



ICRISAT in

# Ethiopia



## Country Overview

Home to about **115 million** people, Ethiopia is the second most populous nation in Africa after Nigeria. Despite rapid growth in 2019/20, according to the **World Bank**, Ethiopia is also one of the poorest countries, with a per capita gross national income of **USD 890**. Ethiopia aims to reach lower-middle-income status by 2025.

Ethiopia is predominantly **arid, semi-arid and dry sub-humid**. Farm landscapes have highly varied slope gradients and diverse altitudinal ranges. Agriculture provides employment to over **70%** of the population and smallholder farmers produce **90-95%** of the country's agricultural output. Unsustainable cropping practices and low use of inputs contribute to soil depletion, resulting in **low yields** with **cascading socio-economic impacts**.

According to the **World Food Programme**, food insecurity and malnutrition are a major concern across the country. An estimated **20.4 million** people currently require food support. This includes **4.5 million** internally displaced persons due to the conflict in the country's north and the severe drought in the south and southeast.





## Partnerships

- **1981:** ICRISAT begins work in Ethiopia through the **United States Agency for International Development (USAID)-funded Semi-Arid Food Grain Research and Development (SAFGRAD) Project.**
- **Mid-80s:** Various farming system programs are funded largely by the **Dutch Government** in partnership with the **Ethiopian Ministry of Agriculture, the Institute of Agricultural Research, International Livestock Center for Africa and Alemaya University.**
- **2013:** ICRISAT opens a country office in Ethiopia.
- **2014-19:** Work commences on the **Yewol watershed project** funded by the **CGIAR Research Program on Water, Land and Ecosystems (WLE)** and implemented in partnership with the **Ministry of Agriculture and Natural Resources, Ethiopia and Wollo University.**
- **2015-21:** Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (**GIZ**) funds projects for enhancing **soil fertility management** and managing **soil acidity** across Ethiopia, and for **harnessing floodwater in the Afar region.**
- **2020-22:** 'Targeting fertilizer source and rate in Ethiopia' is funded by the **United States Agency for International Development (USAID)** through the **International Fertilizer Development Center (IFDC).** The project, **Enhancing resilience of Livestock-based Systems in Afar and Eastern Amhara through integrating tailored dryland innovations (ELSAT)** is funded by the **European Union Delegation through CORDAID - ICCO Cooperation** which will end in October 2022.
- **2019-23:** The ongoing project **Participatory Small-scale Irrigation Development Program – Phase II (PASIDP II)** funded by the **International Fund for Agricultural Development (IFAD)** in partnership with the **Ethiopian Government** will end in March 2023.
- **2018-23:** The **CGIAR Excellence in Agronomy (EiA) 2030 Project** and the **Geonutrition Project** that promotes agronomic biofortification strategies are funded by the **Bill & Melinda Gates Foundation** through **International Institute of Tropical Agriculture (IITA)** and the **University of Nottingham** respectively.



## Milestones

### Strengthening the local food system

A total of **51** improved varieties and hybrids comprising chickpea (**26**), sorghum (**14**), groundnut (**5**) and finger millet (**6**) were released in Ethiopia as of 2021.

ICRISAT works with local partners to integrate these crops into **local food systems** by strengthening breeding programs, seed systems, agronomic practices, value chains and the food choices of consumers.

**Chickpea yields increase threefold:** ICRISAT contributed to the release of both *kabuli*- and *desi*-types including those tolerant to devastating diseases like Ascochyta blight. Yield improved 3-4 times and surpassed **2t/ha** with yield gain of **60.4 kg/ha/year**. Market traits like seed size, color, texture and hardness improved. The crop has become one of the principal national commodities in Ethiopia. The **Tropical Legumes** project played a key role in achieving many of these impacts.

**Sorghum and finger millet productivity increases by 42%:** Ethiopia is the second largest producer of sorghum after Sudan in sub-Saharan Africa. Yields of sorghum and millet increased significantly over the last 10 years with the use of genomic technologies and improved production techniques. The **Harnessing Opportunities for Productivity Enhancement (HOPE)** project contributed significantly to the development of improved varieties.

**Overcoming constraints in groundnut production:** Groundnut is an important lowland oilseed crop. The area under groundnut increased from about **12,600 ha** in 1993 to **64,500 ha** in 2012 while its yield increased from **750 kg/ha** to **1,600 kg/ha** during the same period. A **scoping study** conducted by ICRISAT in 2019, identified poor soil fertility and lack of access to improved seed as the main production constraints, and that early maturity and drought tolerance are sought-after traits.

## Intensifying farming in crop-livestock systems

**Food, feed and fodder:** Interventions such as **intercropping, diversification, improved on-farm water management, crop rotations with legumes and introduction of fruit trees** increased yields and income in community-managed irrigation schemes in Amhara and Tigray through the **Participatory**



**Small-scale Irrigation Development Program – Phase II (PSIDP II) Project.** Improved irrigated onion production enabled **30-98%** yield increments and **15-65%** income improvements. Irrigated fodder (pigeonpea, cowpea and Brachiaria grass) around irrigation canals, farm boundaries and homesteads enabled farmers to gain **11-19 tons** of nutritious stock feed with cutting frequencies of **4-7 per year.**

**Nutrition-sensitive agriculture:** ICRISAT developed customized guides for **household nutrition profile assessments and nutrition-sensitive agriculture.** A study across sites in Oromia, Amhara and SNNP regions revealed widespread micronutrient deficiencies (vitamins A, D and calcium) with the poor being more vulnerable. Biofortified orange-flesh sweet potato and fruit showed positive results in participatory trials. Efforts to scale in collaboration with the Ministry of Agriculture and regional research institutes have commenced.

**Enhancing food systems:** Irrigation cooperatives were established to supply quality seed to farmers. The cooperative at Barneb 2 irrigation scheme in Northeastern Ethiopia was linked to the local seed certification agency to become a certified supplier of potato seed. The incomes of producer-farmers increased by **78%**. At selected sites in Amhara, Oromia and SNNP regions of Ethiopia, landless farmers formed cooperatives and became **producers and suppliers of grafted fruit seedling.** Throughout Ethiopia, ICRISAT has developed **agroecological maps for four major fruits** (avocado, mango, banana and apples).

**Growing drought-tolerant crops:** Communities in Eastern Amhara face recurrent drought resulting in low crop-livestock productivity and malnutrition. About **30-40%** of children below 5 years are stunted. **Farming and agropastoral communities and local stakeholders were actively engaged in the co-designing of seed production** of new improved nutrient-dense crop varieties and the construction of flood weirs.

At the start of the 2021 cropping season, **173 male and 115 female** farmers and agropastoralists were trained in growing 8 food and fodder crops (sorghum, millet, maize, mung bean, teff, cowpea, lablab and Napier grass) to contribute to the **seed production scheme.**



## Natural resource management

**Water spreading weir-based farming:** Afar is a drought-prone area characterized by low rainfall and high temperatures. It suffers from flash flooding from adjacent highlands.



Using flood-spreading weirs, local communities and other partners transformed the degraded grazing lands into a highly productive green valley.

At Shekayboru in Chifra, from 2010 to 2020, coverage of cultivated and vegetation land increased from nil to **44%**, and **13%** to **29%**, respectively. Bare lands decreased from **87%** to **28%**.

Beyond Afar, the practice is being scaled out in the dry lowlands of Somali and Oromia states. In Afar it can be scaled to **720,000 ha** in the wetter season and **550,000 ha** in the dryer season.





## Soil fertility and plant nutrient management research

**Integrated soil fertility management (ISFM):** Results of a soil fertility management study funded by Africa Rising, indicate that incorporation of vetch and lupin as green manure increases wheat yield by **18–26%** over fertilizer application. The residual effect of green manure could compensate for up to **33%** of the recommended rate of **78 N kg/ha**. ISFM has the potential to improve farm productivity and farmers' livelihoods, promote carbon sequestration, improve soil quality, agricultural productivity and reduce emissions.

**Acid soil management:** In Ethiopia over **40%** of the cultivated soils are acidic. Results of GIZ-ISFM funded nutrient management trials showed that the use of lime with fertilizer resulted in yield increments of **24-53%** in wheat, teff and maize in acidic soils, accompanied by a corresponding increase in pH of up to **1.3 units** and a decrease in soil exchangeable acidity and aluminium (Al) of up to **2.3 cmol/kg**.

**Improved cropping systems:** Yield benefits are high when fertilizer application is accompanied by crop rotation, green manuring and crop residue management. Intercropping of cereals with legumes can increase land-use efficiency by up to **32%**, compared to sole cropping, and sequential cropping with legumes can increase yields of cereals by **26-93%** compared to growing cereals in consecutive seasons.

**Addressing iron deficiency through millets:** In Ethiopia, teff is a preferred staple that is rich in micronutrients. Poor households who cannot afford to buy teff can substitute it with biofortified millet. Agronomic evaluation trials demonstrate that millets grown on hillslopes have higher iron and zinc. The evidence generated contributes strongly to addressing nutrition insecurity in Ethiopia.

**Site-specific fertilizer recommendations:** **Green Innovation-GIZ** has been working with national and international partners in crop variety screening for cereals and legumes and cereal/legume cropping systems to improve and sustain the quantity and quality of crop production. ISFM decision tools such as crop and soil test area-specific fertilizer recommendations contribute to improved nutrition security and enhanced soil health and productivity.

## Looking to the Future

Ethiopian breeding programs are relatively strong and ICRISAT will continue to contribute to the food system transformation agenda of the Ethiopian Government. ICRISAT played a leading role in high-end soil fertility work and implemented decision support tools. Economic implications at the farm level require significant attention, as grain and fertilizer prices at the farm gate can heavily affect the profitability of enterprises. ICRISAT is strengthening existing collaborative efforts with donors such as GIZ and EU and forging new partnerships with IFAD and FAO.

