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Demand assessment for technologies for on-farm management of natural resources

Project Leader

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Organisation

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The University of Reading

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Demand Assessment for Technologies for On-farm Management of Natural Resources

Final Technical Report for project R7537

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The University of Reading

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1. Executive Summary

The project purpose was to validate new strategies for the sustained management of catchments in semi-arid areas. This was to be achieved through an understanding of factors influencing farmers' use of technologies for soil and water conservation, soil nutrient management and plant genetic resource diversification. This in turn would enable more efficient targeting of future research investments and extension activities.

The research used a combination of Participatory Farm Management and survey methods to identify constraints to uptake of natural resource management (NRM) technologies by farmers, particularly the poor. These include institutional factors, incompatibility of the technology with the household's livelihood or production system, and lack of awareness or knowledge. Gender is a factor, though more so in Zimbabwe than Tanzania: this is related to gender differences in resource endowment and access to training and promotion activities.

The potential of available technologies to meet farmers' production constraints was assessed. Resource degradation is of concern to farmers because they see it as a key factor in their low yields. They recognise the need for new knowledge and technology to enable them to deal with a changing physical and economic environment. Participatory economic analysis showed that returns to adoption of NRM technologies are not very high – and less than the potential often claimed in extension programmes.

The project tried to quantify the demand for different types of NRM technology among different categories of household. This was only partially achieved, largely because the level of demand depends on the specific characteristics and resource requirements of the technology. The characteristics of adopters and non-adopters of NRM technologies identified through focus group discussions did not distinguish very accurately between adopters and non-adopters identified in the sample surveys. Further analysis suggested it is not possible to predict with any accuracy the size of the potential market for different kinds of new NRM technology.

Research activities included desk reviews, interviews with members of the scientific and development community in Tanzania and Zimbabwe, focus group discussions with adopters and non-adopters of NRM technologies at two study locations (and five sites within each location) in each country, participatory farm management methods (Scored Causal Diagrams, Participatory Budgets), and sample surveys of farm households.

The research has:

- highlighted constraints to improving poor people's livelihoods through research-based NRM technologies: many currently available technologies are not compatible with the resource access of resource poor households
- provided a tested participatory methodology for identifying household level constraints to adoption of NRM technologies
- identified institutional factors (including land tenure, markets and systems for dissemination of information and promotion of technologies) which will need to be addressed in the formulation of catchment level strategies
- indicated the significance of households' livelihood strategies in their motivation to invest in improving or maintaining the quality of natural resources on their farm holdings.

2. Background

Sustainable agricultural production in semi-arid areas of east and central Africa requires technologies which are adapted to variable and unpredictable weather patterns and the generally low rainfall typical of these areas (Annex B section 1.4; Annex C section 6.2.3). Integration of livestock and crop production, at household and/or landscape levels, is a key element in achieving and maintaining levels of production that will deliver food security to households who depend largely on agriculture for their livelihood. Recycling of crop residues, and concentration of nutrients from extensive grazing, through manure applied to arable land is for many poor farmers a vital part of any strategy for soil nutrient management (SNM). Draught power is an essential ingredient in tillage-based soil and water conservation / management (SWC/SWM) strategies. Incorporation of new plant genetic resources (PGR) into production systems can help farmers adapt to a changing, or less predictable, climate.

Previous research has suggested that:

(a) there are many proven ways in which farmers can improve the levels and sustainability of production through technologies which conserve or enhance the natural resources of their farms. Annex B, section 2.1 gives details of many such technologies which have been developed or tested with farmers in Zimbabwe. Research attention has, however, focused on technical performance of the technologies rather than profitability or economic performance from farmers' perspectives;

(b) improved resource management technologies are not widely practised in semi-arid areas (e.g. Friis-Hansen 1996, re. new PGRs; Scoones and Toulmin1999, re. soil fertility management).

(c) the poor face specific constraints to investing in NRM technologies. These are situation specific and may include limited access to draught animals, insecure property rights, the need to diversify livelihoods which increases the opportunity cost of time spent in (for example) creating SWC structures, and limited access to information.

Against this background, the goal to which the project was designed to contribute was the development and promotion of strategies for the integrated management of crop and livestock production systems which benefit the poor (NRSP Semi-Arid logframe, Output 2). Demand for the project was identified by NRSP management, following a review of completed projects in the fields of SWC/SWM, SNM and PGR. Faced with indications of limited uptake of technologies which seemed to be effective from a technical point of view, it was felt that future commissioning of research in this area should be informed by an assessment of demand for current and potential research outputs. NRSP Call CNC99/SA concluded that "little sustained interest has been generated in resource conserving techniques". The researchable constraint addressed by the research was the lack of detailed understanding of situation specific factors that determine whether farmers are likely to take up new NRM technologies. It was recognised that this should be done within a broad livelihoods perspective, since households' decisions on uptake will be influenced by the relative importance of natural resources and agricultural production in their livelihood options and strategies.

3. Project Purpose

The purpose was to validate new strategies for the sustained use and management of catchments in semi-arid areas, whose productivity (of environmental services as well as farm output) is seen as being under threat from intensive land use and resource degradation. Improved understanding of factors and constraints which influence farmers' adoption decisions about technologies which have the potential to enhance natural resources within the catchment should make possible more effective targeting of future research as well as the development of promotion and dissemination strategies to address constraints in the flow of information and development of knowledge.

4. Outputs

1. Reasons for low uptake of on-farm natural resource management technologies identified and quantified for different categories of beneficiary, including poor households

The main criterion for selection of study sites was that research-based technologies relating to at least two areas of natural resource management (from SWC, SNM and PGR) had been promoted in the area. In Chivi and Zimuto (Zimbabwe), over 20 separate SWC/SWM techniques had been promoted over the past thirty five years, along with new varieties of maize, sorghum and pearl millet, and soil fertility technologies ranging from improved management and use of compost and manure to recommendations for the use of inorganic fertiliser. However, there was a lot of variation between villages in the technologies to which farmers had been exposed (Annex B, section 3, Tables 2 and 4; Annex C, section 1.1). Promotion had often been very localised. In Ilula and Hombolo (Tanzania), fewer separate technologies had been promoted.

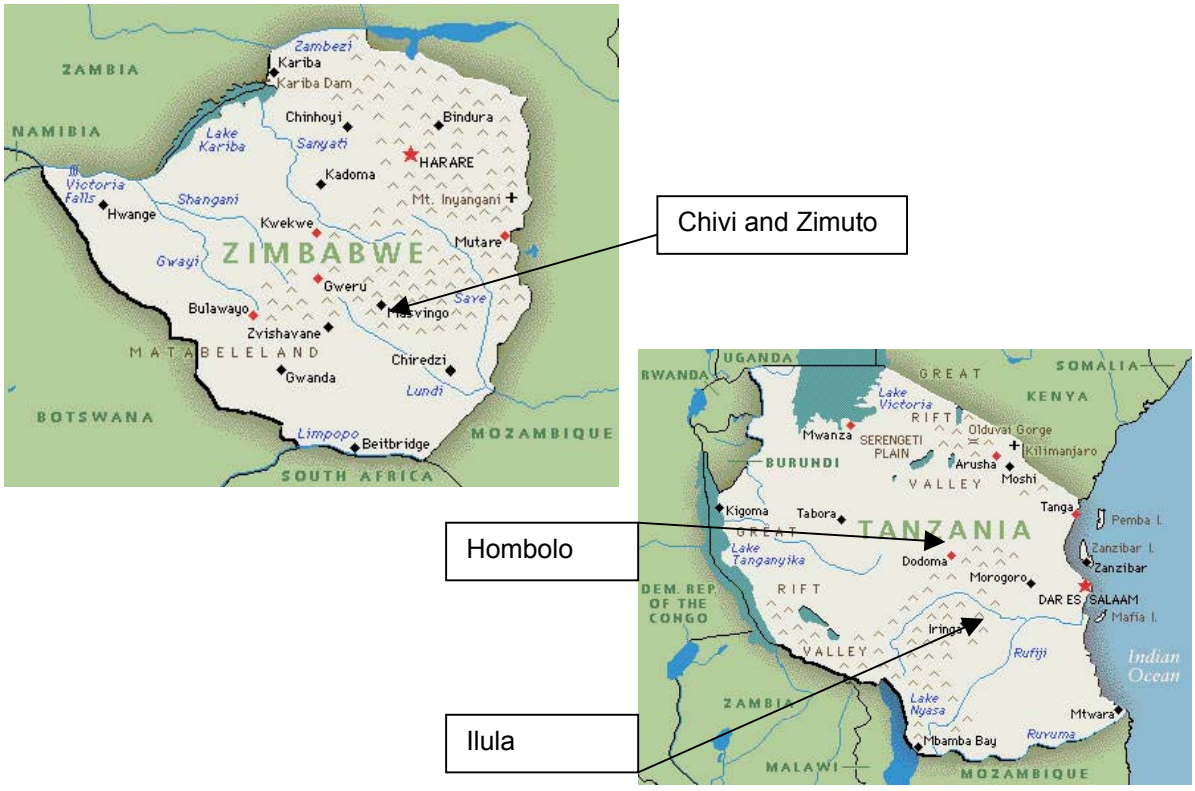

Table 1 NRM technologies which have been promoted in the study sites

	Zimbabwe		Tanzania	
	Chivi	Zimuto	Hombolo	Ilula
SWC / SWM	strip cropping *fanja juu* tied ridges mulching vetiver grass contour construction tree planting infiltration pits stone traps dams	tillage OPFP weed control TFP runoff orchards tree planting stone checks vetiver grass banner grass contour ridges tied ridges	improved tillage	
SNM	improved manure improved compost	manure compost anthill soil crop rotations fertiliser green manure		manure
PGR		new OPVs low N maize	sorghum and millet varieties	new maize varieties

Qualitative enquiry elicited farmers' perceptions of the characteristics which distinguish adopters from non-adopters of the technologies. These included households' resource endowment, involvement in non-farm livelihood activities, and personal characteristics. Table 2 below summarises the characteristics identified in focus group discussions in Zimbabwe (Annex A, Tables 3 and 5).

Table 2 Characterisation of adopters and non-adopters in Zimbabwe

Characteristics	Adopters	Non-adopters
Education	well educated	less educated
Risk preference	innovative, risk takers	risk averse
Exposure to information	attend field days, belong to groups, receive training	rarely attend meetings/ field days/training; not group members
Resource endowment	own relevant equipment; own two or more cattle	own less than two cattle; do not own equipment
Family size	5 – 10	less than 5
Commitment to work	very committed to farm work	not committed to farm work
Age	between 30 and 70	less than 30, more than 70
Gender	majority males	majority females
Income level	earn more income	earn less income
Off farm employment	full time farmers	part time farmers
Soil type	IOPVs: rich red soils *fanja juu*: dry soils	IOPVs: sandy soils *fanja juu*: wet soils

The Zimbabwe study showed that poverty is a factor in non-adoption of NRM technologies. Poorer households are constrained by lack of equipment needed for a particular technology; lack of livestock for production of manure; lack of money to buy materials (such as fencing to protect planted trees). The need of the poor, particularly where holdings are small, to seek off-farm employment also means they may be unwilling to invest time in labour intensive SWC activities.

Table 3 Characterisation of adopters and non-adopters, Tanzania

Characteristics	Adopters	Non-adopters
PGRs		
livelihood strategy	grows cereals for sale	grows for home consumption
perceptions	rainfall adequate for new varieties	rainfall inadequate for new varieties
family preferences	prefers to eat new varieties	prefers to eat existing varieties
physical assets	improved storage	lacks improved storage
SWM - tillage		
soil type	heavy	sandy loam
farming system	grows maize and/or groundnuts	does not grow maize or groundnuts
SNM - manure		
land tenure	owns farming land	does not own farming land
livestock	keeps livestock	does not keep livestock
labour	labour available	labour constrained
attitudes	others' livestock can graze their farm after harvest	livestock on the land after harvest will damage soil

Source: field study; Annex C section 4.9

In Tanzania, the qualitative data were used to create simple models to show the combinations of characteristics associated with the likelihood of adopting a particular type of technology (Annex B, section 4.9). Figure 1 shows that those who adopt new cereal seed varieties are likely to be growing primarily for the market and to be satisfied that the prevailing rainfall regime is better suited to new than to traditional varieties. Those who grow mainly for family consumption are only likely to adopt if they have also adopted improved storage practices. Similarly, Figure 2 suggests that households who grow maize or groundnuts, and households who farm light soils, are more likely to adopt tillage practices. For manure, adoption is closely linked to resource endowment: households who own the land they farm, keep livestock and have enough labour are more likely to use FYM.

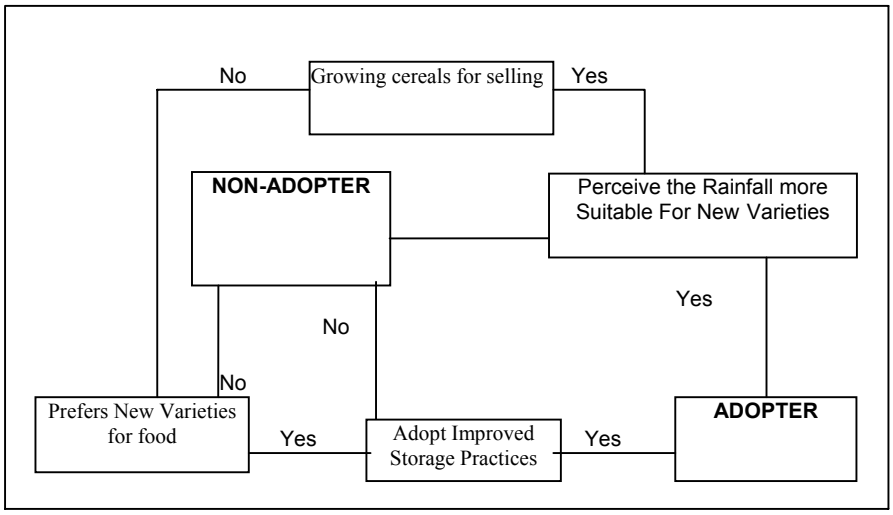

Figure 2 Adoption model for new seed variety, Tanzania

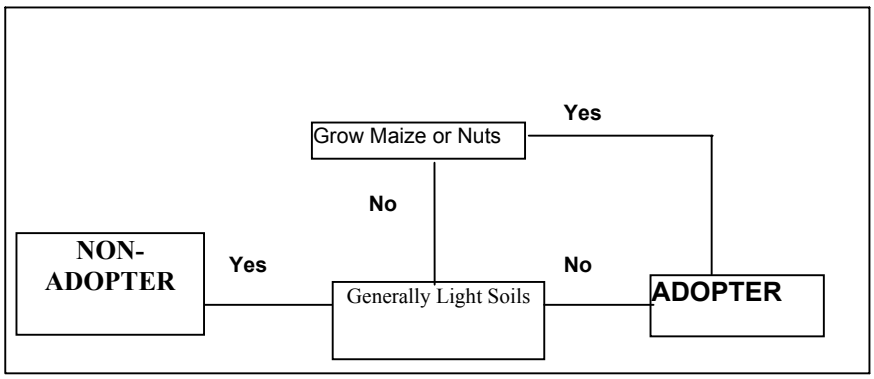

Figure 3 Adoption Model for Tillage, Tanzania

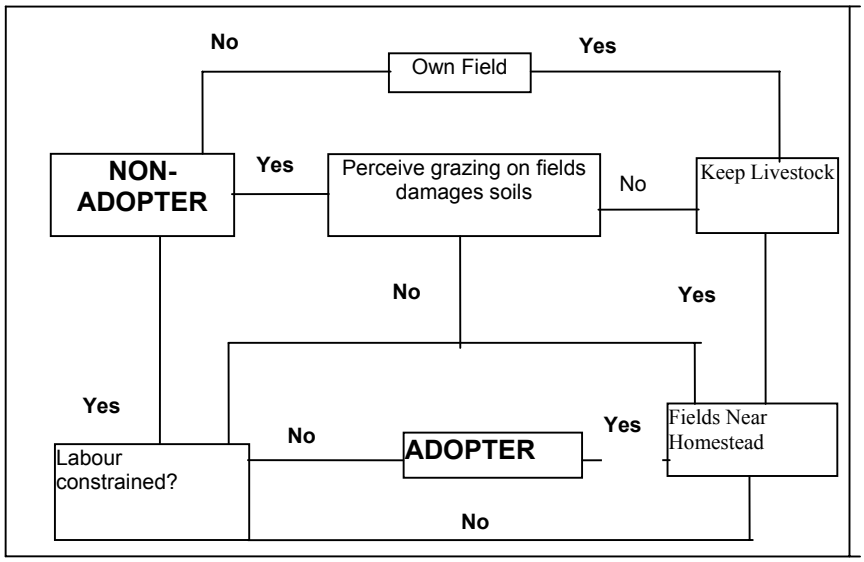

Figure 4 Adoption model for farmyard manure, Tanzania

Promotion and dissemination activities also seem to be a factor, particularly in Zimbabwe. Several of the technologies had only been promoted within the locality in which they had been researched and developed. Even though a high proportion of those who had heard of a particular technology decided to use it, the absolute number of adopters in such cases was low.

One of the reasons why women are considered more likely than previously to adopt NRM technologies is that some agencies now deliberately target female headed households and women members of male headed households. This may be the reason for the tendency in Tanzania for women-headed households to be slightly more likely to have adopted new PGRs than men-headed households (Annex A, page 16). Farmers acknowledge that lack of knowledge – and also the restriction of knowledge to one member of a household – is a constraint to widespread uptake. Lack of knowledge was also identified as a contributory cause of production constraints in the Scored Causal Diagrams created by farmer participants in Zimbabwe (Annex B, Appendix 1).

The importance of these various factors in restricting uptake was confirmed by sample surveys in which the characteristics of adopters and non-adopters of the promoted technologies were assessed (Annex B, section 4; Annex C, section 5). Overall, the main reasons for low uptake were identified as:

- features of the household's production and livelihood system
- institutional factors, including land tenure, group membership and promotional activities
- lack of specific resources required for effective use of the technology
- lack of awareness or detailed knowledge about a technology.

2. The potential of available technologies to meet production system constraints in ways acceptable to farmers identified.

The available NRM technologies, and the research that has generated them, are clearly addressing important production constraints which are recognised by farmers. In Zimbabwe, the two most serious production constraints elicited through Scored Causal Diagrams were low or declining soil fertility (Annex B, section 3.1.4, and Appendices 1 and 2), and shortage of cattle. Use of manure and fertilisers were recognised as a solution to their production constraints by farmers in Zimbabwe; SWC/SWM and improved varieties were not, even though soil erosion (in Zimuto) was ranked highly as a production constraint by non-adopters (Annex B, section 4.5.3). In Tanzania, the key problem on which discussions focused was food insecurity, due largely to poor crop production: among the main causes of this were unreliable (and changing patterns of) rainfall, and continuous cultivation which has led to a decline in fertility and hence in yields. Farmers acknowledge that SWC/SWM, SNM and PGR technologies can address these constraints. However, economic analysis through Participatory Budgets (PB) suggests that the returns to adoption of the available technologies are at best marginal (Annex B, section 3.1.5 and Appendix 3; Annex C, section 4.6.6). It is also clear that farmers perceive the positive effects of the available technologies to be less substantial than is claimed in some promotional or extension programmes (Annex C, section 4.6.6.1).

The research suggests that acceptability to farmers has two main dimensions: feasibility given households' access to resources, and the extent to which a technology will lead to a short-term increase in production or decrease in costs. Most farmers are not interested in conserving or improving the natural resource base as an end in itself. In Zimbabwe, a high proportion of farmers intend to use, or continue using, available SWC and SNM technologies because they are seen as addressing key production constraints. Very few intend to use available PGRs (Annex B, section 4.5.1).

The two technologies for which a clear economic benefit was shown were improved OPVs of maize and improved compost manure in Zimbabwe: the PBs indicated a higher gross margin for adopters than for non-adopters. In the case of maize varieties, this was because the OPVs required less expenditure on external inputs. For soil nutrient management using improved manure, adopters reported higher yields than non-adopters in the same village (Annex B Appendix 3). In the Zimbabwe PBs, a high proportion of the total labour input goes on the collection, processing and application of manure and compost (Annex B section 3.1.5).

In Tanzania, the overall output reflected in the PBs is low, and where promoted technologies have been adopted, lower than anticipated by those promoting them (Annex C section 4.6.6.1). Where inputs and produce are valued at local market rates, most PBs in Tanzania showed an overall negative return, suggesting that food production is valued more highly for family consumption than in the market and that family labour is not regarded as a cost. In sorghum and millet production, the PBs show bird scaring represents about 50% of the total labour input. The highest level of maize production per acre recorded in the Tanzania PBs came from a combination of new variety and the use of manure suggesting that new technologies may have more impact when used in combination than singly (Annex C, Table 4.8).

Farmers see production constraints in terms of the changes they experience in the physical and economic environment, and in their resource base. There is a general recognition that existing knowledge and technologies are no longer able to sustain production in the face of these changes. The demand for new varieties, for example, is an expression not of a desire for greater on-farm diversity within and between species, but of a need for varieties which are better adapted to prevailing weather patterns and the current fertility status of their soils.

3. Demand for different types of natural resource management technology quantified among different categories of rural household

The overall approach to this output, which was set out in detail in the project Inception Report and is described in Annex A to this report (section 3.1), was to estimate the distribution in the population of households in semi-arid areas with characteristics which distinguish between adopters and non-adopters of currently promoted NRM technologies. In this way, we were seeking to estimate the potential market for new NRM technologies which addressed the production constraints of farmers. Based on the characteristics identified through focus groups and the other qualitative methods, estimates were made and are presented in Table 4 below (Annex A p.22).

Table 4 Estimate of potential size of market for NRM technologies (thousands of households)

	Number of farming households in semi-arid areas (1)	Number with adopter characteristics who have not adopted (est.)* (2)	Number with adopter characteristics who have adopted (est.)* (3)	Size of potential market for new NRM technologies (4) = (2) + (3)
Tanzania	1,690			
PGR		0	98	98 *(50 to 146)*
SNM		46	165	211 (*142 to 279)*
SWM		33	301	334 *(252 to 417)*
Zimbabwe	1,470			
PGR		172	17	188 *(129 to 247)*
SNM		39	39	78 *(38 to 117)*
SWM		17	117	134 *(83 to 185)*

Source: Annex A, Table 5 on page 22

However, it was clear from analysis of single variables that several of the characteristics identified in the qualitative study did not distinguish very clearly between adopters and non-adopters. Interestingly, the fact that a household's livelihood was predominantly based on farming was not strongly associated with adoption.

The robustness of the estimates was therefore tested by subjecting the survey data to further, multivariate analysis, using a wider set of data than the distinguishing characteristics which emerged from the qualitative study. The purpose of the analysis was to see if the likelihood of being an adopter of the promoted technologies could be predicted from household and farm characteristics. The Zimbabwe data were subjected to logistical regression. In the case of the Tanzania data, most of which were recorded at nominal or ordinal levels, discriminant analysis was used.

The results of the analysis are presented in Annex A, sections 4.3.1 and 4.3.2. In the case of Zimbabwe, a model was produced which correctly predicted over half the adopters of one or more of the promoted technologies; and a second which predicted over half the adopters of tillage technology. The study location itself has a strong influence in both models: the dummy area variable is highly significant, and variables which are significant in one of the two areas are not in the other.

Overall, the analysis showed that the suggested characteristics do not distinguish between adopters and non-adopters with a sufficient degree of accuracy, either individually or in combination. Explanatory variables which show modest statistical significance in identifying adopters are those related to location, education and agricultural training, and resource ownership or access. This highlights the challenge of developing NRM technologies which resource poor households will feel able to take up. Variables relating primarily to livelihood strategy (such as agriculture as a full time occupation) show little association with adoption, despite their being identified by informants in the qualitative phase of the study.

Demand for a technology depends to a large extent on the characteristics of the technology itself. For example, the Tanzania data suggest that a new cereal variety will not be widely adopted unless it is acceptable on taste and cooking criteria, except for the minority of households (10%) who grow primarily for the market (Annex C, section 4.9.1, 5.1.2.2). Similarly, while there is clearly a perceived need in both countries for technologies that address low and declining soil fertility, extending the use of FYM to a wider set of households is not a realistic option. There may, however, be scope for improved management and use of FYM by those households who currently use it (30-35% in Tanzania, 25% in Zimbabwe).

There is not much difference in demand for NRM technologies between male and female headed households in Tanzania: female headed households are more likely to have adopted new PGRs, and less likely to have adopted FYM and SWC technologies. In Zimbabwe (Annex B, section 4.2.2), male headed households are 50% more likely to have adopted one or more of the technologies than female headed household. In both countries, decision making about adoption in most households is done jointly by men and women (Annex B, section 3.1.8; Annex C, section 4.6.6.4).

Demand among resource poor households will depend crucially on the resource demands of the technologies that are developed. In particular, it is unrealistic to assume a low opportunity cost for the labour of members of poor households, where there are alternative sources of income (temporary migration, non-farm employment) open to them.

Although the Zimbabwe study reported a high proportion of farmers who intend to use available SWC and SNM technologies, the numbers intending to use any specific technology are small (Annex B, section 4.5.2). This suggests that any single new technology will not meet a high level of demand. Having a set of options is important for farmers in semi-arid areas, so that they can select ones which match their resource situation and perceptions. Diversity of solutions and technologies is a desirable feature of sustainable systems and is a valid goal in research and development programmes.

5. Research Activities

1.1 Desk reviews were carried out in the UK, Tanzania and Zimbabwe. The UK review was presented at the planning workshop (Activity 1.2); the in-country reviews are summarised in the country reports (Annex B, sections 1, 2.1; Annex C, section 1).

1.2 Nine members of the research team convened for a planning workshop in Reading 1-3 February 2000, a report of which is annexed to the project Inception Report (Garforth 2000). Professor Mattee was unable to attend because the British High Commission in Dar es Salaam would not issue a visa in time. The methodology, including criteria for selecting study areas and sites, and a timetable for the field studies were agreed.

1.3 Key informants among the scientific and development community in Tazania and Zimbabwe were identified and then interviewed, to gain background information on NRM technologies which have been promoted, possible areas for field studies, and their perceptions of farmers' reactions to technologies.

1.4 Two study locations were identified in each country and five sites or villages selected at each location. Focus group discussions at each site, covering the history of the promotion of technologies and characteristics of adopters and non-adopters of the technologies. Although the intention was to hold separate discussions for men and for women, this was resisted by participants. A survey was then planned and carried out at each site, with the intention of estimating the numbers of households with characteristics associated with adoption and non-adoption. Random samples of 257 and 265 farm decision makers were interviewed in Tanzania and Zimbabwe respectively.

2.1 This Activity was carried out at the same time as the first part of Activity 1.4. Scored Causal Diagrams and Participatory Budgets were used with groups of adopters and non-adopters of technologies at each site. These proved a very useful tool for exploring farmers' perceptions of production constraints and the economics of the technologies which have been promoted in their area.

3.1 A workshop was held at Sokoine University of Agriculture in Tanzania, to present the findings of the Tanzanian field study. The planned workshop in Zimbabwe was not held because of political disturbances in the latter half of 2000.

3.2 This has not yet been completed. We have agreed that a summary report of the Tanzanian study will be prepared in both English and Kiswahili. A summary is to be placed on the University of Reading website.

A useful outcome of the field studies was the development of capacity in the use of Participatory Farm Management methods among the research partners. Interest in their use was also generated among other stakeholders who were involved in the research, including NGOs, bilateral projects and extension agencies. Twenty copies of the PFM training manual were distributed on request to interested parties.

6. Contribution of Outputs

NRSP's goal for the semi-arid production system is "livelihoods for poor people improved through sustainably enhanced production and productivity of RNR systems". The outputs of the project have:

(1) Highlighted constraints to improving poor people's livelihoods through research-based NRM technologies. Many currently available technologies are not compatible with the resource access of resource poor households.

(2) Provided a tested participatory methodology for identifying household level constraints to adoption of NRM technologies, which could be used in the design and process of future research.

(3) Identified institutional factors which will need to be addressed in the formulation of strategies for improving the sustainability of production and livelihoods in semi-arid areas. These include training, promotion and extension, and security of land rights.

(4) Shown that households' livelihood strategies are an important influence on their motivation to invest in improving or maintaining the quality of natural resources on their farms.

(5) Shown that NRM technologies must provide short term improvements to production: for many poor farmers, investing in NRM improvements which do not bring immediate gains in output is not an attractive option.

Any impact of these achievements on the lives of poor people will be through the better targeting of future research, and through promotion and extension activities that are more accessible to the poor.

It is too early to assess the achievement of Purpose level OVIs. The main impact so far has been the acceptance by research partners and other stakeholders of the value of PFM methods for exploring farmers' perceptions of constraints and the economics of current and potential technologies.

The principal users of the research outputs were identified in the RD1/PMF as NRSP management and project leaders. Outputs will be communicated through the FTR and its Annexes, and through a project summary to be placed on the University of Reading and NRSP websites. Key target institutions are research and extension agencies (including NGOs) in the region. These will be reached through a forthcoming scientific publication in a journal, and a printed summary of the project and its outputs for distribution by mail.

7. Communication materials

(Achieved)

Garforth, C., Mudimu, G.D., Mattee, A., Asseid, B., Dorward, P.T., Harford, N., Wiggins, S., Goldey, P., Wilson, I., Pilbeam, C., and Cromwell, E. 2002a. *Scientific report: Demand assessment for technologies for on-farm management of natural resources in semi-arid areas of Zimbabwe and Tanzania.* Annex A to Final Technical Report for research project R7537. Reading, UK: International and Rural Development Department, The University of Reading [unpublished report]

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Data sets: survey data, in SPSS format, are available from the sample surveys conducted in Tanzania and Zimbabwe. They are currently held by the in-country research partners. A copy has been submitted to NRSP management on CD.

(planned)

- scientific paper for submission to an international journal
- Kiswahili summary of the Tanzania study
- Summary of project and outputs to be placed on the WWW

8. Project logframe

Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Goal			
Strategies for the integrated management of crop and livestock production systems which benefit the poor developed and promoted at the catchment level	By 2002 in two targeted catchment areas: the role of social and human capital in natural resources management understood new approaches to rainwater harvesting, conservation tillage and small scale irrigation validated new approaches to soil nutrient management validated new approaches to the selection and management of plant and animal genetic resources important to the poor validated By 2003 an improved strategy for the integrated management of natural resources at catchment level adopted by target institutions in two targeted countries	Appropriate dissemination products Local, national and international statistical data	Budgets and programmes of target institutions are sufficient and well managed Economic and policy environment provides incentives to sustainable agricultural production and natural resource management by the rural poor
Purpose			
New catchment strategies developed and validated	By March 2001, new research commissioned by NRSP to test and validate catchment strategies based on selected technologies for natural resource management. By March 2001, research programmes of target institutions include projects to test and validate catchment strategies based on selected technologies for natural resource management	NRSP Calls and reports Target institutions' reports on their research programmes	New strategies accepted and implemented by national NR planners and donors. Future research produces technologies acceptable and attractive to resource-poor households in the prevailing economic and policy environment.
Outputs			
1.Reasons for low uptake of on-farm natural resource management technologies identified and quantified for different categories of beneficiary, including poor households.	Analysis of reasons for low uptake disseminated to and accepted by wide spectrum of stakeholders by end of project.	Report delivered and approved by NRSP management	Findings accepted and used by target institutions to inform future research into natural resource management.

2. The potential of available technologies to meet production system constraints in ways acceptable to farmers identified.	Production system constraints quantified and the potential of available and in-development technologies to meet these in ways acceptable and attractive to farmers identified, by end of project.	Report delivered and approved by NRSP management	
3. Demand for different types of natural resource management technology quantified among different categories of rural household.	Demand for technologies for on-farm conservation and enhancement of soil and water, soil nutrients, and plant genetic resources assessed by end of project.	Report delivered and approved by NRSP management	

Activities	**Project Milestones and budget**	
1.1 Desk review of reasons for non-adoption of natural resource management technologies in semi-arid areas of eastern, central and southern Africa.	Desk review complete by end of month 1	Target institutions willing to participate in the research by providing information on research projects and in-development technologies Households in the study locations willing to participate fully in the PRA and survey activities Technologies can be characterised in sufficient detail to enable their potential to meet production system constraints to be assessed. Target institutions and rural households participate in the research.
1.2 Hold workshop in Reading for all research partners, to develop methodology and identify locations for field study.	Locations identified by end of month 1	
1.3 Obtain information through interviews with researchers and project staff in Tanzania and Zimbabwe on farmer response to technologies.		
1.4 Conduct participatory appraisal in each location, supplemented by rapid sample survey, of household responses to available natural resource management technologies and the reasons behind them.	PRAs and rapid surveys completed in each country and written up by end of month five	
2.1 Apply Participatory Farm Management methods (in particular, Causal Diagrams and Participatory Budgets) to analyse and quantify production system constraints from the perspective of different categories of farmer and household; and assess available natural resource management technologies using the same methods.	PFM assessment completed and written up by end of month 5	
3.1 Hold workshops in each country to review outputs of the above activities and, in the light of these, assess likely demand for available (types of) technology.	Workshops held and reported by end of month 6	

3.2 Prepare synthesis report, in form suitable for publication, and a summary for widespread distribution; and place summary on WWW.	Synthesis completed by end of project Paper submitted for journal publication within 3 months of project end.	
	Budget: £60,000	

9. Keywords

Tanzania, Zimbabwe, adoption, soils, varieties, conservation, extension

References

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