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On-farm demonstration of improved field pea varieties in selected districts of bale highlands, Oromiya national regional state, Ethiopia

Bayeta Gadissa^{ID*}, Amare Biftu and Ayalew Sida

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ABSTRACT

On-farm demonstration of improved field pea varieties was conducted in Goba, Sinana and Agarfa districts of Bale zone. The main objective of the study was to demonstrate and evaluate recently released Hortu variety along with standard check. The demonstration was under taken on single plot of 10m x 10m area for each variety with row planting, recommended seed rate of 75 kg ha⁻¹ and fertilizer rate of 100 kg ha⁻¹ NPS. Mini-field day involving different stakeholders was organized at each respective site. Yield data per plot was recorded and analysed using descriptive statistics, while farmers' preference to the demonstrated varieties was identified using focused group discussion and summarized using pair wise ranking methods. The demonstration result revealed that Hortu variety performed better than the standard check Harena variety with an average yield of 36.30 qt ha⁻¹ and 31.42 qt ha⁻¹, respectively. Hortu variety had 15.53% yield advantage over the standard check. Furthermore, farmers selected this variety. Thus, Hortu variety was recommended for further scaling up.

Keywords: Demonstration, Farmers' preference, Field pea, Hortu, Selection criteria

Oromiya Agricultural Research Institute (OARI), Sinana Agricultural Research Center (SARC), P.O.Box-208, Bale-Robe, Ethiopia

*Corresponding author's email: bayetag29@gmail.com (Bayeta Gadissa)

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Introduction

Field pea is the most important high land pulse, which is mainly used for human consumption in Ethiopia. It is widely grown in the Highlands and performs well at an altitude of 1800-3000 meter above sea level. In addition, the crop also better adapted under low rainfall environments as compared to other pulses such as Faba bean, lentil, and chickpea. Field pea has moisture requirements similar to those of cereal grains. However, field peas have lower tolerance to saline and waterlogged soil conditions than cereal grains (Mohammed *et al.*, 2016). Among the pulse crops produced in Bale zone, 9,562.24 hectare of land was covered by field pea with average productivity of 20.15 quintal per hectare (CSA, 2017).

It contains high levels of amino acids, lysine and tryptophan, which are relatively low in cereals. It also contains approximately 21-25% protein and rich in carbohydrates. Moreover, it plays a significant role in soil fertility restoration as a suitable rotation crop that fixes atmospheric nitrogen. It is used as source of protein and income for the poor farmers (Telaye *et al.*, 1994).

However, local varieties are becoming low yielding and less profitable to subsistence farmers. The reduction in yield is due to pests like pea weevil and pea aphid; diseases like Ascochyta blight and powdery mildew, poor management practices and climatic changes (Fikere *et al.*, 2010). By considering this prevailing problem, researchers from Sinana Agricultural Research Center had made significant efforts by releasing high yielding and disease tolerant variety namely Hortu with yield potential of 42.04 quintal per hectare. The yield advantage of Hortu over Urji (standard check) and local check is 26.28% and 43.1%, respectively. However, target beneficiaries did not evaluate this variety, since it was released.

Participatory technology evaluation under farmer's management condition may have many advantages, such as increased and stable crop productivity, faster release and adoption of varieties, better understanding farmers' criteria for variety selection, enhanced biodiversity, increased cost effectiveness, facilitated farmers learning and empowerment (Sperling *et al.*, 2001). The two-way feedback between farmers

and researchers is indeed vital component of high yielder and disease and pest resistant varietal development process (Getachew *et al.*, 2008). Hence, participatory on farm demonstration of these varieties under farmers' condition and enhancing farmers to select variety/varieties of their interest to their locality is a vital task.

Objectives

- To evaluate the yield performance of field pea varieties under farmers' condition in Bale zone;
- To create awareness on the importance of field pea varieties among farmers, DAs, SMSs and other participant stakeholders;
- To collect farmers' feedbacks on field pea varieties for further development of field pea technologies;

Methodology

Description of the study area

The activity was conducted in Goba, Sinana and Agarfa districts of Bale zone, Oromiya National Regional State (ONRS), Ethiopia. Bale zone is among the 20 administrative zones located in southeastern parts of Oromiya, Ethiopia.

Site and farmers selection

Purposive sampling methods were employed to select the districts based on the potential of the crop. Two PAs from Goba and Agarfa and three PAs from Sinana were selected based on accessibility or vicinity to the road. Similarly, one trial farmer from each PA was used to carry out the demonstration process considering each farmer's field as replication of the trial.

Materials used and Field design

Improved field pea variety (Hortu) was demonstrated and compared with standard check Harena. The demonstration was under taken on

simple plot design of 10m x 10m area for each variety with full recommendation packages. In addition, twice hand weeding was done on time. SARC was the source of all agricultural inputs. Hosting farmers provided their land. Land preparations were carried out by trial/hosting farmers, whereas land leveling, planting, first and second weeding, follow up and visit, harvesting, threshing were handled and managed by SARC.

Data collection

Data were collected using direct field observation/measurements, key informant interview and focused group discussion (FGD). Yield data per plot in all locations were recorded. Farmers' preference to the demonstrated varieties was identified.

Data analysis

Descriptive statistics was used to analyze the yield data. Pair wise ranking was used to compare traits of demonstrated varieties.

Results and Discussion

Training

Training was given to farmers, DAs, and agricultural experts on field pea crop production techniques and management packages, agro-chemical applications and safety precautions. Stakeholders such as zone and district level agriculture development office, Zone and district level cooperative promotion offices, zone and district level agricultural inputs regulations and quarantine experts were invited and participated during consultation meeting and training.

Yield performance of demonstrated varieties

The mean yield of demonstrated varieties of field pea collected from all sites were summarized in the following chart.

Table 1. Yield performance of the demonstrated varieties.

No	Variety	Yield obtained (Qt ha ⁻¹)				Yield advantage over standard check
		Goba	Sinana	Agarfa	Mean	
1	Hortu	30.98	40.53	37.40	36.30	15.53%
2	Harena	24.82	33.90	35.50	31.42	-

The demonstration result revealed that, the new variety (Hortu) performed better than the standard check (Harena variety) all over the demonstration sites. It gave higher yield at all locations. The mean yield of Hortu variety was 30.98 qt ha⁻¹, 40.53 qt ha⁻¹, and 37.40 qt ha⁻¹ at Goba, Sinana and Agarfa, respectively with all over mean yield of 36.30 qt ha⁻¹. Similarly, the mean yield of Harena variety was 24.82 qt ha⁻¹,

33.90 qt ha⁻¹ and 35.50 qt ha⁻¹ at Goba, Sinana and Agarfa, respectively with all over mean yield of 31.42 qt ha⁻¹ (Chart 1). The yield advantage of Hortu over Harena is 15.53%. The cost benefit ratio analysis also showed that (Table 1), Hortu variety (2.01) had higher cost benefit ratio (1.64). This means, Hortu variety is more profitable than Harena variety.

Table 1. Cost-Benefit analysis of the demonstrated varieties.

No	Variables	Varieties	
		Hortu	Harena
1	Yield obtained (qt ha ⁻¹)	36.30	31.42
2	Sale price (ETB/qt)	1600	1600
3	Gross returns (Price X Qt) TR	58080	50272
4	Total variable costs TVC (ETB/ha)	11290	11030
5	Fixed cost (FC)	8000	8000
6	Total cost (TC)	19290	19030
7	Net return (GR-TC)	38790	31242
8	Benefit cost ratio (NR/TVC)	2.01	1.64

Table 2. Result of Independent sample t test.

	Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	0.235	0.653	-1.125	4	0.324	-4.9	4.35

The independent sample t-test revealed that, there was no statistically significant difference between the mean yield of Hortu and Harena varieties. However, there was a mean difference of 4.9 qt ha⁻¹ between both varieties (Table 2).

Farmers' preference to demonstrated varieties

The farmers' preferences toward the demonstrated varieties were assessed by

enhancing them to reflect their preference to varietal attributes by setting their own varietal selection criteria.

Pair wise ranking was used to identify farmers' preference of variety traits. Accordingly, yield, disease tolerance, number of branches/plant, pod/plant and early maturity were the top five priority concern given by farmers (Table 3).

Table 3. Pair wise ranking result to rank variety traits in order of importance.

No	Variety traits	A	B	C	D	E	F	G	H	I	J	Frequency	Rank
1	A											7	2 nd
2	B	B										7	2 nd
3	C	A	B									4	6 th
4	D	A	B	D								6	4 th
5	E	A	E	E	D							6	4 th
6	F	A	B	C	D	E						3	7 th
7	G	A	B	C	D	E	F					0	10 th
8	H	A	B	C	D	E	F	H				1	9 th
9	I	A	B	C	D	E	F	I	I			2	8 th
10	J	J	J	J	J	J	J	J	J	J		9	1 st

A= Disease tolerance, B= Number of branches, C= Seed/pod, D= Pod/plant, E= Early maturity, F= Uniformity of maturity, G= Stem strength, H= Seed color, I=Plumpness, J= Yield.

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

No	Varieties	Rank	Reasons
1	Harena	2 nd	Low yielder, lower number of branches, seed/pod (4-8), pod/plant(28), late mature, non-uniformity of maturity, less tolerant to disease
2	Hortu	1 st	High yielder, higher number of branches(7), early mature, tolerant to disease, good seed color, number of pod/plant (56), seed/pod(4-8), uniformity of maturity, resistant to water lodging

Varieties were ranked based on the farmers' preference criteria. Their preference criteria were almost similar in all locations.

Conclusions and Recommendations

On-farm demonstration and evaluation of field pea varieties was carried out on seven (7) representative trial farmers' fields. Improved variety viz. *Hortu* was demonstrated along with *Harena* variety, which is the standard check. Accordingly, *Hortu* gave higher yield than *Harena* variety.

Moreover, *Hortu* was selected by participant farmers in all districts due to it is high yielder, higher number of branches (7), early mature, tolerant to disease, good seed color, number of pod plant⁻¹ (56), seed pod⁻¹ (4-8), uniformity of maturity, resistant to water lodging. Based on these facts, *Hortu* variety was recommended for further scaling up.

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