Factsheet
2018

Long-term Farming Systems Comparison Trials in the Tropics: Kenya Component

What is the contribution of organic agriculture to sustainable development?

Background, Aims and Relevance of the Project

There is continued global debate on which agricultural production systems are more productive, natural resource conserving, environmentally friendly, economically viable and acceptable by society. Many stakeholders have raised concerns about the long-term impact of conventional agriculture on soil productivity, yields and the ecosystem. Organic agriculture is one of the prominent alternative farming approaches, advocated for its benefits to health, environment and social welfare, but is generally perceived as not productive enough to meet growing food demands. The potential and challenges for organic agriculture have been demonstrated in temperate regions in Europe and North-America, but sound scientific information on the comparative performance of organic agriculture under tropical conditions is still very limited.

Experimental plots at the trial site at Thika.

To fill the knowledge gap, in 2006 FiBL started a program called the 'Long-term Farming Systems Comparison in the Tropics (SysCom)' in collaboration with local partners in Bolivia, India and Kenya. The main aim of the SysCom program is to assess the potential contribution of organic agriculture to sustainable agricultural intensification in the tropics through on-station long-term experiments (LTE) and participatory on-farm research (POR). The target groups are farmers, extension agents, academic and scientific community and policy/decision makers. The following information focuses on the project in Kenya. The research design in India and Bolivia is similar, yet with different crops and reflecting the respective local situation. The following outcomes are achieved in SysCom Kenya:

- High quality comparative data on the impacts of low- and high-input organic and conventional farming systems on soil fertility, crop yields and economic returns have been collected, published and disseminated.
- Practitioners and other stakeholders have enhanced their skills, capacity and knowledge on organic agriculture and its role, potential and limitations for improved food security.

Project Methodology

The Kenya long-term experiments are implemented at two sites (Chuka and Thika). Maize, beans, potatoes and vegetables are grown in 6-season 3-year rotation. The plots compare conventional and organic systems at low-input levels (representing smallholder farming) and at high-input levels (representing commercial farming). The long-term experiments are supported by participatory on-farm research aimed to develop locally adapted technologies. For the participatory on-farm research, farmers discuss their challenges with scientists in focus group discussions and workshops. Together they identify and develop suitable technologies that are tested in demonstration plots managed by scientists (mother trial) and on farmers' own fields under their own management (baby trials).

Highlights and most important results

The results from the long-term experiments at Chuka and Thika show that:

- Yields of maize grain and baby corn in the high- and low-input levels were similar under organic and conventional farming systems in both sites (and for the low input when crops were intercropped).
- High- and low-input organic production costs were higher than conventional ones. However, from year 3, profitability of organic was similar to conventional (without premium). With 25 to 50 % premium prices on organic products, profitability in the organic high input system was 53 % higher than the profit from the high input conventional system.
- Soil fertility (soil physical, chemical and soil microbial biomass and activity) after six years of cultivation was significantly higher in the high-input organic system compared to the high input conventional system and the low input systems; implying faster regeneration of healthier and productive soils under the organic high input scheme.
- Compared to organic, the conventional systems resulted in more nutrients being removed from the fields through harvests and crop residue removal.
- The organic and conventional systems had similar effect on soil organic carbon storage. In order to assess the long-term effects of conventional and organic land use on the carbon content of the soil, it would be important to continue the comparative trials. Results would give a better understanding of whether organic agriculture can help to combat land degradation and sequester CO_2 to mitigate against climate change under tropical climate conditions.
- The comparative studies have shown that food crops, biomass for animal feed, soil and running water from high and low input organic fields were free from bio-pesticide residues. However, those from high and low input conventional fields were highly contaminated with pesticide residues that exceeded the acceptable thresholds to the extent that it contaminates the surrounding environment including the organic field).
- The termite populations, an important indicator for biodiversity conservation and environmental sustainability, were higher in organic high input systems due to the use of organic inputs and the absence of chemical fertilizers and pesticides.
- So far, more than 800 organic farmers have been trained in various agricultural technologies. Furthermore, 8 BSc, 6 MSc, 3 PhD students are working on the experiment in Kenya and Switzerland.

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