Since 2006, the Syngenta Foundation for Sustainable Agriculture (SFSA) has been working with the Ethiopian Institute for Agricultural Research (EIAR) and the University of Bern (UniBern) to improve the productivity of Tef, one of the most important staple crops in Ethiopia, through developing and delivering improved varieties.

Since 2017, SFSA further invests in Tef seed system development by working with EIAR and local seed companies on the introduction, registration, and dissemination of improved Tef varieties.

The first phase of this project concluded in 2022 with the release of five improved tef varieties Tesfa, Ebba, Bora, Boni and Bishoftu.

Since 2022, SFSA also aims to build resilient and remunerative Tef value chains to support local food security and new opportunities for processed tef products in Ethiopia by increasing the capacity of local seed companies to multiply and deliver high-yield Tef seed varieties to farmers.
**CONTEXT AND PROJECT DESIGN**

**Ethiopia** is the second most populous country in Africa. Although over 80% of its inhabitants are engaged in agriculture, **food security is a major challenge.**

**Tef** (*Eragrostis tef*) is a small-grained cereal and one of the most important staple crops in Ethiopia. Despite providing **staple food** to more than 70 million people in Ethiopia, Tef is an ‘**orphan crop’**, receiving poor investment in varietal improvement and seed delivery.

Sustainable intensification of Tef production can increase local food security and open opportunities for Tef-based products in domestic and export markets.

Together, this can contribute to a more **sustainable, resilient, and equitable food system.**

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**STRENGTHEN SEED SYSTEMS OF TEF IN ETHIOPIA**

**PROBLEM DEFINITION**

1. **Lack of investment** in Tef breeding leads to low availability of improved varieties
2. **Weak seed systems** slow down farmer access to improved varieties
3. **Tef productivity** is further constrained by inefficient agronomical practices and value chain linkages

**OBJECTIVES**

1. **Use** modern, non-GM breeding techniques to develop improved Tef varieties
2. **Invest** in local seed production and link public and private organizations involved in delivery of improved genetics
3. **Identify** targeted agronomic interventions to improve tef productivity and resilience

**ACTIONS**

1. **Develop and release** new varieties with higher yields and drought and lodging tolerance traits
2. **Connect seed companies to breeders** and improve their seed production capacity
3. **Identify solutions** for row planting and mechanized harvesting/threshing

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**PROJECT AT A GLANCE**

- **Project Period**: 2006-2023
- **Outreach**: 5 new Tef varieties delivered to >300,000 farmers
- **Project Partners**:
  - University of Bern
  - Ethiopian Institute for Agricultural Research
  - Amuari Seed, Nono Seed
  - Swiss Agency for Development and Cooperation
- **Technology**: Generation of high yield Tef varieties
  - Formal seed multiplication

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STRENGTHEN SEED SYSTEMS OF TEF IN ETHIOPIA
CLIMATE CHANGE CHALLENGE

In Ethiopia, Tef is preferred by farmers over other cereals due to its higher resilience to extreme climatic conditions, such as drought and waterlogged soils during planting and crop establishment. Tef productivity (1.5 tons/ha), however, is low compared to maize yields (3.2 tons/ha). Tef is also susceptible to lodging, which is the permanent displacement of the stem from an upright position caused by wind or rain. New improved Tef varieties developed by the EIAR, in collaboration with UniBern and SFSA, display higher yield and better quality-related traits, including resistance to lodging, which can increase production and the farmer’s income and resilience.

HOW THE PROJECT IS CLIMATE-SMART

The project’s ‘climate smartness’ can be assessed according to the 3 pillars of profitability, resilience, and mitigation. The Climate-smart resilient agriculture (CSRA) benefits are highlighted in the table below and are described in greater detail on the next pages.
The use of new and improved Tef seed varieties increases resilience and productivity. Yields from Tef landraces are low compared with other cereals, and production is further hampered by lodging and drought. Within this project, five improved tef varieties, Tesfa, Ebba, Bora, Boni, and Bishoftu displayed higher yield and tolerance to lodging, drought, and diseases. As all are early-maturing varieties, they can escape adverse environmental conditions during heading and flowering and grow in relatively low rainfall areas. Together, this can increase Tef productivity and resilience under climate-related stressful conditions and increase food production in yet food insecure areas as improved Tef varieties display yield gains of 0.1 – 0.5 t/ha compared to currently used landraces.

**PILLAR 2: MITIGATION**

The development and distribution of improved varieties with better stress tolerance and productivity lead to:

- **Increased yield** per area and reduced the need of expanding farmland to grow and meet current and future food demand
- **Reduced crop loss** leading to increased input- and water-use efficiency.

Tef grain yield and aboveground biomass respond well to deficit irrigation strategies, which consist of additional watering during the grain filling phase only. This can save up to 55% of water resources.
The project offers the following profitability benefits:

1. **Higher yield** The new released Tef varieties Tesfa, Ebba, Bora, Boni, and Bishoftu all display yield gains of 0.3 – 1 tons/ha compared to currently used landraces.

2. **Reduced harvest and post harvest loss** Morphological and agronomic properties of some of the new released Tef varieties (i.e., Tesfa) allows farmers to use mechanical harvesting techniques.

3. **Higher labor and cost efficiencies** Training and improved building capacities in local seed companies will help to efficiently scale up Tef production and storage. Furthermore, a stronger connection between seed companies and EIAR will facilitate the transfer and multiplication of improved Tef varieties, and distribution to farmers. This model of intervention has already shown success. In 2021, seed production of released high-yield Tef varieties was 2/3 of the total production volume in one of the EIAR and SFSA Tef seed company partners in Ethiopia. This is sufficient to plant over 10,000 Ha of Tef seeds.

4. **Lower input cost** Seeds of improved Tef varieties is a low-cost input as it can accounts for only 2-3 % of the total production costs while increasing 10-22% the profitability.

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**STRENGTHEN SEED SYSTEMS OF TEF IN ETHIOPIA**
RESULTS TO DATE

- Registration, release, and seed production of **5 new Tef varieties**
- **Production of 2000 tons of pre-basic seed of new varieties**, sufficient to plant 150,000 ha for basic seed production.
- **Training for more than 6000 seed-producing ‘lead’ farmers**: Company personnel and other seed system stakeholders have benefited from capacity-building.
- At **least 320,000 farmers** directly profit from improved varieties (>600,000 farmers indirectly) and USD 25-60 million value is created from increased production volumes thanks to improved varieties.

STRENGTHEN SEED SYSTEMS OF TEF IN ETHIOPIA
Climate-smart resilient agriculture (CSRA) is an important strategic pillar of SFSA’s work.

**SFSA’s objective:** To help smallholders grow profits (**profitability**) while increasing their capacity to deal with shocks (**resilience**) and reducing their negative impact on the environment (**mitigation**).

### 5 CSRA DESIGN PRINCIPLES

<table>
<thead>
<tr>
<th>Adapt CSRA as starting point</th>
<th>More erratic and extreme weather events threaten teff productivity through lodging and drought</th>
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<tbody>
<tr>
<td>Become expert on target audience</td>
<td>A lack of investment in breeding and seed systems constrains farmer access to improved teff varieties to deal with climate change challenges</td>
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</tbody>
</table>
| Clarify SFSA’s role | A) Invest in and coordinate partnerships to develop new varieties  
B) Build the capacity of local partners to deliver improved varieties to farmers |
| Design for farmer profitability & accessibility | - Conduct P&L analysis to understand impact on short- and long-term profits  
- Understand cash flow implications and potential financing need  
- Ensure financial sustainability after project subsidies end  
- Improved genetics offer increased productivity and resilience with low additional input costs  
- Focus on a neglected crop with high prices and growing consumer demand |
| Ensure coherent project design | - Demonstrate how activities contribute to achievement of objectives  
- Ensure that activities are adapted to target audience  
- Set indicators in alignment with the objectives and SFSA’s role  
- Make conscious trade-offs to ensure farmer adoption |

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**STRENGTHEN SEED SYSTEMS OF TEF IN ETHIOPIA**