Research Article

Cluster-based pre-scaling up of improved faba bean variety technology demonstration at Arsirobe District of Arsi Zone, Oromia Regional State, Ethiopia

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Abstract

Large Scale Demonstration (LSD) of Faba bean was conducted at Arsi robe district of Oromia regional state of Ethiopia. The district was selected due to its potential for Faba bean production. One cluster was formed in collaboration with district level agricultural experts. Generally the cluster size covered 4.6 hectares of land. A Faba bean variety called “Ashebeka” was demonstrated along with its full-recommended packages. Training were given for a total of 46 participants (39 farmers, 3 DAs and 4 SMS) at different stage on agronome practice of Faba bean and chemical applications. To raise farmer’s awareness on the performance of the Faba bean technologies, a field day was organized and by this field day, a total of 74 participants were attended the field events (59 farmeres, 7 Experts and DAs and 5 distinguished guests were attened the events). From the variety demonstrated at study district the variety was acceptable during field visit and field day by farmers due to its disease tolerant and well adaptation and its productivity after harvesting (the variety has a yield advantage over the Ethiopian national average yield of fababean (21 quintals per hectare CSA 2020 and “Ashebeka”; Avarage Yield=30.2; quintals per hectare was recorded in the study area.

Background and justification

Faba bean (Vicia faba L.) is believed to be one of the earliest domesticated legumes next to chickpea and pea [1,2]. It is an important pulse crop produced all over the world for both foods, feed & it serves as a cheap source of protein. It also plays a great as an excellent crop for fixing atmospheric nitrogen [3,4].

In Ethiopia, faba bean is grown in the highlands (1800–3000 m.a.s.l.). Both Amhara and Oromiya are the two major pulse-producing regions in Ethiopia [5]. Among the twelve pulse species grown in Ethiopia. Faba bean (Vicia faba L.) is one of pulse crops grown in the cooler highlands [6].

Next to China, Ethiopia is the second largest faba bean producing country in the world. The crop occupies close to 466,697.68 hectares of land with an annual production close to 10,067,518.28 quintals [7]. Even though Ethiopia is the world’s second largest producer of faba bean, its share is not exceed 7% of world production [8].

The major factors that are usually mentioned for the low yield of faba bean in Ethiopia include climatic, edaphic, biotic (diseases, pests and weeds) factors, and poor agronomic practices [9].

Majority of the farmers use low yielding of the local varieties which contribute for low production [10,11].
When comparing the yield of fababean in Ethiopia, it is below the world average due to several factors: among these lack of improved seed is a key issue. Therefore, this activity was aimed at promoting high yielding and most adaptable faba bean variety called “Ashebeka” in the study area by a new extension modality i.e. Large Scale Demonstration (LSD) or cluster-based farming with following general and specific objectives.

**Objective**

**General objective:** Generally, this activity was aimed to contribute for Food security by promoting newly released Faba bean technologies through Large Scale Demonstration (LSD).

**Specific objectives are:**

1. To access and utilization of improved Faba bean technologies
2. To acquaint the Large Scale Demonstration (LSD) approach for the concerned body and to understand the benefits of LSD approach
3. To create awareness on the importance of Faba bean technologies among stakeholders,
4. To document best practices, experiences, and lessons learned from the large-scale demonstration of Faba bean varieties.

**Materials and methods**

**Description of the study areas**

The activity was implemented in Arsirobe district of potential among Faba bean producing districts of Oromia regional state in 2019/20 cropping season.

**Arsi robe district:** Arsi robe district is situated at a distance of about 225 km from Addis Ababa and 98 km from the Eastern Arsi zone capital city, Asela. The district is situated in Eastern Arsi Zone, Oromia regional state of geographical locations. The district has a bimodal rainfall pattern consisting of along rainy season “kiremit” from July to September and short rainy season “belig” extending March to May. It has an Latitude (DMS) of 09° 36’ N and Longitude (DMS) 39° 08’ E. [13,14]. Barley, fababean, Bread wheat, cereals and Oil seeds, are important cash crops grown in the district [14].

**Input utilization**

A Faba bean Variety called “Ahebeka” was demonstrated along with its full-recommended packages. Planting was also done in a row at a seed rate of 200 kg ha⁻¹, NPS fertilizer were applied at the rate of 121 kg ha⁻¹. Ploughing, weeding, and other agronomic management practices were applied by farmers according to the recommendations.

**Method of data collection**

Data on Yield was collected and comparison with Ethiopian national average yield was made among the varieties planted in the study area (Cluster).

**Data analysis method**

The collected data (quantitative data) was analyzed by using average grain yield and package comparison among study areas were made.

**Locations and farmers selection**

The activity was implemented in Arsirobe one of potential of Faba bean producing districts of Oromia regional state in 2019/20 cropping season. Arsi robe was from Arsi zone Oromiya regional state. Was selected for Large Scale Demonstration (LSD) program.

**Direct and indirect beneficiaries of farmers**

In general, 16 farmers (16 Male) were got an improved variety of Faba bean called “Ashebeka” according to the land allocated for the demonstration program, so that they were directly benefited in the activity and 16 farmers (Male) were benefited directly from input (improved seed) and 46 farmers (28 Male and 18 Female) were benefited from the training provided on different training topics sponsored by the Ethiopian Institute of Agricultural Research (EIAR) and facilitated by kulumsa Agricultural Research Center (KARC) and 72 participants (53 Male and 19 Female) were also participated/benefited in the field days and in experience sharing events directly.

**Faba bean**

As indicated in Table 1: One district was namely Arsirobe from Arsi zone, among fababean growing districts was selected for Faba bean technologies demonstration in Large Scale Demonstration (LSD) program.

A Faba bean cluster which contains 4.6 hectares of land was formed in collaboration with the district level experts and “kebeles” level Development Agents (DAs).

**Faba bean variety demonstrated and popularized:**

Regarding the variety demonstrated and promoted in large scale demonstration. In large scale demonstration on one cluster which covered 4.6 hectares of land in Arsi zone which was coordinated and facilitated by Kulumsa Agricultural Research center.

**Trainings provided on faba bean technologies for the beneficial farmers as well as other stakeholders**

As indicated in Table 2: In general Training were given for 46 participants for different stakeholders on agronomie practice of Faba bean, chemical applications and safety mechanisms.

Again as indicated in Table 2, a total of 39 farmers (23 male and 16 female) were attende on different topics of training. Regarding developing agents (DAs) an awareness creations were made on the Faba bean related issues by this a total of 3 DAs (2 Male and 1 Female) were attended. Different experts also gain different training on fababean technologies in this regards a total of 4 experts (3 male and 1 female experts at district level were attended training on Faba bean technologies related.
Field days

To raise farmer’s awareness on the performance of the Faba bean technologies, field day was organized, by this field day, a total of 74 participants were attend the field events. Among these 59 participants were farmers (43 Male and 16 Female), 4 participants were Development Agents (DAs) (3 male and 1 female) again 4 of participants were also experts (3 Male and 1 Female), 5 participants were others invited special guests (4 Male and 1 Female) were attended the field days and belived that awareness were created among participants of the field days including experts, SMS, DAs and among participant farmers (Table 3 below).

Faba bean productivity at study area

- Status of “Ashebeka” variety popularized in LSD in 2019/20 cropping season

As indicated in Table 4 below an actual grain yield of the variety Ashebeka was collected from 4.6 hectares of land from Arsi robe district of Arsi zone of Oromia regional state and a minimum of 18.7 quintals per hectare, a maximum grain yields of 42.1 quintals per hectare and an average grain yields 30.2 quintals per hectare per cluster were scored.

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Table 1: Indicate area Covered by Large Scale Demonstration (LSD) on Faba bean technologies.

| Region   | Zone | District | No. Farmers | Varities | No. clusters | Hectars |
|----------|------|----------|-------------|----------|--------------|---------|
| Oromia   | Arsi | Arsi robe| 16          | 0        | 1            | 4.6     |
| Total    | 1    | 1        | 16          | 0        | 1            | 4.6     |

Table 2: Trainings given by the research center (KARC) to beneficiaries.

| S.No | Participants | Gender |
|------|--------------|--------|
|      |              | M      | F      |
| 1    | Farmers      | 23     | 16     |
| 2    | Development Agents (DAs) | 2 | 1 |
| 3    | Experts      | 3      | 1      |
| Total|              | 28     | 18     |

Table 3: Number of participants for the field day events.

| S.No | Participants       | Gender |
|------|--------------------|--------|
|      |                    | M      | F      |
| 1    | Farmers            | 43     | 16     |
| 2    | Development Agents (DAs) | 3 | 1 |
| 3    | Experts            | 3      | 1      |
| 4    | Other invited guest| 4      | 1      |
| Total|                    | 53     | 19     |

Table 4: Shows minimum, Maximum and average yield per hectare.

| Variety | Zones | district | cluster | Hectares | Min. | Max. | Ava. |
|---------|-------|----------|---------|----------|------|------|------|
| Ashebeka| Arsi  | Arsi robe| 1       | 4.6      | 18.7 | 42.1 | 30.2 |

Ashebeka

In general cluster based approach with new verity and input utilization demonstration was successful in terms of yield. Therefore, based on this result the researcher recommend farmers and other development practitioner to focus more on Large Scale Demonstration (LSD). Again the author recommend the farmers to produce in cluster farming approach for scale up activity with best performed Faba bean variety has to be done in areas where Faba bean is not scaled up especially in areas where Faba bean is potential like study area.

Recommendations

In general cluster based approach with new variety and input utilization demonstration was successful in terms of yield. Therefore, based on this result the researcher recommend farmers and other development practitioner to focus more on Large Scale Demonstration (LSD). Again the author recommend the farmers to produce in cluster farming approach for scale up activity with best performed Faba bean variety has to be done in areas where Faba bean is not scaled up especially in areas where Faba bean is potential like study area.
Faba bean is a potential crop in the highlands of Ethiopia in general. The crop is primarily used for household consumption and generating income for farmers and improve soil fertility. The average yields of the variety “Ashebeka” demonstrated has yield advantage over the Ethiopian national Faba bean average 21 quintals per hectare [15]. Therefore, implementing LSD approach can improve yield, so it should be better for farmers and development practitioners to use it as a good extension approach.

Now a days commercialization is an agenda for the governments of Ethiopia so the cluster-based (Large Scale Demonstration) approach is a good start to meet the commercialization issue. Therefore, concerned body should exercise the Large Scale Demonstration (LSD ) as one extension modality.

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