COLLABORATIVE CROP RESEARCH PROGRAM
THE McKNIGHT FOUNDATION

Impact of agroecological techniques on soil fertility and productivity of sorghum and pearl millet in Burkina Faso

Introduction

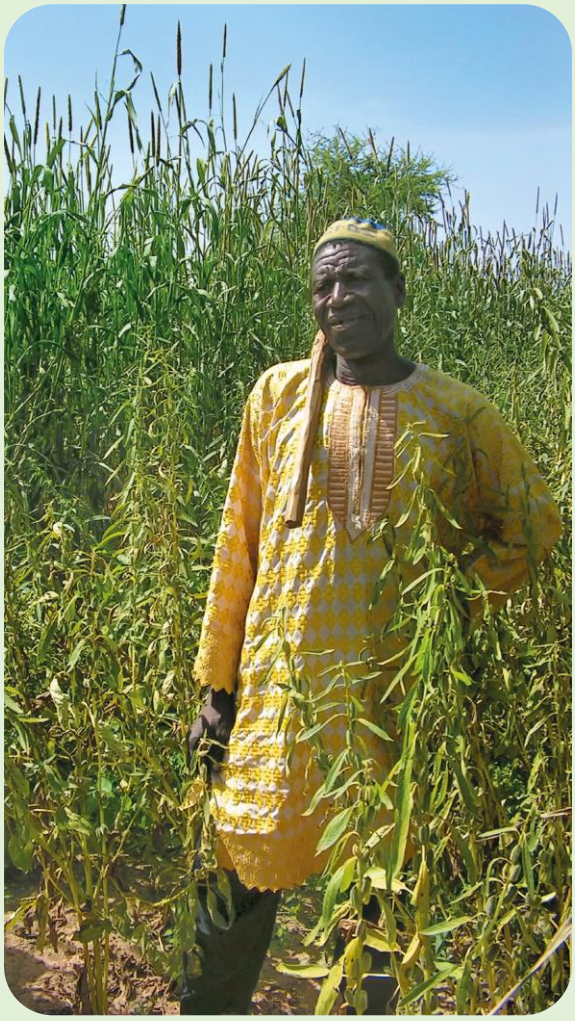

Figure 1. Farmer trainer in the project on agro-ecological intensification in Burkina Faso

Burkina Faso is a landlocked country in the Sahel whose economy is highly dominated by agriculture and livestock husbandry, with more than 70% of the population living in rural areas. The prevailing farming system is smallholder agriculture based on cereal production, especially sorghum (Sorghum bicolor (L.) Moench) and pearl millet (Pennisetum glaucum L.) which form the staple diet for the population. The two crops occupy almost 2.9 million hectares of land, however, production is constantly challenged by climate hazards, inefficient farming practices, and declining soil fertility. To address these concerns, several agroecological techniques have been developed and promoted among farmers by the project "Farmer led agro-ecological intensification in Burkina Faso". The project is financed by the Collaborative Crop Research Program (CCRP) of the McKnight Foundation.

The project is implemented in three districts located in the agro ecological buffer zone I and II in north eastern Burkina Faso that receives a rainfall of about 700mm on average per year. This buffer zone is considered ecological fragile risk prone area where food insecurity affects and is affected by degradation of natural resources. The project activities consisted of conducting tests on demonstration plots, establishing farmer field schools, training for volunteer farmer experimenters. These farmers were selected by their community members based on their dynamism, willingness to use at least 225square meters of their land for undertaking tests for own wellbeing and that of their community. This require their commitment to engage in participatory learning and sharing knowledge with other farmers in their own and surrounding villages. The objective of farmer field schools was to evaluate, in a participatory manner, the impact of these agroecological techniques on soils and crops. Another was to help local communities to understand these techniques and to adapt them, as they saw fit, in their fields with the aim of sustainably managing their lands and improving their wellbeing by increased production and income from these techniques.

Case study provided by Georges Zomboudre from INERA, Fatou Batta from Groundswell, Roger Kaboré from AMSP, and Tsuamba Bourgou from ANSD. (Contact: zomboudreg@yahoo.fr; fbatta@groundswellinternational.org; agrisahel@yahoo.fr; tbourgou@groundswellinternational.org)

Description of the Agroecology system

The study on the impact of agroecological techniques was conducted from 2013 to 2015 in a participative manner with more than 150 male and female farmers from the communities of Korsimoro, Andemtenga, Bilanga and Gayérie. Each farmer was asked to test out 2 or 3 agroecological techniques of his choice and to measure these new techniques against their usual farming practices. These techniques combined the use of organic fertilizer (5t/ha) and/or mineral fertilizer (2g/seed hole) with the systems of crop rotation and mixed cropping, in addition to the improved "zaï" technique (Figure 3) and the half-moon method (Figure 2). Zaï and half-moon pits are water collection techniques, implemented on bare and crusted soils. Additionally to the water harvest function, benefits of localized tillage occur, and animal manure or other organic and/or inorganic material can be brought in the basin to optimise crop growth. While the Zaï technique uses smaller pits of 30cm, half-moon pits consist of semi-circular basins that are several meters wide.

Figure 2. Sawadogo Salam a farmer testing the half-moon method

Micro-dosing of mineral fertilizer is a method that consists of applying small amounts of fertilizer directly into the planting hole. It is therefore supposed to reduce the required total amount of fertilizer, thereby being more affordable to small-scale farmers. Plant material was composed of local landraces and improved varieties of sorghum, pearl millet, sesame and cowpea. These improved varieties are already being promoted in the project area because of their performance such as tolerance to heavy rains, the parasitic weed "Striga" and drought, early maturity and high production potential. The productivity of these varieties and of the soil organic matter were evaluated during the course of the study.

Figure 3. Woba Diakiro farmer trainer in Mardianga - Zai techniques

Outcomes of the practices

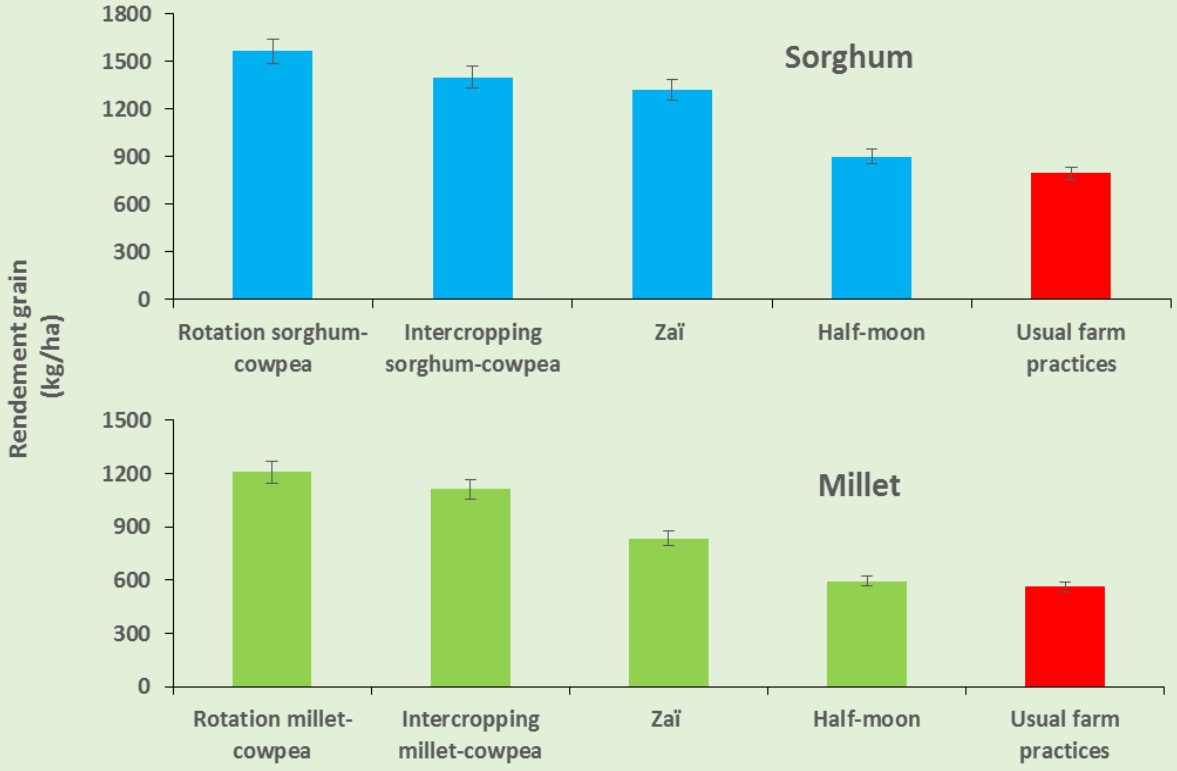

Figure 4. Sorghum and pearl millet yield from agroecological techniques compared to farmer practices in the 4 communities

On-farm application of agroecological technologies resulted in significantly increased sorghum and pearl millet production in all four communities. The rates of increase for grain yield were 8% for the half-moon fields and more than 130% for the rotation systems when compared to the farmers' usual practices (Figure 4). More limited results were achieved with the chemical components of the soil after two years of experimentation. Only the soil's organic matter showed improvement over the first year (Figure 5).

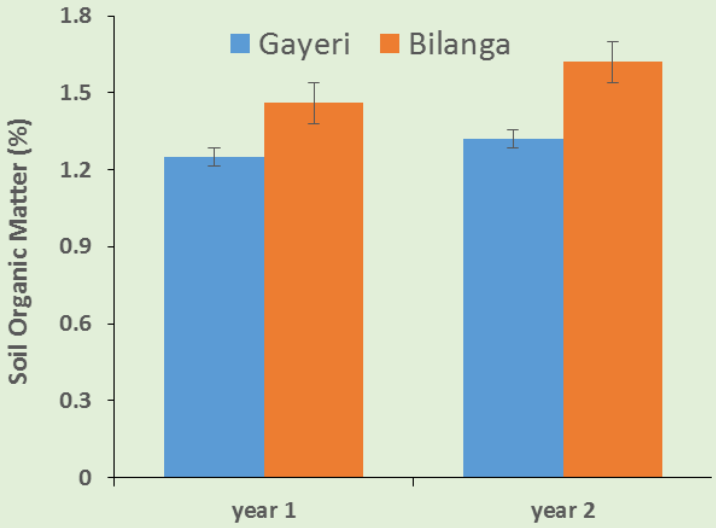

Figure 5. Change in soil organic matter rate over years 1 & 2 of trials in the communes of Gayéri and Bilanga

This study shows that crop rotation, mixed cropping and the improved "zaï" technique in combination with compost and improved drought-resistant varieties constitute agroecological strategies favorable to the intensification and diversification of farming systems in the studied locations. The farmers were above all impressed by the on-site management of compost by means of the zaï technique which enabled large-scale fertilization of fields. Through innovative "scaling out" techniques, including farmer field schools and "farmer to farmer" training, the study enabled 6,832 farmers (over 40% women) in 80 villages across 4 communities to test and adapt various combinations of Agroecological intensification (AEI) techniques. The farmers learned that the innovations of farmer managed natural regeneration (FMNR), contour rock bunds, Zaï basins, composting, legume intensification in the context of rotation and intercropping, and improved seeds best addressed their priority problems. In addition to these AEI techniques, many farmers also applied conventional micro-dosing of chemical fertilizer.

Figure 6. Naba Télindiéba in Diora half-moon with sorghum

Message from farmer to farmers

"When I started digging the zaï holes and half-moons on the clearing, passers-by approached to see if it was gold that I was looking for. When they understood what I was doing, most were disinterested and some called me mad and predicted that I would not get anything out of this land. But when they subsequently saw the performance of the space thus developed from my field, they were all surprised and began to give consideration to what I do. The next agricultural season, many have come to ask my advice"

— Message from Francois Lankoandé from the village of Tiguili, in the commune of Bilanga, province of Gnagna

Figure 7. Woman farmers during a training in agroecological intensification techniques near Fada NGourma (Burkina Faso)