



Finger millet with Endris closer, Bati (left) - Finger millet field with single plant root system, Kewnit (middle) - With wider spaces between rows and plants, SCI is now becoming the 'normal' way of growing finger millet. (right) Photo: Hailu Araya / ISD

SCI: Planting with Space

The use of finger millet seedlings has shown very positive results in the region of Tahtai Maichew, near Aksum, Ethiopia, as has the use of alternative management practices for a number of other crops. The principles that make up a System of Crop Intensification are now spreading through the regions of Tigray and South Wollo for a range of crops.

Agriculture, mainly rainfed and subsistence-based, is Ethiopia's main economic activity, contributing 50 percent of the country's GDP, and up to 80 percent of the employment opportunities. However, small-scale farmers are increasingly confronted with a changing climate and need to adapt their practices.

Unreliable rainfall has pressed farmers to shift their cropping patterns – especially in the most water-stressed regions. When the rainy season comes late, and as the moisture constraints become more serious, farmers shift from long growing-season crops like sorghum and finger millet, to wheat or barley, and to tef and chick pea.

This solution creates its own problems, as shifting from one crop to another is costly in kind and cash, and farmers become more likely to fall into debt and or sell their assets.

A new technique in the making

Back in 2002, Ato Aregawi Abay, then head of the Agricultural Bureau of the Tigray region, started working with the Institute for Sustainable Development (ISD) to find ways to tackle crop failure due to unreliable water supply. Knowing that Ethiopia is a drought-ridden country, we started to look for farmer practices in our project areas in Tigray that could help minimise the risk of crop failure.

When we reached the community of Sherafo we heard that its entire crop production was lost during the Great Drought of 1984/85 – except for the crop of Priest Haregot. He had taken the unusual action of uprooting his younger finger millet plants and replanting them in the moist river bed. By doing so, he obtained sufficient crop to have seed for the next rainy season.

This experience added to information we had gained from the Niger river basin in West Africa. Here, farmers raise seedlings of sorghum and pearl millet in seed beds and then plant them in their fields as the flood waters from the Niger river retreat. We built on

these two experiences to look for ways that would help farmers extend the growing season for their slow-growing crops and counter the shortage of rain or moisture in their fields. We started to look at the SRI (System of Rice Intensification) practices developed in Madagascar in the 1980s, and at the possibilities of developing a similar system for wheat or tef.

Now known as SCI, the System of Crop Intensification is based on a series of management practices. It involves directly sowing seeds, or transplanting seedlings, in compost-treated soil, with wider spacing than normal between the rows and plants.

The system is referred to by farmers as “planting with space”. Weed control is done with simple tools that disturb the soil, improving aeration. ISD have been working with farmers and local technicians to find out how SCI can be applied in the Tigray region; which crops give the best responses; and how farmers can integrate SCI into their farming practices.

A case in Tigray

Farmers in Ethiopia have traditionally relied on broadcasting as a technique for sowing all their field crops: randomly throwing seeds within marked-out sections of their field. This type of sowing is faster but not always efficient, and it can be labour-intensive, as it makes weeding and harvesting more difficult. Broadcasting results in an inefficient use of moisture, with competition between plants for water (as well as nutrients). Farmers are poorly rewarded for the resources and time used, and productivity levels remain low.

We met a group of local agricultural experts in the Tahtai Maichew woreda (district) in 2003 to address these issues. Seedlings of finger millet were raised for 30 days in a state-owned nursery and then distributed to three farmers in the Mai Berazio village area. Only one of the three had positive results, an elderly woman called Mama Yehanusu Atsbeha.



SCI requires a leap of trust – but the results are soon evident.
Photo: ISD

Mama Yehanusu planted the seedlings in a 5 x 5 metre area in a field where she had applied compost to the soil. She left 25 to 30 cm space between the plants. Meanwhile, she sowed the same variety of finger millet seeds directly into the rest of her field, by broadcasting.

The results were impressive. At an early stage, the plot of transplanted seedlings looked sparse; but later on the crop became dense with many tillers, each having longer, denser fingers (panicles) than the seed-sown plants in the rest of the field. She got a yield equivalent to 7.6 tons/ha, compared to 2.8 tons/ha for the rest of the field. Further field observations with other farmers and other crops confirmed the increased strength of transplanted, well-spaced,

row-planted crops, which had more tillers per plant. The cereals had larger seed heads and the pulses had more pods along the stem.

Local technicians and many neighbouring farmers were present when Mama Yehanusu harvested her crop. Not surprisingly, many farmers began adopting “her” way of raising finger millet seedlings before the start of the main rainy season. They have shown that Mama Yehanusu’s field was not a one-time success. In their fields and in different training centres, farmers and development agents have been able to raise the yield of finger millet to 5-7 tons/ha by raising seedlings and transplanting them. With conventional broadcasting methods, average yields remain about 1.3 tons per hectare.

Spreading the word

After meeting Norman Uphoff in 2008, and following the successful experience in Tahtai Maichew, reported above, ISD organised a series of training workshops in research stations, farmers’ training centres and on farmers’ fields. The workshops focused on the preparation of healthy seedlings and on the best way to transplant them, combined with the making and use of compost.

Farmers showed a strong interest in these approaches and many quickly started to try them out, preparing seedlings and transplanting them into small plots. They experimented with tef, other cereals and even pulses.

Tef is Ethiopia’s iconic and most popular cereal, and is grown with traditional methods, with an average grain yield across the country of 1 ton/ha. Tef has responded dramatically to “planting with space” with yields of 2.5-5.0 tons/ha being achieved in farmers’

fields. Yields of over 6 tons/ha have been observed under research conditions. Improving tef production based on SCI principles is now a major programme of the Ethiopian government’s Agricultural Transformation Agency (ATA).

In 2012, more than 50,000 farmers and 1,200 Farmers’ Training Centers were expected to use SCI for growing tef.

SCI is now becoming the “normal” way of growing finger millet. In 2011 there were 118 farmers using this technology in Tahtai Maichew alone. These practices have spread through farmer-to-farmer contact from a few in the Tahtai Maichew and La’elai Maichew woredas to other districts in Tigray and South Wollo. Trying them first on small plots, farmers are now applying SCI as standard practice for their most commercially valuable crops. The results from SCI have also convinced development agents, technicians and policy makers.

Remaining challenges

While the use of seedlings and “planting with space” are spreading rapidly, one of the main challenges is the need for continuous training and follow-up, which is beyond the capacity of ISD. This is linked to another difficulty: many farmers still do not feel comfortable with the wider spaces left between plants. There is a common perception that this is “wasted land”.

The practice allows many weeds to emerge during the early stages of the crops’ growth and involves an initial additional labour input compared to broadcasting. In a way, SCI requires a leap of trust, which needs underpinning by observation and experience, not just by words. Hence, getting farmers to experiment with the new ideas for themselves is important. SCI can help farmers to produce their crops more efficiently and address the problems of small fields, food insecurity, low incomes and climate change.



Finger millet with Hailu, Bati
Photo: Hailu Araya / ISD

To be successful, SCI needs to lead to a more predictable and increased agricultural production and reduced production costs.

Farmers are showing that SCI has the potential to greatly increase a household’s food security and reduce their costs. Its broader dissemination, however, requires support from local administrations, experts and civil society organisations. They will have to draw on their different experiences and expertise, and make effective use of their resources.

Lessons learned

In addition to increasing production, transplanting seedlings of finger millet and other crops has shown various advantages:

- Using this technique, crops become more tolerant to drought and water-logged soil;
- Transplanting seedlings reduces the amount of seed required by at least 75% compared to broadcast sowing;
- Farm labour is reduced because:
 - transplanting facilitates inter-row and interplant weed control. This enables farmers to use simple weeding tools to incorporate the weeds into the soil, boosting fertility, or collect them for animal feed. While the movement of animals for grazing is restricted during the growing season, this feed is much needed;
 - aerating the soil stimulates the growth of plant roots and benefits aerobic soil organisms;
 - harvesting by sickle becomes easier as plant growth is more uniform and the mature panicles do not get tangled up as they do in a broadcast-sown field.
- Establishing the crop in rows allows for a more efficient use of inputs (e.g. compost) which are placed alongside the seed or in the hole with the seedling rather than being spread over the whole field;
- These changes in practice can also help farmers mitigate or adapt to changes in climate because seedlings can be raised in small areas, making more efficient use of the available water. They are then transplanted when the soil is moist. Their roots grow bigger and deeper, making better use of the moisture at lower soil depths;
- Farmers in some moisture-stressed areas using SCI have also started to make water-retention structures between the rows in the fields to help maintain the soil moisture.

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