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Highland Maize Technology Demonstration in Bule Hora District of Borana Zone

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Abstract
The research activity was carried out with the objective of evaluating and identifying adaptable and improved maize varieties and to familiarize farmers with maize production techniques. It was executed at Bule Hora District of Borana Zone for two years (2012/13-2014/15). A multidisciplinary team composed of breeder, pathologist, agronomist and agricultural extensionist was closely working both with the farmers and respective woreda agricultural experts and DAs**.** Regular visits, trainings and field days were conducted to provide for interaction among researchers, extension workers and farmers**.** The variety selection process was carried out from different dimensions including utilization, marketing and field performance. The major selection criteria of the farmers in the trial sites were almost similar except in very few cases where they vary in level of emphasis to a particular criterion. In general, Biomass production, cob size, seed size, grain color, palatability of stover, suitability for Injera and bread, market demand were identified as important farmer criteria. The other important criteria were related to field performance of the variety that includes: yield and tolerance to disease and insect pest followed by maturity period. Using these criterias the farmers identified varieties that suit their respective location. Accordingly, trial farmers showed special interest to Jibat and Wenchi varieties. The yield advantage of the preferred varieties over the local ones ranged from 48.83% to 67.44% compared to the local checks 64 and 72 Qt/ha respectively.
Keywords: Maize, Demonstration, Jibat and Wenchi

Introduction

Maize (*Zea mays, L.*), Poaceae family also known as corn, is the world's third most important cereal grain after wheat and rice. Cultivated maize may have originated from the pod corn indigenous to low land of southern America. However (Abate, 2006) suggested that teosinte like grass could be the world wild progenitor, although know extinct. Euchlaina mexicana (teosinte) is the closest wild relative of maize.

In Ethiopia maize is produced for food, especially, in major maize producing region mainly for low-income groups, it also used as staple food. Maize is grown in almost all the agro –ecology ranging from arid to highly humid areas, from very cold region of altitude to warm temperature of Sahara desert in the soil that range from purely sandy to heavy clay and from flat land to the steep slope of hill. This is attributed to the availability its ability of enormous genetic variability within the specious and its ability to yield new genotype adaptable to varied and contrasting environment (FAO, 2009)

Maize is grown primarily for grain and secondarily for fodder. All parts of the crop can be used for food and non-food products. In industrialized countries, maize is largely used as livestock feed and as a raw material for industrial products. Maize accounts for 30−50% of low-income household expenditures in Eastern and Southern Africa. A heavy reliance on maize in the diet, however, can lead to malnutrition and vitamin deficiency diseases such as night blindness and kwashiorkor (FAO, 2009). Common warm weather cereal crops in Ethiopia are maize, sorghum, and millet, where they are cultivated mostly at lower altitudes along the country's western, southwestern, and eastern peripheries. These three grains are the staple foods for a large part of the population and are major items in the diet for pastoralists. Maize is grown chiefly between elevations of l500 and 2200 meters and requires large amounts of rainfall to ensure good harvests. Maize is particularly important in southwest Ethiopia, with the Oromiya Region producing the largest amount of maize. (ECA, 2005).

Maize is characterized by more resistant to drought. The crop can recover from early season drought. Maize is sensitive to freezing temperature except in very early stage and can recover from the effect of frost if it occurs if the plant is less than 15 cm height (Habtu, 1995). From this finding it is evident that maize can recover from early adverse climatic condition during early stage. Hence, early sowing of maize with onset of rains, even at the risk early drought due to late onset of regular rains recommended. Similarly early sowing to avoid pest and disease may be resorted to even at the risk of freezing temperature during early crop periods.

In most parts of Borana highland small scale maize production gradually become permanent activity for different purpose. However, the production and productivity is very low. Therefore, there is strong interest from farmers to replace the currently growing low yielding variety by improved maize variety. To achieve this demonstration and evaluation of released highland maize variety for their adaptability and agronomic performance is essential to tackle the problem which cause lack of food security.

Therefore, this activity was designed to demonstrate the various improved maize varieties to farmers in

major maize growing areas in the Borana Zone, particularly, in Bule Hora District.

Methodology

Description of the study area

Bule Hora (Gerba site) is found in southern Ethiopian rift valley 475km away from Addis Ababa. It has an altitude of 2244masl. The area is characteried by bi modal type of rain fall. Annual rain fall ranges from 700mm-900mm. Main rain fall season starts in March and reaches its peak in November. According to the soil map of Ethiopia (National Atlas), the district has three dominantly occurring soil types. The first two are orthic acrisols, which cover about 65% and orthic luvisols 15% of the total area of the district, while calcaric and eutric fluvisols covers about 10% of the area of the district. Dystric nitosols and chromic eutric and cambisols cover about 10% (each 5%) of the total area of the district.

Site and farmers' selection

The activity was carried out in Bule Hora District of Borana Zone of Oromia region purposively selected based on potential in maize production. It was implemented for two years (2012/13-2014/15. There were 15 participating farmers based on their interest towards the technologies, willingness to manage and allocate field trial for the activity. Majority of the farmers were male farmers. The woreda agricultural office experts and Development Agents (DA) had also taken part in the implementation process.

Multidisciplinary team composed of an Agriculutural Extensionist, crop breeder, Pathologist, Entomologist and Agronomist were in charge of this activity.

Research design

Two different maize varieties Jibat and Wonchi were used along with local check. The trial was carried out on selected farmers fields in such a way that three varieties (two improved and one local check) were planted side by side on equal sized plots (10m x 10m) replicated by the number of participant farmers. The improved varieties used were the ones ranked first and second by bio-physical researchers during the on-station adaptation trial process.

Technology evaluation and demonstration methods

The demonstration of the trials were implemented on farmers' fields to create awareness about the maize varieties. The demonstration of the trials was followed process demonstration approach by involving FRGs, development agents and experts at different growth stage of the crop. The activity was jointly monitored by FRGs, researchers, experts and development agents.

Data collection

During life span of the activity data like yield of the crop and farmers preference toward the crop were collected through supervision and organizing mini field day by researchers and DA of the respective kebeles.

Data analysis

The collected data (quantitative data) were analyzed by using average and frequency distribution while qualitative data were analyzed using descriptive statistics and preference ranking.

Results and Discussion

Training of farmers and other stakeholders

Training on maize production and management practices were given in 2013 and 2014 (Table 1). This includes both theoretical and practical types of training. The following table illustrates the number of farmers, DAs annd experts participated on the training.

Table 1: Training of farmers and other stakeholders

Year	Participants					
	Experts (DA + SMS)			Farmers		
	Male	Female	Total	Male	Female	Total
2013	2	-	2	12	3	15
2014	4	1	5	18	4	22

During regular visits, there was difference in planting pattern, weeding and other cultural practices. Accordingly, a tailored midterm training was organized for 15 farmers 2 DAs and 1 SMS to fill these gaps. During the training, in addition to observed field gaps, participants were divided into small groups and discussed on the following important issues: Record keeping, Group size, Farmers' participation in FRG activity, problems and weaknesses observed and finally how to handle the task ahead.

Farmers' and other stakeholders' participation in demonstration

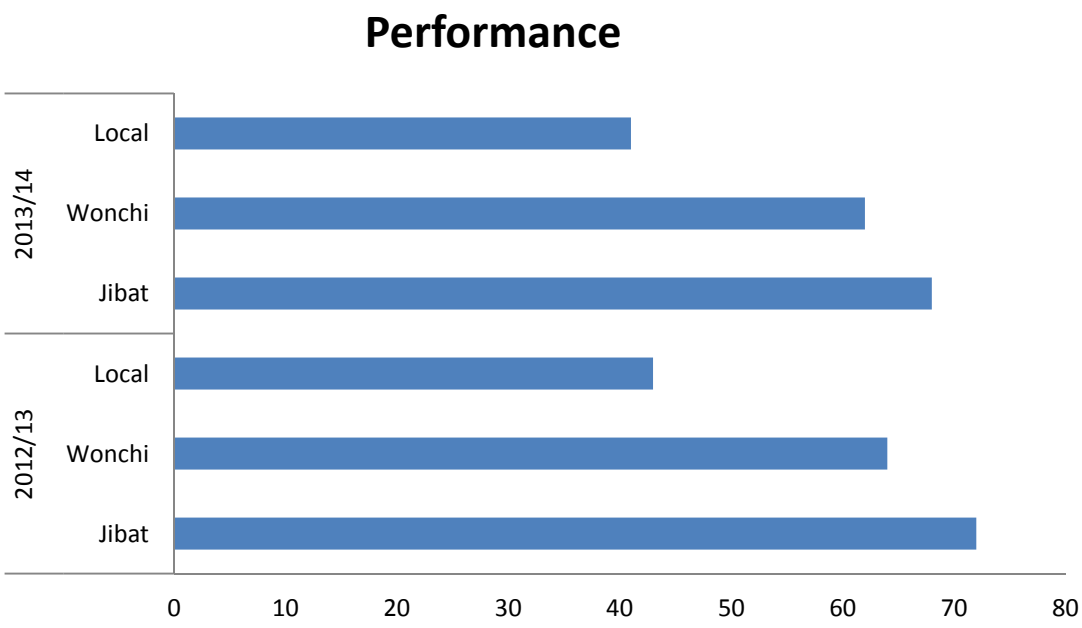
The trial sites were identified in such a way that many other/surrounding farmers would get the chance to observe the trial while passing by. The trial had two plots of the top preferred maize varieties and a check plot of local variety. The land preparation was carried out by the trial farmers with other farmers assisting and observing the exercise.

Planting was done in the presence of trial farmers and DA in each location. Seed, fertilizer, data entering forms were provided to 15 host farmers. DAs were also provided with display card of all maize varieties as well as data entry format to record various parameters as they closely monitor the trial.

Based on a pre-informed visit it was attempted to follow up the trial on average every two weeks. During each visit discussions were made with the farmers and DAs right on the trial field in order to jointly evaluate the performance of the varieties on the field. During the visit both farmer's and DAs' data recording format were checked to observe how they handled the information gathering process.

Agronomic and yield performance

The varieties ranked from first to second in respective trial sites (Table 2) were evaluated for their field performance. In one of the sites, the varieties selected just by using their physical (color, size), chemical (taste, cookability) and market also exhibited outstanding field performance.



	2012/13			2013/14		
	Jibat	Wonchi	Local	Jibat	Wonchi	Local
On-farm yield(Qt/ha)	72	64	43	68	62	41

Figure 1: Average Yield of maize varieties, Bule Hora, 2012/13 and 2013/14

In Bule Hora District the varieties tested with fifteen trial farmers as indicated earlier were Jibat,Wonchi and local varieties. As shown in fig 1, Jibat had the highest (67%) yield advantage over the local followed by Wonchi (48%). Although both varieties were appreciated for being high yielder, its susceptibility to leaf rust was expressed as a concern by the farmers. The local variety was comparatively found poor both in yield and uniformity. There was visible variation among farmers' plot, mainly due to difference in management (ploughing frequency and weeding). The land of two of the farmers was ploughed once while that of other three farmers was not properly weeded and followed up.

Farmers' opinion/perception

Two different maize varieties; Jibat, Wenchi and Local varieties were used. Based on the criteria set by the farmers, these varieties were ranked in order from most to least preferred. The ranking process was done by identifying farmers' response (from most preferred/very good (score 1) to least preferred/poor (score 3) against each one of the selection criteria.

Based on discussion with the trial farmers the following selection criteria were identified. These include Biomass production, cob size, seed size, grain color, and palatability of stover, suitability for Injera and bread,

and demand in the local market which is basically a reflection of the combination of preferences for certain physical and chemical characteristics.

Based on these selection criteria farmers in each sites ranked the maize varieties as indicated in Table 2. During the selection process, it was recognized that color, size, taste as well as yield were the most important criteria of the farmers. Market value was also another important criterion, however, it is basically, a reflection of the preferences of the above criteria.

Table 2: Rank of different maize varieties as evaluated by the FRG farmers

Varieties	Bule Hora farmers (N-45)						
	Grain color	Cob size	Disease resistant	Market preference	Sweetness	Yield	Rank
	No.	No.	No.	No.	No.	No.	
Jibat	20	25	24	22	20	35	1
Wenchi	18	20	21	23	15	10	2
Local	7	0	0	0	10	0	3

Conclusion and Recommendation

Conclusion

The major variety selection criteria of farmers in the trial sites were almost similar except in very few cases where they vary in level of emphasis to a particular criterion. In general, color, size, cookability (easiness to cook), taste, market demand were identified as important farmer criteria. The other important criteria were related to field performance of the variety that includes: yield and tolerance to disease and pest followed by maturity period. The farmers have identified, using the above criteria, the varieties that suits their respective location. Accordingly, the trial farmers showed special interest to Jibat and Wonchi. Farmers had little understanding on importance of some cultural practices (row planting, weeding). Training organized to fill such gaps coupled with an on farm visit to Hera lephitu FRG farmers' field had helped the farmers to gain knowledge on the significance of proper weeding and row planting in maize production.

Recommendation

Based on the preference showed by the farmers and field performance of the varieties Jibat and Wonchi in that order are best recommended in Bule-hora area. It is believed that the order of importance may change depending on the behavior of the market, nevertheless, fitness to the target environment and preference by the farmers remains in this activity as a proof for significance of the varieties in the respective locations.

It was observed that there is a better scope to improve productivity by improving the management practices which were less practiced by most farmers specially, in Gerba 01 area. Therefore, it would be necessary that follow up activities need to emphasize on improving cultural practices such as weeding, land preparation, row planting.

Despite the high yield potential of preferred varieties in respective sites, absence of enough market information system leaves no option for incentive to continue production. Thus there need to be a mechanism put in place to provide market information for the farmers.

The trial farmers have now developed a better capacity in identifying best varieties and management practices of maize, thus they should be given the opportunity to share their experience to other farmers thereby strengthen farmer to farmer extension.

As the preference of the farmers in each sites have already been identified, it will be productive if the extension service consider farmers' preferences in varietal promotion activity.

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