

Syngenta Foundation for Sustainable Agriculture

Review 2014-2015



“We’re tackling a huge need and a great opportunity”

Improving the orphan that feeds Ethiopia



Dr. Zerihun Tadele leads our Tef Improvement Project. He and his international team made major progress in 2014-2015. We asked him about the background to this work.

Syngenta Foundation: *What brought you into tef research?*

Zerihun Tadele: Tef is the national cereal of my home country Ethiopia. So it naturally formed a part of my plant science studies there. My first posts devoted to the topic were as a researcher in the late 1980’s and then as a National Tef Research Coordinator in the mid-1990’s.

What particularly fascinates you about tef?

For Ethiopians, tef is much more than a crop. It’s part of the national culture – a bit like cherry blossom for the Japanese, but with some key differences. Firstly, tef is vital for the country’s nutrition; about 50 million Ethiopians depend on it as their daily staple. Secondly, tef is an ‘orphan’: unlike for most cereals, there has been virtually no international research into improving the plant. So for an Ethiopian researcher like me, tef represents both a huge need and a great opportunity.

You work at the University of Bern in Switzerland, supported by our Foundation. How did this ‘Swiss connection’ come about?

The connection actually pre-dates the Tef Improvement Project (see box). I did some research in Basel in 1996-97, and completed my PhD in Botany there in 2002. I then moved to Bern as a Post-Doc. In the Swiss capital, one thing led to another, and I got the chance to work on tef again. When I approached the Syngenta Foundation, people there immediately understood the problems preventing Ethiopian smallholders from getting better yields, and were very supportive.

What are the problems that keep tef yield low?

The main one directly related to the plant is ‘lodging’. Tef traditionally has long weak stalks, and therefore falls over easily in the wind. Ethiopia is a windy country, so a lot of tef ends up lying on the ground, making it hard to harvest. Another challenge in many areas is lack of water, so breeding more drought-tolerant varieties is also important. As there has been very little international research into tef, there are relatively few data on which to draw. Among my team’s tasks has therefore been to sequence the tef genome. We accomplished that in 2014, and made the information publicly available*.

That is a major achievement. But working in a European laboratory, how relevant is your work really for Ethiopia?

We’ve borne this crucial question in mind from the beginning. If our research doesn’t help my country’s farmers to improve food security, it’s just an intellectual exercise. That is why we have cooperated closely all the way with the Ethiopian Institute of Agricultural Research (EIAR). Once we had developed tef with shorter stalks in Bern, we tested the varieties under Ethiopian conditions. We did so mainly at the EIAR site in Debre Zeit near Addis Ababa, but also at 15 other research centers across the

country. In 2014 and 2015 we have been able to select the best varieties, which we hope the government will make available to leading farmers in 2016. They will try out the new tef on their own fields, and if all goes well, then encourage their neighbors to do the same.

Widespread adoption of this 'semi-dwarf' tef would help solve the lodging problem. But what about drought-tolerance and other challenges?

The EIAR is testing several tef lines that look as if they cope better with dry conditions than the traditional sort. We should be able to make a more precise judgment in 2016. We have also started investigating the possibility of coating the tiny seeds in a uniform way to protect tef against disease.

The Tef Improvement Project has attracted a lot of media attention, and already won prizes. How has Ethiopia benefited from this side of your work?

Journalists have done a great job in drawing attention to a vital food source of which most people outside Ethiopia had never even heard. Raising tef's profile has made many Europeans, in particular, more conscious of challenges faced by our smallholders; such awareness is always valuable. Longer-term, Ethiopia may even be able to grow enough tef to satisfy some of the increasing demand for this very healthy cereal in other countries. Meanwhile, I have been able to donate prize money to a charity I started, Opportunity for Kids Ethiopia**. So indirectly, children's education is also benefiting from tef research.

* Cannarozzi et al., BMC Genomics 2014, 15:581, accessible via www.syngentafoundation.org/index.cfm?pageID=529.

** OK Ethiopia (www.opportunitykids.org) provides school supplies, clothing, educational and farming opportunities for children.



Zerihun Tadele

Born in south-eastern Ethiopia in 1963, married, two sons. Degrees from the universities of Addis Ababa, Haramaya and Basel. Institute of Plant Sciences at Bern University since 2002, currently as a Group Leader. His project website is www.tef-research.org. In his spare time, Zerihun likes to read and support the education of underprivileged children.

Tef Improvement Project

Eragrostis tef belongs to the grass family; it is closely related to small millets such as finger millet. The seeds contain high levels of protein and are free of gluten, to which many people are allergic.

Tef is a vital food source for Ethiopia, but suffers seriously from 'lodging' (see interview). To develop shorter tef less likely to fall over, Zerihun Tadele's team has used a technology called TILLING (Targeting Induced Local Lesions IN Genomes). This non-transgenic method is designed to introduce heritable variation in the tef germplasm, and identify mutant lines with relevant traits.

The Syngenta Foundation has supported the Tef Improvement Project since it began in mid-2006. In 2015, we extended the project contract for a further three years.

More information is available on www.syngentafoundation.org/index.cfm?pageID=529

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