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Research Article

Maize technology popularization in selected Agricultural Growth Program-II districts of Harari region and Dire Dawa administration

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Abstract

Now days food and nutrition insecurity is a key challenge of small holder farmers faces in Ethiopia in general and study area in particular. Based on this notion the research was conducted with objectives of promoting and popularize improved maize technologies, create awareness, improving farmers' knowledge and skills through giving training, improve farmers' livelihood and enhance stakeholders' participation. A total of fifteen (15) trial farmers were selected from two potential Maize growing kebeles of Dire Dawa administration and one from Harari region. Three Farmers Research Groups having 45 farmers were established at each kebele. Two improved maize varieties (Melkassa-2 and Melkassa-6) were planted on a plot of 40mx40m per variety and trial farmers were used as replication. Training on which a total of 39 participants and field day on which 107 participants took part were also organized at Dire Dawa and Harari region. Melkassa maize varieties were evaluated based on their early maturity, yield and disease tolerance. Agronomic data and yield data were collected and analyzed using descriptive statistics. Based on this yield data of 21.6qt/ha Melkassa-6 and 23.6 qt/ha Melkassa-2 were obtained from overall farmers' land in average. Melkassa-2 had 9.3% yield advantage over Melkassa-6. Thus Melkassa-2 ranked first by yield, Melkassa-6 second and, therefore, both varieties(Melkasa-2 and Melkasa-6) are recommended for further scaling up to reach large small holder farmers through government organizations, Non-government Organizations, research institutes and other stakeholders works on maize technology promotion.

Introduction

Food security in Ethiopia, and elsewhere in Africa, is a major socio-political issue. Its economic wellbeing is also dependent on the success of its agriculture. Ethiopia has long suffered from food shortages and economic underdevelopment even though it is endowed with a wide range of crop and agro-ecological diversity. Maize, teff (*Eragrostis tef*), sorghum, wheat, and barley among cereals and enset (*Ensete ventricosum*) among roots and tubers provide the main calorie requirements in the Ethiopian diet. Crop productivity and production remained low and variable in the 90s for the most part but there have been clear signs of change over the past decade. Maize has expanded rapidly and transformed production systems in Africa as a

popular and widely cultivated food crop since its introduction to the continent around 1500 A.D [1].

Maize production and its status in determining food security in the country received a major focus in the mid-1980s, particularly spurred by the 1984 devastating drought and the famine that followed. The wide adaptability of the crop and the potential to produce more calories and food per area of land cultivated than all major cereals grown in Ethiopia were important factors in considering maize as part of the national food security strategy, including its inclusion under the government-led intensive agricultural extension program (Berhane et al. 2011). With increased production driving market prices down, maize became more affordable (e.g., relative to other staples such as teff and wheat) to rural and urban

consumers. It is now increasingly used both separately as well as in mixed flour with other more expensive cereals in traditional Ethiopian diets. Maize is the most important staple in terms of calorie intake in rural Ethiopia. The 2004/5 national survey of consumption expenditure indicated that maize accounted for 16.7 % of the national calorie intake followed by sorghum (14.1 %) and wheat (12.6 %) among the major cereals [2].

Compared to the 1960s the share of maize consumption among cereals more than doubled to nearly 30% in the 2000s onwards, whereas the share of teff, a cereal that occupies the largest area of all crops in Ethiopia, declined from more than 30% to about 18% during the same period. The popularity of maize in Ethiopia is partly because of its high value as a food crop as well as the growing demand for the Stover as animal fodder and source of fuel for rural families. Approximately 88 % of maize produced in Ethiopia is consumed as food, both as green and dry grain. Maize for industrial use has also supported growing demand. Very little maize is currently used as feed but this too is changing in order to support a rapidly growing urbanization and poultry industry. Unlike its neighbor, Kenya, which imports a significant share for its consumption needs, Ethiopia has increasingly attained self-sufficiency in maize production since early this decade and even exports some quantities to neighboring countries (e.g., Sudan and Djibouti) in years of surplus production. If production can be significantly expanded, the potential for maize export to all the neighboring countries including Kenya is very high although the national demand is expected to continue to grow in the coming years [3].

The emerging maize green revolution for Africa envisioned [4-6] in the 1990s has remained elusive so far but is showing strong signs of becoming a reality now in Ethiopia and perhaps in other countries of sub-Saharan Africa (SSA). There is evidence that the increased productivity and production of maize is also having a significant positive impact on poverty reduction (Dercon et al. 2009). Melkasa series maize varieties give high yield when compared with local maize varieties. Melkasa maize varieties mature earlier than local maize and somewhat drought tolerant than local. Farmers in the study area use the local variety which needs enough amount of rainfall and obtain low production if rainfall is not enough. These varieties could tolerate drought and insects than local, this helped farmers to selected varieties based on their interest and criteria and researcher for further technology generation. Therefore, this project was conducted to alleviate these problems and ensure the benefits small holder farmers from these Melkasa Maize technologies.

Objectives

- To evaluate the productivity and profitability of technology under farmers condition
- To create awareness among farmers, developmental agents, subject matter specialists and other participant stakeholders on improved maize production technologies.
- To build farmers' knowledge and skill of production and management of the enterprise

- To strengthen linkage among stakeholders.

Materials and methods

The activity was conducted in nationally selected Agricultural growth program-II implementation districts of Harari region and Dire Dawa administration. Harari regional state is located on distance of 526 kms from capital city Finfine in direction of country's eastern part; it is all in all bordered by Oromia region and hosts one capital town of Oromia Regional state's zone that is East Hararghe. The climatic condition of the region includes highland, midland and lowland; the soil types that exist in the region is different in different ecologies of the region that is clay, loam, sandy and black types.

Dire Dawa Administration is located on distance of 515kms from capital city Finfine in direction of county's Eastern part; it is bordered by Somali, and Oromia regions in all directions. Dire Dawa Administration has both urban and rural set governance system. The climatic condition of Dire Dawa is almost dry land with the maximum and minimum annual temperature 38^oc and 25^oc respectively (EBC broadcasting on metrology allocated time).

Site and farmers selection

Two districts from Dire Dawa and one districts Harari Region were selected .From Dire dawa three kebeles (Adada, Dujuma and Wahil) and Sofi from Harari region were selected Farmers were also selected purposively based on their interest, innovation he/she has, land provision for this pre-extension demonstration, interest in cost-sharing, willingness to share experiences for other farmers, and studying their profile with the participation of Development Agents. The selected farmers were grouped in the form of Farmers Research and Extension Group (FREG) with the member of 15 farmers per kebele in consideration of gender issues (women, men and youth). A total of 3 FRGs (One FRG/ PA) from one PA 15 farmers and a total of 45 farmers were grouped in 3 FREGs organized. In the FREG, 5 farmers were trial farmers (3 male and 2 female) and 10 farmers were non trial farmers.

Implementation design

Two improved (Malkessa 2 and Malkessa 6) Maize varieties and one local check were used for the study. The varieties were replicated across five trial farmers per kebele .Each variety was planted on a plot size: 40mx40m, at seeding rate of 25-30kg/ha. A spacing of 75cm*25cm (Between row and plant) and fertilizer (NPS) at rate of 100kg/ha were also used.

Training, field visit and filed-day organized

Multidisciplinary research team; crop, extension and socio-economic research team and other stakeholders (Offices of Agriculture and Natural Resource) actively participated by sharing their experience and knowledge. Development agents, experts and farmers were participated on the training given on maize production and management, post-harvest handling and marketing information. Field day was also organized for more awareness creation.



No.	Participants	Dodota				Bishan Bahe				Total
		Male	Female	Ave. Age	Edu. level	Male	Female	Ave. Age	Edu. level	
1	Farmers	40	10	34-50	Primary school	35	26	34-50	Primary school	111
2	DAs	4	1	Dipiloma	24-30	5	3	30-36	Dipiloma	13
3	District experts	4	2	Degree	30-38	4	2	30-36	Degree	12
4	Journalist	3	0			3	0			6
	Total	51	13			47	31			142

Data collection and analysis method

Both quantitative and qualitative data were collected. The collected quantitative data were subjected to analysis using SPSS software version 20 (frequency, mean, standard deviation and range) while qualitative data collected using group discussion, key informant interviews, field observation and focus group discussion were analyzed using narrative explanation and argument. Finally data from different sources were triangulated to get reliable information.

Results and discussion

Training of target group (Farmers, DAs and Experts)

The training was organized at both regions. It was given on the topics of agronomic practices (crop weed and disease management), stakeholders' linkage and extension approach and market and information linkage. At Harari region, 34 (28 male and 6 female) farmers, 2 male development agents and 2 experts were participated while at Dire Dawa, 27 (20 male and 7 female) farmers, 5 male development agents and 4 experts were participated.

Yield performance across districts

The following graph describes the yield performances of the demonstrated varieties across the study site. The grain yield performance of the improved varieties (Melkassa-6 and Melkassa-2) were 17.26 and 18.91qt/ha at Adada, 24.71 and 24.31qt/ha at Kile, 21 and 24.73qt/ha at Dujuma and 23.47 and 26.59qt/ha at Wahil respectively. The average grain yield performance of Melkassa-2 higher (26.59 quintal per hectare) at wahil but Melkassa-6 variety was higher at 24.71qt/ha at kile. The yield performance of Melkassa-2 variety was higher than and Melkassa-6 at Wahil (26.59qt/ha), Dujuma (24.73qt/ha) and Adada (18.91qt/ha). However, the grain yield performance of Melkassa-6 was higher at Kile (24.71qt/ha) Figure 1.

Field day organized and Farmers' perception toward the varieties

Farmers' in the study area also selected the best performing improved lowland maize varieties by using their own criteria. Farmers set these criteria after having know-how about the variety and using those criteria they could select the varieties at harvest time. The opinion of those farmers on varietal preference was collected from participants during variety demonstration. The major criteria used by farmers were grain yielding, diseases tolerance, performance throughout growing stage, Adaptable to the environment, moisture stress tolerance, biomass and labor demand. Based on the above criteria's;

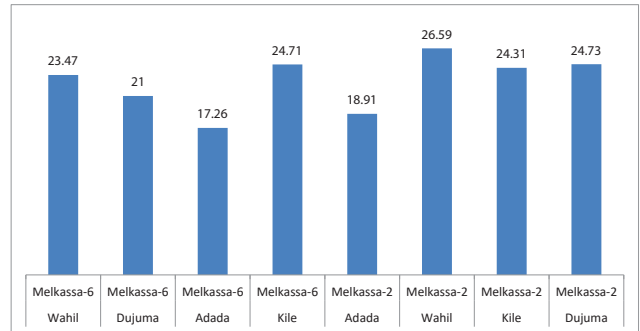


Figure 1: Yield performance of improved lowland maize varieties across districts on Farmers land.

farmers evaluated the varieties and ranked first Melkessa-2 followed by Melkassa-6. Generally, farmers selected the varieties (Melkassa-2 and Melkassa-6) based on the current climate and the response of the varieties with regard to their early maturity, disease tolerance and adaptability to the environment. Therefore, the most farmers selected both improved varieties to reuse on their farm for the future. The following table describes farmers' selection criteria and their perception (feedback) toward the varieties Tables 1,2.

Table 1: Farmers' perception on improved maize varieties.

Variety	No. of farmers responding	Farmers feedback on the varieties of maize varieties
Melkessa-2	28	<ul style="list-style-type: none"> ✓ Relatively good grain yielding ✓ Very good diseases tolerance ✓ Very good performance throughout growing stage ✓ Adaptable to the environment ✓ Very good in moisture stress tolerance ✓ Good feed stalk/biomass/low labor demand ✓ Easily manageable/low labor demand
Melkessa-6	28	<ul style="list-style-type: none"> ✓ Good grain yield ✓ Relative diseases tolerance ✓ Good performance at the growing stage ✓ Relatively adaptable to the environment ✓ Good in moisture tolerance ✓ Relatively good feed stalk/biomass ✓ Easily manageable/low labor demand
Local	28	<ul style="list-style-type: none"> ✓ Low grain yield due to moisture stress ✓ Low to diseases tolerance ✓ Low performance throughout growing stage due to current climate condition ✓ Low moisture tolerance ✓ Adaptable for the area if and only if there is a sufficient rainfall pattern ✓ High feed stalk/biomass ✓ Not easily manageable/labor demanded due to long time taken by variety



Table 2: Overall farmers' decision on the varieties performance at study areas.

Variety	No. Farmers	Yield	Diseases tolerance	Performance	Adaptability	Early maturity	Biomass	Low labor	Frequency	Rank
M2	28	Medium	High	High	High	High	Medium	High	16	1 st
M6	28	Medium	Medium	Medium	Medium	Medium	Low	High	9	2 nd
Local	28	-	Low	Low	Low	Low	High	Low	3	3 rd

Conclusion and recommendation

In the study area, the rainfall shortage were the most problems that influencing maize production. To address this problem, Fedis Agricultural Research Center (FARC) has undertaken adaptation trials on improved early maturing Maize varieties and identified the well adapted varieties to the areas. These varieties performed well by grain yield and early maturity to the spread of severe low rainfall distribution pattern which has a negative effect on yield and yield components.

These Maize varieties adaptation trial were conducted to solve the identified problems and succeed observed in yield and yield components as compare to the local varieties. Using these technologies that have great advantages for the producers to minimize risks associated with it and maximizes their benefits. But currently, improving the productivity of our farmers remains a challenge that has to be faced with a multiple problems. Therefore, center has disseminated and popularized the demonstrated and selected varieties to the target farmers for the last two years.

The varieties were well appreciated by farmers in the areas. Moreover, farmers said that using these varieties is alleviating the existed problems on production and productivity in the areas. Maize not only for grain yield but also they used the stalk for animal feed, fire wood/fuel. Overall the varieties are well accepted and suggested to widely promote and make farmers beneficials through the Office of Agriculture and Natural Resource of the Zone. This can achieved through applying appropriate extension approach like giving training to DAs and farmers, experience sharing, field day organizing and collaborative work with stakeholders, private producers, and NGOs that with close supervision of reseach center.

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