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Bridging research and development in soil fertility management: Practical approaches and tools for local farmers and professionals in the Ugandan hillsides.

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## **Abbreviations and Acronyms**

AHI	African Highland Initiative
CIAT	International Centre for Tropical Agriculture, Cali, Columbia
DAO	District Agricultural Officer
DFI	District Farm Institute
DFID	Department for International Development
LP	Local Professional
MECDP	Mount Elgon Conservation and Development Project
NARO	National Agricultural Research Organisation
NRSP	Natural Resource Systems Program
ODG	Overseas Development Group
RA	Research Assisstant
SFM	Soil Fertility Management
SWC	Soil and Water Conservation
TSBF	Tropical Soil Biology and Fertility

## 1. Executive Summary

This research was located in the eastern Ugandan hillsides with the purpose of *developing means for local professionals (LPs) to identify "best bet" and "win-win" technologies targeting them to relevant communities and households through the use of improved biophysical and socio-economic analytical tools and approaches*. The project focused on improving the capacity of LPs to work with farmers on soil management and involved a group of LPs directly in the research. The outputs address in particular the systems, problems and management options most relevant to poor subsistence farmers in the study region. Thus there was a strong poverty focus.

To achieve its purpose, the project produced the following outputs:

1. An integrated understanding of local and formal research-generated knowledge on soil fertility management/soil and water conservation (SFM/SWC) measures and their implications and resource requirements for farmers' implementation.
2. A package of tools and approaches for assessing soil fertility status, identifying appropriate SFM/SWC options and supporting farmers efforts to experiment with and fine-tune SFM/SWC management options to fit their circumstances and needs.
3. Communication of project results and identification of pathways and mechanisms for effective scaling up of outputs.
4. Increased institutional capacity for effective Research-LP collaboration in SFM/SWC in the project area.

Project activities included:

- Needs assessment activities to determine the nature of the demand for soil related support to LPs.
- A literature review conducted to facilitate the research planning, help define the scope of the responsibilities of LPs and establish a framework for the development of new tools and approaches in soil management.
- Two surveys. The first, to document local livelihood strategies, perceptions and knowledge around soil and the local context in which outputs were to be developed and tested. The second, an uptake and adoption survey attempting to evaluate the uptake, adoption and adaptation by farmers of SFM/SWC options provided by LPs working with R7517.
- A number of workshops were held with different formats and purposes: identifying needs, reviewing and monitoring progress, testing and refining the products, and reporting/disseminating project results.
- Field testing of the products with modification made to the products on the basis of this testing.
- Farmer-led on-farm experimentation to test and refine the tools and approaches and help achieve the "targeting" element of the project purpose.

The contribution of research outputs to project goal can be summarised as follows:

- The tools and approaches developed and tested by this project are of proven value to LPs in eastern Uganda.
- The resource guides produced integrate relevant research-generated and local knowledge in a format accessible to local professionals and some farmers.
- The project products link soil assessment activities to options for soil management in ways particularly relevant to low input systems and poor farmers, and focus on the priorities identified by local LPs.
- Researchers, district and sub-county officials, LPs and farmers were all involved in the development, testing and evaluation of the project outputs and there is a strong sense of local ownership as a result.

## 2. Background

The goal of the project was to generate benefits for poor people in target countries through the application of new knowledge in natural resources management in hillside production systems. This goal is a key feature of the environmental conservation strategies of tropical hillsides in general and is aligned with the development priorities of Uganda (Uganda 2001).

The importance of soil fertility management/soil and water conservation (SFM/SWC) in agricultural production is recognised generally (e.g. Deugd *et al.* 1998) and also specifically for hillside areas (e.g. Gardner 1997). Past failures in promoting improvements in SFM/SWC have been dramatic and it is now recognised that new approaches need to be participatory, interdisciplinary, locally based and sensitive to people's problems and priorities, combining resource conservation and livelihood improvement (Ghai, 1992; Ashby *et al.*, 1999; Ellis-Jones, 1999)

This research project was devised in response to DFID's NRSP called on research to help local professionals to identify 'best-bet' and 'win-win' strategies for soil fertility management. In the case of Uganda, local demand for the project was indicated by needs assessment studies (reviewed in the project proposal), with demand confirmed by the project inception workshop. Specifically:

- i) Soil fertility decline and increasing land degradation are recognised as major problems in the densely populated Ugandan hillsides (Briggs *et al.* 1998, Semalulu *et al.* 1999). There is a direct relationship between food security and rural livelihood development and problems of land husbandry such as SFM/SWC.
- ii) The lack of access for farmers and local professionals to research-generated knowledge on SFM/SWC. There has been little or no impact at the farmer level from much of the past research in soil management indicating that the linkages between research activities/outputs and development are functioning poorly.
- iii) The lack of practical tools and methodologies enabling local professionals to advise farmers on appropriate soil nutrient management and degradation control practices.
- iv) Specific demands from LPs for practical diagnostic kits to help them identify soil and crop problems, in particular, nutrient deficiencies.
- v) A feeling that the contact between researchers and local professionals is limited or, in many cases, non-existent and that much of the available information is out-dated or inappropriate for the environments in which local professionals and farmers are working.
- vi) A feeling that the information local professionals and farmers have is often too general and available in a rather inflexible format such that adapting and fine-tuning management options to specific conditions is not possible.

(McDonagh *et al.*, 2000a, Annex B).

The focus of R7517 also fits well into the context of poverty reduction in Uganda. Uganda is one of the low income-economies in SSA and is among the poorest countries in the world. Poverty is most pronounced in the rural areas, particularly in the north and east and this contributes to food shortage; child malnutrition; frequent illness and high rates of HIV/AIDS (MFPED, 2000); and widespread illiteracy. Although there has been an overall decline in numbers of poor in recent years, farming households still account for 80.6% of the total (Appleton, 1998). Current macro policy in Uganda has a strong poverty focus (Uganda 2001), particularly in the agriculture sector (Uganda, 2000).

Addressing SFM/SWC will contribute positively to the nation's poverty reduction efforts through sustaining agricultural production. Agriculture is the mainstay of the national economy, accounting for 44% of the GDP, 90% of exports, and employing 80% of the national labour force in 1996.

Farming is the primary source of income for most Ugandans with, on average, rural households deriving nearly three-quarters of their income from crop farming. Smallholders dominate the agricultural sector with over 90% of crop production occurring on household farms averaging less than 2 ha (EIU, 1997).

There have been several recent attempts to produce ‘tool-kits’ for LPs in soil management (e.g. Defoer et al. 2001, Gachimbi et al. 2002). However, most of recently produced tools and “tool-kits” are very demanding of the time and resources of the LP. The LP community is generally poorly resourced and it was our intention in this project to develop “resource-light” tools and approaches that could realistically be adopted by most LPs without dramatic increases in levels of resourcing and support.

### **3. Project Purpose**

The purpose of the project was defined as *means for local professionals to identify "best bet" and "win-win" technologies developed and targeted to relevant communities/households through use of improved biophysical and socio-economic analytical tools and approaches*. The focus of this research was on improving the capacity of LPs to work with farmers on soil management. We undertook to involve LPs and farmers in the research (i.e. the development and testing of the tools and approaches) from the very beginning of the project, and to establish a researcher-LP-farmer linkage to ensure that the tools and approaches were developed in line with local needs and capacity, and were relevant to different groups of farmers. The main guiding principle in the research was to produce tools and approaches that could be used with a minimum of resources and training (Annex A, section 1.3). This strategy ensured LPs would feel confident in adopting them and using them effectively but also greatly improves the opportunities for potential scaling up of outputs to the wider LP community.

## **4. Outputs**

### **4.1 Planned Outputs**

The planned outputs of the project (revised after the MTR, Quin, 2001, Annex J) were as follows:

1. An integrated understanding of local and formal research- generated knowledge on SFM and SWC gained. The implications and resource requirements for farmers’ implementation understood.
2. A package of tools and approaches for assessing SF status, selecting/fine-tuning SFM options and assessing the position of farmers viz. a viz. SFM developed and locally tested.
3. Results of project disseminated and wider applicability investigated and identified.
4. Institutional capacity for effective Research-LP collaboration in SFM in Uganda increased, particularly in project area.

### **4.2 Actual Outputs**

The project fully achieved its planned outputs.

#### **4.2.1 Output 1**

This output aimed to improve the project team’s understanding of local and formal knowledge concerning SFM and SWC so that they could develop and test appropriate soil management tools and approaches. The MOVs for this output included a literature review (McDonagh *et al.* 2000b, Annex C), a field/situation survey report (Lu *et al.*, 2000, Annex D) and an assessment of the implications and resource demands of soil management options currently practised or potentially suitable in the research area (Tables 12 and 13, Lu *et al.*, 2003b, Annex E). Though not explicit in the wording of the output the understanding gained was used to help define the nature and extent of the tools and approaches required by LPs (McDonagh *et al.* 2000b, Table 2, p 5,

Annex C). This generated a framework important in guiding the research of R 7517 and its subsequent focus, which was the development of tools to:

- i. identify and assess the importance of soil-related constraints
- ii. identify or develop new management options most suitable for addressing these constraints from both a technical and a socio-economic perspective
- iii. identify farmers with different characteristics and tailor advice and management options to each of these
- iv. facilitate farmer experimentation and fine-tuning of soil management techniques

Shortly after the review was finished it became clear that (iii) above was probably not a realistic objective and not compatible with the guiding principle of R7517 to produce tools that were straightforward for an LP to use (section 3 above). The project did not, therefore, try to develop tools for identifying and supporting different recommendation domains in farming communities. In place of this, increasing emphasis was placed on (iv) above as the research team appreciated the potential that farmer experimentation has to allow farmer-led fine-tuning and selection of soil management options to fit with farmer circumstance. The rationale for this change in research emphasis is elaborated in (McDonagh *et al.* 2000b, section 1.3, Annex A).

The understanding of the team continued to improve after the activities associated with this output (see section 5 below) had finished, for example, as additional relevant studies were located or published or as the team learned from its own research activities. Where relevant the research team did take account of this additional material when developing its products.

#### **4.2.2 Output 2**

A number of tools were developed and tested addressing the four categories aspects defined in output 1 (see i) – iv) above, also, Annex C), though as mentioned above, iii) was not emphasised. These tools are collected together in a two part Resource Guide (Lu *et al.* 2003 a & b, Annexes E & F) and have the following features:

- They are largely visual with simple format and text supported by figures, photographs etc.
- They are locally relevant with local indicators, images (photographs) and management options incorporated where possible.
- They are practically oriented, linking field assessment of a problem to intervention recommendations.

Twenty-three visual information sheets were produced covering the categories of nutrient deficiency identification, soil erosion assessment, options of soil fertility management and financial assessment of different options (Resource Guide Part II, Annex F). These visual guides have proven effective in facilitating the communication between LPs and farmers on the issues of soil fertility management.

Accompanying the visual guide, a more detailed manual was produced (Resource Guide Part I, Annex E) primarily designed to give the technical background to some of the soil-related issues and processes dealt with in Part II and also as support material for LP training and so an important potential resource for scaling up R7517 outputs. In addition to the technical information regarding soil fertility management, Part I also includes a number of participatory methods for collecting and analysing relevant information for soil fertility management, such as yield trend analysis, financial appraisal of soil management options, protocols for on-farm experimentation etc. These methods have been illustrated with local example(s) from the project work.

Fifty copies of parts I and II of the resource guide have been distributed to relevant individuals and institutions (listed in Annex I).



A brochure was produced summarising the background, approaches and outputs of the project (copy submitted with report). One hundred copies of the brochure were distributed to relevant institutions through Kawanda Agricultural Research Institute and at project workshops.

### 4.2.3 Output 3

The results from the uptake and adoption survey carried out with farmers in the project communities (Annex G) indicated there had been impact as a result of R7517 activities. Specifically:

- Increasing engagement of people with soil conservation (Figure 1, p 3, Annex G);
- Increased reliance on extension officers compared with the initial survey results

This survey also indicated:

- The value farmers attach to multipurpose management options
- Some examples of farmers modifying/fine-tuning practices to suit their specific situations.

Farmers were satisfied with the overall performance of these SFM/SWC measures. The most popular SFM/SWC measure was trenches/ditches, which received a 100% satisfaction rating from farmers who implemented the measure; a lower score was given to mucuna, where 67% of farmers were satisfied with its performance (see Table 6 in Annex G)

The project results, mainly output 2, were communicated to a wide range of stakeholders at and around the results communication workshop and feedback was collected. The applicability of project results was investigated from two aspects: firstly the value of the results and secondly, options for scaling up results and outputs.

The following Table summarises the feedback from the 31 participants at the project workshop (Lu *et al.*, 2003, Annex H). This represents an indicator of the wide applicability of project results. The workshop participants clearly felt that R7517 outputs could be useful for a wide range of different stakeholders.

**Table 1. Applicability of project products identified by different stakeholders**

<b>Value of the project products</b>	<b>Uses of the project products</b>	<b>Potential users of the project products</b>
<ul style="list-style-type: none"> <li>• Simple and properly illustrated</li> <li>• Relevant to situation on the ground</li> <li>• Community participation indicates a sense of ownership of the tools</li> <li>• Durable packaging</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitating farmer participation in identification of soil fertility problems and solutions</li> <li>• Teaching, training material for short courses, farmer field schools etc.</li> <li>• Sensitizing local leaders, farmers</li> <li>• Africa 2000 Network<sup>1</sup> (NGO) and similar training programs</li> </ul>	<ul style="list-style-type: none"> <li>• NGOs, Training institutions for agriculturalists (e.g. Makerere and Nkozi Universities and National agriculture colleges)</li> <li>• Students</li> <li>• All extension and service providers</li> <li>• Farmer fora in NAADS districts</li> <li>• Community leaders</li> </ul>

<sup>1</sup>one of the most active NGO networks in the region

The following suggestions for improvement and scaling up project products were identified at the work-shop and these can also be used as an indicator of potential application of project results:

- Include information from other agro-ecological zones and more crop species in addition to banana and maize

- Further disseminate the products in formats that can be easily and widely disseminated (posters, calendars, booklets etc.).
- Integrate policy issues to advocate formulation and re-enforcement of relevant bylaws
- Translate into local languages (this was not done automatically as the products were developed for use by LPs who are competent in English)
- Make the project products available to educational institutions including schools and agricultural training colleges/universities and research organisations
- Create a cheap, small and easy to carry package.

These proposed options represent different dimensions of scaling up but many comments emphasised the importance of making the products available to key national institutions.

Other evidence of wider applicability of research results include:

- Project R7962 will use the tools to train local project staff and extension workers in Kenya;
- Researchers of Makerere University and TSBF/CIAT in Uganda are interested in use and further development training materials based products from this project;
- The NAADS co-ordinator of Tororo District is interested in using the materials for extension workers training courses. He also believes there is likely to be a broad demand for these products to support NAADS training activities in other districts.

The last point above represents a real and important entry point for R7517 products into the NAADS framework – the new private sector extension system in Uganda. With the demand expressed by District NAADS co-ordinators and District Agricultural Officers (DAOs – they work closely with the NAADS co-ordinators or perform a combined role) it would be straightforward to organize soil management training workshops for prospective private sector LPs at District Farm Institutes (DFIs). These LPs would be largely ex-extension service field officers and NGO soil management personnel. The Resource Guide (Parts I and II, Annexes E and F) would be introduced and discussed with field visits to train in use of the guides. In this way the outputs could be scaled up quite quickly to other districts. It is hoped that, with the newly structured NAADS/NARO systems there will be a mechanism for LPs and farmers to access the inputs required by some of the SFM/SWC options suitable for farmers in the project area, in particular seeds and planting materials. These could be provided through DFIs but national level commitment to bearing at least some of the costs of this would be required.

#### **4.2.4 Output 4**

To increase the institutional capacity for effective Researcher-LP-Farmer collaboration, R7517 fostered a good partnership between these three stakeholder groups. This process was initiated by involving all stakeholders at the project inception workshop and maintained by involving LPs, farmers and local officials actively in the development and testing of the tools.

This research fostered the Research-LP-Farmer partnership at two levels. Firstly the project team comprised a tight partnership between researchers, extension officers and farmers. The second level of partnership was the professional linkage between the research team and other stakeholders summarised in Table 2. Farmers were key informants in identifying and assessing soil-related problems, making the final decisions on soil management activities and leading the fine-tuning/on farm research process. LPs were the facilitators supporting farmers' soil management decisions and the partnership they had with researchers (NARO) allowed them to do this effectively. The presence of a research assistant (RA) on an almost continuous basis in the research area was important for R7517 because the tools and approaches were being developed and tested and it was important for the research team to have high quality feedback from the field (via the RA). Scaling up of outputs would probably be more successful if there were RAs (or some form of research presence) at sub-

county level and in the field but the resource costs of introducing this tier of LP backstopping would be prohibitively high. A more realistic vision for scaling-up would consist of researchers, based at district farm institutes (DFIs) running workshops training LPs in the use of the tools and approaches and then offering some (likely quite limited) form of back-stopping support from the DFIs. It is to be hoped that some form of public sector research presence at district level emerges from the current institutional restructuring to allow these effective Research/LP partnerships to form.

**Table 2. Partnership established through the project**

<b>Project Team</b>	<b>National Institutions (NARO, MECDP Universities, AHI)*</b>	<b>Local Institutions (DFIs, DAOs)*</b>	<b>LPs (extension officers, NGO workers e.g. A2N)</b>	<b>Farmers</b>
Included researchers from international and national institutions, LPs, and farmers willing to participate in the project	As active team members; informed about the objectives of the project; some research products were targeted at national institutions	Involved in the development and modification of the tools; participated in workshops and field visits; integrated project field activities into other programmes	Active team members, linking farmers and researchers; developed and utilized research products	Actively involved in the project, shared their knowledge on soil assessment and management, tested and modified soil management options.

\*NARO – National Agricultural Research Organisation; MECDP – Mt. Elgon Conservation and Development Project; AHI – Africa Highland Initiative; DFI – District Farming Institute; DAO – District Agricultural Office; A2N – Africa 2000 Network.

## **5. Research Activities**

A variety of research activities were carried out in order to achieve the above outputs. Detail of site selection is given followed by the research activities listed under the corresponding outputs.

### **5.1 Selection of research sites**

Working with representatives from the District Agricultural and Production Offices from Mbale and Kapchorwa and with staff from MECDP, eight villages in four sub-counties were identified as the most appropriate areas in which to focus project activities. The sub-counties were Bududa and Butiru in Mbale District and Chesower and Sipi in Kapchorwa District and details of the villages are given in Table 3. Access, degree of involvement with existing NGOs etc, cropping systems, land-use intensity and type/degree of soil related problems were important criteria in making this selection.

**Table 3.** Characteristics of villages in which R7517 was working

Districts	Sub-counties	Villages	Main features
Kapchorwa	Chesower	Bisho	High altitude, maize as the main crop, erosion and fertility problems widespread.
		Kongta	High altitude, maize as main crop, erosion and fertility problems widespread.
	Sipi	Kewachesit	Medium high altitude; banana and coffee as main crops, mainly inter-cropped; erosion and fertility problems widespread
		Kabore	Medium high altitude; banana and coffee as main crops, mainly inter-cropped; erosion and fertility problems widespread.
Mbale	Bududa	Namaitu	Medium low altitude, banana, coffee as main crops, intensively cultivated on steep slopes up to top of the hills, soil erosion and fertility problems.
		Bunembe	Medium low altitude, banana, coffee as main crops, intensively cultivated on steep slopes up to top of the hills, soil erosion and fertility problems widespread.
	Butiru	Buwopuwa	Foot of Mt Elgon, much drier than other villages, sandy and stony soils, continuous cultivation, low fertility, mainly annual crops of maize, beans, sweet potatoes, cassava, cotton, sorghum, very few banana. Slightly larger land-holdings than other villages.
		Bukhasusa	Part of the village is on steep land on the slopes of a nearby hill and part is flat. Soils on the upper parts have been cultivated for about 15 years, still relative fertile but suffer from severe erosion and fertility decline. Soils in the lower parts have been cultivated for many years, and fertility is low. A lot of banana here but somewhat more annual crops: beans, maize & sorghum.

## 5.2 Output 1.

### 5.2.1 Inception workshop

This two-day workshop was held on the 7<sup>th</sup> and 8<sup>th</sup> of March 2000, with the following objectives (McDonagh *et al.* 2000a, Annex B):

1. Review current research, extension and adoption of improved SFM/SWC practices;
2. Identify the gaps within research, extension, implementation and feedback;
3. Identify the types of tools/approaches most needed locally; and
4. Clarify/modify planned project research activities accordingly.

The workshop brought together 26 participants with a wide range of backgrounds and experience including extension workers, NGO personnel, District Agricultural Officers (DAOs), and researchers.

### 5.2.2 Literature review (Annex C)

The primary objective of the review was to facilitate research planning for this project. In content and structure it therefore addressed the project objectives and in some places had a Ugandan or "hillsides" focus. However, much of the review was more widely relevant to Sub-Saharan Africa where smallholder farmers and local professionals (LPs) are confronted with soil-related production constraints and management issues.

The review defined the scope of LPs work with farmers on soil management, and identified areas where tools and approaches needed to be developed and tested. It also identified:

- the requirement for a broad perspective on soil management (p 3)
- the importance of characterising the “LP” and recognizing their constraints (p 4)
- the nature and extent of the tools and approaches required by LPs (Table 2, p 5). This generated a framework important in guiding the research of R 7517 (discussed above, section 4.2.1).
- the need for tools to help to educate farmers as well as identify appropriate soil management options (p 6)
- the value of tools that help link soil related indicators to severity of a soil- related problem (p 8) or link form of management to impact (p 15)

- poor accessibility of information to LPs e.g. in relation to nutrient deficiency identification (p 10)
- the value of locally important indicators (p 12).

The review documented relevant existing approaches in developing tools LPs working with soil management in the field.

### **5.2.3 Field (Situation) Survey**

The purpose of the survey was to understand local perceptions and knowledge around soil and the local context in which the tools and approaches were to be developed and tested. The survey centred on the following aspects of farmers and farming systems:

1. The basic characteristics of the farmers which may influence soil management
2. The current productive activities and soil management measures practised by farmers and their assessment of the effectiveness and weakness of these practices.
3. Farmers' perspectives on the main problems in crop production, and factors preventing them from addressing problems in the way they would like.
4. The sources and types of technical information on soil management currently available to and expected by farmers.

The survey report highlights the important findings that the demands of the community sampled were consistent with the purpose and developing approach of the project i.e. the resource poor nature of most of the community; the high ranking given to soil related production constraints, the feeling that they were not well served by the extension service; the general non-engagement with promoted soil management options, across the different wealth categories.

It was found that there is obvious variation between households in their access to assets (labour, land, techniques, capital etc.) and livelihood strategies, and this variation affects soil management practice in a number of ways. Farmers perceive soil erosion/soil fertility decline as one of a number of constraints to crop production. The resources a farmer devotes to soil management will depend partly on the magnitude of other production and livelihood constraints. Farmers are naturally more interested in measures that provide quick returns and that are less input demanding or for which required inputs are locally available. Farmers' interest in potential interventions depends on their perceptions of constraints and resources available. Clearly, resource poor farmers are the least able to make large investments or take a medium to long term view in their soil management.

Farmers also provided a long list of local indicators regarding different soil problems. These indicators were used in the development of the tools for field assessment.

Although farmers tend to obtain soil management knowledge from multiple sources including parents, fellow farmers and schools, the extension service was given as an important but failing source of new information. Any tools and approaches that help LPs communicate better, will therefore be of direct benefits to farmers.

### **5.2.4 Assessment of soil management options**

Through District level workshops (see 5.5 below) with farmers, extension workers, district and sub-county officers, different soil management options were reviewed and assessed in terms of their objectives, limitations, resource requirement, accessibility constraints, and the scope for their modifications for use in the Ugandan hillsides. The indicators and criteria used for the assessment were agreed through the discussions between different stakeholders and included labour, cost etc. The results of the assessment were tabulated and can be used as decision-support tool in selecting appropriate interventions. (Table 12, p 29 Lu *et al.* 2003a, Annex E).

## **5.3 Output 2.**

### **5.3.1 Tool Production**

The first drafts of the tools and field sheets in the Resource Guide (Annexes E and F) were produced by the UK researchers. Text and images were either taken from secondary sources or formulated/provided by the research team. Production and design was guided by expressed demand and the guiding themes summarised in section 4.2 above, in particular the need to be simple, locally contextualized where possible and for the field guides to be very visual. For Part II (Annex F) it was typical for the first draft of individual sheets to be rejected as too complex by the LPs working with the researchers and for it to require re-drafting before being tested in the field. Drafts then presented at the District research workshops and were refined or field tested until the final format was agreed.

Several formats for Part II were experimented with. Some (e.g. those depicting soil erosion) were produced as posters (A3 or A2 size) and used successfully by LPs as visual aids at village meetings (some examples attached to FTR). All were produced as laminated A4 size sheets in a waterproof field binder (Annex F) to which additional sheets could be added. These were produced at relatively high cost in the UK (approx. £5 per guide) but these costs would be substantially less if produced in the region (e.g. Nairobi) with little or no compromise in quality.

### **5.3.2 Workshops**

Village and District workshops were key activities for the development, testing and discussion of project products. Village workshops were held regularly in the project villages (three times a year on average) with participation of researchers, extension workers, village leaders and farmers. These workshops allowed the researchers and LPs to test some of the tools and approaches with farmers and receive feedback from these activities and more generally from LPs working in the community. Village workshops were conducted in conjunction with farmers' field visits. District research workshops were held when each round of village workshops was completed, with the participation of researchers, extension workers responsible for the project villages, district agricultural and production officers, and MECDP staff. The district workshops enabled the project team to synthesize the specific situations and experiences from each of the project villages and integrate this information into the process of refining the tools. With the active participation of local agricultural officers, the district workshops also brought in the views of local leaders and policy makers.

### **5.3.3 LP field activities**

Four extension workers (one for each of four sub-counties in which the project worked, details in Table 1) worked full time with the project. As far as possible they followed their normal patterns of work but tested and used the tools and approaches being developed by R7517. In reality they have almost no budget for the most basic operational costs e.g. travel to villages so it was necessary for the project to facilitate their work by paying their operational costs and field allowances. These were paid at the rates paid as standard by Government and long-standing NGOs working in the area. The project also helped the extension workers to address some issues of real concern in their communities by paying some of the labour costs required to implement a particular measure (e.g. building soil traps to control gully erosion on roads or fields). These activities were sponsored primarily to improve the standing of the extension worker in the community (in some cases this was low at the start of the project) and so act as entry points for testing the project products. The project RA had regular contact with the extension workers in the field, providing them with support and the research team with a means of regular, reliable contact with the field activities.

An important part of the project approach was the development of an approach for LPs to support farmer experimentation. The process consisted of: (i) a meeting held with villagers at which a range of SFM/SWC options were introduced with farmers deciding which option(s) they would like to try; (ii) necessary planting materials were provided (e.g. Napier cuttings, cover crop seeds); (iii)

extension workers and farmers worked on a simple research design and implementation plan; (iv) regular visits were made by extension workers and other interested farmers to monitor the progress of the trials; (v) at the end of the season farmers working on a particular theme, issue or practice would meet for a discussion on the progress and results of their activities, facilitated by the LP/researcher.

### **5.4 Output 3**

An *Uptake and adoption survey* was held in November 2002 towards the end of the project surveying 15 households in each of the eight villages in which R7517 had been active (Annex G). There were some problems with the implementation of the survey. Unfortunately this meant that this survey did not target the same individuals surveyed in the situation survey (Annex D) so a direct 'before and after' project comparison was not possible. It was also not possible to track the impact of individual products e.g. guides on research protocols or separate the positive impact of the project outputs from the impact of having enthusiastic and active extension workers after several years of a very poor service.

A *Results communication workshop* was held in April 2003 (Lu *et al.* 2003d, Annex H) The purposes of the workshop were to report to the stakeholders the project achievements and outputs; assess and evaluate the project products; identify the gaps in the project outputs; identify potential users, and the strategies for the wider dissemination and application of the project outputs. There were 31 participants at the workshop, representing the 5 broad stakeholder groups of researchers, university staff, government officers, NGO workers, and extension workers. The findings are discussed above in section 4.2.3.

## **6. Environmental assessment**

**6.1** Project activities have resulted in greater engagement of farmers with soil management (Annex G) and the environmental effects of this are thought to be wholly positive (i.e. reduced soil degradation).

**6.2** Wider dissemination and scaling up of project outputs would lead to reduced soil degradation and increased positive environmental impact.

**6.3** The rate of adoption of improved SFM/SWC measures is the most direct indicator of this positive environmental impact. The survey in November 2002 in the project villages showed that 60% of currently implemented SFM/SWC measures were adopted after 2000, *i.e.* since the project started (see Figure 1 in Annex G).

**6.4** No follow up, other than scaling up of R7517 outputs, is recommended by the research team.

## **7. Contribution of Outputs**

The goal of the project was defined as *improved hillside farming strategies relevant to the needs of marginal farmers developed and promoted.*

The outputs have a clear poverty focus in that they address improved soil husbandry, emphasising crops, problems and forms of management most relevant to poor marginal farmers. The main achievement of the project was to provide soil management tools and approaches that are accessible to local professionals i.e. they do not require unrealistically high levels of training or resources to use effectively. These outputs address a demand expressed by LPs and start to fill a huge gap in material support available to LPs in Uganda and more widely in sub-Saharan Africa. R7517 outputs do not completely fill this gap but using the same approach additional materials, particularly for use

in the field, could be added to the package of products to allow them to be used in different systems, for different management options etc. It is hoped that an improved capacity to manage soil more effectively could directly improve the productivity, food and livelihood security of all groups of people in areas where R7517 products are available.

By the end of the project LPs in NGOs, district offices and government agencies in the project areas were aware of the project outputs. Those directly involved with the project were using them and others took copies (sometimes multiple copies) at the results communication workshop (Annexes H and I) for testing. There was insufficient time between this dissemination of results and the end of the project for feedback from this wider testing to be sought.

The results of the uptake and adoption survey (Annex G) demonstrate that farmers had a much greater interest and involvement in soil fertility management at the project end than at the start of the project. It is impossible to say how much of this effect was directly due to the project products rather than due to the higher level of general activity and enthusiasm from the LPs as a result of their association with the project. However, the specific impact on soil management, does suggest the ability of LPs to provide support in this area was increased.

Feedback from the results communication workshop indicated broad approval of the project products and a number of suggestions were made for extending the use of the products beyond that originally intended (Annex H).

Researchers, district and sub-county officials, extension workers and farmers were all involved in the project activities and the benefit of this research partnership and resultant local ownership of the outputs was specifically noted and commented on by participants at the results communication workshop. The value of this strong partnership, the focus on the LP (rather than the farmer directly) and the emphasis of R7517 on building LP capacity and the capacity of NARO to support LPs were all widely recognised as valuable elements of the project approach. It is to be hoped that NARO will place increasing emphasis on supporting LPs in the future and that LPs will, whenever possible, seek to strengthen their links with research institutions. A supportive policy environment is required, however, if the Research/LP support model is to become widespread in Uganda e.g. by recognizing the need for research presence and research/LP interaction at District level.

In addition to the dissemination of products to a large number of potentially interested individuals and organizations in Uganda (recipients listed in Annex I) the products have been lodged electronically in country with the NARO research partners and are available on request. Possible routes for scaling up R7517 products include:

- a) Collaborating with NAADS to offer training in soil management to LPs at District Farm Institutes. This would be the most useful and achievable means of promoting the project outputs within Uganda in the short term. It emerged as an option during discussions with Mr J Kalange, Tororo District NAADS coordinator who saw it as a very useful way of giving soil management support to private sector LPs within NAADS. He also believed there would be demand for this in all Districts as soil management has been identified as a “cross-cutting” issue under NAADS i.e. all LPs would need to be able to give support in this area (Kalange, personal communication). There is also scope for working in similar ways with other private or public institutions responsible for supporting the work of private sector extension providers. At project end it was still unclear who would be responsible for this.
- b) There is potential for integrating and consolidating the work on soil management tools and approaches with two other groups engaged in similar work in Uganda: The Soil Science Department of Makerere University, Kampala and the CIAT/TSBF team based at Kawanda, Kampala.



c) The materials produced could be used as training and education materials for use by several institutions, in addition to NAADS districts mentioned above: Makerere University in training new extension staff; NARO outreach sections (if this division survives re-structuring) working with farmers and local service providers at district and sub-county level and they could possibly contribute to the national school agricultural curriculum.

## 8. Publications and other communication materials

### 8.1 Book chapters

**Lu, Y., McDonagh, J., Semalulu, O., Stocking, M. and Nkalubo, S. 2002.** Bridging research and development in soil management: matching technical options with local livelihoods. pp 309-316 In: Jiao Juren (ed.), *Sustainable Utilization of Global Soil and Water Resources*. Vol. 3. Beijing, China: Tsinghua University Press.

**Lu, Y., McDonagh, J., Semalulu, O., Stocking, M. and Owuor, C. 2003.** Enhancing the Impacts of Research in Soil Management-Development of Practical Tools in the hillsides of Eastern Uganda. In: Stocking, M., Helleman, H. & White, R. (eds.) *Renewable Natural Resources Research for Mountain Communities*, Kathmandu, Nepal: ICIMOD (forthcoming).

### 8.2 Journal articles drafted for publishing

**Lu, Y., McDonagh, J., and Semalulu, O.** Adoption and Adaptation of Soil Management Practices.

**McDonagh, J., Lu, Y. and Semalulu, O.** Soil management in Africa: a lighter touch.

### 8.3 Conferences/workshops papers

**Lu, Y., McDonagh, J., Semalulu, O., Stocking, M. and Nkalubo, S. 2002.** Bridging research and development in soil management: matching technical options with local livelihoods, presented at *12th International Soil Conservation Organization Conference, Beijing, May, 2002*. 8pp [paper published as book chapter Lu *et al.* 2002, above]

**Lu, Y., McDonagh, J., Semalulu, O., Stocking, M. and Owuor, C. 2003.** Enhancing the Impacts of Research in Soil Management - Development of practical tools in the hillsides of Eastern Uganda Paper presented at the *Symposium on Renewable Natural Resource Management for Mountain Communities, Kathmandu, February, 2003*. 11pp: ICIMOD [paper published as book chapter Lu *et al.* 2003, above]

**O. Semalulu, C. Owuor, McDonagh, J. and Lu, Y. 2002.** Proposed Tools for Dissemination of Soil Management Technologies in Uganda, presented at *Eastern Africa Soil Conference, December, 2002, Mbale*, In Press.

### 8.4 Extension brochures and posters

One brochure and two posters were produced detailing project approach and results (copies attached).

### 8.5 Manual and guidelines

**Lu, Y., McDonagh, J. and Semalulu, O. 2003a.** Soil Management in Eastern Uganda Hillsides. Practical tools and approaches, Part I Technical background. Overseas Development Group, University of East Anglia and Soils Division, Kawanda Agricultural Research Institute, NARO, Uganda. 51pp.

**Lu, Y., McDonagh, J. and Semalulu, O. 2003b.** Soil Management in Eastern Uganda Hillsides. Practical tools and approaches, Part II Visual Guides. Overseas Development Group, University of East Anglia and Soils Division, Kawanda Agricultural Research Institute, NARO, Uganda. 24pp.

### 8.6 Project reports

**Lu, Y., Semalulu, O., Nkalubo, S.T. and McDonagh, J. 2000.** Bridging research and development in soil fertility management. Field Survey Report, December 2000. Overseas Development Group, University of East Anglia and Soils Division, Kawanda Agricultural Research Institute, NARO, Uganda. 11pp.

**Lu, Y., McDonagh, J. and Semalulu, O. 2003c.** Soil Management in Eastern Uganda Hillsides. Practical tools and approaches, Uptake and adoption survey report. Overseas Development Group, University of East Anglia and Soils Division, Kawanda Agricultural Research Institute, NARO, Uganda. 9pp.

**Lu, Y., McDonagh, J. and Semalulu, O. 2003d.** Soil Management in Eastern Uganda Hillsides. Practical tools and approaches, Results reporting workshop report. Overseas Development Group, University of East Anglia and Soils Division, Kawanda Agricultural Research Institute, NARO, Uganda. 17pp.

**McDonagh, J., Lu, Y. and Semalulu, O. 2000a.** Bridging research and development in soil fertility management. Project Inception Report. 15pp.

**McDonagh, J., Lu, Y. and Semalulu, O. 2000b.** Bridging research and development in soil fertility management. Literature review. 41pp.

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- Uganda 2001.** Poverty eradication action plan (PEAP), 2000-2003. Kampala: Ministry of Finance Planning and Economic Development.

## 10. R7517 Project logframe

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Assumptions/Risks
<p><b>Goal:</b></p> <p>Improved hillside farming strategies relevant to the needs of marginal farmers developed and promoted (HS Output 1)</p>	<p><b>By 2002</b>, new approaches to the maintenance and improvement of soil fertility validated in two target areas</p> <p><b>By 2003</b>, this new knowledge incorporated into strategies to increase the local availability of food and/or fodder supplies and adopted</p>	<p>Reviews by Programme manager</p> <p>Reports of research team and collaborating /target institutions</p> <p>Dissemination of products</p> <p>Local and international statistical data</p> <p>Data collected and collated by programme manager</p>	<p>Target beneficiaries promote systems and approaches.</p> <p>Enabling environment exists.</p> <p>Budgets and programmes of target institutions are sufficient and well managed.</p>
<p><b>Purpose:</b></p> <p>Means for local professionals to identify "best bet" and "win-win" technologies developed and targeted to relevant communities/households through use of improved biophysical and socio-economic analytical tools and approaches</p>	<p><b>By 2003:</b></p> <p>Local professionals in NGOs, district offices and government agencies are aware of and beginning to use new tools and approaches developed by the project</p> <p>Farmers demonstrate a greater interest and involvement in soil fertility management.</p> <p>Target institutions regularly search for "best-bet" and "win-win" technologies for soil fertility management.</p>	<p>Final Technical Report</p> <p>Annual reports of local professionals and target institutions.</p> <p>Future PRA surveys and needs assessments of local farming groups.</p> <p>Programme Manager's reviews</p>	<p>Enabling environment for adoption of new strategies exists.</p> <p>Target institutions remain interested in, prepared and have the resources to adopt new analytical tools.</p> <p>Favourable political conditions continue in support of work of local professionals.</p>
<p>1. An integrated understanding of local and formal research- generated knowledge on SFM &amp; SWC gained. The implications and resource requirements for farmers' implementation understood.</p>	<p><b>By project end</b> LPs understanding the principles of land degradation/soil fertility decline and the main options for dealing with them.</p> <p><b>By project end</b> project team and collaborating partners able to make practical assessments of soil fertility problems and potential solutions in relation to farmers' circumstances.</p>	<p>Project reports.</p> <p>Plans made for field testing together with collaborators.</p> <p>Review document of local and formal research-generated knowledge on SFM and SWC.</p>	<p>Information required for the review available and accessible to project team.</p>

<b>Outputs:</b>	<b>OVI:</b>	<b>MOVs:</b>	<b>Assumptions/Risks:</b>
<p>2. A package of <b>tools and approaches</b> for assessing SF status, selecting/fine-tuning SFM options and assessing the position of farmers viz. a viz. SFM developed and locally tested.</p> <p>3. Results of project disseminated and wider applicability investigated and identified.</p> <p>4. Institutional capacity for effective Research-LP collaboration in SFM in Uganda increased, particularly in project area.</p>	<p><b>By Oct 2001</b> project field activities have resulted in the active participation of local professionals and farmers in the context of Eastern Uganda hillsides.</p> <p><b>By Dec 2002</b> tools and approaches for assessing improved SFM options being tested and refined.</p> <p><b>By Dec 2002</b> LPs able to use resource profile information generated from their own experience and project wealth-ranking to attempt to ensure one or more SFM/SWC options accessible to all categories (wealth) of client farmers.</p> <p><b>By Oct 2001</b> Instruments and mechanisms for dissemination of package of tools and approaches designed.</p> <p><b>By Dec 2002</b> Pathways for scaling-up the research findings to a wider range of situations identified.</p> <p><b>By June 2002</b>, all LPs have helped to develop and refine the tools and approaches for farmer communication and technology intervention</p> <p><b>By end of project:</b> At least 3 local officials and 4 LPs articulate sense of strengthened working relationship with research and the requirements for sustaining this</p> <p><b>All</b> LPs and at least 10 farmers make evaluations of the effectiveness of LP services relative to start of project</p>	<p>Project reports of field meetings.</p> <p>Mid-Term review by Programme Manager.</p> <p>Manual detailing tools/approaches/methodologies.</p> <p>Presentation at regional and/or international conference and/or journal papers.</p> <p>Various dissemination materials including peer reviewed publications; meetings and project workshop.</p> <p>Project reports of field visits</p> <p>Project records of LP and farmer assessment of LP services</p> <p>Workshop proceedings</p>	<p>Improved analytical tools exist that farmers and local professionals find acceptable.</p> <p>A productive working relationship with farmers and local professionals can be developed and maintained.</p> <p>Capacity of target institutions insufficient to accommodate project results and implications.</p> <p>Improved tools and approaches exist that farmers and local professionals find acceptable.</p> <p>A productive working relationship with farmers and local professionals can be developed and maintained</p>

<b>Activities:</b>	<b>Activity Milestones:</b>	<b>Assumptions/Risks:</b>
<p>1.1. Uganda-based stakeholder and planning workshop.</p> <p>1.2. A literature review undertaken in the UK based on published and grey literature.</p> <p>1.3. A situation survey in the study villages to understand farmers' perspective on SFM and biophysical and socio-economic constraints to their adoption of SFM options.</p> <p>1.4. Innovative farmers targeted for more in depth follow up interviews.</p> <p>1.5. Synthesize and analyze the results from 1.1-1.4 for the development of activities 2.1-2.4.</p>	<p>March 2000 w/shop held. Details of collaborative research team and activities refined.</p> <p>review completed and available by Dec 2000</p> <p>Project implementation report produced</p> <p>Surveys completed by May 2001. Results disseminated and integrated into planning of subsequent activities.</p> <p>Innovative information on local practice accessed.</p> <p>Project team able to make practical use of information generated by review, surveys and interviews.</p> <p>Guidelines for identification and development of appropriate tools and approaches</p>	<p><i>All activities</i></p> <p>Support from collaborating institutions is continued;</p> <p>Continued social and economic stability in project area.</p> <p><i>Activities 1.1.-1.4.</i></p> <p>Relevant published and grey literature available and accessible.</p> <p>Research activities yield sufficient good quality data</p>
<p>2.1. Work with local professionals/farmers to identify and/or develop a number detailed tools and approaches for use by local professionals</p> <p>2.2. Hold SFM/SWC workshops in target villages that introduce and test the understanding of the principles and tools identified/developed in 2.1.</p> <p>2.3. Test and refine the tools and approaches (developed in 2.1.) with the local professionals and farmers.</p> <p>2.4. Monitor the engagement, modification and success in providing options for SFM/SWC to different categories of farmers.</p>	<p>Set of tools and approaches identified and developed by Oct 2001</p> <p>Workshops held and farmers and local professionals understand and are interested in testing tools and approaches.</p> <p>Tools and approaches tested and refined</p> <p>Monitoring sessions and surveys completed through years two and three of project</p>	<p><i>Activities 2.1.- 2.4.</i></p> <p>An effective and productive collaborative relationship develops between collaborating institutions.</p>
<p>3.1. Project results disseminated to local stakeholders and higher level organizations</p> <p>3.2. Wider participation in project workshops encouraged.</p> <p>3.3. Interactions with relevant projects, NGOs and national/district/sub-county Agricultural Offices and organizations</p>	<p>Reports and papers produced and circulated</p> <p>By end of 2002 numbers of LPs attending workshops and using/testing tools and approaches increased.</p> <p>Formal and informal briefings to interaction targets on research progress and findings.</p> <p>Posters and flyers produced throughout project</p>	<p><i>Activities 3.1.-3.3.</i></p> <p>Local stake-holders receptive to project results</p>

<b>Activities:</b>	<b>Activity Milestones:</b>	<b>Assumptions/Risks:</b>
<p>4.1 Establish effective working partnership between LPs and Research.</p> <p>4.2 A programme of informal workshops, meetings and field visits with involvement of researchers, LPs and local officials around soil management issues.</p> <p>4.3 Final evaluation workshop (March 2003)</p>	<p>LPs participating fully in workshop and field activities, contributing ideas and views freely.</p> <p>On-farm participatory research plots established with clear farmer and LP ownership and an effective feed-back and monitoring system in place.</p>	<p><i>Activities 4.1.- 4.2.</i></p> <p>An effective and productive collaborative relationship develops between collaborating institutions</p>

## 11. Keywords

Soil fertility management, soil and water conservation, sustainable land use, analytical tools, smallholder farmers, rural environment, sustainable rural livelihoods, poverty elimination, tropical hillsides, Uganda

## **12. Annexes**

<b>Annex A</b>	<b>R7517 scientific report</b>
<b>Annex B</b>	<b>Project inception report</b>
<b>Annex C</b>	<b>Literature review</b>
<b>Annex D</b>	<b>Field (situation) survey report</b>
<b>Annex E</b>	<b>Resource Guide Part I</b>
<b>Annex F</b>	<b>Resource Guide Part II</b>
<b>Annex G</b>	<b>Uptake and adoption survey report</b>
<b>Annex H</b>	<b>Results reporting workshop report</b>
<b>Annex I</b>	<b>List of recipients of R7517 products</b>
<b>Annex J</b>	<b>MTR report</b>
<b>Annex K</b>	<b>LADDER paper: McDonagh and Bahigwa 2002</b>
<b>Annex L</b>	<b>Final project inventory</b>