

## WP3:

### Participatory variety selection and multiplication of early generation seed of cereals and food legumes for mixed farming system in North Shoa, Ethiopia

Belayneh Shibabaw<sup>1</sup>, Tesfaye Mulugeta<sup>1</sup>, Neway Tefera<sup>1</sup>, Altaye Tiruneh<sup>1</sup>, Kefyalew Taye<sup>1</sup>, Aemiro Bezabih<sup>1</sup>, Shumet Chaklie<sup>1</sup>, Emebet Takele<sup>1</sup>, Yehuala Kassa<sup>1</sup>, Dejene Mamo<sup>1</sup>, Demis Managido<sup>1</sup>, Yetsedaw Aynewa<sup>2</sup>, Cherinet Alem<sup>2</sup>, Seid Ahmed<sup>2</sup> and Zewdie Bishaw<sup>2</sup>



Author affiliation <sup>1</sup>Amhara Regional Agricultural Research Institute (ARARI), Debre Berhan Agricultural Research Centre, Ethiopia

<sup>2</sup>International Center for Agricultural Research in the Dry Areas (ICARDA), Addis Ababa, Ethiopia.

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Through action research and development partnerships, the Initiative will improve smallholder farmers' resilience to weather-induced shocks, provide a more stable income and significant benefits in welfare, and enhance social justice and inclusion for 13 million people by 2030.


Activities will be implemented in six focus countries globally representing diverse mixed farming systems as follows: Ghana (cereal–root crop mixed), Ethiopia (highland mixed), Malawi: (maize mixed), Bangladesh (rice mixed), Nepal (highland mixed), and Lao People's Democratic Republic (upland intensive mixed/ highland extensive mixed).

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## Abbreviations and acronyms

<b>ARARI</b>	Amhara Regional Agricultural Research Institute
<b>ICARDA</b>	International Center for Agricultural Research in the Dry Areas
<b>SDG</b>	Sustainable Development Goals
<b>SI-MFS</b>	Sustainable Intensification of Mixed Farming Systems Initiative
<b>WP</b>	Work Package

## **Background**

The highlands of North Shoa in Amhara region are dominated by cereals (wheat, barley and tef) followed by food legumes. The productivity of cereals and food legumes is low due to biotic and abiotic factors as well as insufficient input supplies like certified seed, inoculants, and other inputs. Because of diseases and insect pests, acidity and water logging problems, farmers are reducing areas of food legumes and growing more cereals leading to low crop diversity leading to reduced soil fertility, incomes, and food diversity. Several cereal and food legume varieties are released by many centres but did not reach farmers due to limited demonstration to create awareness and demand and shortage of quality early generation seed. The poor access to quality seed contributes to low crop productivity.

## **Objectives**

1. Identifying farmer preferred cereal and legume varieties.
2. Production of early generation seed of food and legume varieties; and
3. Creating awareness and demand of new varieties to growers.

## Methodologies

### **Participatory variety selection of food legumes and food oat:**

PVS trials of desi chickpea, faba bean, field pea and food oat were conducted on farmers' fields and Farmer Training Centres (FTCs) in Moretina Jiru, Siyadebirwayu, Menz-Lalo and Basona Worana districts in North Shoa. The plot size for each variety of food legumes and food oat was 25 m<sup>2</sup>. All recommended agronomic practices were applied to the trials.

**Chickpea and lentil:** The PVS trials were planted in 2022 and evaluations were made in 2023 for both crops. Six desi chickpea varieties (*Eshete, Dimtu, Natoli, Mastewal, Girar, Dalota*) released by different centres were evaluated as mother-baby trial in three farmer fields and one FTC in Moretina-Jiru district. Eight released lentil varieties (*Beredu, Furi, Derash, Alem Tena, Jiru, Alemay and Debine*) with local check were planted at one FTC and three farmers' fields in Moretina Jiru, Siyadebirna Wayu and Menz Lalo districts in 2022/23 cropping season.

**Faba bean and field pea:** Six released faba bean varieties (*Shewa, Gora, Dagim, Walki, Chalew and Hachalu*) were planted at one FTC and one farmer field in Woiramba kebele, Moretina Jiru district and one farmer field each at Abamote and Mush kebeles in Basona-Worana district. Three released field pea varieties (*Jeldu, Bilalo and Etatu*) with local checks were planted at two farmers' fields in Aba Mote and Mush kebeles in Basona-Worana district.

**Food oat:** As an alternative crop to acid affected soils in the highlands, four released food oat varieties (*Tena, Enat, Hulegeb and Sorataf*) were planted in two farmers' fields in Aba Mote and Mush kebeles in Basona-Worana district.

**Early generation seed production:** Breeder seed of bread wheat, barley and faba bean were planted in 2023/2024 cropping season under rainfed condition in research stations and farmers' fields in North Shoa zone.

### **Demonstration of cereal and food legume varieties and**

**liquid foliar fertilizer:** A bread wheat variety *Emegwa* released in 2022 for North Shoa and similar highlands for its high yield was demonstrated in Moretina Jiru (Kusaye and Woiramba kebeles) and Menz Lalo (Tole and 05 kebeles) districts on 100m<sup>2</sup> plots on 10 farmer's fields and two farmer training centers. Moreover, four bread wheat varieties (*Boru, Hachalu, Dursa and Galan*) selected from 2022 PVS were demonstrated in Basona-Worana (four farmers) and Moretina Jiru (four farmers) districts.

Two farmers preferred food barley varieties (*Hagere* and *HB1307*) were demonstrated in one female farmer at Mush kebele in Basona-Worana district. Nationally registered liquid foliar fertilizer (WUXAL foliar liquid fertilizer) containing macro and micronutrients was demonstrated on bread wheat on three farmers' fields and faba bean on four farmer fields in North Shoa.

## Results

### Participatory variety selections

**Chickpea:** The most important criteria of variety selection were grain yield followed by adaptation, frost, and disease resistance. A total of 32 (10 female) farmers and three experts evaluated the varieties using traits identified by farmers (Fig 1). Based on male and female farmer ranking, cvs. Mastewal and Natoli were selected for further seed production and scaling in 2023/2024 cropping season.



Figure 0.1 Participatory variety Selection of Desi Chickpea, North Shoa, Ethiopia

**Lentil:** Farmers preferred cv. Jiru in the three districts based on key criteria for diseases and agronomic traits (Fig. 2) as compared to the most popular cvs. Alemaya and Derash (Table 1). Although local lentil varieties are preferred by farmers, during rust epidemics farmers can lose all their crops. For the past five years, viruses like Pea seed born mosaic virus (PsBMV) have been devastating lentil crops in North Shoa due to vector activities and infected seeds. High virus epidemics was observed in SiyaDebir-Wayu and Moretina-Jiru districts and varieties showed different levels of reactions to virus infection (Table 2).



Table 1. Ranking of lentil varieties by male and female farmers in three districts, North Shoa

Varieties	Year of release*	Moretina-Jiru	Siyadebir-Wayu	Menz-Lalo
Jiru	2015	2	1	2
Alem Tena	2004	8	NA	5
Beredu	2019	4	NA	NA
Furi	2021	1	4	4
Derash	2012	5	6	NA
Debine	2021	7	5	NA
Alemaya	1998	6	3	NA
Local	NA	NA	2	3

\*NA: Not applicable

Table 2. Percent incidence of viruses on lentil varieties planted in three districts, 2022/23 cropping season.

Varieties	Moretina-Jiru	Siyadebir-Yayu	Menz-Lalo	Average virus incidence (%)
Jiru	8.0	12.0	7.0	<b>9.0</b>
Alem Tena	23.0	11.0	15.0	<b>16.3</b>
Beredu	27.0	32.0	8.0	<b>22.3</b>
Furi	10.0	14.0	12.0	<b>12.0</b>
Derash	22.0	22.0	13.0	<b>19.0</b>
Debine	12.0	22.0	10.0	<b>14.7</b>
Alemaya	15.0	22.0	7.0	<b>14.7</b>
Local	13.0	27.0	18.0	<b>19.3</b>
<b>Mean</b>	<b>16.3</b>	<b>20.3</b>	<b>11.3</b>	



Figure 0.2. Participatory lentil variety selection at vegetative (right) and maturity (left) crop growth stages.

Field days were not organized for PVS, and demonstration trials planted in 2022/23 cropping season, due to security problems (Figs. 3-4 and 6). The

performance of the trials was visited during the vegetative stages of the crops and yield data will be obtained in early 2024.



Figure 0.3: Participatory variety selection of field pea (left) and faba bean (right) planted in farmers' fields North Shoa



Figure 0.4. Participatory variety selection of food oat varieties planted at Abamotie (Left) and Mush (Right) villages, North Shoa

## Early generation seed production of cereals and food legumes

To increase availability and access to certified seed, production of early generation seed (breeder, pre-basic and basic seeds) of farmer preferred varieties of bread wheat (*Emegwa*, *Tsehay* and *Dendaa*), food barley (cvs. *HBI307* and *Hagere*), malt barley (cv. *Holker*) and faba bean (cvs. *Shewa*, *Walki* and *Hacahlu*) was carried out on 6.3 ha in two districts of North Shoa. A total of 2.13 t of nine varieties of bread wheat, malt barley, food barley and faba bean was produced for next year pre-basic seed production.



Figure 0.5. Breeder and pre-basic seed production by Debre Berhan Agricultural Research Center, North Shoa.

**Demonstration of cereal and legume varieties and foliar fertilizer application:** The performance of the demonstration trials was visited during the vegetative stages of the crops and yield data will be obtained in early 2024.



Figure 0.6. Demonstration of foliar liquid fertilizer application on faba bean, North Shoa.

## **Conclusion**

The activities were jointly implemented with ARARI, Debre Berhan Agricultural Research Centre to increase the availability of male and female preferred varieties for community seed growers. The cereal and faba bean varieties were selected by farmers through PVS by different projects in North Shoa. Through the support of SI-MFS, production of breeder seed by research center can contribute to drive scaling in the coming season and beyond. The faba bean varieties are targeted to waterlogged black soils in North Shoa.

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