

Integrated soil fertility management in practice in western Kenya

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TSBF-CIAT and its partners are working in western Kenya to develop, evaluate and disseminate integrated soil fertility management practices in which legumes are a prominent component. A substantial part of this work (figure 1) is implemented through PhD projects co-supervised by Cornell University, Wageningen University and TSBF-CIAT. A field trip by scientists from TSBF-CIAT, the Rockefeller Foundation, Kenya Forestry Research Institute (KEFRI), Moi University, Cornell University and Wageningen University to some of the research sites on 10–11 November 2003 examined the progress in these activities, discussed the way forward and gave a representative of one of the major investors, J Lynam of the Rockefeller Foundation, the opportunity to see firsthand the work on the ground.

The field trip kicked off with an introductory session in

which the visitors were welcomed by the director of KEFRI-Maseno, Dr M Gichora.

B Vanlauwe then highlighted the scope of the field trip, followed by individual presentations by the PhD candidates (D Amudavi, M Kamau, J

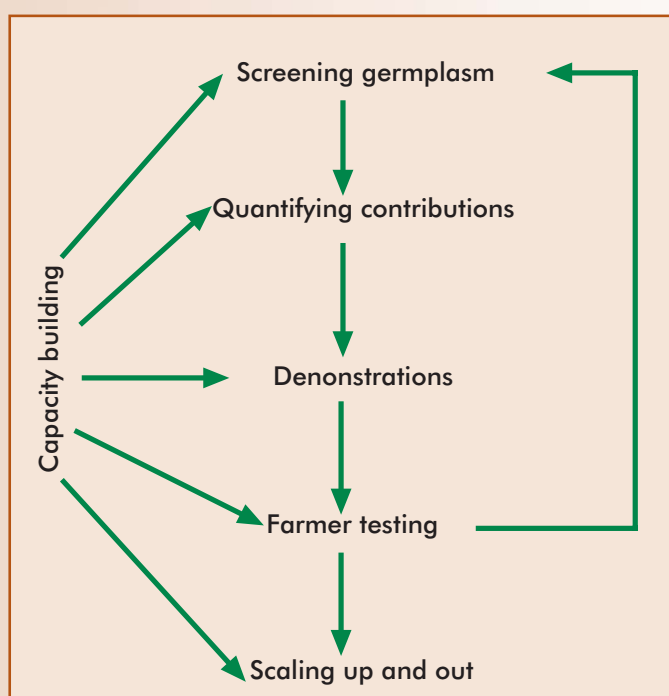


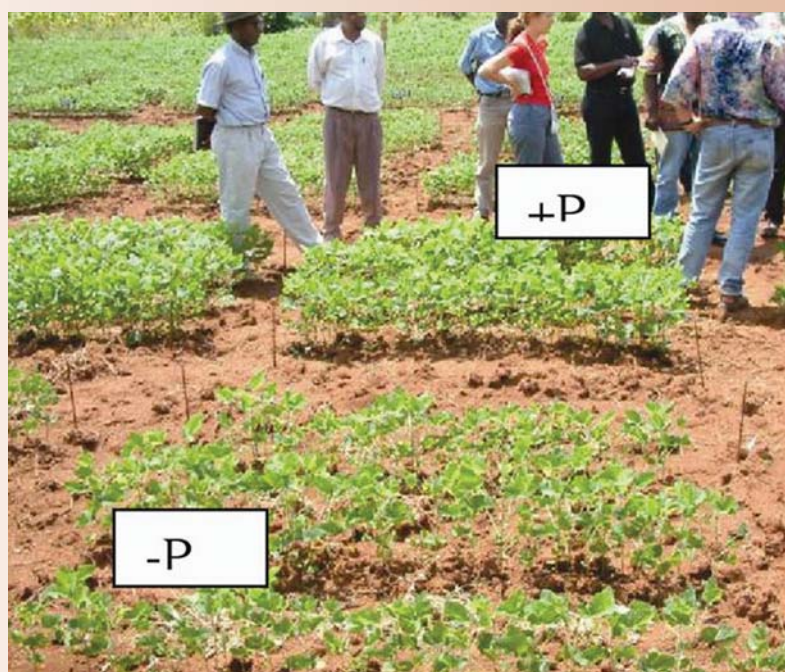
Figure 1: Components of the research process for integrating legumes into cropping systems.

Kapkiyai, J Ojiem, and T Owoiyo), describing the objectives, major activities and target sites of their projects. After these presentations, A Bationo, J Ndufa, A Pell, J Ramisch and B Vanlauwe gave an overview of the projects they were managing in western Kenya. The team then proceeded to the field sites. The various stops were organized to show the phases of the research and development process.

Screening soybean varieties in Emunyonyi

Several dual-purpose promiscuous soybean varieties (TGX 1831-32E, TGX 1895-4F, TGX 1893-7F, TGX 1889-12F, TGX 1895-6F, TGX 1869-31E and TGX 1830-20E) are being screened in Emunyonyi, Vihiga District, for the effect of phosphorus fertilizer on their nodulation, biomass production and grain yield. These varieties were bred at the International Institute of Tropical Agriculture (IITA), Nigeria, for promiscuous nodulation (that is, to nodulate with indigenous Rhizobia, avoiding the need for inoculation) and for low nitrogen harvest index (that is, to leave a net amount of nitrogen in the soil that can benefit subsequent cereals). Preliminary results show that most of these varieties retain their promiscuous nodulation characteristics and about half

of them produce a substantially larger amount of biomass while retaining high grain yield, than do local varieties (Ex-Barton and J499) at most sites screened in Kenya. This, however, is true only with phosphorus fertilizer although there are differences between lines for tolerance to low phosphorus levels.



Dual purpose soybean varieties show a strong response to phosphorus in Emuhaya, Vihiga District, but the response varies from variety to variety.

Quantifying the contribution of legumes to a following cereal in Vihiga, Kakamega and Bondo districts

Screening trials last season identified various best-bet legume varieties including various soybean varieties, pigeon pea, groundnut, beans, lablab and

mucuna currently grown on 18 farmers' fields in Vihiga, Kakamega and Bondo districts in western Kenya to quantify their contribution to a subsequent maize crop. In terms of biomass production, crotalaria, mucuna and soybean did the best.

system (legume rotation, legume intercrop or continuous maize) on crop yield, soil fertility and water use. The treatments showed varying resistance to stress from drought, which was prevalent at the time of the visit. Plots that had received conventional tilling and had

crop residues retained showed little stress from drought, but maize yields in treatments with minimum tillage and from which crop residues had been removed were strongly affected by the lack of rain.



A study in western Kenya is assessing the contribution of various best-bet legumes to a subsequent maize crop

Quantifying the contribution of tillage and rotations to crop production and soil fertility status in Nyabeda

A trial in Nyabeda, Siaya District, is investigating the impact of tillage (conventional and minimum tillage), crop residue management and the cropping

system (legume rotation, legume intercrop or continuous maize) on crop yield, soil fertility and water use. The treatments showed varying resistance to stress from drought, which was prevalent at the time of the visit. Plots that had received conventional tilling and had crop residues retained showed little stress from drought, but maize yields in treatments with minimum tillage and from which crop residues had been removed were strongly affected by the lack of rain.

Demonstrating best-bet rotations in Emunonyi and Muyafwa

In Emunonyi, Vihiga District, various integrated soil fertility management options based on legume rotations and biomass transfer are demonstrated to farming communities as part of the farmers' field school initiative. The legumes selected by the farmers' group to be included were mucuna, yellow grams and soybean. With phosphorus, mucuna and soybean had the same residual effects on maize at the Emunonyi site.

A similar set of demonstrations has been initiated in Muyafwa, Busia District, with the 'Umoja ni Nguvu' farmers' research group. This group was formed recently and is driven by the desire to improve the community's livelihoods.



These demonstrations also deal with legume rotation and biomass transfer. Biomass transfer demonstrations focus on the effects of applying organic resources of different qualities. High quality residues such as *Tithonia diversifolia* leaves resulted in the best maize crop yield, while medium to low quality biomass such as maize stover or low quality manure only marginally affected maize growth. The impact of phosphorus varied among the demonstration sites.

Farmers testing best-bet legumes in Yala

Farmers in Yala, Vihiga District, are exposed to various ways of managing striga and soil fertility decline through targeted use of fertilizer, improved maize varieties (like IR) and farm diversification in the framework of a project supported by the Department for International Development (DfID), UK. An important component of this project is the provision of credit for agricultural inputs through the Sustainable Community-based Input Credit Scheme (SCOBICS). Credit (for example in the form of fertilizer and seeds) is extended to groups comprising at least 20 farmers. The interest rate is 20%, of which 10% is returned to the project for administering the farmers' groups. There are strong links between the DfID project and Wedco, a credit provider operating in western Kenya, to ensure sustainability of



Maize and bean yields are higher after soybean (top) than after maize (bottom) in Emunyonyi, Vihiga District.

the scheme after termination of the project. Diversification is achieved through the introduction of best-bet legumes such as soybean, groundnut or crotalaria along with maize, the staple crop in most of western Kenya. The farmers are now testing some of these legumes on their own. There is a lot of interest in soybean, since the farmers appreciate its ability to provide food and cash and to improve the soil. The farmers sell the soybean crop in Kisumu, but they cannot meet the current demand.



Mr James Owino, a farmer in Yala in Vihiga District, has expanded the area he dedicates to soybean from a small plot to a large section of his farm. He is currently bulking Nyala and TGX-1448-2E varieties.

Scaling up the credit scheme for farm inputs

The SCOBICS credit scheme is in the process merging with Wedco, a microfinance organization operating in western Kenya, to ensure the scheme's sustainability. Farmers have been trained on credit management. Since farmers in the areas where SCOBICS does not operate have similar problems as those affecting farmers that SCOBICS is helping – such as the lack of phosphorus or improved seed – it was considered appropriate to expand the credit scheme to the areas where TSBF-CIAT is operating, namely Emanyonyi in Vihiga District and Muyafwa in Busia District. This is to be implemented in the next phase.

Farmers testing best-bet soybean varieties in Muyafwa

Farmers in Muyafwa, Busia District, are growing improved soybean varieties (TGX 1831-32E, TGX 1895-4F, TGX 1893-7F, TGX 1889-12F and TGX 1895-6F) on their own initiative, preferring to plant maize and bananas in the soybean plots instead of growing it as a monocrop. Farmers basically produce for the market, with a small portion for home consumption. One of their major constraints to crop production is lack of credit.



Muyafwa in Busia District farmers are organized around farmer research groups for more effective dissemination of information. These groups interact with other farmers through activities such as field days and cross-site visits. One of the tools for disseminating knowledge about improved soil management is songs and poems. Songs and poems have been written about the management of nitrogen, phosphorus and striga and the use of organic resources.

A farmer in Muyafwa, Busia District, has incorporated maize into his soybean field, as maize is the major food security crop in the area.

Scaling up and out phase

Scaling up ISFM options through farmer-to-farmer interaction in Vihiga and Busia districts

In both Emunyonyi in Vihiga District and



Farmers from Emunyonyi, Vihiga District, have composed songs about the various options for enhancing nitrogen status of the soil, specifically mentioning the use of soybean, tithonia and tephrosia.

Supporting farmers' research activities: the folk ecology project in western Kenya

Joshua Ramisch

Farmer-led research on soil fertility management has been a key approach in TSBF-CIAT activities since the mid-1990s (figure 2). In 2001 farmers in four communities in western Kenya (Bukhalalire and Muyafwa in Busia District, Akites in Teso District and Ebusiloli in Vihiga District) decided to organize their research groups into farmer field schools (FFS) through which they meet at a central place twice a week with one of the days committed to field visits and the other to discussion and brainstorming. These research groups began as part of a project funded by the

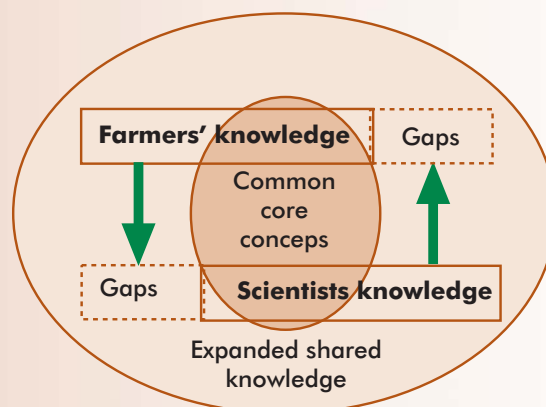


Figure 2: The principle of the folk ecology project is to have farmers and scientists enrich each others knowledge on soil fertility.

International Development Research Centre (IDRC) on community-based learning and innovation in soil fertility management. The research activities began in 2001 concentrating on enriching the local knowledge on soil ecology (informally known as 'folk ecology') and building capacity to experiment and demonstrate ISFM concepts.



Field days provide the opportunity for local farmers and visitors to talk about new approaches and their successes and challenges. This group is visiting a legume-cereal rotation plot that was part of the Muyafwa farmers' groups' 2003 experiments.



Planning and analysis of experiments are done collectively. Newcomers have many opportunities to learn from longer term participants both formally and informally.

Initially all the four FFS wanted to test and demonstrate to other farmers the different fertilizing effects of organic materials of different qualities. High, medium and low quality organic materials, based on the classification of the TSBF organic resource database (ORD), were applied to test plots, together with inorganic inputs of nitrogen on its own or nitrogen with phosphorus. Some plots did not receive inorganic inputs. The sites, which were managed collectively by each FFS, generated considerable interest and debate. This exercise provided many farmers with their first opportunity to appreciate the benefits provided by different organic materials. It also highlighted the important role that inorganic inputs can play in combating the phosphorus deficiency of local soils.

One of the concerns raised about the

resource-quality experiments was that 'high' quality materials are scarce at the local level. Most farmers also consider biomass transfer approaches to be extremely labour-demanding, even if they improve crop yields dramatically. The subsequent FFS learning activities, therefore, have sought to test and demonstrate the potential of more attractive technologies, such as multiple-purpose legumes in rotations and local manure of improved quality.

The round of FFS activities completed in 2003 was the most diverse yet. More than 200 farmers tested a wide range of legumes, including soybean, yellow grams, groundnuts and mucuna. The aftereffects on maize and bean crops were carefully monitored and the most promising varieties of soybean were bulked by the field schools for their members and new groups to plant in 2004.