International Journal of Agricultural Extension and Rural Development Studies
Vol.5, No.1, pp.34-41, March 2018
Published by European Centre for Research Training and Development UK (www.eajournals.org)

PARTICIPATORY EVALUATION AND DEMONSTRATION OF IMPROVED TEFF VARIETIES IN SELECTED DISTRICTS OF BORANA ZONE

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ABSTRACT: *The research activity was carried out with the objective of evaluating and identifying adaptable and improved teff varieties and to familiarize farmers and agro-pastoralists with teff production techniques. It was executed at Abaya and Yabello woredas 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 two locations were almost similar except in very few cases where they vary in level of emphasis to a particular criterion. In general, color, panicle length, 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 insect pest followed by maturity period. Using these criteria the farmers identified varieties that suit their respective location. Accordingly, Abaya farmers showed special interest to Tsedey and Ajord, while Tsedey and Magna were preferred at Yabello. The most interesting part of the finding was that most of the varieties preferred from utilization and marketing angle were also found superior to the local ones in their field performance. Side by side, with the aim of strengthening local availability of seeds of preferred varieties, farmer based seed production was launched and the seed produced was purchased both in cash and in kind by non-participant farmers. Moreover, by way of revolving seed it was attempted to redistribute the seed to other non participant farmers in the area. In so doing both awareness and access to the technology was improved.*

KEYWORDS: Participatory Evaluation, Demonstration, Tsedey, Magna, Ajord

INTRODUCTION

Teff (*Eragrostis tef*) is grown primarily as a cereal crop in Ethiopia. The word teff is thought to have been derived from the Amharic word “teffa” which means, "lost," due to small size of the grain and how easily it is lost if dropped. It is the smallest grain in the world, ranging from 1–1.7mm long and 0.6–1mm diameter with l000 seed weight averaging 0.3–0.4 grams and taking 150 grains to weigh as much as one grain of wheat. The common English names for teff are teff, love grass, and annual bunch grass. It is intermediate between a tropical and temperate grass. (Berhe and Miller, 1976).

Eragrostis tef is adapted to environments ranging from drought stress to waterlogged soil conditions. Maximum teff production occurs at altitudes of 1,800 to 2,100 m, growing season rainfall of 450 to 550 mm, and a temperature range of 10 to 27 °C. Teff is day length sensitive and flowers best with 12 hours of daylight. Teff can be produced in a relative short growing season and will produce both grain for human food and fodder for cattle. The grain is either

Print ISSN: 2058-9093, Online ISSN: 2058-9107

white or a very deep reddish brown in color. Published accounts of teff in the late 1800s report that upper class consumed the white grain, the dark grain was the food of soldiers and servants, while bullocks (Boe, 1990) consumed hay made from teff. Late 20th century publications in the United States describes teff grain as being marketed as a health food product, or used as a late planted emergency forage for livestock (Goerge, 1991).

Teff can be used as a high quality feed for livestock and horses. Forage quality has compared favorably with Timothy hay. Animal acceptance and palatability has been reported to be excellent by horse owners. Protein content of teff hay can range from 12-20% depending on maturity at cutting. To maximize yield and quality, it is recommended to cut the crop at approximately 30-40 day intervals (Weibye, 2011).

Many teff varieties were adapted by the Pastoral and Dry-land Agriculture Research Center in addressing the technology gap that fills both the market and consumption demand. Nevertheless, those technologies were not sufficiently introduced to all potential production sites. Recently adapted teff varieties (Ajord, Tsedey and Magna) were also found potential for small scale farmers. The varieties were good yielders (up to 16Qt/ha) compared to previously released ones and also have short maturity cycle (85 days), they pose an opportunity for the farmers and agro-pastoralists who at times hardly wait too long to feed the family, especially in Borana lowlands where moisture is a limiting factor for crop production. On the other side, most of the farming community had little chance to know and make own choice from the ranges of available teff varieties adapted.

Therefore, this activity was designed to evaluate and demonstrate the various improved teff varieties and teff seed production techniques to farmers and agro-pastoralists in major teff growing areas in the Borana Zone, particularly, in Abaya and Yabello Districts

METHODOLOGY

Description of the study area

Yabalo is found in southern Ethiopian rift valley 575km away from Addis Ababa. It has an altitude of 1656masl. The area is characterized by erratic, low and unpredictable seasonal rain fall. Occasionally high temperature during the rainy season exacerbates soil moisture stress. As a result moisture deficit is the most pressing problem causing frequent crop failure in the area. Annual rain fall ranges from 500mm to 700mm. Main season rain fall starts in March and reaches its peak in April. Soil in this area is of diverse type, generally low in organic matter, poor in water holding capacity and Electrical conductivity hence drought prone contributing to periodic crop moisture deficit (Habtu, 1995). Abeya (Semero) is also found in southern Ethiopian rift valley 367km away from Addis Ababa. It has an altitude of 1641 masl, annual rain fall ranging from 900mm to 1400mm and temperature 16-28$^{0}_{c}$). It is characterized by black paddy clay soil.

Site and farmers' selection

The activity was carried out in two Districts (Abaya and Yabello) of Borana Zone of Oromia region purposively selected based on potential in haricot bean production. It was implemented for two years (2012/13-2014/15): the first year focused mainly on evaluation and identification

Print ISSN: 2058-9093, Online ISSN: 2058-9107

of the best varieties for the respective sites while farmer based seed multiplication of the best (preferred) varieties was done in the following year.

There were 10 and 20 participating farmers in Abaya and Yabello, respectively based their interest towards the technologies, willingness to manage and allocate field trial for the activity. Majority of the farmers were male farmers. The number of female farmers ranged from 3 in Abaya to 8 in Yabello. The District 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

Three different teff varieties Ajord, Tsedey and Magna were used along with local check. The trial was carried out on selected farmers fields in such a way that four varieties (three 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 in each site were the ones ranked first, second and third by bio-physical researchers during the on-station adaptation trial process.

Technology evaluation and demonstration methods

The evaluation and demonstration of the trials were implemented on farmers' fields to create awareness about the teff varieties. The evaluation and 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 teff 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.

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Table 1: Training of farmers and other stakeholders

Year	Participants					
	Experts (DA + SMS)			Farmers		
	Male	Female	Total	Male	Female	Total
2013	9	5	14	35	16	51
2014	6	8	14	43	10	53

During regular visits, it was recognized that the farmers had hard time identifying one disease from another, weeding and other cultural practices. Accordingly, a tailored midterm training was organized for 30 farmers 5 DAs and 2 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 three plots of the top preferred bean varieties and a check plot of local variety. The land preparation was carried out by the host (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 30 trial farmers. DAs were also provided with display card of all haricot bean 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 sites (Table 3) were evaluated for their field performance. In some of the sites, the varieties selected just by using their physical (color, size), chemical (taste) and market also exhibited outstanding field performance.

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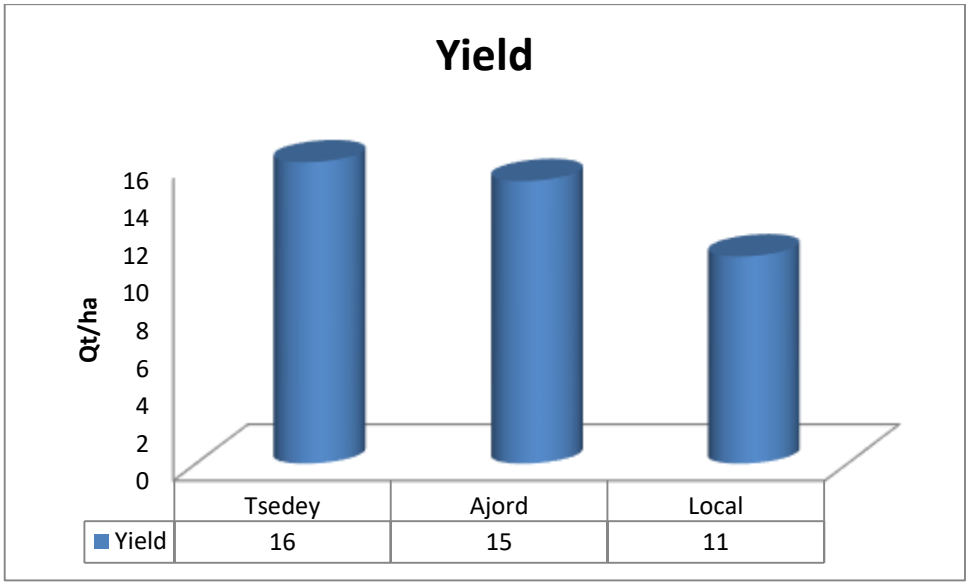

Figure 1: Average Yield of teff varieties, Abaya, 2012/13 and 2013/14

In Abaya at Samaro PA the varieties tested with ten trial farmers as indicate earlier were Tsedey, Ajord and local variety. As shown in fig 1, Tsedey had the highest (45%) yield advantage over the local followed by Ajord (36%). There was visible variation among farmers' plot, mainly due to difference in management (ploughing frequency and weeding). The land of three of the farmers was ploughed once while that of other two farmers was not properly weeded and followed up. Only few of the varieties were known in the market that it was difficult to judge the market demand of other varieties prior to observing the demand after awareness creation to the farmers/agro-pastoralists and consumers.

Two varieties of teff preferred improved varieties viz Tsedey and Magna and one local variety were tested on twenty farmers/agro-pastorlists field in Yabello at Did-Yabello, Darito,Gagna and Elwaya PAs. The result of the trial is illustrated in figure 2. The farmers/agro-pastoralists in this location showed distinct preference to the teff varieties for market and food. The performance on the agro-pastoralists' field indicated that Tsedey had the highest yield advantage (55%) over the local followed by Magna (33%). In addition to the market value, agro-pastoralists also attached importance to the earliness of Magna. The yield potential as well as consumption preference was also clearly appreciated and exhibited towards the two varieties (Tsedey and Magna).

Comparatively, the locally produced variety was also early maturing but susceptible to disease and pests in addition to lower yield potential. It may be important to note at this point that proper cultural practices are also potential factors for differences in yield between the local varieties and improved ones.

Print ISSN: 2058-9093, Online ISSN: 2058-9107

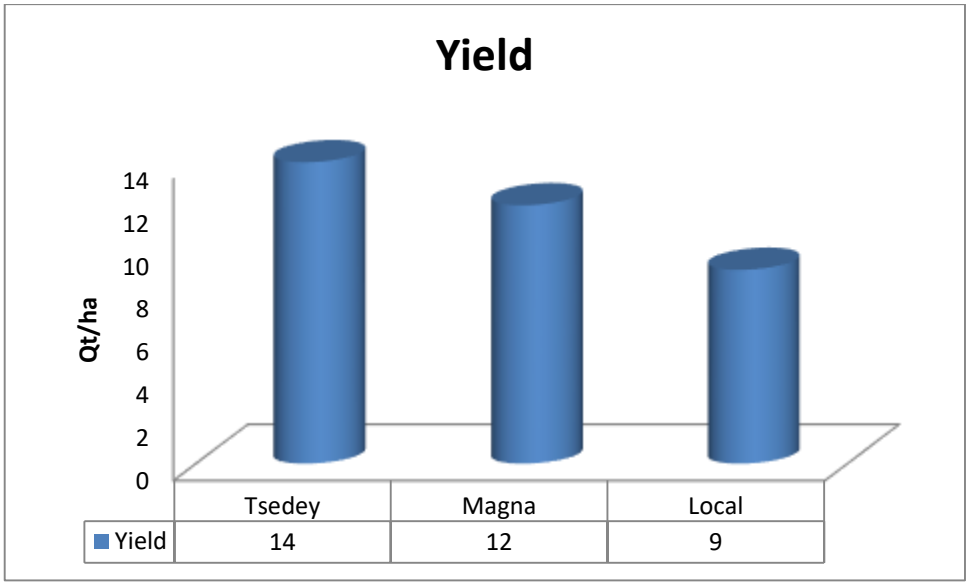

Figure 2. Average Yield of on farm teff varieties at Yabello, (2012/13 and 2013/14)

Enhancing Access to Seeds of Preferred Varieties By Farmer/agro-pastoralists

Following the selection of varieties by the respective farmers/agro-pastoralists, an arrangement was made to produce the seed on farmers' field thereby improve access to the technology by the surrounding farmers. In addition, events, such as field days were organized to create awareness and interest in surrounding non trial farmers.

All the varieties were multiplied by the trial farmers in respective sites. The amount of seed produced is indicated in Table 2. However, it should be noted that the figure indicated on the quantity of seed produced refers to what the research team had followed up, otherwise, the farmers/agro-pastoralists had produced more from the seeds they harvested in the previous year.

The seed provided for each farmer/agro-pastoralist was collected and revolved to the non trial farmers in respective sites. The information on the quantity of seed produced was also shared to the respective woreda agricultural offices to facilitate the dissemination of the technology from farmers to farmers. It was reported from farmers (Abaya) that there was a temptation on their side to sell the seed as a grain to traders due to problems associated to storage pest. On the other hand, other agro-pastoralists (Yabello) were complaining on lack of market for the seed (Tsedey and Magna) they produced. Both situations were communicated with respective woreda agricultural offices to consider arrangements (to facilitate) whereby the seeds can be passed to surrounding farmers on cash, credit or any other possible means.

Table 2: Quantity of seed produced by farmers/agro-pastoralists

Locations	Variety	Quantity produced(Kg)	Number of farmers involved	Remark
Abaya	Tsedey	225	3	There was unaccounted seed of
	Ajord	295	4	Tsedey produced by the
Yabello	Tsedey	325	6	

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Magna	232	4	farmers/agro-pastoralists using last year's harvest

Farmers' opinion/perception

Based on discussion with the trial farmers/agro-pastoralists the following selection criteria were identified. These include physical characteristics (color, panicle length); chemical characteristics (taste); field (agronomic) traits (yield), maturity period, tolerance/resistance to disease and insect pests, germination, growth habit (vigor) and demand in the local market which is basically a reflection of the combination of preferences for certain physical and chemical characteristics.

Based on color, taste and marketability as the first selection criteria the farmers/agro-pastoralists in each site ranked the teff varieties as indicated in Table 3. During the selection process, it was recognized that color, taste as well as yield were the most important criteria of the farmers/agro-pastoralists. Market value was also another important criterion, however, it is basically, a reflection of the preferences of the above criteria.

Table 3: Rank of different teff varieties as evaluated by farmers/agro-pastoralists at the two sites

Varieties	Abaya farmers (N=10)						
	Color	Early maturity	Disease resistant	Market preference	Sweetness	Yield	Rank
	No.	No.	No.	No.	No.	No.	
Tsedey	3	4	6	3	4	8	1
Ajord	3	2	4	3	4	2	2
Local	4	4	0	4	2	0	3
	Yabello agro-pastoralists (N=20)						
Tsedey	4	15	12	6	7	15	1
Magna	10	5	8	12	8	5	2
Local	6	0	0	2	5	0	3

CONCLUSION AND RECOMMENDATION

Conclusion

The trial farmers in the two locations are aware of the physical characteristics and field performance of all the food and market type adapted teff varieties. The major variety selection criteria of farmers in the two locations were almost similar except in very few cases where they vary in level of emphasis to a particular criterion. In general, color, panicle length, taste, market demand were identified as important farmer/agro-pastoralists 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, Abaya farmers showed special interest to Tsedey and Ajord while that of Yabello to Tsedey and Magna. Surrounding non trial farmers got the opportunity to observe and learn the potentials of the improved teff

Print ISSN: 2058-9093, Online ISSN: 2058-9107

varieties selected by the farmers for respective Districts. Besides, seeds of the best varieties were made available to other farmers through farmer based seed production. Exchange of seed both in cash and kind has already been taking place in respective Districts.

Recommendation

Based on the preference showed by the farmers and field performance of the varieties Tsedey and Ajord, respectively are best recommended in Abaya area and Tsedey and Magna in Yabello 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.

Despite the high yield potential of preferred varieties in respective woredas, 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 teff, 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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Print ISSN: 2058-9093, Online ISSN: 2058-9107