The 'Seeds for Needs' initiative in Ethiopia: Integrating farmer and scientist knowledge

For more information about the 'Seeds for Needs' initiative, see:

- Factsheet 1
  A participatory approach for landrace evaluation
- Factsheet 2
  The crowdsourcing approach
- Factsheet 3
  Strengthening the informal seed system through community seedbanks
- Factsheet 4
  Diversity in durum wheat landraces to tackle drought
- Factsheet 5
  Molecular techniques to map farmer and breeder preferences – an innovative approach towards participatory plant breeding
- Factsheet 6
  Improving Ethiopian durum wheat landraces through breeding

Central and northern highlands production systems in Ethiopia are largely dominated by cereals. Barley, teff, durum and bread wheat are some of the most important crops, and are key to achieve food security in Oromiya, Amhara and Tigray regions. Yet, due to climatic changes the productivity of these crops is declining (IPCC, 2014). Farmers need solutions now, and might not be able to wait until breeders have gone through the long process of crop improvement. The traits farmers need could be found in the vast genetic diversity conserved at the national genebank of Ethiopia, the largest in Africa, managed by one of our partners in the initiative, the Ethiopian Biodiversity Institute (EBI). The aim of the initiative is to identify landraces of durum wheat and barley with the potential to adapt to changing climatic conditions, and make them available to farmers and breeders.

Photo: Farmers are scoring durum wheat varieties in a field trial in the Tigray Region, Northern Ethiopia.
Credit: Bioversity International/C.Fadda

The process is complex: we need to integrate scientific knowledge with farmers' knowledge and needs, and provide evidence that our research is helping farmers in their effort to adapt to climate change, and contributing to improve their food security and livelihood alongside.

We developed an approach in which farmers and scientists work together to find solutions to their problems.

After screening barley and durum wheat accessions (samples of plant material) in the genebank using a Geographic Information System (GIS) methodology, we selected the varieties that could grow well in different climatic conditions in the three regions. We then asked farmers to evaluate the selected varieties using a participatory approach.

The key challenge was to link, in a scientifically-sound way, two different sets of information: the detailed agronomic and morphological data of the varieties, with the farmers' preferences. This information could be of great interest to breeders, who could better target their efforts to meet farmers' needs. Factsheet 1 explains the approach.

Linking these sets of information helped us further narrow down the number of varieties for farmers to test under their own conditions. To better understand the linkage

Photo: Children playing near the wheat trials, Ethiopia.
Credit: Bioversity International/C.Fadda

between climatic conditions, performance and preference of varieties, we wanted to cover the broadest possible geographic areas and have as many farmers as possible to test the seeds. Hence we used a crowdsourcing approach that allowed us to easily reach farmers and get their feedback. In the crowdsourcing approach, farmers receive three varieties to blind test from a portfolio of 20 and one control variety. These mini trials allow us to involve more farmers than a typical station trial.

The initiative included 12 villages, covering an area of roughly 350 km^2. To know the climatic conditions in all villages, we used sensors called iButtons® that monitor temperature and humidity eight times/day. In each village, we installed a plot where all the varieties used in the trial are planted together, so farmers can observe and evaluate the diversity. The village coordinator was selected among the farmers through a competitive call, and a small team composed of scientists and extension agents was in charge of collecting agronomic and morphological data on the performance of the varieties. By combining weather data with the performance of the varieties, we were able to link farmers' feedback with scientific data (see Factsheet 2).

Once farmers have an understanding of how different varieties perform, they need to have access to this diversity, which is not commercially available. Consulting with farmers, we identified a sustainable solution to overcome this challenge: the creation of a community seedbank. Farmers built the infrastructure where seeds are stored in rooms below ground level to ensure more stable temperature and humidity conditions, monitored through iButtons®. The community seedbank opened in May 2014 (see Factsheet 3).

One of the main climate stresses faced by farmers is drought, so we concentrated our efforts on identifying drought-resistant varieties. This work started with the support of the Vavilov-Frankel fellowship and was conducted by Mekelle University on one of the site. This research is already providing encouraging results: we were able to identify several varieties that are more resistant to drought than the one commercially released by breeders with the same goal (see Factsheet 4).

Meanwhile, we conducted a thorough study at the genetic level for the durum wheat accessions, to have a better understanding of the genetic diversity we are using. This analysis revealed that we introduced new valuable genetic traits for climate change adaptation to farmers. Most importantly, we are trying to identify where the traits preferred by farmers are located in the genome (see Factsheet 5).

This information is also useful for a breeding programme being conducted by the Sirinka Agricultural Research Station. The programme aims to create new lines using the best material identified by scientists and farmers. Factsheet 6 explains the breeding programme and highlights major achievements so far.

Photo: Farmers at the trial field during a focus group discussion in Melba village, Hageresalam, Ethiopia.
Credit: Bioversity International/J.V.Gevel

Cover Photo: Wheat varieties grown in a field trial in the Tigray Region, Northern Ethiopia.
Credit: Bioversity International/J.V.Gevel

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