15 Enhancing the Impacts of Research in Soil Management – Development of Practical Tools in the Hillsides of Eastern Uganda[1]

Yuelai Lu[2], John McDonagh[2], Onesmus Semalulu[3], Michael Stocking[2], and Charles Owuor [3]

Abstract

The dearth of practical tools for local professionals (LPs) for use in identifying and targeting appropriate technologies for client farmers has limited the impact of soil management research. This chapter presents research aimed at bridging the research and development gap in soil management through the development of tools with which the LPs can work better with farmers. The scope of the tools was defined through household surveys, group discussions, and stakeholder workshops. With a strong emphasis on visualisation and the use of local indicators, the developed tools are practical and resource light, so that they are able to address the diversity and complexity of local circumstances as well as the resource constraints to the LPs. On-farm experiments by farmers were encouraged and facilitated by LPs and different adaptation strategies were observed. An active partnership between farmers, LPs, researchers, and local officials proved to be an important factor for the successful application of the tools developed in the research. Further research challenges are the development of approaches for exploring more technical options for soil management and strengthening and mobilising elements of local social capital important for soil management at the community level.

Introduction

The goal of soil management research is to make positive impacts on rural livelihoods through sustainable utilisation of soil and other natural resources. Soil degradation is recognised as a major threat to rural livelihoods in sub-Saharan Africa and is ranked high on regional and national agendas (Dejene et al. 1997; Casey and Donovan 1998; MFPED 2000; Sanchez 2002). However, research and technical progress in soil management have made less impact than they should in tackling the problems and many comment on the poor uptake by farmers of promoted soil management practices (SMPs) (Bunch 1999).

[1] This research is funded by the Natural Resources Systems Programme (NRSP) of the Department for International Development (UK) (DFID) under Project R7517

[2] School of Development Studies, University of East Anglia, Norwich, NR4 7TJ, UK

[3] Kawanda Agricultural Research Institute, National Agricultural Research Organization (Uganda) (NARO), Kampala, Uganda

al. 2001; Scoones 2001; Lu et al. 2002). However, tools and approaches for describing and analysing this complexity and then incorporating this into development practice are resource demanding (Baltissen et al. 2000; Bunch 2000). Acknowledging the resource constraints under which LPs operate in eastern Uganda it would seem appropriate to focus on 'resource-light' (that is, simple, fast, and easy to access and use) options more realistic for LPs working today and to avoid 'resource-heavy' approaches wherever possible.

One way to reduce the resource demands of the tools and approaches is to make them more locally relevant, which includes the localisation of content as well as format. This was achieved by means of a livelihood survey and a series of workshops that assessed the local demand for soil management services, thereby defining the required scope of the interaction between LPs and farmers.

A household survey in the project areas showed farmers to be different in many ways – in their access to resources, in their perceptions of soil degradation, and in the constraints they experienced in crop production (Lu et al. 2002). These differences are apparent at the levels of household, community, village, and district. Farmers living on steep slopes, having experienced rapid soil fertility decline due mainly to erosion, view the worsening soil condition as their greatest constraint. In less steeply sloping areas where decline in soil fertility has occurred over a long period of cultivation, farmers are more concerned by the lack of inputs for crop production. The constraints to crop production were ranked differently by farmers with different wealth status (Table 15.1). Farmers' wealth status was classified based on criteria identified by farmers during a participatory wealth-ranking exercise. These included land area, types of crops and management levels, age and composition of family members, off-farm activities, and education levels. Rich farmers were more concerned about the physical constraints and shortages of labour while poor farmers were more concerned with financial constraints relating to input shortages and limited access to land. These and other differences explain why farmers manage their land differently and this complexity has to be catered

Table 15.1: **Constraints to crop production ranked by different groups of farmers**

Site	Wealth status	1st	2nd	3rd	4th	5th
Kapchorwa	R	Poor soil conditions	Pests and diseases	Lack of labour	Lack of input	Poor marketing facilities
	M	Poor soil conditions	Pests and diseases	Lack of inputs	Lack of labour	Lack of land
	P	Poor soil conditions	Pests and diseases	Lack of inputs	Lack of land	Lack of labour
Mbale	R	Lack of labour	Poor soil conditions	Pests and diseases	Lack of input	Theft
	M	Pests and diseases	Lack of inputs	Poor soil conditions	Lack of labour	Unfavourable weather
	P	Lack of inputs	Poor soil conditions	Lack of land	Pests and diseases	Unfavourable weather

Note: *R – rich, M – medium, P - poor

Table 15.3: **Knowledge and tools required by LPs working in the field**	
Objectives	**Knowledge and tools required by LPs**
Problem identification	**Knowledge** • signs and symptoms of erosion and soil fertility decline • livelihood characteristics of the community **Tools** • field methods for identifying problems (nutrient deficiency and land degradation guides) • protocols for holding group meetings, area walks, identifying and prioritising soil problems in the community • deciding what sort of activities are required (primarily teaching or farmer-led experimentation) • economic analysis tools
Participatory learning	**Knowledge** • soil structure, function, and processes, roles of main nutrients, causes and effects of common soil problems **Tools** • aids for teaching farmers in signs and causes of soil problems – posters and other visual aids, resource flow mapping techniques • protocols for holding structured group meetings and prioritising soil-related problems
Solutions identification	**Knowledge** for different problems to understand the • extent to which they can be resolved • current approaches to resolving them • most appropriate generic solutions and a number of adaptations farmers may like to experiment with • costs of adopting the solutions (land, labour, cash, knowledge) **Tools** • decision support tools
Fine tuning	**Knowledge** • guiding principles for on-farm experimentation, simplicity, small size, reducing variation, isolating variable of interest. **Tools** • framework and protocol for facilitating, monitoring, and evaluating farmers experiments • inputs (seeds, seedlings, contour measuring instruments, fertilisers) in small quantities to give to farmers for experimentation

The use of localised visual indicators improves the communication between LPs and farmers. When LPs use the visual field assessment tools in their work, farmers can easily identify particular soil-related problems and management options. Furthermore, local indicators help farmers link soil fertility status to other crop production constraints that are important in formulating intervention measures. This, in turn, improves the participation of farmers in problem assessment and identification of the solutions. Furthermore, this encourages the mutual learning through sharing of knowledge between farmers and LPs. For example, when discussing the symptom of nitrogen deficiency, farmers listed a number of factors which they thought were connected to the problem, including weed invasion, drought, and dense planting; indeed all these related factors not only explained why nitrogen deficiency occurred, but also indicated some of the possible measures for alleviating the problem.

Table 15.4: **The reasons for farmers' adoption of SMPs (%) in Mbale and Kapchorwa districts, Uganda**

	Napier grass strips	Mulching	Planting trees	Contour bunds	Cover crops (*Mucuna*)	Compost/ farmyard manure	Crop rotation	*Sesbania* hedges	Trenches/ ditches	Fertiliser application	Contour planting
Maintain and improve fertility	9	46	26	10	79	74	74	56	24	71	
Erosion control	37	19	7	76		8		8	44		100
Increase yield	4	6		5	4	15	19	17		29	
Produce fodder	33		7	1	4			17	32		
Conserve moisture	5	10		8		2	3				
Fire and construction wood			52								
Weed control		12			8						
Increase income	3	8	4								
Mulching material	5										
Reinforce bunds	3										
Improve soil structure					5	1					
Retain sediment	1										
Pest control							4				
Shade			4								

Table 15.5: **Fine tuning the SMPs to fit the specific situation**		
Recommended method of implementation	**Actual method of implementation**	**Reasons for modification**
Bunds Mark out and leave the bunds when ploughing	After ploughing, plant napier grass and sunflower along the contour to form bunds; construct bunds after weeding and planting; reinforce and maintain the bunds that were already established	Easy to make when labour is available.
Compost making Apply after ploughing; apply during dry season when fields are being prepared; spread in the field during ploughing	Apply around plants; around the banana stool or in hole during planting; apply whenever compost has accumulated	To reduce labour for carrying to the field; compost is in short supply; expected benefit to the crop will be more rapid; apply whenever it is available to avoid being washed away by rain.
Fertiliser application Diammonium phosphate (DAP) at planting, urea at the knee height for top dressing	Did not apply DAP at planting, only applied urea for top dressing; planted with DAP but no top dressing	Lack of money for both DAP and urea; dry spells interfere with top dressing timing; field was still fertile and there was no need for two applications
Mulching Apply mulch across the banana plantation, not touching the stool; use any available vegetation materials	Using dried banana leaves and pseudo stems; mulching is done after harvesting maize; arranged mulch during weeding	When mulching material is in good supply; simplify the procedure
Residue incorporation Plough back residue during ploughing	Arrange residues in a line before ploughing; residues from beans taken to the banana plantation	Maize stover makes ploughing difficult; A lot of residues from beans are available after threshing beans.

interpreted, farmers' priorities can be addressed at the same time as improvements in soil management are made.

Good Partnership

A good partnership between researchers, LPs, and farmers is regarded as an effective way to understand and handle the complexity and diversity of local conditions. One of the important components of this research is the fostering of partnerships.

The partnership in this project is built up at two levels. First the project team is a partnership, which includes researchers, extension officers, and farmers as active team members. The second-level partnership is the professional linkage between the research team and other stakeholders. Table 15.6 lists the partners and the nature of the partnership established by the project. Farmers are the key informants in identifying and assessing soil fertility-related problems; farmers make the final decisions on which type of soil management should be undertaken; farmers lead the fine tuning of the on-farm research process; LPs are the facilitators supporting farmers' soil management decisions and the partnership they have with formal researchers (NARO) allows them to

In order to enhance the application of the tools and approaches developed in this project and overcome the constraints as identified above, stakeholders (LPs in particular) have made a number of recommendations:

- generating more technical options to fit with the different situations (social, economic) of farmers;
- concentrating on identifying and developing multi-purpose options;
- establishing small demonstration plots at district farm institutes (these centres are increasing in importance with the decentralisation of the agricultural support and research services);
- mobilising local politicians' support, with village, parish, and sub-county councillors involved in the process;
- strengthening existing community bye-laws promoting better land management and formulating new bye-laws, for example for controlling grazing on farm land;
- mobilising grass roots level community groups where resolutions can be made and implemented effectively;
- adopting a catchment approach, particularly for soil conservation;
- blending new management recommendations with what farmers are currently doing, for example, it is easier for farmers to adopt compost making if they are already applying animal manure in their field;
- encouraging those techniques for which the necessary materials are locally available.

These and more challenges could be addressed during the scaling-up phase of this work.

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