52
2017	22	4	26	40	5	45	8	0	8	79

Generally result indicated that Kolba variety has gave the highest grain yield (62.92Qt) followed by Jibat variety (58.78Qt) and Hora variety (53.1Qt) scored third in average grain yield, which gives the lowest grain yield. This variation could be attributed to the differences environmental and genetic combined factors over

years. Generally the crop technology demonstration has given a good impact over the farming community as they were motivated by recommended technology applied in the demonstration fields.

Maize in general becomes a new entry in the farming system, moreover the technology is highly accepted by client and non client farmers from the performance of the crop and several farmers came to get seed of highland maize varieties (kolba,jibat & Hora) due to the awareness created during field day events.

Table 3 Planned and achieved highland maize varieties in two demonstration years

Year	Varieties	Number of districts	Number of kebeles involved	Demonstration Plan /individuals farmers involved	Demo achieved	Follow up
2016/17	Koloba	6	12	32	32	2
	Jibat	6	12	28	28	2
2017/18	Hora	2	4	20	32	3
	Jibat	2	4	12	12	3

Summary and recommendation

Adoption of new Agricultural technologies requires long process for new crops in new areas where agricultural technology is not well introduced particularly highland maize. Hybrid maize technologies increase both in yield, area coverage and maize producers farmers during the years of demonstration. In general all 92 demonstrations were successful .However, there is still big gap ,in that the highest mean grain yield obtained from full package 68.28 Qt/ha was 17% more productive than farmers practice (56.6 Qt/ha) which is 28% productive to the national average. Therefore, based on this result the researcher recommend farmers & other development practitioner to focus more on full package for scale out activity with best performed highland maize varieties has to be done in areas where highland maize is not introduced especially in areas where highland maize is potential.

REFERENCES

Abbassian, A. (2008). Maize International Market Profile,Trade and Markets Division Food and Agriculture Organization of the United Nations (FAO) (pp. 25).

Chilot Yirga, Dawit Alemu, Oruko, L., Kefyalew Negisho, & Taxler, G. (2016). Tracking the Diffusion of Crop Varieties Using DNA Fingerprinting (Vol. 112, pp. 43): EIAR.

CSA. (2017). Report On Area And Production of Major Crops (Vol. 1, pp. 57). Addis Abeba.

Dawit Alemu, Mwangi, W., Mandefro Nigussie , & J.Spielman, D. (2008). The maize seed system in Ethiopia: challenges and opportunities in drought prone areas. *3*(4), 305-314.

Firoz Hossain , V. M., Jayant S. Bhat , Shailendra K. Jha , Rajkumar Zunjare , Abhijit Das , Konsam Sarika ,and Rajesh Kumar. (2016). Maize. 23. doi: DOI 10.1007/978-81-322-3613-9_4

Gebiso, T. (2015). Adoption of Modern Bee Hive in Arsi Zone of Oromia Region: Determinants and Financial Benefits. *6, 382-396*, 15.

Harold Macauley, D. G. o. A. R. (2015). Feeding Africa (pp. 36). IBM SPSS Stastics 20 (Version 20.0.0.0).

Mekureyaw, M. F. (2016). *Identification and Characterization ofMaize ChloroticMottle Virus and SugarcaneMosaic Virus Associated withMaize Lethal Necrosis Disease in Benishangul-Gumuz and Oromia Regions of Ethiopia.* (Master of Science in Biotechnology Master of Science in Biotechnology), ADDIS ABABA UNIVERSITY.

Tefera, A. (2013). Grain and Feed Annual. In Q. Gray (Ed.), (pp. 16): USDA Forign Agricultural Service.

Tsedeke Abate , Bekele Shiferaw , Abebe Menkir , Dagne Wegary, YilmaKebede , Kindie Tesfaye , . . . ToleraKeno. (2015). Factors that transformed maize productivity in Ethiopia. 18. doi: DOI 10.1007/s12571-015-0488-z

Zeng, D., Alwang, J., Norton, G., Jaleta, M., Shiferaw, B., & Yirga, C. (2018). Land ownership and technology adoption revisited: Improved maize varieties in Ethiopia. *Land Use Policy, 72*, 270-279. doi: https://doi.org/10.1016/j.landusepol.2017.12.047