STRENGTHEN SEED SYSTEMS OF TEF IN ETHIOPIA

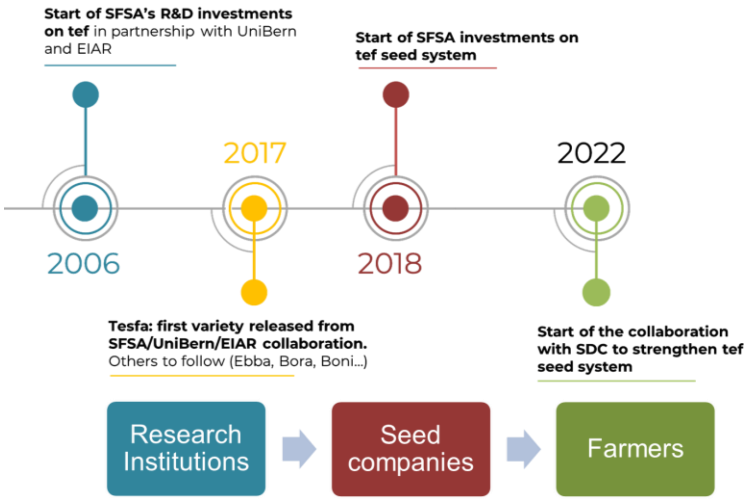
PROJECT SNAPSHOT

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.**

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

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

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.

RESILIENCE

+ Reduced crop loss
+ Increased water use efficiency and tolerance to dry climate
+ Reduced risk of harvest loss
+ Decreased production risk

MITIGATION

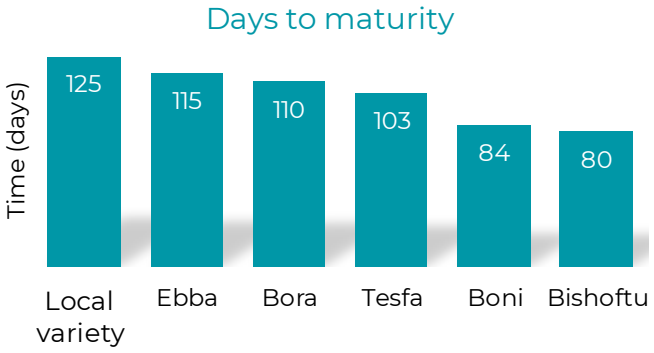
+ Increased input use efficiency
+ Improved land-use efficiency
+ Increased water use efficiency in drought-prone areas

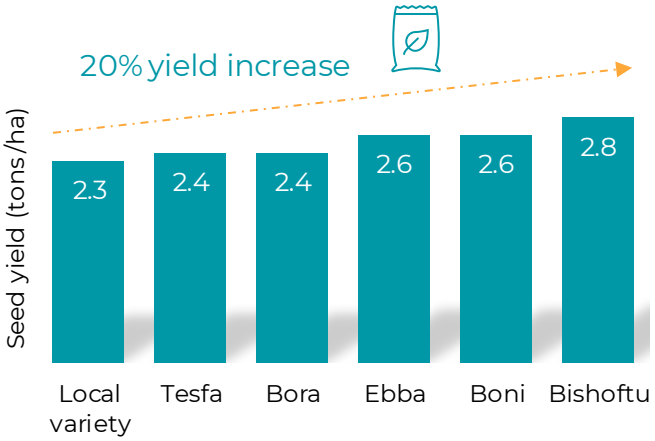
PROFITABILITY

+ Increased yield
+ Reduced harvest loss
+ Improved labor-use efficiency
+ Low investment with high benefits

PILLAR 1: RESILIENCE

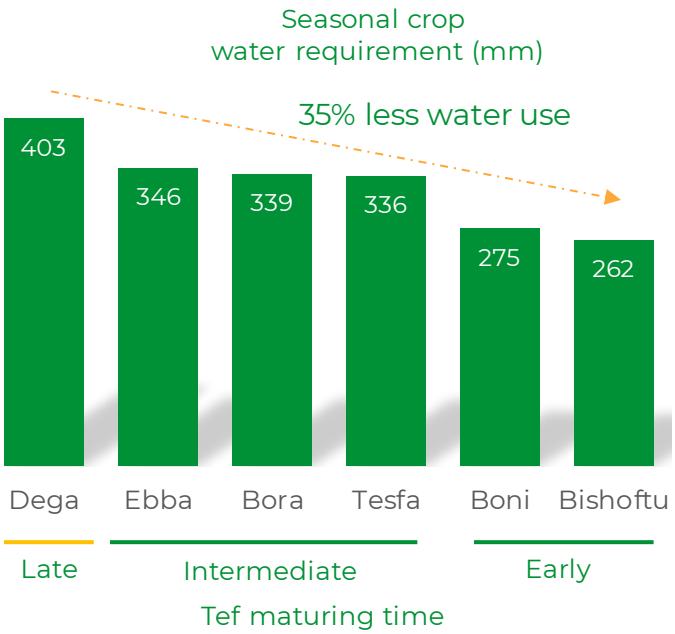
The use of new and improved Tef seed varieties **increases resilience and productivity.** Yields from Tef landraces are low compared with other cereals, and production is further hampered by lodging and drought. Within this project, five improved tef varieties, ***Tesfa***, ***Ebba***, ***Bora***, ***Boni***, **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

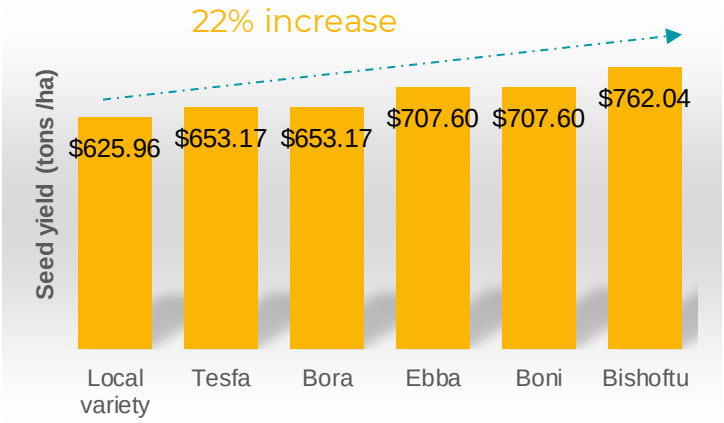
Reduced crop loss leading to increased input- and water-use efficiency.

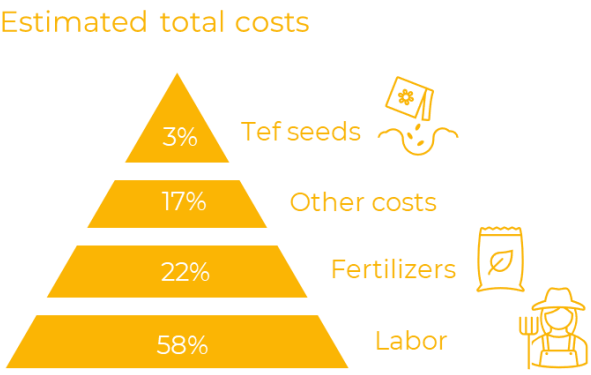
Tef grain yield and aboveground biomass **respond well to deficit irrigation strategies**, which consist of additional watering during the grain filling phase only. This can save up to 55% of water resources.

PILLAR 3: PROFITABILITY

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.





RESULTS TO DATE

Training

6000 lead farmers

Tef seed production

2000 tons

Planting area

150.000 ha

Seed distribution

320.000 farmers

Extra profit

USD 26-60 millions

- 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.

CSRA IN A NUTSHELL

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	DESCRIPTION	
 **A**dapt CSRA as starting point	- Identify most important climate challenge - Formulate objectives across the 3 CSRA pillars	- More erratic and extreme weather events threaten tef productivity through lodging and drought
 **B**ecome expert on target audience	- Define and prioritise various target audiences - Identify drivers and barriers to adoption of promoted behaviour - Integrate behavioural change into project design	- A lack of investment in breeding and seed systems constrains farmer access to improved tef varieties to deal with climate change challenges
 **C**larify SFSAs role	Clearly define SFSA's role: - R&D - Testing to drive initial adoption, Scaling / hand-over to partners	- A) Invest in and coordinate partnerships to develop new varieties - B) build the capacity of local partners to deliver improved varieties to farmers
 **D**esign 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
 **E**nsure 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	- Design of target profiles of new varieties with farmer preferences and considering factors limiting production (lodging, wind, drought). - Intervention to not just develop improved genetics but also ensure their productoion and delivery to farmers