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**USE OF KNOWLEDGE
IN THE
FOREST AGRICULTURE INTERFACE IN GHANA**

**Review commissioned by
Natural Resources Systems Programme
Department for International Development**

PD 134 Tracking the use of project research products: R7515 and R7516

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1. Executive Summary

Introduction and background

This study was commissioned to track the uptake of research products from two Natural Resources Systems Programme (NRSP) funded projects designed to contribute to improved land use strategies in the Forest Agriculture Interface in Ghana.

In 1999, NRSP issued a call (CNC99-01_FAI) for research to address the knowledge gap between technology design and dissemination in the forest-agriculture interface in Ghana and two research projects were commissioned as a result:

R No	Title	Lead Organisation	Project leader	Dates
R7515	Knowledge dissemination domains in the forest agriculture interface	ODG / UEA	James Sumberg	Mar 2000 – Feb 2002
R7516	Bridging knowledge gaps between soils research and dissemination in Ghana	SAFS, University of Wales at Bangor	Fergus Sinclair	January 2000 – June 2001

They identified a common problem. Both observed that the circumstances of potential technology users are diverse, their livelihood strategies multiple and their knowledge valuable, but technology research and development processes often fail to take these into account.¹ The two projects developed decision support tools to encourage researchers to take better account of the heterogeneity of potential users. R7515 did not have a Ghanaian project partner; R7516 had two partners, principally to undertake field research rather than jointly plan, manage and direct the project; and both relied on workshops in Ghana for testing and disseminating their research products. In both cases the tools had not been finalised by the end of the projects, so dissemination was limited to a series of workshops held to test and refine the products.

During this brief study, the two researchers reviewed project documents and literature related to technology uptake, held discussions in the UK with R7515 and R7516 research project leaders and staff as well as NRSP staff and steering group members, and interviewed workshop participants and potential users of the research products in Ghana in May-June 2004.

Impact of decision support tools

Neither of the largely computer-based decision support tools developed by these projects – ‘Interface’ and ‘Local knowledge and livelihoods: tools for soil research and dissemination in Ghana’ – are currently being used by researchers in Ghana. In both R7515 and R7516, amongst the workshop participants who tested the tools the natural scientists perceived the content to be more relevant to social science than to their own research fields; and many social scientists appreciated the value of the ideas, but some did not find them new.

¹ F. Sinclair, D. Jones, M. McDonald, 2000, Bridging Knowledge Gaps Between Soils Research and Dissemination in Ghana, Research and Development Funding Application, page 4-6 (question 18a. and 18b.); J. Sumberg, 1999, Knowledge Dissemination Domains in the Forest Agriculture Interface, Research and Development Funding Application, page 4 (question 18b.).

Agricultural extensionists lacked access to PCs, older researchers found the use of software difficult, and some lacked confidence in the data. A couple of participants reported that the tools would never be adopted because UK developers had not consulted Ghanaians early enough in the process of design. Although these tools were not found installed on researchers' PC or found in libraries, a database refined by a third NRSP-funded project (R7466) (LEXSYS) is regularly used by a few.

It is not possible to judge whether or not the R7515 and R7516 *decision support tools* would have been more widely used if funding for training and capacity-building had been forthcoming. But it is clear that much of their content remains useful and relevant and that the uptake of these *ideas* by natural scientists is perceived to be a need by both social scientists and policy-makers.

Forest Agriculture Interface in Ghana

The Ghanaian institutional research context is constrained by:

1. erratic donor funding means that organisations expand and contract, and they gain and lose experts, according to project cycles;
2. huge amounts of knowledge already exist about the forest agriculture interface, but it is inaccessible to specialists in Ghana. The most useful information is kept by individuals in their offices rather than shared or held by institutions;
3. academic progress in research institutes/universities depends in part on publications rather than impact on poverty, gender inequality, or other goals related to FAI, according to Ghanaian researchers. Both the opportunities to publish and the incentives to contribute to poverty reduction are low;
4. expertise on soil fertility at the research level is discipline-bound, and often lacks a poverty or gender focus. Issues related to the longer-term goals (secure livelihoods, poverty reduction, gender equality...) are perceived by scientists to be the domain of social science and remain marginalised.

On the more positive side, Ghanaian institutions have valuable knowledge, expertise and a determination to improve their access to, and management of, information.

Key Recommendations

- ⇒ **Lessons on technology R&D:** projects R7515 and R7516 produced interesting findings on the complexity of technology innovation and dissemination processes but further development of the decision support tools, and capacity building programmes to institutionalise them, do not appear to be the most effective strategies for taking this forward.
- ⇒ **Exchange of knowledge within Ghana:** expertise in gender, livelihoods, stakeholders, poverty and related issues is uneven within research institutes in Ghana and the UK. Since the priority is to build research capacity in Ghana, and promote uptake of research findings, the transfer of expertise in these areas should be within and between Ghanaian institutes.
- ⇒ **Disseminating knowledge:** there is a need for *institutionalised* knowledge systems, rather than a dissemination of still more information to individuals. The most promising option for NRSP would be to offer support for the further dissemination of the findings of R7515 and R7516. This would allow researchers in Ghana to repackage information – in publications, training, briefings or other formats – into

more accessible outputs and disseminate them within key institutes (especially CSIR and KNUST).

- ⇒ **Gender and social development:** various Ghanaian researchers, especially social scientists, have expertise in mainstreaming gender and other cross-cutting differentials created by age, ethnicity, and so on. There is the need and opportunity to support those with expertise to transfer some aspects of their knowledge to others within their institutes as well as within partner agencies in Ghana. Support for further uptake of those aspects of the two projects' outputs that inform gender mainstreaming, and integration of other social development issues, in particular should be considered. Any further work in Ghana should work closely with the gender study commissioned by NRSP (PD123).

- ⇒ **Longer-term strategies:** Ghanaian researchers had innovation strategies for improving information management and knowledge dissemination within research institutes. One was to pilot a knowledge resource centre on soil fertility, another was to create a management information system for roots and tubers: neither is within NRSP's remit but both deserve support in terms of advice about which other DFID programmes or other donors might be interested in giving support.

2. Introduction to the Study

This programme development assignment² was commissioned to track the uptake of the research products from two Natural Resources Systems Programme (NRSP) funded projects designed to contribute to improved land use strategies in the Forest Agriculture Interface in Ghana. The two projects were:

R No	Title	Lead Organisation	Project leader	Dates
R7515	Knowledge dissemination domains in the forest agriculture interface	ODG / UEA	James Sumberg	Mar 2000 – Feb 2002
R7516	Bridging knowledge gaps between soils research and dissemination in Ghana	SAFS, University of Wales at Bangor	Fergus Sinclair	January 2000 – June 2001

These projects were commissioned from a call for research to address the knowledge gap between technology design and dissemination in the forest-agriculture interface in Ghana.

One United Kingdom-based consultant (Emma Crewe) and one Ghanaian researcher (Rudith King) carried out the study by:

1. reviewing project documents and outputs, including two computer-based decision support tools, other NRSP documents, and literature related to technology uptake;
2. carrying out interviews with the research project staff and NRSP programme management and steering group members in the UK;
3. undertaking interviews with workshop participants and potential users of the research outputs in Ghana.

The interviews in Ghana were held over a ten day period in May 2004. Thirty five researchers and managers were interviewed from the following organisations:³

GOAN	Ghana Organic Agriculture Network
IITA	International Institute of Tropical Agriculture
STCP	Sustainable Tree Crop Program
MOFA	Ministry of Agriculture
CSIR	Council for Scientific and Industrial Research
Includes:	
CRI	Crop Research Institute
SRI	Soil Research Institute
ARI	Animal Research Institute
FORIG	Forestry Research Institute of Ghana
KNUST	Kumasi Nkrumah University of Science and Technology
Includes:	
BIRD	Bureau of Integrated Rural Development
IRNR	Institute of Renewable Natural Resources

² Study terms of Reference are given in Appendix 1.

³ A key to organisations are listed in Appendix 2.

GTZ	German Development Cooperation
Includes:	
SFS	Sedentary Farming Systems

The interviewees represent about two-thirds of the Ghanaians who participated in project R7515's workshop and one-third of the participants in workshops held by project R7516. Of the 34 people interviewed, 8 were women and 27 were men; 22 were natural scientists, five were social scientists, one was a computer technician and the remainder were managers or administrators. Three interviews were conducted on the telephone; the rest were unstructured face-to-face interviews carried out with the aid of a checklist of questions (see Appendix 3). The data collected from these interviews has been summarised and submitted to NRSP but is confidential and not for circulation.

Structure of the Report

The next section of this report describes the historical background of each project, beginning with the call for proposals issued by NRSP. In relation to both R7515 and then R7516 the proposal, the NRSP's mid-term review, the findings and products, and final technical review, are all outlined in order to explain the context of the decision support tools produced by each project. Sections 4 – 6 contain the main body of the report: section 4 summarises project participants' feedback on the usefulness of the decision support tools, section 5 highlights the problems, constraints and opportunities in the Ghanaian forest-agriculture interface as identified by the projects, and section 6 offers recommendations for the future.

3. Background to NRSP-funded Projects

3.1. The Call for Forest Agriculture Proposals in 1999

In 1999, NRSP issued a call for research proposals addressing the 'knowledge gap between technology design and dissemination' in response to the perceived low uptake of new technologies in Ghana, Nepal, Brazil and Bolivia. The call assumed this gap was at least in part due to inadequate attention to promotion pathways and dissemination. At the same time, it asked for a critical review of technologies themselves to see if there were 'fundamental' reasons for this low uptake.

The Ghana research was expected to focus on the forest-agriculture interface, particularly addressing the poor uptake of outputs from soil research. Farmers had tested these soil fertility management practices but adoption was limited and, in the call, NRSP asked whether dissemination strategies or the technologies themselves were to blame. It sought 'conceptual and methodological approaches to relating the characteristics of technologies to factors within the adoption environment.' It hoped that researchers would determine some 'minimum threshold' to allow them to be, for example, 80% sure that a particular technique will work in a particular domain. The call expected some use of modelling, primary and secondary data, methodological and conceptual elements, and an understanding of agro-ecological and livelihood sustainability. NRSP expected research products that would encourage researchers to do strategic thinking, before working in specific locations with specific clients, including about the systems themselves within a livelihoods and poverty framework.

The two projects commissioned from this call and reviewed by this study (R7515 and R7516) both fulfilled most of the conditions set by the NRSP call. They addressed head-on the question of accounting for the low uptake of technologies, they concentrated on conceptual thinking initially (especially R7515), and then developed some 'decision support tools' that aimed to reduce the gap between knowledge generation and dissemination. NRSP

appeared to increase its emphasis on working closely with partners in the countries concerned. The fact that development of this conceptual thinking and decision support tools involved little cooperation with Ghanaian organisations in the case of R7515, and mainly through the inputs of individual Ghanaian students at FORIG in the case of R7516, had become problematic for NRSP by the projects' mid-term review.

3.2. Knowledge dissemination domains in the FAI (R7515)

The purpose of this project was to: 'decrease the knowledge gap between technology design and dissemination to assure greater impact of research outputs.' This was to be achieved by two outputs:

1. **A state-of-the-art review and synthesis** of conceptual issues and practical methods relating to the assessment the factors affecting the potential use of innovations by end-users.
2. **An innovative analytical framework and tested methodology** for identifying the nature and characteristics of the 'knowledge dissemination domain' of proposed FAI research outputs.

Proposal

In the funding application it was not expected that the project would work with a partner organisation, although the project leaders planned to hold a workshop at Kumasi Nkrumah University of Science and Technology (KNUST). They hoped to test and modify a new framework with both UK and Ghana-based researchers *during* the research, but consultation with Ghanaians was not budgeted for and they were not part of this activity. Ghanaians only participated towards the *end* of the project because one was invited to the UK workshop and another workshop was held for Ghanaian researchers at the Crop Research Institute (CRI) in Kumasi. (However, the budget for the Ghana workshop was too low to cover travel and subsistence for those Ghanaians coming from outside Kumasi.)

It was already clear to the applicants at the proposal stage that when matching technologies to users it is critical to recognise that few people in Ghana are just 'farmers'; most employ a variety of livelihood strategies (selling crops and livestock products, off-farm economic activities etc). This diversity meant that different technologies would suit different categories of people. The failure to recognise this was expected to be part of the explanation for the low uptake of technologies.

Despite the emphasis on the importance of marketing during the course of the project, it is stated in the project proposal that market studies for the outputs of this project were not considered relevant. The failure to explore the demand for their outputs in Ghana was a flaw in this project from the outset.

Mid-term review

The mid-term reviewers of this project recognised the analytical achievements of the early stages of the project and anticipated that the decision support tool might even be relevant to other countries. They referred to the 'solution space' concept as elegant and useful (this referred to the influence of management, that is, 'all combination of values of critical management variables that deliver positive results when a particular technology is used

within a given environment’).⁴ However, they were concerned that the researchers were moving away from a specific focus on soil management practices and land use (the ‘heart of the call’) to technology uptake in a conceptual and generic way. The examples used in the framework, they pointed out, concerned different technologies (e.g., maize varieties), and they made a request that the researchers focus on land management technologies when developing their decision support tool.

The reasons for the NRSP focus on land management were entirely logical: – specialisation improves the chances of quality research and Ghanaian researchers continued to stress its importance during this review. However, the project funding application was approved despite an ambivalence about its focus on land management. ‘Improved soil nutrient management techniques’ are stated in the goal, but in the summary and much of the detail of the proposal, more generic lessons were expected:

‘This project addresses the persistent gap between expected and actual uptake of research results in the FAI... By identifying the knowledge dissemination domain associated with proposed research outputs, researchers and research managers will be better placed to effectively assess, *ex ante*, the circumstances under which the utilisation of new research-based knowledge about particular problems or technologies is most likely to occur.’⁵

Within its own terms it is arguable that the project was meeting its objectives, in the sense that the generic lessons could be applied specifically to land management by others when using the tools, so that whether or not it was appropriate for NRSP to insist on a narrowing down to concentrate on land management at this point was questionable.

NRSP reviewers in the mid-term review also pointed out that the researchers took for granted their assumption that agricultural technologies remain unused, rather than testing it. But this is odd because NRSP made the same assumption in their call; it asked for ways to understand and deal with the gap between generation and uptake of technologies, rather than proof of the existence of the gap.

The reviewers’ insistence on, and explanation of, logframe for all monitoring purposes may have been unnecessarily rigid. The project leader preferred to use it as an external monitoring tool, and may have had his own methods for reviewing progress internally. To ask for more information about how they were monitoring progress for their own purposes might have been more constructive.

The reviewers made a series of points about the relationship between the UK university and researchers in Ghana. They suggested that the arguments made in various project documents for making research more responsive to client needs underestimate the existing efforts of research scientists in West Africa. The latter already do participatory research and the UK project failed to reflect the latest approach of scientists in West Africa. The reviewers also made suggestions about the relationship with target institutions. The expert panel in the UK was expected to finalise market segments, whereas the panel in Ghana should fulfil an equivalent role (rather than validating them as the project planned), reviewers suggested.

The reviewers’ assessment of progress on the A-H pathway (see Appendix 5 for explanation of this pathway) at the MTR appears poorly justified. Given the call’s encouragement to do conceptual thinking, with no mention of partner institutions, the criticism that the project was

⁴ D. Reece, J. Sumberg and L. Pommier, 2003, Matching Technologies with Potential End-User: a Knowledge Engineering Approach for Agricultural Research Management, page 9.

⁵ J. Sumberg, 1999, Knowledge Dissemination Domains in the Forest Agriculture Interface, Research and Development Funding Application, page 4 (question 18b.).

failing to develop institutional partnerships seems rather unfair. Early links with overseas collaborators is a condition explained in the NRSP information pack, but the research grant was awarded on the basis of a plan without early linkage with Ghanaian organisations. A shift towards Ghanaian cooperation would have required additional funding.

Findings and products

The project researchers produced a series of good quality reports and articles for journals⁶. A useful, but not new, underlying assumption was that poor uptake of technologies should not be blamed on users. Technology research and development in both industry and agriculture was reviewed and it was concluded that low uptake of technology is not necessarily due to external factors (lack of education, land tenure, market problems...). The researchers argue for an explanatory emphasis on the inappropriateness of the technology or a mismatch between technology and users.⁷

At times these documents scrutinise, and re-classify, the language and concepts used to explain poor technology uptake in a way that may complicate the debate. For example, past theories that attempt to explain the failure in technology dissemination – in terms of elite research methods, managerial deficiencies or lack of organisational coordination – are deemed flawed for using the word ‘constraints’ incorrectly. ‘Constraints’, they argue, should only refer to issues relating to the match between the innovation and the potential user group. The success or failure of technology uptake should be attributed to this innovation stage.⁸ However, it is then acknowledged that if you do not have the prerequisite conditions (e.g., credit) in place then you cannot proceed to the innovation phase in any case. But it is arguable that credit *is* effectively a constraint to adoption.

The project focus on one aspect (innovation) is useful for analytical purposes but when considering solutions, innovation has to be seen within a broader context. Even if the technology and users are perfectly matched, the uptake could be constrained by other problems (gender blindness, lack of access to information, institutional conflicts etc); furthermore, technology uptake has caused new problems in some instances (flooding the market, contributing to a decrease in prices). The focus on a particular part of a highly complex and inter-related set of processes is constructive at the conceptual stage, but leads to problems when they apply it to decision-making support tools.

A useful paper dwells on market segments and how it can inform decisions about technology research and development (R&D).⁹ As Sumberg suggests in relation to R&D, ‘Market research must play a major role in these early stages, in identifying groups or segments of potential users, in characterising the context within which these segments live and farm, and in providing information so that their interests, resources and minimum requirements are reflected in the emerging innovation.’¹⁰ This is not the first time such ideas have made their way into development thinking (e.g., S. Epstein promoted Culturally-Adapted Social Marketing in the 1990s¹¹, Intermediate Technology Development Group and others have

⁶ See Appendix 4 for a listing of project publications and the decision support tools for R7515 and R7516.

⁷ J. Sumberg, 2003, Rethinking constraints to the adoption of agricultural innovations: Is it time for a rethink? in press, page 10.

⁸ Ibid, page 5-7.

⁹ D. Reece, J. Sumberg and L. Pommier, 2003, Matching Technologies with Potential End-User: a Knowledge Engineering Approach for Agricultural Research Management.

¹⁰ J. Sumberg, 2003, Rethinking constraints to the adoption of agricultural innovations: Is it time for a rethink? in press, page 9.

¹¹ Epstein, S. (ed.), 1999, A Manual for Culturally-Adapted Social Marketing: Health and Population, Sage Publications, London.

used marketing research as part of their approach¹²), but they remain underused, and they may be better received in the current climate as the language of the commercial world becomes more accepted in development discourse.

Another paper of interest argued that as 'farmers' are relying more heavily on non-farm activities for income, the uptake of new technologies for food production (especially by poorer farmers) may decrease, partly because the cost of acquiring information will be high in relation to the proportion of income from food production. Participatory technology development has yet to extrapolate lessons learned from particular sites so that 'farmers' in other sites can benefit and the current reform agenda (which entails decentralisation and a bigger role for farmers in R&D) is likely to focus on the commercial agricultural sector and the needs of better off farmers.¹³ The warning about the additional burdens placed on poorer farmers, or even their exclusion from agricultural services, is well-made.

Reporting and the FTR review

The Final Technical Report of the project makes it clear that although the links with target institutions in Ghana remained weak, the funding application had never given the impression that close cooperation was part of the plan. The significant question about this project is whether the lack of co-operation with Ghanaian organisations had an effect on its impact: this is addressed in section four.

One reviewer of the FTR had some problems with the assumptions underlying the major output – a decision support tool called 'Interface'¹⁴ commenting that:

- Judgments made are open to interpretation (e.g., about wealth),
- The marital status of household head is not specified,
- Data about population and poverty is not qualified in terms of quality,
- Knowledge is socially constructed and contextual so experts will inevitably disagree about farmer behaviour and incentives and certain voices (not necessarily those with most experience) will be louder than others.

The review also observed that the workshop participants were led to give favourable responses about the tool (that is, instead of posing neutral questions about how they found the workshop or tool, they were asked to rank its usefulness giving little room for a negative response). The results of the evaluation of the workshop were largely positive, as workshop evaluations usually tend to be, in contrast to some of the opinions expressed during this study.

The project had had some link with R7560¹⁵ during its progress but R7516 was not mentioned in the final report. NRSP asked for information about which institutions, and key contacts, had been selected for disseminating the DST. However, the project decided that until the market segments in the 'Interface' could be further tested, the tool should not be widely disseminated. The project applied for further support to accomplish this but NRSP

¹² As examples, S. Sundar (1990) Market Research into the Potential Demand for Stoves in Sri Lanka. Unpublished Report. ITDG: Rugby; and K. Clarke (1991) Marketing Strategy to Disseminate Improved Stoves Throughout Sri Lanka. Unpublished Report. Rugby: ITDG.

¹³ J. Sumberg, E. Gilbert, and M. Blackie, 2004, Income Diversity, Technology Choice and Agricultural Research Policy in Sub-Saharan Africa, *Development Policy Review*, 22(2), page 141.

¹⁴ Reece, D and J. Sumberg, *Interface: A Decision Support System for Policy-Relevant Impact Through Natural Resource Research Version 2.0*, CD Rom, ODG, UEA.

¹⁵ R7560. Analysis and synthesis of technical solutions in the forest/agriculture interface. R. Mathews. University of Cranfield. February 2000 – March 2001.

declined the request. At the time of this study, the Project Leader has been in Mali for two years, but is currently considering options for taking the ideas from R7515 forward (especially integrating marketing ideas into technology R&D), including a consideration of which countries might be involved.¹⁶ This may not be Ghana and will not necessarily entail promotion of 'Interface.'

3.3. Bridging knowledge gaps between soils research and dissemination (R7516)

The purpose of this project, as expressed in the funding application, was to develop and promote 'strategies to secure the livelihoods of poor people dependent on agricultural systems near the receding forest margin' through three outputs:

1. Information on success and failure in adoption of soil fertility research outputs collated and disseminated.
2. Reasons for low adoption of soil fertility research outputs in Ghana identified and documented.
3. A rigorous framework for designing soil fertility research and dissemination strategies developed and promoted.

Proposal

The evidence of demand for these outputs from Ghanaian partners was weak: it included merely a statement that partner organisations expressed a need for the research with no mention of who, when or how these opinions were voiced. The proposal did not show evidence that: (a) either partnerships with Ghanaian organisations were well-established or plans for close co-operation were clear, and (b) there was a strong demand for the project's outputs in Ghana. The applicants stated that market studies for the outputs were not relevant because they would not be for sale: however, this may have been misplaced because potential demand should be established from likely users even if material is free. Perhaps more so, due to the inevitable difficulties in measuring the popularity of a product when it is distributed free (in contrast, the popularity of a commercial product can be easily measured by number of sales over time and number of products maintained, replaced or updated).

The most surprising aspect of this project was its brevity: only 18 months to work with partners and 'produce both specific recommendations for effective dissemination in Ghana and a framework for designing integrated research and dissemination strategies for soil fertility research more generally, embracing technical, socio-economic and policy dimensions.'¹⁷ One of the partners – International Institute for Tropical Agriculture (IITA) in Cameroon – never emerged as a participant in the project, either during research or dissemination, and no explanation was given about their lack of involvement. The plan to disseminate the findings through four workshops appears, with the benefit of hindsight, to have amounted to an inadequate strategy for wide dissemination.

¹⁶ J. Sumberg, 2004, Increasing the Effectiveness of Agricultural Research for Small-scale Farmers in Africa: A New Product Development Approach, A Research Concept Note.

¹⁷ F. Sinclair, D. Jones, M. McDonald, 2000, Bridging Knowledge Gaps Between Soils Research and Dissemination in Ghana, Research and Development Funding Application, page 4.

Mid-term review

In NRSP's mid-term review, mostly technical suggestions and requests were made about improving the knowledge database and research focus. Key points were:

- the knowledge of research/extension personnel should be included,
- the number of case studies should be reduced and linked to R7446¹⁸,
- training should be provided to Ghanaian institutions,
- information was requested about plans for the 'framework',
- greater disaggregation of people and account should be taken of non-natural resource income,
- the researchers should adopt a greater focus on poverty in view of DFID's changing agenda embracing that goal,
- strengths and weakness of different fallow/soil management practices should be presented,
- differences between communities should be taken into account,
- encouragement was given to produce 'decision support tools'.

Findings and products

Despite the absence of cooperation between the two projects (R7515 and R7516), they came to similar theoretical conclusions in some respects. One of the researchers, who recently completed her thesis, wrote: 'general reasons for low adoption of existing techniques... include the low value cost ratio of inorganic fertiliser for staple food crops, lack of availability of organic material and limitations within public sector extension services, within the context of a relatively low level of investment in soils research.'¹⁹ During the project researchers found that a 'more fundamental constraint was the lack of systematic consideration of farmers' circumstances in the development of soils technologies. As a consequence of diversity in agricultural practices and limited access to resources in southern Ghana, technologies were only appropriate to a limited number of crops and cropping patterns, and a limited number of farmers. The resource requirements for the majority of these technologies made them more appropriate to male farmers than female farmers.' Thus, the heterogeneity and diversity of technology users is emphasised in the theories postulated by both projects.

To address these problems an integrated framework and a set of tools (partly computer-based, partly paper-based) were produced to make sure that research and dissemination took account of farmers with different circumstances.²⁰ Researchers tried to find ways to match users and technologies by comparing resource access amongst disaggregated groups of farmers against information on the requirements for different potential technologies. This aimed to identify the criteria that technologies must satisfy to be adopted by different groups of farmers. If no technologies for a particular group of farmers existed, then technology researchers would plan appropriate policy interventions to addresses these gaps. The project team concluded that increasing farmer participation in the design of soil fertility management technologies could make those technologies more appropriate to farmers with diverse sets of resource endowments. The ideas underlying this framework,

¹⁸ R7446. Shortened bush-fallow rotations for sustainable rural livelihoods in Ghana. M. McDonald. Dec 1999 – February 2003.

¹⁹ C. Moss, 2004, Understanding and Improving the Adoption of Soil Fertility Interventions at the Forest Margin in Ghana, PhD thesis, page v.

²⁰ Local knowledge and livelihoods: tools for soils research and dissemination in Ghana, School of Agricultural and Forest Sciences, University of Bangor, Wales, CD Rom RR7516/07r

although not new, have yet to be taken up by all research scientists in Ghana. So their consideration and promotion was justified. The critical question is: were this framework and these tools the most effective way to advocate these ideas? This question is answered in Section Four.

Reporting and the FTR review

The project's final report was reviewed in Autumn 2001. In addition to an evaluation of the content of the work of the project – especially what has been left out (e.g., implications for poverty reduction, pitfalls of PRA, details of household structure), the main concern expressed is about whether there is a demand for the package of tools. The reviewers describe the written outputs as thoughtful, but the decision support tools may not be used because: (a) they are not that easy to use, (b) lack of access to computer facilities, (c) the knowledge base (Akt5) lacks social context, (d) the livelihoods and land use diagrams lack an explanation of PRA, (e) the 'technology choice tool' is more of a list than a tool, (f) the framework may not be taken up. Reviewers also pointed out that dissemination had not been completed or made as accessible as possible. In response to the review, project researchers argued that more information and capacity-building were needed before the tools could be widely disseminated. NRSP declined the request for further funding.

4. Impact of Decision Support Tools

Social scientists in Ghana confirmed that to improve technology uptake there has to be a better understanding of:

- the multiple livelihood strategies of technology users,
- the diversity of circumstances and needs (especially due to gender and wealth/poverty),
- the value of indigenous knowledge,
- the need to involve potential users in technology R&D in more appropriate ways.

NRSP decided when projects R7515 and R7516 applied for further funding that these particular decision support tools were not the most effective strategy for tackling the research/ dissemination gap relating to improved soil nutrient management techniques. Was NRSP right? Were other strategies, or could other alternatives, be developed by NRSP to address this gap? To answer these questions, a summary of the uptake of the tools as determined by this study is needed.

In general, many informants reported that they found the decision support tools interesting. On the other hand, there was little evidence of either tools (or of those produced by other NRSP projects) in computers, offices or libraries of the institutions / offices visited. None of the outputs of R7515 or R7516 appear on the GAINS website database about agricultural information.²¹ The main reasons for lack of use of the tools in both cases were:

1. *training was insufficient*: some informants found the training too short, a few said that they did not get enough time (or access to computers) for practising during the workshop, others would have liked some follow-up (but this was not possible because funding ran out);

²¹ See Ghana Agricultural Information Service, www.gains.org.gh

2. *technology problems*: many informants do not have good or even adequate access to computers, had problems installing the CD, or were not sufficiently computer literate;
3. *lack of relevance*: senior managers did not perceive the content to be relevant to their work, natural scientists saw it as the preserve of social scientists, and much of the information was not new to the latter;
4. *individual rather than institutional learning*: a large number of the workshop participants had retired, switched their jobs or were travelling abroad. They did not transfer the knowledge of the tools to others within their organisations, so it left with them.

It is not possible to judge whether or not the decision support tools would have been more widely understood and used if funding for training and capacity-building had been forthcoming. But it is clear that much of the content of the decision support tools, and other research products, remains useful and relevant. Natural scientists in Ghana still appear reluctant to take account of multiple livelihoods, diversity of users, the value of indigenous knowledge and the advantages of a participatory approach. They do not perceive these aspects to be their responsibility. During this study many Ghanaian social scientists and policy-makers suggested that scientists need to be persuaded to integrate a social approach into their work. It appears that there is a need to communicate and advocate many of the conceptual ideas in both projects within Ghana but that the evidence to suggest that the decision support tools are the most appropriate format and mechanism is still lacking.

4.1. Knowledge Domains (R7515)

The project produced a CD Rom – ‘Interface’ – and tested it out in two workshops: one for a panel of three in UEA, and one at the Crop Research Institute (CRI) in Kumasi. At the second event, eighteen people attended ‘Technology and People: a workshop on increasing the impact of natural resource management research’, in December 2001. Six were from the CRI, two from the Forestry Research Institute of Ghana (FORIG), two from the Sunyani Polytechnic, three from Kumasi Nkrumah University of Science and Technology (KNUST), two from the Cocoa Research Institute of Ghana (CRIG), and three from the University of East Anglia (UEA). We interviewed ten of the workshop participants, including Dr J. Sumberg, the Project Leader, but could not contact either participant from CRIG.

Comments about the workshop were mixed. Several reported that they found some of the concepts interesting; however, when they were pressed to say which, only one specified that it was useful to be reminded of the diversity of peoples’ priorities. Others complained that the event was too short. Those who travelled from outside Kumasi expressed a concern that they had had to pay for their expenses out of their own pocket (because none were offered by the project and they had been invited as individuals rather than as representatives of their institution).

The social scientists did not find the concepts in the CD Rom novel, although one learned about stakeholder analysis for the first time if they wanted to refresh their memories about how to do, for example, participatory rural appraisal or impact assessment, most would prefer to consult a document rather than a CD. One found it difficult to have complete confidence in the CD Rom because she had spotted a mistake on one of the maps.

The natural scientists tended to view the content of the CD Rom as in the domain of social science and, therefore, not directly relevant to their work. Of all the participants, only two scientists with a passion for computers found the CD Rom easy to understand and user-

friendly. Some said that they followed it when the facilitators went through it at the workshop, but that when they found the time to try it out on their own they did not find it accessible.

Two participants felt that the initiative could never have got very far because Ghanaians were involved in the process too late. The only way to ensure uptake of such tools would be to get potential users involved from the start. Those who were slightly more positive about the potential usefulness of tool said that they did not have the funds to try it out.

Whether or not the ideas in the large number of academic articles published by the project have had an influence on international agricultural research is harder to say. Many have only been published in the last year. The work produced by R7515 was cited in Moss's thesis, but not in great detail. It is too soon to assess its impact.

It is concluded that the 'Interface' CD Rom has had a minimal impact on researchers in Ghana, Domain W in NRSP's Conceptual Impact Model. Stakeholders in Domains V, X, Y and Z had yet to be targeted as potential users. On the A-H Uptake Pathway, Project R7515 has achieved the following:

A-H Uptake Pathway

Step	Description	Evidence of R7515 impact
A	Agreement with partners	No
B	Research results/outputs	Published articles in peer-reviewed journals, technical reports
C	Development of products through adaptation/packaging	CD Rom produced, but field-testing not completed
D	Promotion of products	Limited to workshop with 15 non-UEA researchers
E	Adoption of products	No for CD Rom (ideas in articles unknown)
F	Application/replication of results	No
G	Promotion of technology/behaviour change by end users	No
H	Adoption of products and purpose delivered	No

4.2. Knowledge Gaps (R7516)

The project developed a CD Rom entitled: 'Local Knowledge and Livelihoods: tools for soils research and dissemination in Ghana'. It consisted of three parts: – (a) *databases of knowledge* about soil fertility in forest and forest-savanna transition zones in Ghana compiled from farmers, researchers extensionists, (b) a *diagram based tool* about rural livelihoods to be used during participatory rural appraisal, (c) a *technology choice tool* that helps decide which technologies are suited for which groups and lists of additional requirements if a technology is to be adopted. These tools were presented at four workshops: in Kumasi at FORIG (10 participants) and at Ghana Organic Agriculture Network (GOAN) (15 participants, mostly KNUST), in Sunyani at Sunyani Polytechnic (17 participants, mostly the Ministry of Forestry and Agriculture (MOFA), and in Accra at the Council for Scientific and Industrial Research (CSIR) secretariat (10 policy-makers from MOFA, CSIR and DFID). 17 of the 52 participants (i.e., one third) were interviewed.

Only one participant reported using the CD Rom or paper-based tools since the workshop. This was a former lecturer at Kwadaso Agricultural College who used the database for teaching purposes, but because he did not transfer the knowledge within his institution, or leave the CD with the computer technician, it left with him when he took up a farm manager job elsewhere. He thought that similar tools should be developed for other ecological zones in Ghana.

Others have used the ideas from the tools but not the software or manual. GTZ's project with MOFA (Sedentary Farming Systems) went through the material and extracted useful ideas to incorporate into their own conceptual system for participatory technology development ('Technology Fair'). However, to adopt a whole new framework would have been counter-productive. Another participant (a student at IRNR, KNUST) used the ideas relating to livelihoods analysis in his MPhil thesis but did so by using his memory of the workshop rather than consulting the CD-Rom. A technician at IRNR advised farming relatives to adopt multi-cropping techniques but has yet to find out whether his advice has been useful.

Despite the need to persuade scientists to embrace the ideas in these tools, once again respondents saw them as more relevant to the work of social scientists. Lack of direct relevance to their work was the main reason given for low uptake. Others said that they enjoyed the workshop, and found the presentations of a very high standard, but that the lack of follow-up made it difficult to put the ideas into practice. One did not use it because he felt that they had over-emphasised the importance of the environment in farmers' choice of crops and underplayed other factors.

The computer-based nature of the database made it inaccessible to some. In the case of these participants, including many from MOFA, they faced a range of technology problems: they did not have a copy of the CD, they did not have their own PC, they were not computer literate or they could not make the installation work.

It is concluded for R7516 as well that the CD Rom and its accompanying manual have had a minimal impact on researchers in Ghana, Domain W in NRSP's Conceptual Impact Model. Stakeholders in Domains V, X, Y and Z had yet to be targeted as potential users. On the A-H Uptake Pathway, Project R7515 has achieved the following:

A-H Uptake Pathway

Step	Description/Verification	Evidence of R7516 impact
A	Agreement with partners	Yes – with FORIG
B	Research results/outputs	Unpublished papers, technical reports, PhD thesis
C	Development of products through adaptation/packaging	CD Rom with three tools, two of which are also paper-based
D	Promotion of products	Two workshops in Kumasi, one in Sunyani and one in Accra
E	Adoption of products	One user for CD Rom for a short time (ideas in papers and thesis unknown)
F	Application/replication of results	No
G	Promotion of technology/behaviour change by end users	No
H	Adoption of products and purpose delivered	No

4.3. Related Projects and Spin-offs

The project team at the University of Wales, Bangor, have also been working on decision support tools for the selection of legumes for incorporation into tropical cropping systems (as part of project R7466). LEXSYS was first developed by the International Institute of Tropical Agriculture in 1993-94. Project R7466 developed it further, making it more user-friendly and introducing new information. Researchers also designed a new decision support tool – LEGINC – based on data from LEXSYS as well as new information collected in Ghana (as part of project R7446). This CD Rom assists in deciding which legume to select and provides information about how to grow it. It is accompanied by a series of information sheets. LEXSYS and LEGINC were tested at a stakeholder workshop in Ghana (October 2002). Once participants' comments had been incorporated, the CDs were widely distributed the following year. GTZ's Sedentary Farming Systems Project disseminated 100 copies of the CDs to national directorates and institutes with a commendation from MOFA's Director of Agricultural Extension. We came across three researchers who use LEXSYS regularly – at CRI, FORIG and SRI – and two others who had been impressed by it when seen on a colleague's computer, but did not have copies. One of these received a CD entitled 'LEXSYS' in the post but it was blank. The CRI researcher who does use it regularly lends it to students. Another at the Kwadaso Agricultural College had heard about LEXSYS and requested a copy.

Age was an important factor in the popularity, or otherwise, of computer-based information and decision support tools. The younger researchers and lecturers were enthusiastic about computers, older ones were, unsurprisingly, keen to have information in alternative forms as well (manuals, information sheets, guidelines etc), especially when used for reference rather than decision-making. As far as disseminating ideas is concerned, one researcher pointed to the importance of radio and video as more appropriate media if trying to reach extensionists or farmers.

5. The Forest Agriculture Interface in Ghana

It appears clear that these decision support tools are not making a contribution to improving researchers' understanding about the uptake of new technologies. The project leaders did not expect them to be put in use without a programme of field-testing, modification, training and capacity-building.

Before making recommendations about strategies that might improve understanding more effectively, it is worth explaining the current context of the forest agriculture interface.

5.1. Problems and Constraints

At a field level, Bokor at the Ghana Organic Agriculture Network (GOAN) points to various constraints facing farmers that partly account for the low uptake of technology (as part of research carried out for R7516), including:

- *Land*: conditions attached to the lease or sale of land can stipulate that only seasonal crops may be grown which reduces farmers' incentive to invest in long lasting soil fertility. The pressure for land (e.g., for building) in the Kumasi area in particular,

means that many livelihoods are being threatened; up to 35% are landless in some areas.

- *Time*: farmers are wary of technologies that require substantial investment of time, eg composting is time consuming whereas manure is quick and easy.
- *Credit*: loans are needed for buying or leasing land, equipment, other inputs, but are not available to poorer farmers.
- *Marketing*: there is insufficient demand for certain produce (e.g., organic products in this case, but more typically for particular crops that are over-produced).
- *Technical problems*: some technologies required complex expertise and there was insufficient follow-up.²²

The R7516 project Final Technical Report explains more about limited market development in Ghana. In some areas it is inaccessibility to markets, in others it is low prices/flooded markets that cause problems, so the researchers advise that 'Improvements in post-harvest storage technology, agricultural credit and farmers' ability to manage cash flow in conjunction with the adoption of improved soils technologies could contribute to more profitable farming. Strategies to improve soil fertility management should not therefore focus on soils technologies alone.'²³

As far as the relationship between researchers and farmers is concerned, Catharine Moss argues that one of the main problems is at the innovation stage. Apparently, 'increased attention is required to the targeting of soil fertility management technologies to specific groups of farmers and farming systems, with recognition of the scope of specific technologies in terms of the size of target groups.'²⁴ This was the constraint that the R7515 and R7516 projects addressed, but in the same report Moss identifies others:

- The national agricultural extension system is overly reliant on external sources of funding for the provision of extension services that has resulted in the current breakdown in the system of information transfer. Research results from participatory technology development do not reach beyond the project area.
- District MOFAs are not active in seeking out the results of research.
- Research projects do not always reach district MOFAs in their networking activities.
- There are problems with the delivery of technologies by extension agents.
- Extension agents are better able to deliver packaged technologies than ones that make greater use of farmers' existing knowledge and encourage farmers to experiment with new technologies.
- Existing perceptions of farmers toward research and development activities need to be recognised before effective collaboration between farmers and researchers, extensionists and development workers can take place.

It is also clear that observations made in the literature about agricultural research – that cultural barriers, social status hierarchies and inequalities mean that the rhetoric about 'farmer-led research' often gets translated into top-down transfer of technology²⁵ – still apply in Ghana. Sutherland recommends that a respectful 'collegiate dialogue', and the perception of legitimacy, have to be generated so that farmers accept results. Many researchers in

²² R. Bokor, 2001, Farmer Field School Evaluation, part two, GOAN report.

²³ F. Sinclair, 2001, Bridging Knowledge Gaps Between Soils Research and Dissemination in Ghana, Forest Agriculture Interface, Project R7516, Final Technical Report, page 14.

²⁴ Catherine Moss, 2001, A case study of cover crop knowledge storage and information flow. R7516, page 13.

²⁵ A. Sutherland, 1999, Linkages between Farmer-Oriented and Formal Research and Development Approaches, Agricultural Research and Extension Network Paper No. 92, January, pages 1-8.

Ghana emphasised that most farmers will only trust the advice of other farmers, rather than extensionists or scientists.

At the institutional level, R7516 repeatedly identified a severe problem (in their funding application and more recent project reports) that there is a need for gender specific dissemination of soils research results. This still has not been addressed. Research scientists perceive gender, and other 'social development' issues, as the preserve of social scientists and not directly relevant to their work. When the Minister of Agriculture gave an address on MOFA's priorities for the next year, the assumption was that R&D should be centred around various food products rather than people and their circumstances. Understanding the needs and interests of food/timber/fuelwood producers or users was not mentioned, let alone that these are diverse and unequal on the basis of gender, wealth, age and other differentials. The R7516 Final Technical Report²⁶ mentions that a gendered approach is needed in Ghana; this study found evidence to strongly support this view.

Further information constraints in the area of soil fertility are also usefully identified by Moss:

- 'There is insufficient information flow to and within the National Agricultural Research System.
- The publication of journal and conference proceedings is often delayed.
- There is insufficient internal reporting within the agricultural research institutions and dissemination of research results within the national agricultural research system.
- Information is scattered in various libraries that make it difficult to access.
- Computer and internet facilities are limited in national agricultural research institutions making it more difficult for researchers to search for information and limiting networking activities.
- Co-operation and communication has been improved with the formation of the Ghana Cover Crop Network but could still be increased.²⁷

A combination of the pressure to publish to secure promotion, difficulties of getting published, fear of plagiarism, competition for funding, and the lack of internal reporting, mean that researchers are often secretive about their research results.²⁸ During this review researchers confirmed that individuals hoard information, agencies compete rather than collaborate as a matter of course, and researchers have chronically poor access to the information they need. Information is time consuming to acquire and often has to be financed by individual researchers themselves: those with computers in their office have usually paid for them out of their own pocket. When institutional budgets are cut, it is often the information and communication components that goes first. There is a general agreement at all levels that better access to information is a priority.

5.2. Opportunities

Social development, pro-poor approaches, and participatory technology development are gaining ground in Ghana (as they are international development agencies), but in an erratic, uneven and at times simplified way. There is tremendous scope for enabling those researchers in Ghana who have a good understanding of social development to convince

²⁶ C. Moss, 2004, A case study of cover crop knowledge storage and information flow. RR7516.,page 13.

²⁷ This network, formerly co-ordinated by Dr Hans Dapaah at CRI, has since folded due to lack of funding.

²⁸ C. Moss, *ibid*, page 8.

others (often in their own institutions) to mainstream gender, livelihood/stakeholder analysis, poverty analysis, and other useful concepts or theories into their work.

The information generated by this project has produced useful ideas about the relationship between users and researchers during the innovation process. Sumberg (Project Leader of R7515) points to the dangers of assuming that users should always be involved in R&D: it may simply load additional burdens on people who cannot afford the time, money or risk of failure. In a rare example of learning across the two projects, Moss (researcher on R7516) refers to Sumberg's point that different approaches may be more successful to different types of technologies, for example complex technologies, or those introducing completely novel concepts, may require more intensive farmers' involvement during the design stage.²⁹ These ideas have yet to be disseminated widely amongst researchers in Ghana.

NRSP has invested in some highly dynamic Ghanaian organisations through projects R7515 and R7516 – CSIR, GOAN, MOFA and KNUST – all repositories of expertise and quality information (even if it is highly individualistic in ownership). Rather than wasting this, there is huge potential to build on the expertise that has been deepened by NRSP projects. At present this expertise is held by individuals: the opportunity to institutionalise ownership and use of this information, and establish strategies for exchanging information across agencies, is obvious.

Capturing the information about gender and soil fertility, which might otherwise be lost because those researchers committed to its value have insufficient support, is timely. NRSP is already planning research into gender and natural resources (PD123); whatever strategies are adopted to build on past projects in Ghana could coordinate closely with the planned gender research. Moss suggests that 'gender focused research should therefore be carried out to understand all aspects of the livelihoods and agricultural activities of women including those of young and married women and female household heads. More detailed understanding of some aspects of rural livelihoods could be used to develop indicators of resource access to reduce complexity in understanding rural livelihoods, and target technology development and dissemination more effectively. More specifically, guidelines for land tenure data collection could be used to overcome apparent complexity and lack of clarity and assess differences in land scarcity. Development of methods for characterising and quantifying access to, and use of different sources of labour would help researchers to consider labour requirements in technology development.'³⁰ Ghanaian researchers could consider filling these research gaps, and meeting other recommendations made by both projects, with NRSP's support.

The existence of huge amounts of information about agriculture in Ghana present opportunities. The Scientific Secretary at the SRI has identified the need to pull together all the information generated by MOFA's Root and Tuber Improvement Programme. This largely successful initiative has produced plenty of information but it is scattered and inaccessible. Better management of information on specialist areas is a clear need.

²⁹ C. Moss, 2004, Understanding and Improving the Adoption of Soil Fertility Interventions at the Forest Margin in Ghana, PhD thesis, page 231.

³⁰ C. Moss, *ibid*, page 259.

6. Recommendations

- ⇒ **Lessons on technology R&D:** projects R7515 and R7516 produced interesting findings on the complexity of technology innovation and dissemination processes. Many of their observations are useful: (a) the heterogeneity of technology users and their circumstances, (b) the importance of mainstreaming gender analysis, (c) different technologies require different levels of user involvement in the design process, (d) the potential of marketing and 'new production development' concepts. But whether there is a sufficient demand for the tools produced by R7515 and R7516 is unknown. Whether or not they are the most effective tools for promoting uptake of these ideas remains inconclusive and can only be decided by institutes in Ghana.
- ⇒ **Exchange of knowledge within Ghana:** expertise in gender, livelihoods, stakeholders, poverty and related issues is uneven within research institutes in Ghana. Since the priority is to build research capacity in Ghana, and promote uptake of research findings, the transfer of expertise in these areas should be within and between Ghanaian institutes. Since UK researchers have developed considerable expertise in this area, they could play a useful role in giving advice, filling gaps in knowledge, and facilitating information sharing. But at this stage a key role for the UK in managing the exchange of knowledge within Ghana is not recommended. It is recognised that there is a trade-off between innovative conceptual thinking and capacity-building when resources are limited; at this late stage of the NRSP, the emphasis should be on knowledge dissemination and institutional capacity-building within Ghana rather than the generation of new knowledge.
- ⇒ **Disseminating knowledge:** there is a need for *institutionalised* knowledge systems, rather than a dissemination of still more information to individuals, as both projects have pointed out. Various Ghanaian researchers, especially social scientists, have expertise in mainstreaming gender – and other social development issues – into technology R&D. Others, less so. There is the need and opportunity to support those with expertise to transfer knowledge to others within their institutes as well as within partner agencies in Ghana.
- ⇒ **Piloting a resource centre:** One option for improving communication between agencies would be a pilot resource centre jointly owned by NRSP's past partners in Kumasi (GOAN, CSIR, KNUST, and MOFA). This proposal came out of discussion with these agencies and all expressed clear interest; senior officials in MOFA (including Mr Abusah Lambert in policy and Mr J. Poku in Crop Services) also voiced an extremely sensible concern about sustainability (see Appendix 6). One way to take this forward would be to suggest that Samuel Adimado, GOAN Co-ordinator, take the attached concept note (Appendix 6), and discuss the potential with CSIR, KNUST and MOFA. If interest and commitment is confirmed at a high level (e.g., Professor D. B Okai, Dean, Faculty of Agric., KNUST; Dr Joseph Cobbina, Head, Natural Resource Management; MOFA, Chief Director + Director of Extension Services, Mr S. Fripong) S. Adimado could co-ordinate the process of putting together and submitting a funding application and business plan to potential donors. The key to this plan would be to convince all concerned that the strategy for ensuring better access to information was sustainable beyond the donors' support. Planning would involve a consideration of: (a) the evidence of demand for the services, (b) ensuring multi-agency ownership and decision-making, (c) gender mainstreaming in the generation and dissemination of research results, (d) clear targets and milestones against which to measure objectives and outputs and to link the conditional schedule of payments. A mixture of commercial and subsidised finance is advisable; advice from Ghanaian business would be useful for the former (e.g.,

internet café businesses), and from a professional fundraiser for the latter (NB. the DFID Central Research strategy draft has as one its four priorities: 'increasing agricultural productivity in Africa' – while another is concerned with communication). Another option is to support an idea developed by SRI that would entail better management of existing information about roots and tubers (see Appendix 7). Neither of these would be within the remit of NRSP but offering advice about other opportunities within DFID, or other donors, might be considered.

- ⇒ **Uptake of findings from R7515 and R7516:** A third, shorter-term option would be to offer support for the further dissemination of the outputs of R7515 and R7516. This would allow researchers in Ghana to repackage information – in publications, training, briefings or other formats – into more accessible outputs and disseminate them within key institutes (especially CSIR [CRI and SRI] and KNUST). Leading researchers in CRI, SRI and KNUST might be invited to submit a proposal for 12 months funding to extract the most useful research findings from all the outputs of the two projects, identify who might be interested in them, and then repackage those findings into appropriate formats. Further uptake of those aspects of the two projects' outputs that inform gender mainstreaming, and integration of other social development issues, in particular might be encouraged. Any further work in Ghana should work closely with the study commissioned by NRSP to synthesise lessons learned about mainstreaming gender.
- ⇒ **Priorities for Forest Agriculture interface:** although soil fertility is still a major concern for farmers, other aspects of ensuring viable and secure livelihoods have been highlighted in Ghana in the last two years (post-harvest services, including processing, credit, marketing and transport). Ghanaian researchers are becoming aware that they should be careful not to encourage organisations (most obviously MOFA) to persuade large numbers of farmers to produce the same crop and then flood the market. Any further support to research should allow and encourage researchers to keep their eye on the bigger FAI picture.
- ⇒ **Partnership:** NRSP might continue to consult widely within Ghanaian organisations about its analysis of problems and setting of priorities, as was made possible in a limited way by this review. When applicants are UK-based, their objectives and budget need to reflect a commitment to working with Ghanaian organisations as partners rather than research assistants. This means being driven by their priorities, rather than merely consulting them about plans, from the start. In addition to the current request for a letter confirming interest from partner organisations, criteria for assessing partnership between Ghanaian and non-Ghanaian applicants could be developed and questions added to NRSP guidelines and reviewers' assessment sheets.
- ⇒ **Communication with projects:** when reviewing projects, and changes in NRSP priorities lead to new demands that incur further costs for researchers, such as changes in their objectives or methodology, additional financial support might be considered.
- ⇒ **Communication with DFID:** a close relationship between NRSP and DFID-Ghana would be mutually beneficial. While the channels of communication have been good at times, DFID-Ghana staff do not currently know what all other parts of DFID (including NRSP) are funding in Ghana. If a more formalised and systematic communication system was in place, DFID-Ghana could play a role in monitoring and evaluation or advising projects. This would allow DFID-Ghana to keep informed

about what is happening in the field, and NRSP to make better use of DFID staff who have useful knowledge of the country as well as of DFID's priorities and policies.

APPENDIX 1 – TERMS OF REFERENCE

Tracking the use of project products: R 7515 and R7516

Background

Natural Resources Systems Programme (NRSP) is one of the eleven bilateral programmes funded under the Renewable Natural Resources Research Strategy (RNRRS) of the Department for International Development (DFID). The goal of the Natural Resources Systems Programme (NRSP) is to generate benefits for poor people by the application of new knowledge to natural resource (NR) systems. This will be achieved through delivering new knowledge that can enable poor people who are largely dependent on the NR base to improve their livelihoods. The programme's research covers the social, economic institutional and biophysical factors that influence people's ability to both use and maintain the productive potential of the natural resource base over a relatively long timeframe.

NRSP is a 10-year programme that began in 1995. The programme covers six production systems: high potential, hillsides, semi-arid, forest agriculture interface, land water interface, and peri-urban interface. In the forest-agriculture interface, research has been carried out in India, Ghana, Nepal and Brazil,

In the FAI logical framework, there is one output: 'Strategies to sustain livelihoods of poor people at the forest- agriculture interface developed and promoted'. Included under activity 1.2, 'Livelihood security increased through improved land use strategies', were two projects which developed computer based decision support tools (DSTs), to be used by both researchers and extensionists and to assist such improved land use. These projects were:

1. R7515: Knowledge dissemination domains in the FAI (March 2000 – Feb 2002)
2. R7516: Bridging knowledge gaps between soils research and dissemination in Ghana (Jan 2000 – Jun 2001).

The decision support tools were:

1. *for R7515*: 'Interface' – a decision support system for policy-relevant impact through natural resource research (MS Access database on CD-ROM)'.
2. *for R7516*: 'Agroecological knowledge toolkit (AKT) 5. (CD-ROM).

Further details of the projects and DSTs are outlined below.

The assignment

As the NRSP enters its final year, it is important to identify, and draw lessons from, the dissemination and efficacy of its outputs and their contribution to pro-poor natural resources research. In the case of electronically-based DSTs, a study tracking their uptake, use, and sustainability will contribute to this understanding. The two Ghana projects, R7515 and R7516, have been identified as appropriate subjects for such a study. The NRSP therefore seeks to commission a consultant to carry out this tracking study.

Specifically, the consultant will be required to:

1. Based on dissemination lists of the R7515 and R7516 DSTs supplied by NRSP, track and analyse uptake and use of the tools within Ghana (and beyond, if appropriate). Particular areas of focus are likely to be NR research institutes and the Ministry of Food and

Agriculture. This should include an assessment of the progress of the DSTs on the A-H scale of research uptake (see below).

2. Make an assessment of the strengths and weaknesses of the DSTs according to the views of key target institutions and individuals.
3. Compare and contrast the strengths and weaknesses of the two tools, discussing the linkages between the two where appropriate, and drawing lessons from the comparison
4. Make recommendations for the enhanced uptake and promotion of the tools, as necessary.

Terms and conditions:

1. The assignment will be undertaken by an independent Ghana-based consultant, with support from the NRSP Steering Group as necessary, and liaison with the former project leaders, based in the UK
2. The assignment will be for 21-28 days, comprising 10-15 days fieldwork, with the remainder for preparatory work and report writing.
3. NRSP will supply the consultant with all necessary background documentation concerning the two projects.
4. The fee for the assignment to be agreed in consultation with NRSP

Projects R7515 and R7516

R7515 – Knowledge dissemination domains in the forest agriculture interface.

This project was led by a team of researchers from the Overseas Development Group, University of East Anglia. The project purpose was ‘To decrease the knowledge gap between technology design and dissemination to assure greater impact of research outputs’.

The outputs were

A review and synthesis of conceptual issues and practical methods relating to the assessment of the factors that affect the use of innovations by anticipated end-users.

An analytical framework and methodology for identifying the nature and characteristics of the 'knowledge dissemination domain' of proposed FAI research undertakings

The methodology took the form of the DST ‘Interface’. Interface was tested at a workshop of key stakeholders at the Crops Research Institute, Kumasi, Ghana and copies of the CD distributed to workshop participants.

Key target institutions included:

- Ministry of Food and Agriculture (MOFA)
- Crops Research Institute (CRI)
- Council for scientific and industrial research (CSIR)
- Cocoa research institute of Ghana (CRIG)
- Sunyani Polytechnic
- International donors including DFID, GTZ

R7516 – Bridging knowledge gaps between soils research and dissemination in Ghana

This project was led by a team of researchers from the School of Agriculture and Forest Science, University of Wales, the Forestry Research Institute of Ghana (FORIG), and Ghana Organic Agriculture Network (GOAN), Kumasi, Ghana. IITA in Yaounde, Cameroon, was also involved. The project purpose was to ‘develop effective strategies for soils research outputs in Ghana through the provision of methodological guidelines on dissemination during research design in order to produce higher adoption rates of soils technologies’.

Outputs were:

- An understanding of the reasons for low adoption of soil fertility management technologies in the forest and transition zones of Ghana.
- A suite of tools for linking agricultural research and dissemination to rural livelihoods.
- A generic framework and a specific framework adapted to Ghana suggesting how the tools can be implemented within the national agricultural research and extension system (NARES).

Among the suite of tools for output 2, was a set of 'knowledge bases' adapting an existing software tool, the Agroecological Knowledge Toolkit (AKT). This tool was installed in three organisations responsible for agricultural research and dissemination in Kumasi. Dissemination workshops were held at FORIG, Sunyani Polytechnic, GOAN, and also at the CSIR Secretariat in Accra.

Key target institutions included:

- Ministry of Food and Agriculture (MOFA)
- FORIG
- Animal Research Institute (ARI)
- Crops Research Institute (CRI)
- Soils Research Institute (SRI)
- GOAN
- Council for scientific and industrial research (CSIR)
- NARES
- Sunyani Polytechnic
- International institute of tropical agriculture (IITA)
- International donors, including DFID, GTZ

APPENDIX 2 – KEY TO ORGANISATIONS

NGOs

GOAN	Ghana Organic Agriculture Network
IITA	International Institute of Tropical Agriculture
STCP	Sustainable Tree Crop Program
CRIG	Cocoa Research Institute of Ghana

Government

MOFA	Ministry of Agriculture
CSIR	Council for Scientific and Industrial Research
Includes:	
CRI	Crop Research Institute
SRI	Soil Research Institute
ARI	Animal Research Institute
FORIG	Forestry Research Institute of Ghana
KNUST	Kumasi Nkrumah University of Science and Technology
Includes:	
BIRD	Bureau of Integrated Rural Development
IRNR	Institute of Renewable Natural Resources
GTZ	German Development Cooperation
Includes:	
SFS	Sedentary Farming Systems
NRSP	Natural Resources Systems Programme, Department for International Development, UK
UEA	University of East Anglia
ODG	Overseas Development Group

APPENDIX 3 – INTERVIEW GUIDE

CHECKLIST OF QUESTIONS

Questions on Training

- Why did you attend the training?
- What did you know about the training or the tool beforehand?
- Was the training in the decision support tool useful or not? If yes, in what ways? If no, explain.
- How was the training conducted?
- Did the training help you to understand the application of the tool or not? If yes/no, explain.
- Given the choice, in what form would you have preferred the information (soft or hard copies)?
- Given the opportunity, which information tools would you like to have skills in? Why?
- How would you compare the CD to hard copies of the manuals of those tool?
- In future in what form would you prefer similar information tools?
- Have you trained others in the use of the tool? If so, when was that and why? How many people have you been able to train in the use of the tool?
- How often have you trained others in the use of the tool?
- Any other comments on the quality of the training?

Questions related to the DSS tools

- Do you find the decision support tool useful or not, accessible or inaccessible, easy or difficult to understand and use? If yes, in which ways? If not, why?
- Have you installed it on your computer? Is it currently installed?
- How often have you used the tool after the training? Explain the frequency of usage.
- For what purpose have you used the tool?
- Was the tool difficult or easy to understand and use? If yes/no, explain.
- Do you use any other similar tools in your work? If so, which ones? How would you compare them in terms of usefulness?
- Is your institution involved in any project that requires the use of the decision support tool?
- Are you engaged in any research activity that requires the use of the decision support tool?
- Has anyone asked you for a copy of the CD? Have you given any copies?
- Did/do you find the specific concepts within the tool useful or not? If yes, which ones and why? If no, why?
- Given the choice, would you support further development of the tool, other tools or a different strategy for knowledge dissemination?

APPENDIX 4 – FULL REFERENCES

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NRSP, 2003, Project Communication Plan Guidelines Uptake Promotion Projects.

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APPENDIX 5 - The A-H pathway

Step	Description (= OVI)*	Means of Verification (data/information sources)
A	Formal/informal agreement with collaborating and target institutions	Memoranda of Understanding with collaborating and target institutions. Correspondence with partner and target organisations. Project inception reports
B	Generation of relevant research results (outputs delivered)	Published papers, technical reports, databases, reviews. Quarterly, annual, and final reports of completed projects
C	Development of appropriate research based products through adaptation/packaging	Software, manuals, guidelines, databases,
D	Promotion of products into target institutions (TIs)	Workshops/symposia, correspondence, dissemination lists (for software, manuals, audio-visual materials etc)
E	Adoption of products by target institutions	Correspondence (indicating intention to use product and/or requests for research products). Annual reports and policy papers of target institutions. Institutional arrangements made
F	Application and replication of results in target institution programmes	Papers, technical reports, policy bulletins etc produced by target institutions using products. Legislation adopted. Production statistics improved. Relevant NR department extension programmes modified
G	Promotion of technology and/or behavioural change among end users by target institutions	Legislation adopted. Co-management strategies established and institutional arrangements made. Products applied.
H	Adoption of technology by end users and generation of economic benefits i.e., developmental impact (purpose delivered)	District and/or provincial and/or national socio-economic indicators, primary production statistics and environmental indicators e.g., water quality

APPENDIX 6 – PROJECT IDEA 1: KNOWLEDGE CENTRE

Concept Idea for Piloting a ‘Knowledge Centre on Soil Fertility in Ghana’

Rationale

NRSP has funded various projects that address the problem of soil degradation in the Forest- Agriculture interface (FAI) in Ghana. The UK organisations involved include NRI, University of Wales, Bangor and University of East Anglia, University of Reading, Overseas Development Institute (ODI) (project nos 6789, 7992, 7560, R7516, R7515, 7446, R7957, R7577). This represents a considerable investment. Evidence from researchers and government officials in Ghana indicates that the outputs from these various projects are not in easily accessible forms (with the exception of LEXSYS). The Ghanaian experts, all involved in the projects above, are working for CSIR, MOFA, GOAN, KNUST, and Sunyani Polytechnic. DFID’s investment in knowledge generation, as well in these institutions, should not be wasted; in particular, the organisations in Ghana deserve more tangible benefits (especially when some have contributed time to DFID-funded projects with no benefit to their own institutions).

The Ghanaian institutional research context faces at least four constraints:

1. erratic donor funding means that organisations expand and contract, and they gain and lose experts, according to project cycles. When not funded by outsiders, quality research becomes unaffordable. CSIR have tried to privatise some services (e.g., their information service in Accra, and by charging consultancy fees) but with limited revenue forthcoming as yet;
2. already huge amounts of knowledge exist about the forest agricultural interface, but it is inaccessible to specialists in Ghana. The computer-based tools are difficult to use, or not perceived as directly relevant to the work, and the most useful information is kept by individuals in their offices rather than shared or held by institutions;
3. academic progress in research institutes/universities depends on publications rather than impact on poverty, gender inequality, or other goals related to FAI. The incentive to generate more funding, and contribute to poverty reduction, is low. Any strategies to improve access to knowledge would have a greater impact on poverty if this institutional system were to be reformed;
4. expertise on soil fertility at the research level is discipline-bound, and often lacks a poverty or gender focus. Issues related to the longer-term goals (secure livelihoods, poverty reduction, gender equality...) are perceived by scientists to be the domain of social science. Social scientists remain marginalised.

Project Purpose

To improve researchers’ access to quality knowledge on soil fertility in Ghana in order to assure greater impact of research outputs.

Project Outputs

1) A 'knowledge resource centre on soil fertility' established in Kumasi, Ghana:

The options for this include making use of the available space with GOAN, employing CSIR, MOFA, Sunyani Polytechnic, and KNUST experts (especially those that have worked on past DFID-funded projects) as consultants to work on identifying existing quality knowledge, and using external expertise (another developing country?) for inputs into knowledge/ICT management.

2) Knowledge and capacity gaps identified and strategies for addressing these developed:

Although much information is available, Ghanaian experts have pointed out that knowledge and research capacity gaps remain. If GOAN managed the centre, they could employ MOFA, CSIR, Sunyani Polytechnic, KNUST as consultants to identify what knowledge is missing, what skills need upgrading, what organisational capacity needs development, as well as designing strategies for achieving these (e.g., field research, training, MIS development, technical enquiries, creation of databases [see Appendix 5] etc). UK agencies have emphasised that gender specific dissemination of soils research results remains low.

3) Sustainable strategy for maintenance of resource centre developed, longer-term institutional agreements in place, and resources secured:

There are various options for the institutional set up of this resource centre. It could be owned jointly by GOAN, CSIR, KNUST and MOFA. Core services might include a free reference library and internet site as well as additional services supplied on demand and paid for by users (e.g., copying information, use of broadband internet connected computers, training courses, technical enquiries). This would cover the cost of rent/management fees to GOAN. Additional research/consultancy fees could be raised by CSIR/MOFA, KNUST using their ownership and link to the resource centre as leverage. The demand for the expertise gained during this pilot could be considerable internationally. The Centre could aim to be linked to MOFA information centres, CSIR's Ghana Agricultural Information Network in Accra, and others (e.g., the Community Information Centre in Kintampo District, NRSP project R8258) when technology/funding allows (10 years, for example).

Workplan

Activity	Year 1	Year 2	Year 3
Institutional agreements between owners			
Establish Centre			
Collect existing resources on soil fertility and related issues (poverty, gender, livelihoods etc)			
Knowledge gaps identified and consultants recruited			
Field research, writing up findings, produce in accessible formats (e.g., booklets, web, radio, video etc)			
Update resources/produce in accessible formats (as above)			
Capacity development needs and strategies identified			
Training, consultancy (e.g., MIS development within other institutions), technical enquiries			
Fundraising: grants/consultancies/paid services/business agreements			
Sustainable strategy for maintenance in place with resources secured			
Monitor and document usage/feedback/problems /solutions at Centre			
Internal reports for Centre, report for NRSP, Write-up of pilot experience			

Partnership

The institutional premise is that the centre would be:

- managed by Ghanaian institutions (leaders in soil fertility and organisations that DFID have already invested in),
- demand-led (those using resources, training or consultancy would be the people driving identification of the services), and
- only use external expertise when necessary and identified by Ghanaians.

Since Ghanaians have identified the need for some expertise from outside the country, one option could be to allocate a percentage of the budget for external expertise (e.g., a maximum of 15%). When the resource centre requires expertise not available in the country, they could make a request to a voluntary UK Advisory Panel (e.g., made up of representatives from NRI, UEA, Bangor, ITDG, IIED, ODI). They would then submit suggestions for consultants from outside Ghana (Europe, other African countries, Asia, Latin America) to the Resource Centre, with CVs/references, and those that had the most appropriate expertise and represented value for money could be selected by the Centre. The UK Advisory Panel would also be asked for advice on identifying existing material/knowledge gaps; when the Centre requires their inputs for more than a certain amount of time agreed (e.g., half a day), they might be expected to pay for their time.

Decisions about use of external expertise, as well as other policy (rather than day-to-day coordination) issues should be decided by a Board or Executive Committee with equal representation from CSIR, MOFA, KNUST and GOAN. While DFID is supporting the Centre, it would be allowed one representative (either DFID-Ghana Officer or consultant of their choice) on this Board/Committee to act as liaison with the UK Advisory Panel and to ensure

that DFID learns from the pilot. There might also be two representatives of farmer organisations; their focus would be to ensure that knowledge generation and dissemination would ultimately satisfy the needs of farmers, including poorer, marginalised, women farmers. The Committee should have at least one third men and at least one third women, but preferably 50:50.

The centre would be theme-based (soil fertility) so that the focus can be on quality, rather than quantity, of knowledge. It would also have its own identity and name chosen by the owners (e.g., Knowledge Centre on Soil Fertility, Soil Fertility Information Centre, Soil Fertility Resource Centre, or Soil Fertility Network), and would aim to become Ghana's leader in the field. Thus, the joint ownership and independent identity would not only ensure wide use by all those involved, but would encourage others to use what might be perceived as a dynamic, client-led service (rather than a development/welfare project). This limited form of privatisation may be inappropriate if the main clientele were poorer farmers, but since it is primarily targeted at researchers/extension agents it is the best strategy for working towards quality knowledge dissemination.

Priority use might be given to members (owners could pay for an institutional membership); the Board would decide on membership policy, ensuring that those that need the information most have access to it and that poorer farmers are given access within their limits of affordability.

Impact and Learning

The Centre will monitor the activities and impact of the project for its own purposes:

1. to measure and understand progress for improving management,
2. to measure and understand impact so that the Centre can adjust plans to maximise and scale-up impact,
3. to gather information for future fundraising and forming further collaboration,

In addition to these functions, DFID may be interested in learning from the pilot so that, if successful, lessons can be learned for replication. A member of staff at the Centre and/or an external consultant could write-up the experience for dissemination outside Ghana.

Participating organisations could be asked to submit a business plan with details of their target market, likely demand for services, set-up costs and strategies for mainstreaming gender, poverty approach and sustainability.

APPENDIX 7 – PROJECT IDEA 2: MANAGING INFO ON CROPS

MANAGEMENT OF SCIENTIFIC INFORMATION ON ROOTS AND TUBERS

Introduction

Root and tuber (R&T) crops in Ghana constitute 40% of the total contribution of agriculture to national development (MOFA, 1999). The crops serve as inexpensive source of calories for the people and livestock thereby enhancing food security. These crops have also contributed to the improvement in income of farmer and have provided employment opportunities to many. With the current introduction of the President's Special Initiative (PSI) on Cassava, the crop has now become an industrial crop with factories established to process cassava into starch for the world market (MOFA, 2002).

In 1999 the government of Ghana with assistance from IFAD started the Root and Tubers Improvement Programme (RTIP) with the overall goal of enhancing food security and increase incomes of resource-poor farmers by facilitating access to locally adopted and proven improved technologies of R&T crops such as cassava, yam, cocoyam, Frafra potato and sweet potato (RooTubers, 2000).

The RTIP is to achieve among others, the following:

1. Develop an integrated pest management system to reduce the incidence of disease and pest
2. Strengthen adaptive research system to increase the flow of new technologies to farmers
3. Conserve the rich biodiversity through collection, evaluation and conservation of germplasm

The RTIP has, over the years, generated such rich information that is invaluable for the development of agriculture in Ghana and the entire tropical world on root and tuber crops.

The problem

The RTIP and other research programmes in Ghana have generated a lot of information on R&T crops that is needed for national development. This information is however, scattered in different journals, technical reports, on computers of participating research scientists and in annual reports of participating research institutions. Information on R&T crops is therefore very difficult to access by researchers, students, policy-makers and farmers even at the RTIP secretariat, primarily due to poor information management. There is no systematic compilation, organization, storage and packaging of the generated information for easy access.

Project Goal

The overall goal of this project is to improve the impact of RTIP generated information and it's expertise in information/knowledge systems on the achievement of food security and poverty reduction.

Objectives

1. Create and manage a computerized database on root and tuber crops in Ghana using information generated from the RTIP as the starting data.
2. Develop an appropriate decision support tool for easy access to the database created.
3. Produce extension material from the database for R&T technologies promotion.

Outputs

Outputs for objective 1

Data for creation of the databases will be derived mainly from the information generated from the RTIP research activities as well as from other research activities carried out outside the RTIP over the years. Databases to be created will include:

- Databases on the germplasm of all root and tuber crops in Ghana
- Databases on the socio-economic considerations affecting the development of the root and tuber crops in Ghana
- Databases on the local and improved varieties (genotypes) of all root and tuber crops in Ghana
- Databases on the pests and diseases as well as their control of all root and tuber crops in Ghana
- Databases on the soil management factors of all root and tuber crops in Ghana
- Databases on the nutritional requirements of all root and tuber crops in Ghana
- Databases on the agronomic factors affecting all root and tuber crops in Ghana
- Databases on the farming systems considerations for the development of all root and tuber crops in Ghana
- Databases on the post harvest management of all root and tuber crops in Ghana
- Databases on the research and development activities of all root and tuber crops in Ghana
- Database on the abstracts of all RTIP publications
- Databases on the Experts of all root and tuber crops in Ghana

Outputs for objective 2

Software (decision support tool) designed for easy access/navigation through the databases created in Objective 1

Networking all stakeholders using current ICT for assessing the databases

Creating a website for the RTIP

Outputs for objective 3

Video/Radio documentaries and other forms of extension materials derived from the created database produced in the following categories:

- Posters
- Folders
- Production guides
- Information bulletins
- Newsletters

Project team

Information Scientists:

The project team will consist of information scientist from the Soil Research Institute, Crops Research Institute and the RTIP Secretariat. Information scientist from partner institutions with advance knowledge in software development will also join the team. The main work the team will involve collection, analysis, storage and processing of information.

Project monitoring team/Scientific advisory team:

Experts in R&T crops in the following areas will form the monitoring team:

- Germplasm collection
- Breeding
- Pest & Diseases
- Soil Management
- Agronomy
- Socio-economics
- Post harvest
- GIS/Programming

Major project output

A computerized database on root and tuber crops in Ghana developed with an appropriate decision support tool for easy access to the database created.

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