

Research Article

Pre-extension Demonstration and Evaluation of Fenugreek Technologies in Goro District of Bale Zone

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Abstract

Fenugreek is an important seed spice crop widely grown all over the world. It is one of the most important spice crops in Ethiopia. The country has suitable environmental conditions for fenugreek production and the crop has extraordinary economic importance in the country. Despite its suitable agro-ecology for the production of fenugreek in Ethiopia, its production and productivity is low compared to its potential. This is due to lack of improved optional varieties and production packages. Pre-extension demonstration and evaluation of improved fenugreek technologies was conducted at Goro district of Bale zone. The district was selected purposively based the potential of the crop. Two kebeles were selected from the district based on the potential of the crop and accessibility. Improved fenugreek variety Arganne was demonstrated and compared against the standard check Burka. Accordingly, an improved variety Arganne have relatively higher yield (19.17 qt/ha) than the standard check (17.42 qt/ha. Moreover, Arganne variety was selected by farmers due to its Arganne variety was selected by participant farmers due to its high yield, bigger seed size, higher number of seed/pod, early maturing, better tolerant to disease, better tolerant to insects and good plant height. Thus, Arganne variety was recommended for pre-scaling up.

Keywords

Arganne, Burka, Demonstration, Fenugreek, Goro, Farmers' Selection Criteria

1. Introduction

Fenugreeks (*Trigonella* L. spp.), are well-known herbs belonging to the family Fabaceae, whose fresh and dried leaves have economic, nutritional and medicinal values [3, 4]. It is a leguminous plant that is consumed as a spice to improve the flavor of food around the world [1]. Fenugreek is an important seed spice crop widely grown all over the world [12].

Fenugreek has long been regarded as both traditional food and medicine [13]. It is native to southern Europe and Asia and cultivated mostly across the semiarid parts of the worlds. The major fenugreek producing countries are India, Argentina, Egypt, Morocco, Southern France, Algeria, Ethiopia and

Lebanon. Fenugreek is known as the only widely merchandized leguminous spice, and is useful as rotational crop for improving soil fertility by fixing nitrogen [10]. It is one of the oldest spice crops of the world. It is mostly grown in sandy loam soil [14]. The production and distribution of fenugreek is nearly similar to those of other cool season food legumes such as faba bean, field pea, lentils, chick pea and grass pea [11].

Fenugreek (*Trigonella foenum-graecum* L) is one of the most important spice crops in Ethiopia. The country has suitable environmental conditions for fenugreek production and

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the crop has extraordinary economic importance in the country [15]. In Ethiopia, fenugreek-growing regions are the high plateaus (1800-2300 masl.) characterized by subtropical climate of wet and dry seasons [10].

In the country, about 479,973 households were participated in fenugreek production and a total area of 30,145.56 hectares of land was covered by fenugreek during 2021/2022 (2014 E. C.) main production season [5].

Despite its suitable agro-ecology for the production of fenugreek in Ethiopia, its production and productivity is low compared to its potential due to lack of improved optional varieties and production packages [8]. Similarly, in Bale zone is constrained by lack of improved seed and nutrient depletion [9]. Therefore, it is important to develop and disseminate improved fenugreek varieties to overcome the problem. Based on this, Sinana Agricultural Research Center has released improved fenugreek variety called Arganne with yield potential of 17-26qt/ha and 11.23% yield advantage over the standard check [2]. Therefore, this activity was planned to demonstrate and evaluate this variety under farmers' condition.

2. Objectives

- 1) To evaluate the yield performance of the variety under farmers condition.
- 2) To create awareness on the importance of the new improved fenugreek technologies.
- 3) To collect farmers' feedbacks on improved faba bean technologies for further variety development of fenugreek production.

3. Materials and Methods

3.1. Site and Farmers' Selection

Participatory demonstration and evaluation of improved fenugreek technologies was conducted Goro district of Bale zone. Purposive sampling methods were employed to select the district based on the potential for fenugreek production. Two kebeles from were also selected purposefully based on their accessibility and production potential of the crop.

Participatory approach using Farmers Research Group (FRGs) was the main strategy during demonstration of the technology. Selection of FRGs members was based on farmers' willingness to be held as member, accessibility for supervision of activities (vicinity), good history of compatibility with groups and genuineness and transparency to share innovations to other farmers. Therefore one FRG was selected to conduct the activity at each kebele.

Having suitable and sufficient land to accommodate the trials, willingness to contribute the land, vicinity to roads so as to facilitate the chance of being visited by many farmers, initiatives to implement the activity in high-quality, good in field management and willingness to explain the technolo-

gies to others were the criteria used to select the hosting farmers. Accordingly, two representative trial farmers from each kebele were selected. Farmers (FRG members and other follower farmers) were encouraged to participate in the physical activities from the beginning up to the end and at each stage of the demonstration activity.

3.2. Materials Used and Field Design

One recently released fenugreek variety (Arganne) with one standard check (Burka) was planted on selected farmers' land with simple plot design (10m x 10m) in the main cropping season. The varieties were treated with full recommended fenugreek production and management packages (row planting with 30 cm b/n rows, seed rate of 20 kg per hectare and fertilizer rate of 100kg of NPS). SARC was the source of agricultural inputs (seeds, fertilizer and agro-chemicals in case needed during the implementation of the activity).

Hosting farmers provided their land. Farm operations (land preparation-ploughing four to five times using oxen plough) 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. Depending on weed infestation, two effective hand weeding were applied; the first at one month after sowing and the second at two months after sowing of the varieties.

3.3. Data Type and Method of Data Collection

Both qualitative and quantitative data were collected using appropriate data collection methods such as direct field observation, measurements and focus group discussions (FGDs). Yield data per plot in all locations were recorded. Total number of farmers participated on field visits and mini field days were recorded. Farmers' preference to the demonstrated varieties (likes and dislikes, which is the base for plant breeding process and perceptions towards the performance of the technologies) was identified.

3.4. Data Analysis

SPSS was used as statistical package (descriptive statistics was used to analyze the data). Pair wise ranking and simple ranking method was used to rank the varieties in order of their importance.

3.5. Technology Demonstration and Evaluation Methods/Techniques

FRGs members and other follower farmers were encouraged to participate on different extension events organized at each site. These were mechanisms used to enhance farmer-to-farmer learning and information exchange such as field visits/tours, field days, etc.

4. Result and Discussions

4.1. Training

Training was given for farmers, development agents and

experts on fenugreek production and management packages at each district. Participants of the training were listed in the Table 1 below. Accordingly, a total of 91 farmers, 18 development agents and 13 subject matter specialists participated on the training.

Table 1. Participants of training in Goro district.

District	Farmers			DAs			SMS		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Goro	44	7	51	2	2	4	7	0	7
Total	44	7	51	2	2	4	7	0	7

4.2. Yield Performance of Demonstrated Varieties

The yield performance of the demonstrated varieties was presented in Table 2 below. Accordingly, the new variety Arganne gave relatively higher average yield of 17.42 quintals per hectare with standard deviation of 3.37. Similarly, the standard check also gave mean yield of 15.75 quintals per hectare with standard deviation of 5.09. Moreover, yield performance evaluation was carried using t-test to reveal the yield difference between the new variety and standard check.

Table 2. Yield Performance and t-test result among the varieties.

Varieties	Yield/ha (Qt)
Arganne	15.75
Burka	17.42

4.3. Comparison of Yield Advantage of Improved Varieties

Comparison of yield advantage of the varieties was computed. Thus, an improved variety Arganne has 10.6% yield advantage over the standard check Burka.

$$\text{Yield advantage\%} = \frac{\text{Yield of new variety (qt/ha)} - \text{Yield of commercial variety (qt/ha)}}{\text{Yield of commercial variety (qt/ha)}} \times 100$$

$$= \frac{19.17 - 17.15}{17.15} \times 100 = 11.78\%$$

4.4. Cost Benefit Analysis

The cost benefit analysis shows that improved variety Arganne gave higher net profit (109,080.00 ETB) than the

standard check Burka (93,430.00 ETB). The result also revealed Arganne variety has higher cost benefit ratio (1.72) than Burka (1.47). This implies, farmers can get additional net profit by selecting Arganne variety over Burka variety with the same cost of production.

Table 3. Cost benefit analysis of demonstrated varieties.

No.	Variables	Varieties	
		Arganne	Burka
1	Yield obtained (qt ha ⁻¹)	19.17	17.42

No.	Variables	Varieties	
		Arganne	Burka
2	Sale price (ETB)	9,000	9,000
3	Total Revenue (ETB)	172,530	156,780
	Land preparation (tractor rent)	6,000	6,000
	Seed purchase	2,000	2,000
	Fertilizers purchase (NPS)	3,950	3,950
	Weeding	2,000	2,000
	Cost of Chemicals (insecticide)	600	600
4	Labor cost for chemical spray	500	500
	Harvesting	1,600	1,600
	Threshing	800	800
	Loading	400	360
	Store (bag purchase)	600	540
	Total variable cost (TVC) (ETB)	18,450	18,350
5	Total Fixed Cost (TFC) (ETB)	45,000	45,000
6	Total Cost (TC) (ETB)	63,450	63,350
7	Net profit (ETB)	109,080	9,3430
8	Cost Benefit Ratio	1.72	1.47

4.5. Participatory Variety Evaluation and Selection

Consulting the intended end users to assess which quality/ies of a particular variety they desire is highly important. Because, it will not only be resource saving in terms of preferred variety promotion/dissemination, but also time saving and fast adoption [6]. To enhance farmers' participation on evaluation of varieties' field performance, mini-field days were organized and finally selected the variety that fits their criteria. Before leading the participant farmers and experts to

focus group discussion, brief orientation was given to the evaluators on why variety/technology evaluation and selection is necessary in research process. Then evaluators were grouped in to small manageable groups (by selecting one group leader) and encouraged to set their own criteria to select the demonstrated varieties in order of their preference, how to carefully assess each variety by considering each criteria and using rating scale, how to organize collected data, how to make group discussion and reach on consensus, and finally report through their respective group leaders. Accordingly, the task of variety evaluation and selection was carried out at Goro district.

4.6. Farmers' Preference to Demonstrated Varieties

Table 4. Participants of participatory variety selection.

Location	Farmers			DAs			SMS		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Goro	13	0	13	2	0	2	1	0	1

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.

Table 5. Rank of the varieties based on farmers' selection criteria.

No.	Variety	Rank	Reason
1	Arganne	1 st	high yielder, bigger seed size, higher, number of seed/pod, early maturing, better tolerant to disease, better tolerant to insects, good plant height
2	Burka	2 nd	low yielder, smaller seed size, smaller number of seed/pod, relatively late maturing, more affected by disease, more affected by insect

Pair wise Ranking Result to Rank Variety Traits

Pair wise ranking was used to identify farmers' preference of accession traits. Accordingly, yield, number of pod/plant, number of branch/plant, number of seed/pod and disease

tolerance are the five priority concern given by participant farmers. This finding is in line with the finding of [7] in which the farmers in the study area gave first priority for yield and yield related traits.

Table 6. Pair wise ranking result to rank variety traits in order of importance.

Code	Variety Traits	A	B	C	D	E	F	G	Frequency	Rank
A	Yield								6	1 st
B	Seed size	A							1	6 th
C	Seed/pod	A	C						4	3 rd
D	Early maturity	A	D	C					2	5 th
E	Disease tolerant	A	E	E	E				5	2 nd
F	Insect tolerant	A	F	C	F	E			3	4 th
G	Plant height	A	B	C	D	E	F		0	7 th

5. Conclusion and Recommendations

Pre-extension demonstration and evaluation of fenugreek technologies was carried out on farmers' field. Improved variety viz. Arganne was demonstrated, evaluated and compared against the standard check Burka. The mean yield of

the varieties was analyzed using simple descriptive statistics. Accordingly Arganne is high yielder than the standard check variety Burka.

Moreover, Arganne variety was selected by participant farmers due to its high yield, bigger seed size, higher number of seed/pod, early maturing, better tolerant to disease, better tolerant to insects and good plant height. Thus, Arganne variety was recommended for pre-scaling in the district and simi-

lar agro-ecology.

Abbreviations

CSA	Central Statistical Agency
DAs	Development Agents
EC	Ethiopian Calendar
ETB	Ethiopian Birr
FGD	Focus Group Discussion
FRG	Farmer Research Group
ha	Hectare
qt	Quintals
SARC	Sinana Agricultural Research Center
SMS	Subject Matter Specialist

Author Contributions

Bayeta Gadissa: Conceptualization, Data curation, Formal Analysis, Methodology, Project administration, Software, Supervision, Writing – original draft, Writing – review & editing

Ayalew Sida: Conceptualization, Data curation, Methodology, Project administration, Supervision

Conflicts of Interest

The authors declare that there is no conflicts of interest.

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