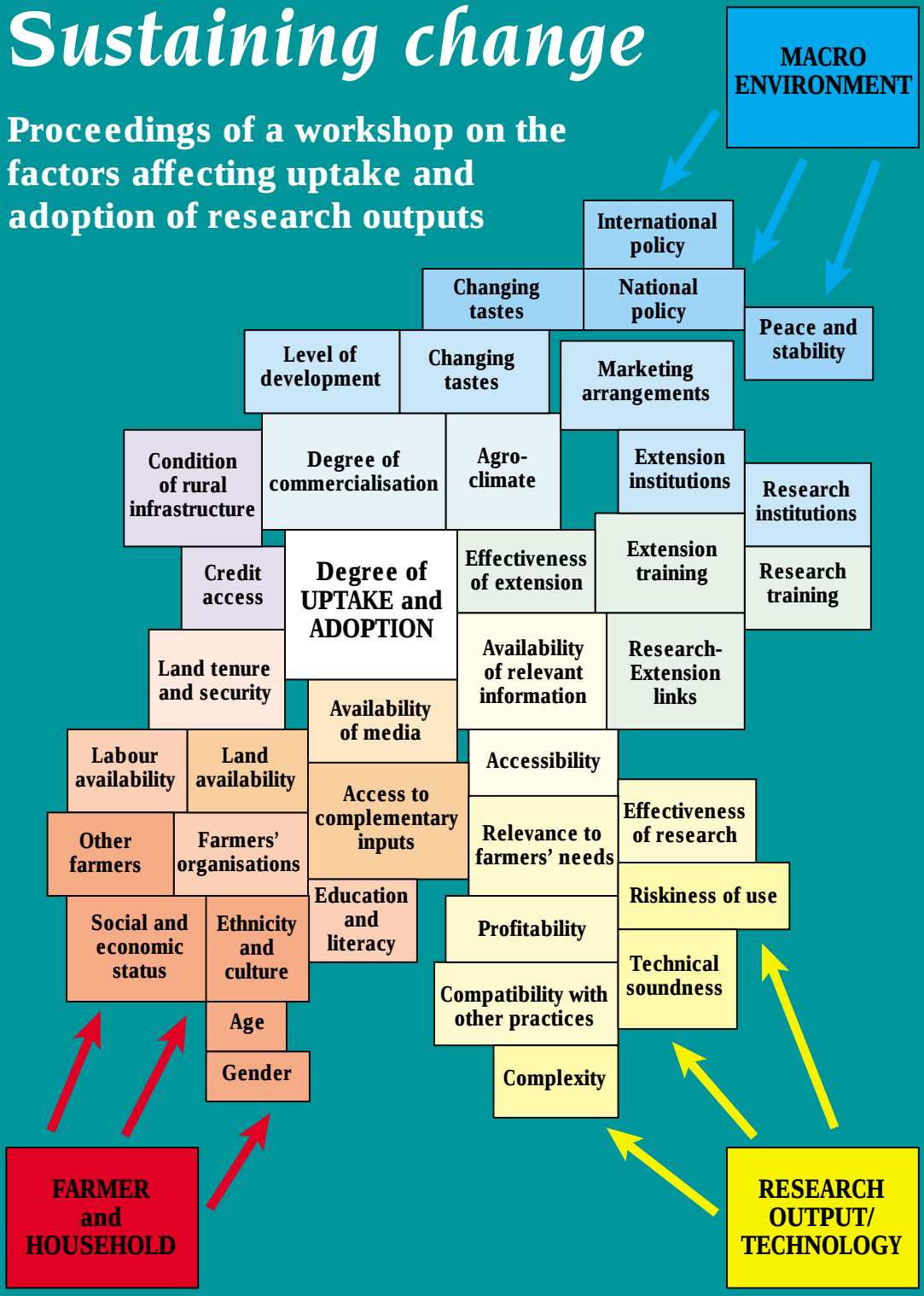
Sustaining change

Proceedings of a workshop on the factors affecting uptake and adoption of research outputs



DFID Department for International Development

CPP Crop Protection Programme

The Department for International Development (DFID) is the UK Government department responsible for promoting international development and the reduction of poverty. The central focus of Government policy is commitment to the internationally agreed target to halve the proportion of people living in extreme poverty by 2015. DFID works in partnership with governments of developing countries, international organisations, voluntary bodies, the private sector, and the research community.

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Cover diagram: Uptake and adoption are influenced by many and varied factors. The degree of influence of individual factors on each output will vary according to environmental and socio-economic circumstances in each specific case. This diagram by L. Kenyon is a graphic representation that attempts to capture some of these factors (see KENYON, L. and FOWLER, M. (2000) Factors affecting the uptake and adoption of outputs of crop protection research on yams in Ghana. pp.15–25, these proceedings).

Sustaining change:

proceedings of a workshop on the factors affecting uptake and adoption of Department for International Development (DFID) Crop Protection Programme (CPP) research outputs

21-23 June 2000
Imperial College at Wye, Kent, UK

Edited by
S.D. Hainsworth and **S.J. Eden-Green**

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Contents

Part 1

Part 2

Summary

The UK Department for International Development's (DFID's) 1997 White Paper reaffirmed that knowledge and technology underpin international development targets for reduction in world poverty, and for improvements in human wellbeing and the global environment. In response, the DFID Crop Protection Programme (CPP) commissioned a series of multidisciplinary studies to examine factors affecting the uptake and adoption of outputs of research in banana, maize, rice, yam, and vegetable cropping systems in Sub-Saharan Africa and South Asia, supported by an analysis of farmers' decision-making in pest management.

These proceedings describe an interactive, multidisciplinary workshop which brought the study teams together in order to identify common factors affecting uptake of research outputs, to assess which factors the CPP could realistically address, and to formulate measures for the CPP to enhance uptake of research outputs.

Part 1 presents summaries of the uptake studies, and Part 2 records brainstorming sessions, facilitated by additional presentations on new institutional economics and communication perspectives, to tease out the main issues and to produce recommendations for action to promote uptake and adoption.

The main conclusions, that are relevant to other research programmes were:

- Research programmes should contribute to capacity building of target institutions through formal and informal training
- Funding should be clearly available for pre-project preparatory/stakeholders meetings
- Economies of scale could be gained with better access and exchange of information with geographic, in-country programmes and other players (including shared access to databases)
- Many outputs and much existing knowledge (indigenous and otherwise) are already available and should be further promoted
- Regional representation by the research programmes would help to promote better identification of demand, forge links with uptake pathways, and monitor post-project sustainability
- Venture capital should be available for start-up costs of small businesses to take up research outputs, or there should be better links to existing initiatives
- There is scope for improved cooperation between regional (Geographic) and centrally funded (Research Strategy) programmes in identification of demand.

Arising from the meeting, a task force was commissioned to identify and prioritise practical recommendations for action by the CPP, for advocacy to others, and to indicate concrete opportunities to promote uptake of outputs from selected projects.

Foreword

M.J. Wilson

Improving the uptake and impact of research is vitally important. To achieve it we need to strengthen the link with development, a theme that will be receiving a lot more attention in the Department for International Development (DFID).

DFID's annual budget is now over £2 billion. Of this perhaps some 7–10% goes into research in all sectors. Research is funded: by country programmes, through our contributions to European and World Bank Research and Development budgets, and through centrally managed programmes like the £30 m annual Renewable Natural Resources (RNR) Research Strategy. Each year the RNR Research Strategy directs £10 m to the 16 Consultative Group on International Agricultural Research (CGIAR) centres and £20 m to 11 bilateral programmes of which Crop Protection is the largest, having received some £50 m over the past 10 years.

Poverty is DFID's bottom line. All that is spent has to impact on the poor. Research is no exception, and has no special licence. We are accountable to the British taxpayers and to Parliament, who want to know how money spent on research has helped the poor: by impacting either directly on poor farmers or, by keeping food prices down, on poor consumers.

We also need to show impact in order to secure future funds for research, and this against no small entrenched resistance and antipathy to research, some of it justified. There are those who have seen research as irrelevant to the real issues, as having no poverty focus, as being institutionally led, or as having poor uptake. There are statistics in support of this position: e.g., recent surveys have shown 70% of the funding to livestock research in two important agencies to have had no impact. In the past, researchers have tended not to engage in promoting the application of their work, considering it 'not their job'.

All this is not good enough now, because DFID is committed to halving the proportion of people in poverty within 15 short years. To help achieve this we need to:

- Identify the demands for researchable solutions in the communities we wish to benefit
- Be innovative in ensuring research fits with the environment in which the poor operate: e.g., no money, neither access to credit nor information, part-time farming, and so on
- Agree with the beneficiaries or their agent, the topic, the outputs, and the indicators of achievement

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- Institute rigorous monitoring and appraisal of progress, including looking to measure impact long after initiatives have been finished
- Identify a clear pathway by which results may be promoted and applied
- Break down the walls between research and extension
- Form partnerships with in-country agencies in which each partner has clear responsibilities
- Be more pragmatic in strengthening research and extension institutions
- Adopt longer, more realistic time frames
- Try innovative ways of promotion such as: advertisements, satellite internet links, the radio, village specialists, the private sector, Sustainable Rural Livelihood and cross-sector initiatives
- Learn from success and how to milk it
- Learn from failure — there is nothing wrong with failure, the crime is to repeat it!
- Exploit our data-banks, 'mining the resource' of existing ideas and knowledge.

There are now encouraging signs in DFID of a supportive atmosphere for research and the 'public goods' it produces. An interest too in forging links with higher education and involving the private sector. The more we can increase the quality of what we are about, its relevance, and impact on the poor, the more we shall enter a 'virtuous circle' of support and finance.

You have chosen a key theme. Thank you for inviting me. I shall listen with interest and wish you every success in your deliberations.

Introduction

J.M. Lenné

Welcome

On behalf of the Department for International Development (DFID) Crop Protection Programme (CPP), I wish to warmly welcome all workshop participants and to especially thank the eight project teams for their contributions over the past six months. These will form the basis of the presentations and discussions taking place over the next few days. A special welcome is given to colleagues from overseas who have been actively involved in the eight studies, we hope their contributions will widen our perspectives of the issues involved.

I would also like to welcome Mike Wilson, Head of the Research Section of DFID's Rural Livelihoods Department, who has been able to join us to hear the presentations and participate in the discussions. Mike has agreed to briefly describe how the DFID research programmes fit into the overall DFID strategy and the critical importance of the increased emphasis being given by the programmes to uptake and promotion of research outputs for greater impact on poverty elimination.

Introduction

The CPP forms part of the DFID centrally funded research strategy that underpins DFID's contribution to the achievement of international development targeted on poverty elimination and environmental sustainability. The CPP is committed to the development and promotion of socially and environmentally acceptable technologies to reduce crop losses from pests in developing countries.

The CPP is the largest of the DFID research programmes. At any one time it supports approximately 60–70 operational projects.

Most of these projects are grouped into thematic clusters. A thematic cluster is a group of inter-linked projects on the complex of biotic constraints affecting a priority crop in the same country or region. The thematic cluster approach offers opportunities to benefit from the synergy between projects: projects build upon each other's expertise; share collaborators; resources; and knowledge. The grouping of projects in thematic clusters provides the programme with cost-effective opportunities to better understand factors affecting uptake of crop protection outputs at the cropping system and production system levels.

The CPP is contracted to both generate and promote crop protection research outputs across six loosely defined production systems, some of which have multiple purposes. The programme is managed by Natural Resources International

Natural Resources International Limited, Pembroke, Chatham Maritime, Kent ME4 4NN, UK.
Presently International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patanacheru 502 324, Andhra Pradesh, India.

Limited (NRIL)—not be confused with the Natural Resources Institute (NRI). NRIL is owned by a consortium of universities comprising Greenwich, Edinburgh, and Imperial College into which Wye College (our present venue) is now integrated.

Background

The DFID's 1997 White Paper recognises that knowledge and technology underpin development and that the elimination of poverty, improved economic growth, and protection of the environment can be achieved through support for research and development which enhances the sustainable livelihoods of poor people.

In response to the White Paper, the CPP strategically focuses its research on three main elements: poverty elimination, environmental sustainability, and sustainable livelihoods.

Poverty elimination

The CPP contributes to poverty elimination principally through enhancing economic and productivity growth through the management of the serious pests of food crops that annually cause global losses of 30% worldwide. This contribution results in increased quantity and improved quality of food, increased and stabilised food supply, and decreased unit production costs — ultimately leading to cheaper food for the poor. CPP's geographic focus is strongly pro-poor with approximately 60% of projects and programme budget targeted at sub-Saharan Africa (principally Ghana, Kenya, Tanzania, Uganda, and Zimbabwe) and 30% to south Asia (Bangladesh, India, and Nepal).

These regions are the 'hot spots' of poverty and malnutrition where almost 70% of the world's most food-insecure and over 80% of the world's malnourished children live.

Environmental sustainability

The CPP contributes to protecting and improving the environment through the development and promotion of such socially and environmentally acceptable pest management technologies as host-plant resistance, enhancing the impact of natural predators and enemies, adapting cultural practices, and the judicious and selective use of safer pesticides. The environmental benefits include improved ecosystem health through reduced and safer use of pesticides (including biopesticides) and decreased expansion of cropped land into marginal environments, thus reducing degradation of the natural resource base through increased unit production per area.

Sustainable livelihoods

Analysis of how pest management strategies can enhance the asset status for particular groups of people provides entry points to the sustainable livelihoods framework for the CPP.

Pest management strategies that increase the yield of a crop with year-round demand and a well-functioning market can result in increased incomes for farmers and for labourers. Thus, pest management strategies that stabilise crop yields can be extremely important in reducing poor people's vulnerability, they can also have a significant impact on human capital assets. Use of herbicides will reduce labour requirements. Integrated pest management (IPM) approaches that build local people's capacity to utilise knowledge about pests can contribute to increased well-being. A reduction in the quantity or toxicity of pesticides will bring increases in well-being for those directly involved in pesticide application. Approaches to pest management that require community action, such as the wide-scale use of pheromones or village-wide disease forecasting systems can enhance social capital. The availability and type of physical capital will affect the outcomes of pest management strategies, e.g., control over water aids rice farmers in managing weeds, diseases, and insect pests.

Finally, pest management strategies can improve poor people's access to financial capital indirectly through increased crop yields and quality and reduced inputs.

Objectives of the workshop

In response to the revision of DFID's research strategy in 1998/99, the CPP is placing greater emphasis on the development of strategies to promote the uptake and adoption of crop protection research outputs.

Lack of adoption of crop protection technologies may be due to the unsuitability of the technology for the intermediate user or beneficiary, but is often due to lack of understanding of the processes that may constrain uptake and adoption and/or lack of mechanisms for promotion.

To develop more robust strategies to promote the uptake and adoption of crop protection research outputs, we may like to think about the following objectives:

- Better understanding of the interactions between crop protection options, farmers' access to and control over resources and their farming and livelihood systems
- Development of crop protection technologies appropriate to different farmers' circumstances and resource levels
- Development of better means to communicate with different stakeholders who have different awareness of pests and management options
- Recognition of the needs of different stakeholders involved in pest management — such as farmers, labourers, pesticide dealers, policy makers, etc.
- Identification and establishment of linkages and mechanisms with development partners that will support improved uptake and promotion of crop protection research outputs.

Uptake studies

Different DFID research programmes have responded in various ways to the greater emphasis on uptake and promotion. One of the ways in which the CPP responded was to commission seven short studies in late 1999 to look specifically at the factors affecting uptake and adoption of crop protection research outputs in seven priority cropping systems where, in most cases, thematic clusters of projects are actively generating outputs. A complementary study on farmer decision-making processes in crop protection research was also commissioned, and further studies targeted at other thematic clusters may be commissioned in the future.

This workshop has been called to present and discuss the findings from these eight studies; and specifically to look at certain objectives that lead to three major questions.

- To identify important lessons for the CPP (and hopefully other DFID research programmes)

Question 1. What common factors have emerged from the studies?

- To realistically assess which of these factors/constraints the CPP is in a position to address (and which would be better addressed by others, and who such groups are?)

Question 2. Which of the issues is the CPP in a position to address?

- To formulate specific measures that the CPP may be able to take over the next five years to enhance uptake and adoption of research outputs (projects, activities, etc.).

Question 3. Which of these issues, if addressed, would have a high chance of succeeding, and would benefit uptake and adoption and what specific measures can the CPP take to address the issues identified as needing immediate consideration for action?

The realisation of these outputs will greatly help the CPP to develop strategies to improve the uptake of its research outputs and to encourage wider adoption and impact. We thank you in advance for contributing your time and expertise to help us. The CPP is looking forward to a very interactive and constructive workshop.

Format

In Part I the programme will first involve presentations from the eight CPP commissioned studies. These will be followed by an interactive Part 2.

The interactive processes of this meeting have been developed by five experienced uptake specialists: C.J. Garforth from Reading University, P. Norrish, currently a consultant but formerly from Reading, and J. Kydd, A. Dorward, and C. Poulton from the University of London, Imperial College at Wye. The five facilitators will make presentations to elucidate various stages, and lead us through each step of the process. An Overview of the process follows this Introduction.

To help readers and participants the following definitions are used in the meeting and proceedings:

Research outputs — findings or results of the research process. These may be a visible product or technology, an invisible piece of information, a methodology, or a conceptual model.

Pathways — the route or channel through which the research output reaches the end-user. This normally means the institution through which dissemination happens. For example, Consultative Group on International Agricultural Research (CGIAR) centres, local non-governmental organisations (NGOs), local schools, a radio station, etc.

Media products — the actual packaging in which the research output is contained, or by which it is communicated. For example, a video, a journal article, a radio programme.

Communication activities — activities developed and used in the process of communication. For example, participatory rural appraisal (PRA), focus group discussions, workshops, training. These activities may or may not involve the use of a media product.

End-users — farmers and others (individuals, households, communities, companies, associations) engaged in productive activities using renewable natural resources.

Intermediate users — those who use the outputs of research to produce information, technology and products for end-users. For example, researchers in international/national agricultural research centres, NGOs, private sector, technology transfer or extension agencies, bilateral and other donors.

Notes Appendix 1 contains further reading relevant to the projects and the techniques used during the meeting.

Acronyms used throughout the proceedings are defined in Appendix 2.

Participants are listed in Appendix 3.

The Research Project Cycle is briefly described on the inside back cover.

Overview: process used to analyse workshop findings and formulate recommendations

P. Norrish

Process

The process, designed by the five facilitators detailed in the Introduction was intended to be open, participatory, and flexible enough to accommodate ideas from the participants as the workshop developed. The process depended on various designated activities undertaken by all participants or by working groups.

Working group formation

Group memberships were decided in advance by the facilitators and were intended to make best use of the different ranges of skill, experience, and expertise amongst the participants, and to enable people to express their views freely. There were three groups composed mainly of natural scientists, social scientists, and management.

On the second day participants were reshuffled, into four randomly selected groups, in an attempt to acheive consensus.

Overseas participants were given the option of forming a group of their own, but declined, preferring to contribute to their designated disciplinary or randomly selected groups.

Recording the process

Each group was assigned one of the facilitators and a note-taker. The groups appointed their own raporteurs for feedback to plenary sessions. Facilitators held frequent meetings throughout the workshop to review the process and to feed in ideas and suggestions.

Workshop structure

The workshop was structured into two very different parts.

Part 1 was devoted to eight plenary presentations from the projects on uptake and adoption that had either been commissioned by the Crop Protection Programme (CPP), or selected from those put forward as a response to a call for bids put out by the CPP. Each presentation was followed by a short question and answer session, and there was a general discussion at the end of the presentations.

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Participants were asked to keep track of important issues and themes as they came up during the presentations and general discussions and to record what they considered to be the three most important issues onto 'Postits'.

These Postits were given to the facilitators who carried out an initial sort, removing obvious duplicates. This narrowed the list down to 51 (numbered) issues, a fairly daunting prospect for the working groups to tackle during Part 2.

Part 2 involved group activities designed to lead to answers to three questions posed by the CPP. It also contain presentations, given by facilitators on issues that would take the group processes forward. The link between the presentations and the group activities was that the themes and issues emerging from the presentations would form the basis for the group work.

Activity 1

The facilitators posed the following question to all working groups:

Question 1. What common factors affecting uptake of research have emerged from the studies?

The first group activity was to prioritise (select the 'top ten') from the list of 51 issues and themes and to justify the choices made.

Groups were free to add to the list of issues if they felt anything vital was missing. Only one group took advantage of this opportunity and added one more issue. Presentations were then made to a chaired plenary session with discussion.

After the plenary presentation the selected issues were matched across groups. The resulting lists formed the basis for Activity 2.

Activity 2

The same groups were then all posed the next question:

Question 2. Which of these issues, that are common to two or more groups, is the CPP in a position to address?

Groups were asked to look at those issues that were common to two or more groups and to answer an extended version of Question 2.

- What can the CPP tackle directly and what measures should it take?
- Which issues need action by others, by whom? what kind of action is needed? and where would advocacy by CPP be useful?
- Which issues should CPP take into account when projects are being set up?

Answers from the groups to these questions were presented in plenary and were then used as the basis for Activities 3 and 4.

For Activities 3 and 4 participants were reshuffled into four randomly chosen groups.

Activity 3

All the four new groups were asked a supplementary question:

Question 3a. Which of these issues/activities, if addressed, would have a high chance of succeeding and would benefit the uptake and adoption?

This question was approached through a specific 3-step method.

Step 1. Groups were asked to write each activity/issue onto different coloured Postits:

- Yellow for activities that could be carried out directly by the CPP
- Green for activities that the CPP would advocate other organisations should carry out.

Step 2. The Postits were to be placed by groups on a matrix with a vertical axis labelled 'Chance of success' and a horizontal axis labelled 'Uptake'.

This lead to a rough and ready clustering with issues clustered in the top right-hand corner of a matrix considered to be the ones worth immediate consideration for action.

Step 3. Groups had to decide which things were in the top right-hand corner of their matrix. Even though boundaries were fuzzy in some cases, groups had to decide on importance for action and 'draw the line' before proceeding to Activity 4.

Activity 4

Within the same groups participants addressed the final question:

Question 3b. What specific measures can the CPP take to address the issues identified as needing immediate consideration for action?

Groups considered the identified issues/activities and made detailed proposals for action. These proposals were presented and briefly discussed in a final plenary session.

Facilitator activity

Whilst Activity 4 was taking place one of the facilitators determined whether there was any degree of consensus appearing across the groups' matrices. The facilitator's analysis was presented in plenary prior to the closing session.

Note In order to guide the reader through these proceedings, each reported stage is preceded by a description and illustrated by group reports, notes, copies of flipcharts, and photographs in an attempt to capture the dynamic process.

Part 1

1. Factors affecting the uptake and adoption of outputs of crop protection research on yams in Ghana

L. Kenyon and M. Fowler

Introduction

Yams are an ancient crop — exploited by man since prehistoric times, they are still in the process of being domesticated in some regions (Figure 1). The crop is vegetatively propagated and a mixture of landraces are grown. There is much tradition surrounding cultivation and use, and yams are highly prized at three times the value of cassava (Figure 2).

Yams are one of the major staple food crops grown in Ghana. They contribute 17% of agricultural gross domestic product (GDP), play a key role in guaranteeing household food security and, with more than 2 million tonnes being harvested each year, are the most important food crop in terms of output value. Thus, the potential benefits of any research activity undertaken to improve the productivity of this crop are high. By improving household food security through the application of research findings, the livelihoods of the resource-poor yam producers and their families can be made more resilient. But, yams are grown on small-scale/ subsistence agriculture. An average yam farm is less than 1 ha, so although there is great potential for improvement, the difficult target group is a large number of small-scale farmers, many in remote areas that are hard to reach.

The importance of agricultural research in the development process and the uptake of recommendations arising from it, are areas of considerable interest to the Ghanaian authorities, as well as to other agencies, including the UK Department for International Development (DFID). There have been several Crop Protection Programme (CPP) projects on yam in West Africa (Table 1).

It is against this background that the current study was undertaken to:

- Identify and analyse those factors which affect the uptake of yam research outputs
- Develop recommendations to be used to guide future yam research work, such that farmers are facilitated to take up the new technologies that result from the research.

Natural Resources Institute, Central Avenue, Chatham Maritime, Kent ME4 4TB, UK.

DFID Crop Protection Programme Project R7504 (ZA0354).

KENYON, L. and FOWLER M. (2000) Factors affecting the uptake and adoption of outputs of crop protection research on yams in Ghana. pp. 15–25, In: *Sustaining change: proceedings of a workshop on the factors affecting uptake and adoption of Department for International Development* (DFID) *Crop Protection Programme* (CPP) *research outputs*. Hainsworth, S.D. and Eden-Green, S.J. (Eds.). Imperial College at Wye, Kent, UK. 21–23 June, 2000. Natural Resources International Limited, Chatham Maritime, Kent, UK.

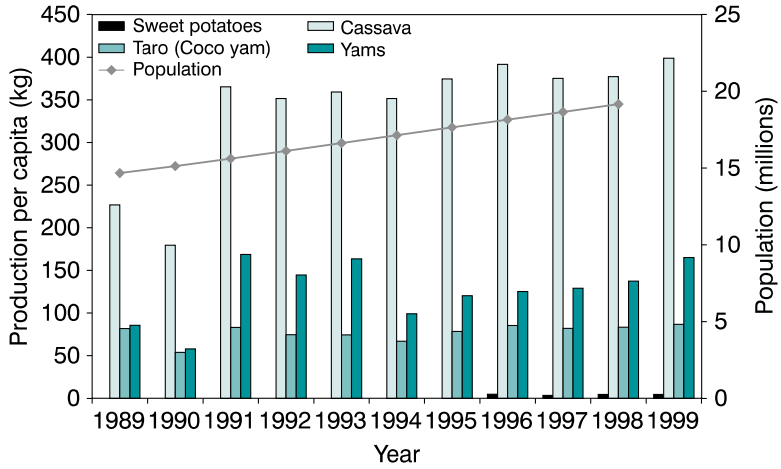

Figure 1. Major root crops in Ghana showing production over the last 10 years.
Source: FAOSTAT agricultural database (http://apps.fao.org/).

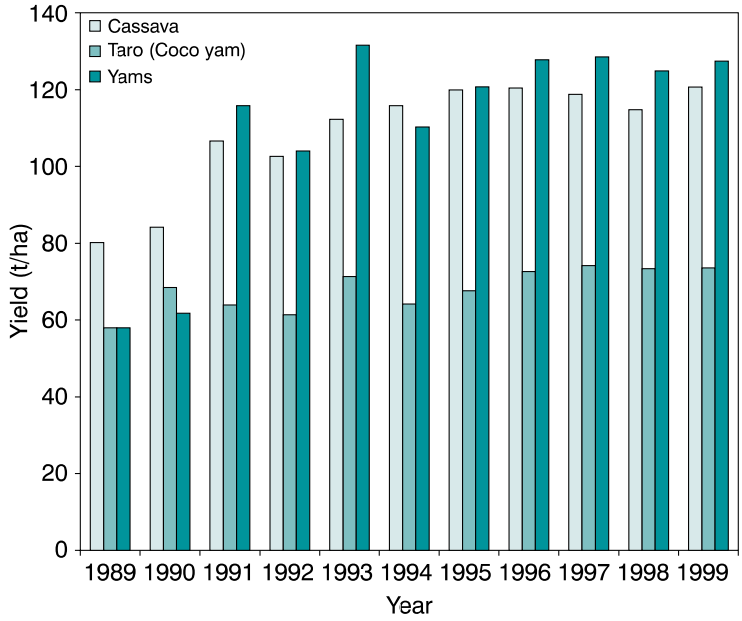

Figure 2. Yields of major root crops in Ghana showing the superiority of yams over taro and cassava.
Source: FAOSTAT agricultural database (http://apps.fao.org/).

Table 1. DFID Crop Protection Projects on yam in West Africa

Project	Output	Means of dissemination	Immediate targets
R6694	Nematode resistance		Ghana and Nigeria
	• Resistant germplasm identified	Reports and theses, publications	Yam breeders
	• Information on resistance mechanisms	Reports and theses, publications	Yam breeders and researchers
R6691	Control of yam diseases		Ghana
	• Information on distribution and importance of diseases in time and space	Reports, theses	Other researchers, Extension
	• Methods for identifying diseases	Reports, publications, posters, farmer field days	Extension, Front line staff (FLS) Farmers
	• Methods for improving health of seed yams	Posters, farmer field days, farmer workshops, on-farm trials	Extension Front line staff Farmers
R5983	Yam tuber rots		Nigeria
	• Information on causes of tuber rots	Publication, reports	Other researchers Diocesean Development Service (DDS) Farmers
R5735CB	Yam health		Nigeria
	• Treatments to improve survival of planting pieces	Reports, posters, on-farm trials	Other researchers Extension Trial farmers
R5688	Yam anthracnose		Nigeria
	• Practices to reduce incidence of anthracnose	Poster, theses, publications	Other researchers

Methodology

The approach adopted was to undertake a literature review in the UK, followed by a series of semi-structured interviews with key personnel involved either directly or indirectly in research and agricultural extension with yams. The organization of agricultural research is very complex in Ghana (Figure 3). This results in many persons' and organisations' involvement in the process of research information dissemination to farmers (Figure 4).

Meetings were also held with representatives of some of Ghana's development partners supporting agricultural research and extension activities in the country, and a visit made to the headquarters of the International Institute for Tropical Agriculture (IITA) in Nigeria for discussions with scientists involved with root crops

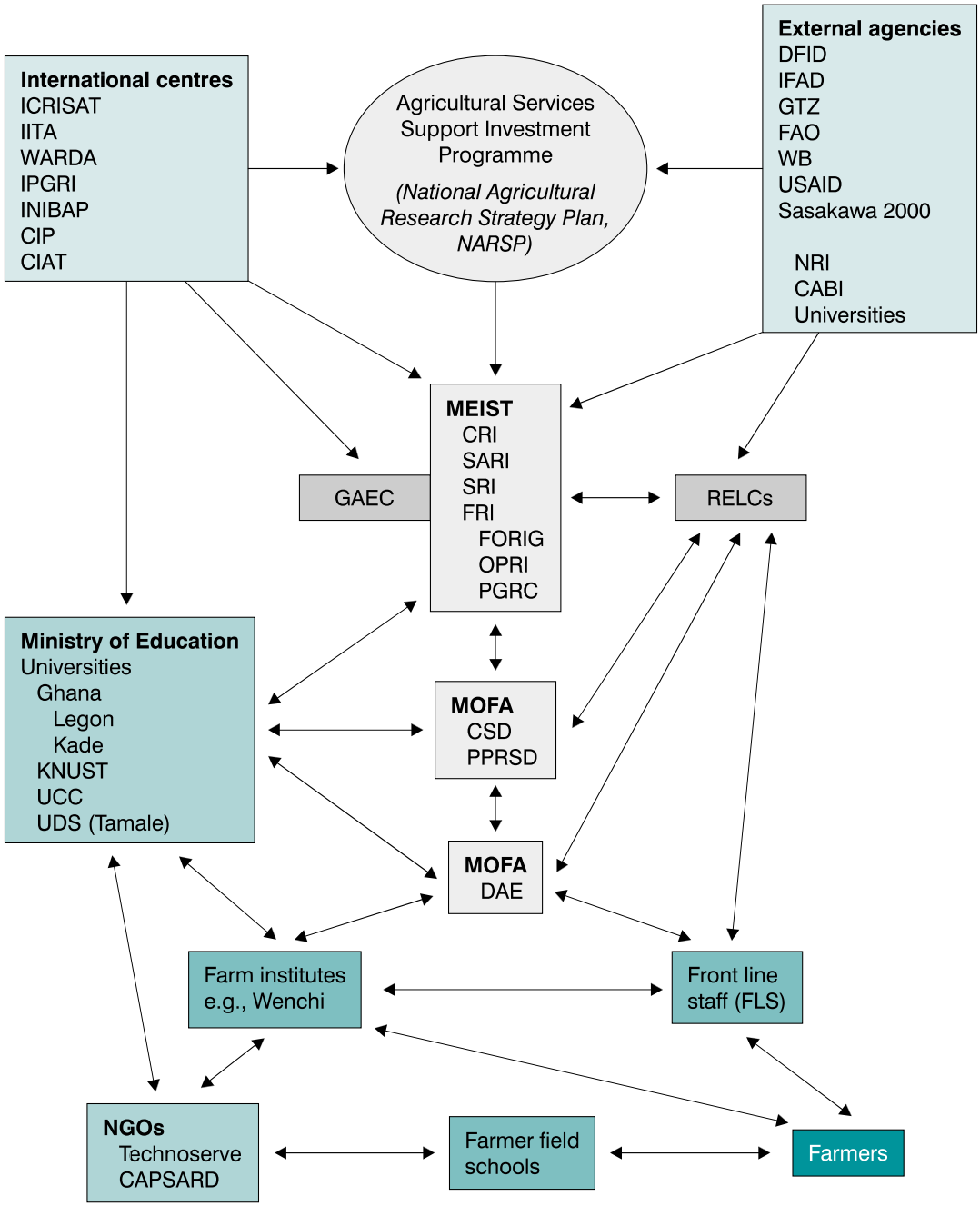

Figure 3. Organisation of agricultural research and extension in Ghana, showing the complexity of the internal establishment and the number of external agencies involved. Note: Acronyms are defined in Appendix 2.

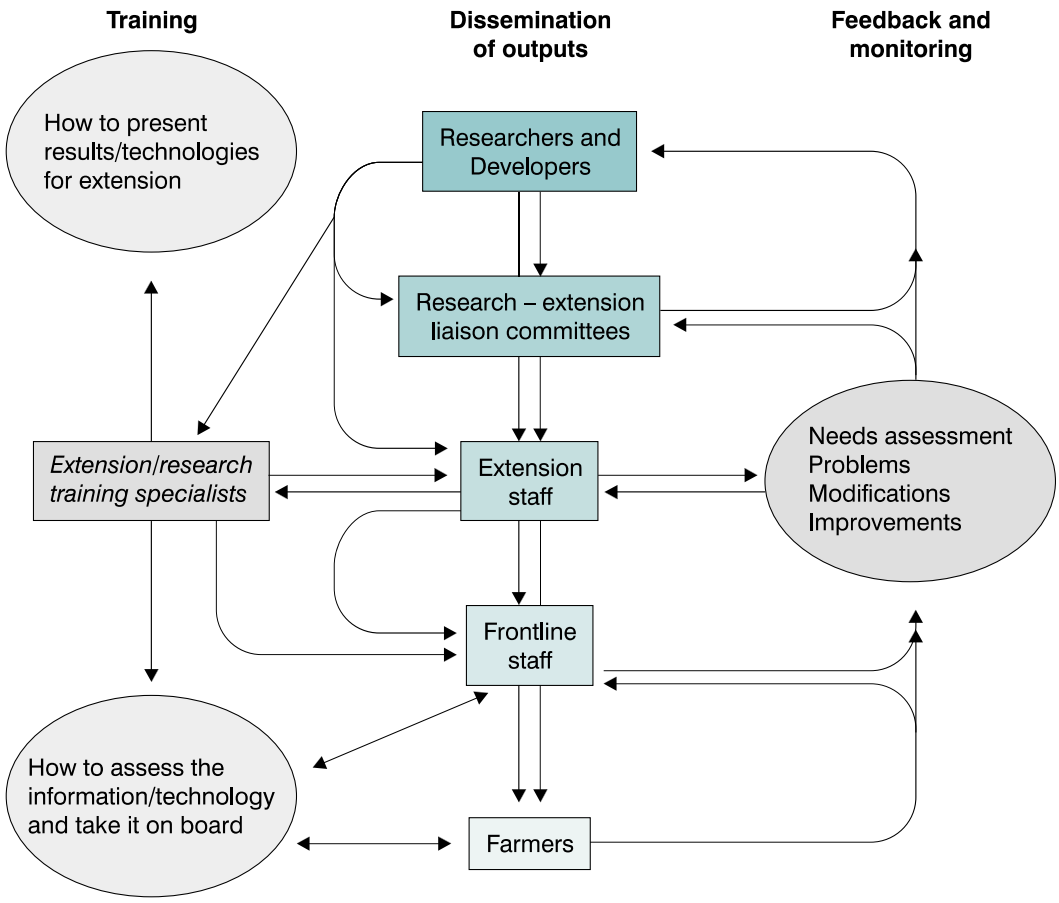

Figure 4. Information flow for dissemination of agricultural research outputs in Ghana, showing how many people and organisations are involved before knowledge can reach the farmers.

research programmes. A single example, that of the use of yam 'minisetts' was used as a case study to facilitate the analysis.

Because little of the work on the uptake of new crop technologies in Ghana was on yams, and almost none related to yam crop protection research, it was decided that experiences of other crop technologies would also be included in the study, since useful lessons were likely to be learned that could apply equally to yams. A draft study report was prepared and presented during a stakeholders' workshop on yam research and technology uptake in Kumasi held in March 2000. The final draft report was circulated for review to a small number of people who had attended the workshop, and to other interested parties. They made a number of useful comments that were, where appropriate, incorporated into the final version of the report.

Findings

The study showed that even if farmers are made aware of improved procedures or new technologies, they may fail to adopt them for a number of reasons (An extensive bibliography of references related to this study can be found in Fowler, 2000, copies available from L. Kenyon). These reasons were grouped under four principal headings: Technology, Farmer/farm households, Farmers' immediate environment, and External (macro-economic) environment. Inevitably, there is some overlap between these categories and some of the factors, e.g., credit availability could be placed in more than one category. The cover of this publication explains this complexity in graphic form.

Case study results

Because insufficient planting material is a major constraint to increased yam production, the yam minisett technique was developed by scientists in Nigeria as a means of rapidly multiplying selected varieties. The technique involves the use of small (25–30 g) pieces of tuber as planting material, treated with pesticide before planting, and cosseted for the first season to produce small seed yams for planting in second season. It is an effective way of producing good quality (healthy) planting material.

However, there are several reasons for poor uptake/adoption in Ghana.

- Poor promotion — it was not targetted at appropriate farmers or correct situations
- Insufficient instruction to extension staff resulting in lack of confidence and poor demonstrations
- Poor availability and high cost of inputs (fungicides, insecticides, etc.)
- Appeared time-consuming, tedious, and too technical
- Popular white yam varieties respond poorly
- Incompatible with traditional intercropping farming system
- Failure to get across to extension staff and farmers the correspondence between size of sett and resulting tubers
- Farmers not involved in trying to adapt technique to make it more appropriate to their situation.

However, innovative yam farmers in the Caribbean found that by using slightly bigger setts (100–150 g) they could produce uniform tubers of 1–2 kg that are ideal for the export market.

Recommendations for yam research

By examining the different stages of the yam cropping cycle, the factors that impinge on them, and information on previous research, the study identified several priority areas on which yam research should be focussed.

Research priorities identified during the study

Yams

- Breed: higher-yielding, more stable-yielding, disease-resistant varieties with tuber characteristics that facilitate harvesting and handling and that also meet consumer preferences. This work needs to take into account the impact of the 'sedentarisation of yam-based systems and the shortening of fallow periods', which is resulting from increasing population pressures in the rural areas
- Explore artificial means of inducing sprouting in dormant seed tubers in order to increase cycles of seed multiplication
- Improve systems for the rapid mass propagation and delivery of propagules, especially of newly introduced or highly desirable varieties.

Cropping system/environment

- Investigate the influence of the cropping system on the performance of yams (e.g., on intercropping and tuber size)
- Research on soil fertility and fertiliser application, concentrated in the savannah zone where the shortage of fertile land is most acute
- Develop more productive cultivation techniques for land preparation, staking, weeding and harvesting, than the current ones that are slow and require heavy inputs of labour.

Crop protection

- Develop integrated management practices for nematodes and pathogens associated with tuber rots, e.g., hot-water treatment
- Develop improved diagnostics for the better health of propagules and safe international exchange of germplasm
- Investigate any moves towards the development of a yam seed market, with farmers specialising in growing clean seed for sale.

Harvesting, storage, and transport

- Seek out culturally acceptable improvements in yam storage practices, including the way in which the shelf-life of tubers can be increased to improve household food security, boost export quality, and raise returns to market-oriented yam farmers

- Explore the need for, and possibility of supplying short-term working capital to assist existing and new traders with bulk purchasing and stockholding activities.

Post-harvest processing and marketing

- Investigate the impact that the Market Queens (women who are responsible for market sales) and other actors have on the trade in yams
- Develop processing / alternative uses of yams and reduce the perishability of the tubers
- Monitor any changes taking place in consumer tastes in all parts of the country.

Some of these research areas are already being addressed while others are not. In addition, certain specific improvements could be made to the management and operations of the agricultural extension system, relatively easily and at little cost, which have the potential to increase the efficiency of this uptake pathway.

Suggested improvements to the National Extension System

Stakeholders

- Farmers and local groups should be more systematically consulted and involved in the technology definition and development process.

Monitoring and evaluation

- Simple monitoring and evaluation methodologies must be developed and systematically incorporated into the research-extension system (and/or into specific agricultural research projects) in order to provide up-to-date information on the impact of specific technologies to those working in it (budgetary provision needed).

Training extension staff

- Continuing training programmes to upgrade the capacity of both field and managerial extension staff will be required, as will logistical support to enable them to undertake their work more effectively. Training is urgently needed in such areas as:
  - The causes, vectors, and transmission mechanisms for yam pests and diseases
  - How to recognise discard yam tubers that should not be used as seed
  - Improved storage techniques and structures
  - Rapid propagation practices
  - The efficient use of fertilisers.

Extension staff need the capacity to pass on this information with confidence, to the farming community, and associated with this better access is the need to improve extension literature.

Training of farmers

- Extension and research staff need to come together to train farmers and traders in improved tuber harvesting and post-harvest handling techniques, so as to reduce damage caused by bruising—possibly preceded by a thorough investigation of the losses incurred during transportation.

Extension infrastructure

- Without a more viable public extension system, the chances of it being an effective cog in the adoption-process 'wheel' are limited. For this reason, the recent proposal to pilot various alternative financing and service delivery systems for agricultural extension is welcome (e.g., yam traders' associations/ yam exporters being approached for support to specific, targetted programmes).

There are also several other non-agricultural constraints that will need to be addressed if an enabling environment is to be put in place for the increased uptake of productivity-enhancing innovations.

Non-research or extension interventions

- Urgently needed expansion of the rural access road network
- Existing access roads and tracks need regular maintenance in order for produce to be moved to the market centres and for inputs and agricultural advisory personnel to gain access to the main areas of yam production
- Publication and widespread dissemination of regular bulletins detailing the prices of yams and other tubers, together with other pertinent market information
- Training farmers and traders in: optimal yam handling practices, understanding marketing standards, and in grading tubers for export
- Investigate the principal characteristics and trends of the export market for yams.

If the agricultural research system as a whole is to become more effective, it will be necessary for the research coordination to be addressed at the highest level. Detailed monitoring of the uptake process should be fully integrated within future yam research support interventions, so that a better understanding is reached of the most-effective communication pathways together with the key factors influencing uptake of the crop in Ghana. This knowledge may be applicable thereafter, both in other West African yam-growing areas and for the uptake by resource-poor farmers of agricultural research outputs more generally.

It is important for all stakeholders in technology development activities to be realistic in their expectations. Agricultural research is a slow process and there will be a time-lag before most new technologies are developed to the point where they can start to be disseminated, particularly if one takes into account the relatively long-term nature of yam production.

General recommendations for improved uptake/adoption

- Involve end-users of the research, as well as funding agencies, policy makers, and extension agents as researchers in the research needs identification (i.e., let the farmers and front-line extension staff work out with researchers and planners what should be researched/developed — and when)
- Understand who the target beneficiaries are, and aim the research/development at them
- Identify which dissemination pathways are to be used (and who will pay for them)
- If farmers are not the immediate targets of the research project, then identify how the immediate targets will get their message to the end-user (and who will pay)
- Involve all parties in a feedback mechanism so the system can respond to changing requirements, and can be quickly brought back on line if it wanders off course
- Incorporate provision for training at stages along the dissemination pathways.

Conclusions and implications

Although yams play an important part in Ghana's economy**,** the contribution that the crop currently makes to farmer and trader incomes, food security, and export earnings is significantly below its potential due to a gamut of technical, infrastructural, socio-economic, institutional, and other constraints. Were these to be overcome, yam production could be increased significantly.

Fundamental institutional shortcomings have impacted negatively upon the development and uptake of new crop technologies, including those for yams. Resources earmarked for spending on research into yams have been far below what might be expected given their importance in the national diet and their contribution to the sector's GDP. In addition to structural impediments associated with the efficiency of the public research and extension services, there are a large number of factors that influence the decisions made by Ghanaian farmers to take up and use new production and post-harvest technologies and techniques. The relative importance of specific factors in influencing uptake decisions will vary between farmers over both time and space.

Only very rarely does adoption just happen. Rather, the dissemination and application of innovations need to be planned in a systematic and comprehensive way — with goals, responsibilities, and time-bound adoption projections defined at an early stage. Researchers must play an integral part in this process through reference to the funding agencies, policy-makers, extension agents, and not least, the end-users of the research findings — the yam growers.

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Discussion

Q. What lessons could be learned from the Caribbean?

A. There is a market for exported yams, growers in the West Indies export directly, but in West Africa growers go through middlemen, so to implement changes here we have to work with both the growers and the traders.

Q. What are the relationships between the national ministries — were these revealed at the workshop?

A. As shown by the presented diagram the situation is very complex. One critical aspect affecting the dissemination and uptake of research is that researchers generally are assessed on academic achievement, not on the uptake of their research.

Q. Does the secrecy over varieties affect uptake?

A. Uptake is certainly affected by the lack of trade in seed yams, and there is apparent need for seed production units to produce seed of desired varieties.

Q. With so many institutions how do you get to the right people?

A. We are trying to reach farmers via NGOs, but it is more difficult in Ghana than in Nigeria. There is a need to develop alternative dissemination pathways.

2. Factors affecting uptake and adoption of outputs of crop protection research in peri-urban vegetable systems in Kenya

L. Otieno Oruko[1], J.F. Asaba[1] and H.M. Kindness[2]

Introduction

In peri-urban smallholder vegetable systems in Kenya, pests and diseases are a serious constraint to production and marketing. A literature review showed that although a wide range of strategies for crop pest management has been developed, there is evidence of low uptake of these strategies, and concern that failure to use them properly has led to pesticide resistance, damage to the environment, and health problems. In addition, where chemicals are used to control pests and diseases, the costs are high. Even so, well over 90% of producers contacted during the current study own a sprayer. Research targetted at the peri-urban smallholder production system indicates a disparity between the actual and recommended pest management practices. For example, reporting in 1999 on Project R6616, Cooper found that 50% of farmers apply more than three times the recommended volume of pesticides, dosage rates varied from 6% to 315% of recommendations, and less than 10% of lower leaf surfaces were covered with pesticide sprays. Furthermore, an evaluation by the Safe Use of Pesticides (SUP) Project in 1994 concluded that adoption of safe use practices was less than 30% as noted by Conroy in NRI Report VS3177. These and other indicators show that effective adoption of pest management strategies could be a major obstacle in turning research outputs into benefits to poor farmers. Accordingly, a study to analyse the key constraints to the uptake and adoption of pest management strategies in the peri-urban smallholder vegetable production systems in Kenya was commissioned. The purpose of the study was to identify ways in which the uptake and adoption of these strategies could be improved.

The following factors were considered likely to influence uptake and adoption:

- Institutional setting
- Available crop protection strategies or technologies
- Dissemination methods employed
- Farmer circumstances.

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2. Natural Resources Institute, Central Avenue, Chatham Maritime, Kent ME4 4TB, UK.

DFID Crop Protection Programme Project R7512 (ZA0357).

OTIENO ORUKO, L., ASABA, J.F. and KINDNESS, H.M. (2000) Factors affecting uptake and adoption of outputs of crop protection research in peri-urban vegetable systems in Kenya. pp. 27–34, In: *Sustaining change: proceedings of a workshop on the factors affecting uptake and adoption of Department for International Development* (DFID) *Crop Protection Programme* (CPP) *research outputs*. Hainsworth, S.D. and Eden-Green, S.J. (Eds.). Imperial College at Wye, Kent, UK. 21–23 June, 2000. Natural Resources International Limited, Chatham Maritime, Kent, UK.

Methodology

Initially, a stakeholder consultative workshop was held on 2 December 1999 to assess the status of crop protection research and extension in the peri-urban vegetable production system in Kenya. Representatives of organisations involved in the generation and dissemination of vegetable production technologies, including chemical companies, non-governmental organisations (NGOs), public sector, research, and extension, shared experiences on constraints to, and means of enhancing uptake. In addition, the research process was discussed and a lack of an operational definition of the peri-urban system became apparent. This had a bearing on the selection of research sites. It was decided at the workshop that the project should target smallholder farmers producing mainly for the local rather than the export market. It was also hypothesised that vegetable production in the peri-urban areas represented by these research sites is driven to a large extent by the existence of ready markets in nearby urban centres. Accordingly, the peri-urban region was hypothesised to be an area in the immediate environs of an urban boundary and where the land-use pattern, particularly vegetable production, is influenced by the presence of a given urban centre. Study sites in Machakos, Kiambu, and Thika districts were selected on the basis of their close proximity to Nairobi and as typifying smallholder vegetable production.

A list of all the NGOs, public, and private sector organisations promoting vegetable production in these areas was compiled. Semi-structured interviews were conducted with the organisations to determine the institutional setting for research and extension in the peri-urban system. From the researchers, information was sought on past and on-going work on vegetable crop protection. Information on research problem identification and prioritisation, linkages with other organisations, and methods of disseminating research outputs were collected. From the disseminators, who are considered intermediary users of research outputs, mainly researchers, public and private sector extension, and agro-chemical companies, the interviews focussed on methods of acquiring information and dissemination. Their modes of communication, frequency of contact with end-users, and the reasons for electing the given strategies were established. Generators and disseminators of research outputs were asked to identify the key constraining factors to uptake and ways of addressing these constraints.

In order to determine the geographic and farm-level factors influencing uptake and adoption, focus group and individual household interviews were held in four locations; Athi River in Machakos district, Gatanga and Gatuanyaga in Thika district, and Nyathuna in Kiambu district. The aims of the focus group interviews were to establish the main pest and disease problems, knowledge and use of crop protection technologies, and farmers' perceptions of different information pathways and methods. Individual household interviews focussed on actual crop protection practices. Information was sought on which and why certain crop protection strategies are preferred, sources of information, communication methods, and frequency of contact with the disseminators. Farmers were asked

to set their own criteria and to use these to evaluate the crop protection strategies, pathways, and communication methods themselves.

Findings

Current institutional setting

In Kenya, the main institutions involved in agricultural research and dissemination are the Kenya Agricultural Research Institute (KARI), international research organisations, NGOs, local universities, agro-chemical companies, and other public organisations. Most international research organisations have formal links with the national agricultural research and extension systems (NARES). The majority of research organisations involve stakeholders, both intermediary and end-users, in research priority setting to some extent. However, there is room to improve stakeholder involvement throughout the whole research–extension process. Insufficient resources and poor coordination among institutions involved in research and extension are major constraints to dissemination of research outputs. The existing registration and regulatory procedures are cumbersome and often result in delays and inappropriate use of some technologies.

Refocussing agricultural research and extension activities in order to develop better technologies could contribute towards reversing, or at least halting, the recent trend of declining investment. Ways of making more efficient use of available national resources include forming functional linkages with the private sector and other NGOs and demonstrating greater positive impact of research and extension activities. In addition, a national forum to coordinate research and dissemination and to facilitate implementation of regulatory procedures for the use of technologies is recommended.

On-going research and available pest control strategies in vegetable production

On-going research covers five broad areas: plant host resistance, alternatives to chemical control, integrated pest management (IPM), optimal chemical application levels, and testing of introduced chemicals. Most of the IPM research is already at the validation stage. Likewise, the chemical validation tests reflect adaptive research whose outputs can be applied directly to farming situations. Some alternatives to chemicals such as P*lutella xylostella* granulosis, a virus that controls diamond back moth (DBM) a serious pest on brassicas, are currently being validated while others are yet to be validated and require further research. The key question remains whether these initiatives have been responsive to farmers needs.

The majority of farmers use chemical control strategies for pests and diseases, mainly because of 'demonstrable efficacy' and repeated exposure to this strategy. Although farmers are generally aware of the recommended chemical application strategies and the adverse effects of chemicals, they sometimes deviate from the recommended practices. Some NGOs promote botanical mixtures and other alternatives to chemical use, yet evidence of their efficacy remains anecdotal.

Cultural practices, such as crop rotation to control bacterial wilt disease in tomatoes, are also used. The on-going research into alternatives to chemicals is a direct response to the problems associated with sole reliance on their use (direct costs, pesticide resistance, environmental damage, and health considerations). Consultations at the final stakeholder workshop on 31 March 2000 indicated that among the ways to address these problems are: increased collaboration in research activities in order to rationalise resources, research on effectiveness of alternative control technologies, enforcement of regulatory procedures on quality standards for products at the local markets, and provision of credit to farmers.

Dissemination of research outputs: delivery pathways

Four broad categories of pathways were identified: the private sector, the public sector, NGOs, and consortia from among the categories. Institutionally, the traditional crop protection delivery pathways are the public sector extension system and the private chemical companies, while the emerging pathways are NGOs, consortia, and export companies, Figure 1 shows the sources of information (by percentage) and how often these agencies contact producers. Downstream in the information delivery chain, farmers identified fellow farmers and indigenous technical knowledge systems as important pathways.

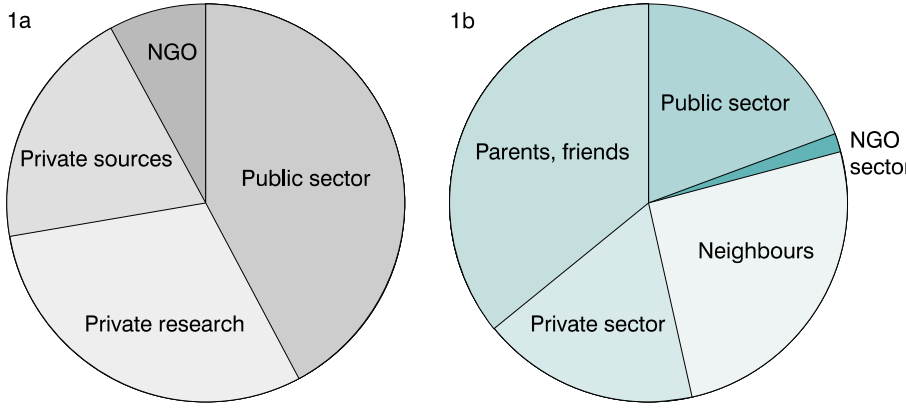

Figure 1a. Crop protection information sources (%) used by peri-urban vegetable producers in Kenya. 1b. Extension contacts, showing the percentage used by farmers during an average year.

Farmers ranked the pathways based on what they considered to be desirable attributes. The criteria given by farmers were combined with information from secondary stakeholders to arrive at the following desirable attributes for an effective pathway:

- Geographic distribution — a pathway or institution that is available in most areas
- Accessibility — physical distance, knowledge of location, and good rapport

- Reliability of information — particularly in terms of how up-to-date it is, and in the case of crop protection, whether prescribed strategies work
- Extensiveness or versatility of source — ability to address multiple problems
- Appropriate communication methods — practical demonstrations are preferred for crop protection technologies.

Using the above criteria, pathways were ranked

1. Public sector extension — found in all study sites and included in most joint activities. They address multiple problems but are sometimes inaccessible
2. Neighbours/parents/fellow farmers, and friends — considered most accessible, but sometimes provide outdated and therefore inappropriate information
3. NGOs — employ suitable communication methods, highly accessible, but limited in geographic distribution and extensiveness of information.

Despite the constraints faced by the government extension system, it was rated highly by the majority of surveyed farmers and was considered accessible and reliable, although costly at times. This rating could be attributed to a number of factors, mainly that the majority of farmers are aware of its existence, it is able to address a wide spectrum of agricultural problems, and that there are more government extension officers in the peri-urban system than in other systems.

The NGO sector appears focussed, to have adequate funding for operations, and is held in high esteem by the farming community. It is reliable and less costly but has a limited geographical scope. The private sector pathway remains an important source of information, not only to farmers but also to secondary users of information. The consortia appear to be a sustainable pathway given the recent trends in agricultural technology generation and dissemination. Besides the synergy derived from different skills and approaches, the cost implications are favourable. It is perhaps this approach to dissemination that has kept the public sector operating in the wake of serious funding cuts in the recent past. Increased collaboration among partners in dissemination activities is thus recommended.

Use of the communication channels by disseminators

Researchers disseminate their findings to intermediate users through a variety of channels, including publications, on-farm research, farmer field schools (FFS), and farmer field days. Seminars are the most commonly used communication method, followed in descending order by demonstrations, farm visits, printed material, on-farm trials, and *barazas* (public meetings). For end-users, demonstrations were the preferred communication method for crop protection strategies. Such verbal communication methods as *barazas*, seminars, and radio are also used. Newer and less-extensively used methods include video and film shows. Given the levels of literacy in the peri-urban system (Figure 2), printed materials are used. Demonstrations, printed materials, and radio programmes are the traditional methods of conveying crop protection information, while FFS, community theatre, and radio group listnerships are emerging methods.

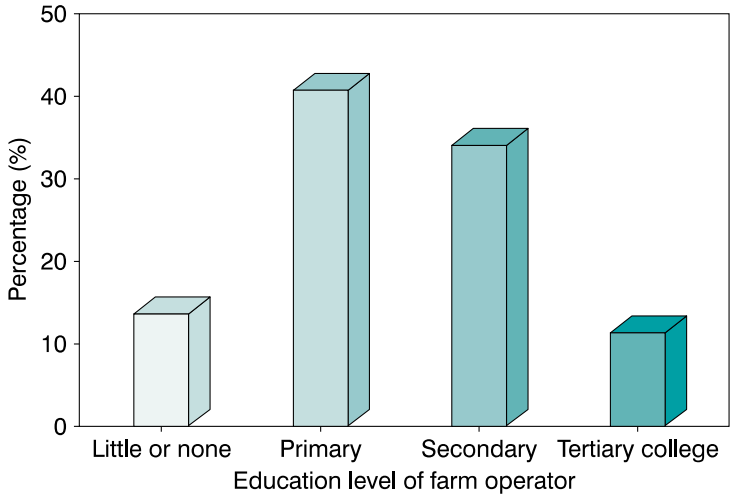

Figure 2. Extent of formal education among peri-urban vegetable producers surveyed in Kenya during 1999.

There was little disparity in evaluations of communication methods by farmers, disseminators, and generators of crop protection information. The desirable attributes included the following:

- Effectiveness — how successful the method is in delivering information
- Extensiveness of information — ability to address many farming problems
- Accuracy of information
- Geographical coverage — most known and used by farmers
- Ability to provide opportunities for networking.

Demonstrations, farm visits, FFS, and radio were rated as the most effective communication methods:

- Demonstrations offer practical means of 'learning by doing' for farmers
- FFS are considered to be sustainable and an effective way of scaling up since farmers trained in these schools go out and train other farmers
- Field days, seminars, and courses provide information on all aspects of farming
- Printed matter (books, manuals, and pamphlets) are considered reliable and accurate, and provide farmers with an opportunity to go back to the information when necessary
- Radio is the leader in terms of geographical coverage and is a direct source of information
- Seminars and *barazas* offer farmers opportunities for networking and therefore learning new ideas.

Scaling up demonstration-based methods and the combined use of traditional and emerging communication methods are recommended, in addition to group approaches such as community theatre, radio group listenership, and promotional events that are more cost-effective than contacting single producers.

Farmer circumstances

The majority of the peri-urban farmers have a functional level of literacy. Given their proximity to urban centres, they have access to agricultural input outlets and the communication systems are relatively well developed. Also, compared to their rural counterparts, the majority of the peri-urban vegetable producers are aware of effective crop protection strategies and 45% of them have received specific training on pest control. To a large extent, the crop choice and enterprise mix of the peri-urban vegetable producers are guided by market demand (driven by nearby urban centres), and sometimes by export demands. Often the climatic conditions do not favour the prevailing production system. Irrigation is therefore a common feature of this system, 95.5% of growers interviewed were irrigating their farms. Production plans target periods of supply shortfall from the traditional and climatically favourable vegetable growing areas in the dry season when prices are high. Also, plot sizes are small, rarely exceeding 0.5 ha per crop.

Conclusions and implications

Institutional linkages for research and dissemination exist between the public, private, and NGO sectors. In most cases resources constrain both research and extension. The key attribute of any given crop protection technology is demonstrable efficacy. Thus, the majority of peri-urban vegetable producers in Kenya employ chemical control methods since there are very few alternatives with comparable levels of efficacy. An array of functional delivery pathways exist in the peri-urban system, and the public sector extension system is rated highly by the farmers, contrary to conventional wisdom. Peri-urban producers are guided by market demand and can act in an opportunistic manner where there are no clear regulatory measures. Demonstrations are the preferred communication method.

Institutions exist, but there is a need to enhance collaboration and support coordination between them. Consortia arrangements should be encouraged. More demonstrations, and scaling up using FFS and fellow farmers would be effective, as would use of the innovative approaches in communication. Because of the environmental hazards there is an urgent need to enforce regulations on pesticide use, to streamline registration procedures, and for policy support for alternatives to chemicals.

It is recommended that partnerships be formed in order to make the technology generation and dissemination process more responsive to farmers needs. Also, given the direct and indirect costs associated with chemical control, there is a continuing need for research on alternatives to chemicals, and on effective communication methods and pathways for these alternatives. Finally, there is

need to explore the use of emerging pathways such as community theatre, radio group listnership and promotional events. These are group approaches and therefore could prove more cost-effective.

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COOPER, J. (1999) Pest management in horticultural crops: integrating sustainable pesticide use into biocontrol-based peri-urban production systems in Kenya. Final Technical Report, Project R6616. Natural Resources Institute (NRI), Chatham, Kent UK. (Unpublished)

Discussion

Q. How poor are these farmers? Do they really need new technologies? DFID needs to accelerate the poverty aspects, to involve lower income groups and provide services to the very poor.

A. The farmers cover a wide spectrum of income categories ranging from the very poor to relatively well-to-do. Yes, all the farmers need alternative technologies to chemicals given that the cost of chemicals keep rising. Whilst the better-off farmers can afford the recommended chemicals, the relatively poorer ones would probably be the greatest beneficiaries of alternatives to chemicals.

3. Factors affecting the uptake and adoption of crop protection research in vegetable systems in India, Bangladesh, and Nepal

N.R. Maslen and M.J. Iles

Introduction

The vegetable sub-sector is an important part of agriculture in Nepal, Bangladesh, and India because vegetables are relatively high-value crops, compared to such staples as pulses and oilseeds. A wide range of vegetables is grown throughout the sub-continent and the areas under vegetables and value of production have kept pace with increases in population and subsequent demand over the past decade. Over the next 25 years, large urban influxes are projected, so the demand for cheap, good quality vegetables in and around cities will be high. Given these conditions, increased developmental support for the vegetable sector is timely and could be directed towards bringing long-term social, economic, and improved nutritional benefits for poor producers and consumers.

The purpose of the study was to review as far as possible the current knowledge of vegetable crop protection technologies available to farmers in India, Bangladesh, and Nepal and to identify those that have, or might have, direct and indirect benefits to poor farmers and consumers. Through analysis of the main technologies available and identification of potential constraints to the uptake of pest management strategies, recommendations could be made for alleviating these potential constraints. These included the need for further work to address the remaining technology gaps. In addition to the technical constraints, economic and social ones were also investigated.

This study is part of a wider Department for International Development (DFID)-funded programme development initiative under the Crop Protection Programme (CPP) to improve promotion of pro-poor strategies in vegetable (rice-vegetable) production systems in South Asia, and to reduce the impact of key pests and diseases; improving yield and quality of crops, and reducing pesticide hazards.

Methodology

The study was carried out between mid-November 1999 and mid-June 2000 by a collaborative team from the Natural Resources Institute (NRI), UK and the Rama Krishna Mission Lokasiksha Parishad (RKMLSP), West Bengal, India, aided on

Natural Resources Institute, Central Avenue, Chatham Maritime, Kent ME4 4TB, UK.

DFID Crop Protection Programme Project DFID R7513 (ZA0358).

MASLEN, N.R. and ILES, M.J. (2000) Factors affecting the uptake and adoption of crop protection research in vegetable systems in India, Bangladesh, and Nepal. pp. 35–41, In: *Sustaining change: proceedings of a workshop on the factors affecting uptake and adoption of Department for International Development* (DFID) *Crop Protection Programme* (CPP) *research outputs*. Hainsworth, S.D. and Eden-Green, S.J. (Eds.). Imperial College at Wye, Kent, UK. 21–23 June. 2000. Natural Resources International Limited, Chatham Maritime, Kent, UK.

regional visits and at a workshop by scientists and specialists from the private sector, NGOs, government offices, and educational, research, and development institutions from the three countries. Farmers were consulted, as were stakeholders from public and private sector research and extension organisations. The study had four components.

Literature review

Some 450 publications on crop protection research and extension were reviewed, covering a period from 1983 to the present. This review served to identify the most commonly researched crops and pests (insects, fungi, bacteria, viruses, nematodes, and weeds), in addition to indicating the main areas of research over the period.

Project review of current and recent vegetable projects

A brief review of current and recent projects concerned with vegetable crop protection and related issues was conducted in India, Bangladesh, and Nepal. These were mainly from the CPP, with a few from other Renewable Natural Resources Research Strategy Programmes—National Agricultural Research Strategic Plan (NARSP), Plant Sciences Research Programme (PSRP), Policy Research Programme (PRP), and DFID bilateral funding.

Stakeholder workshop

A regional stakeholder workshop was held at the Rama Krishna Mission Cultural Centre, Golpark campus in Calcutta between 15–18 February, 2000. This meeting was organised jointly by the Rama Krishna Mission (RKM) and the NRI and was funded by the project (CPP/DFID).

Field study and pilot field survey

Field visits were made to Nepal and Bangladesh (during November 1999). Secondary information was obtained from a number of useful references, prior to and during the field visits. During the visits contact was made with key organisations and individuals involved in the vegetable sub-sector: farmers; NGOs, mainly international; government extension and research (the latter by telephone); and international development agencies, and included a field visit to one vegetable production area in each country; courtesy of the Centre for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED) a national NGO in Nepal and CARE International, Bangladesh (an international NGO).

Findings

The adoption constraints identified during this study fell into six broad categories, five being technology-related and the sixth socio-economic.

1. Unavailability of crop protection tools and materials/technology not yet developed

2. Lack of crop protection knowledge/training
3. Technology too complex, laborious, lengthy, or incompatible with other farm practices
4. Pressure or need to use chemical pesticides
5. Financial constraints to using technology (not enough money; method uneconomic)
6. Social and economic (production and marketing) factors more indirectly constraining the uptake of crop protection technologies.

Literature review

The main areas of crop protection research (about 90% of the total) could be divided roughly into four groups. These were:

- Optimising or evaluating existing chemical pesticides
- Plant-host resistance: Resistant/tolerant varieties and genetic improvement
- Integrated crop/pest management
- Alternatives to conventional chemical control: biopesticides, botanicals, etc.

The remaining published studies (about 10%) were on such miscellaneous topics as organic pest management, seed production and yield, pesticide residues in crops and soil, newer chemicals for control of key pests, and biological studies of other pests including mites.

The main uptake constraints revealed by the literature review were high cost (affordability) and low speed of action (efficacy) of the technologies compared to pesticides. Many farmers continued to use pesticides unless the alternative crop protection method was comparable in efficiency. Being less laborious than pesticide application also increased the chances of technology uptake. Other constraints were the unavailability of crop protection tools and materials, the fact that pesticides were frequently more easily available, the common lack of information about crop, pests, and disease management methods. Quality and availability of seed represent major difficulties for many vegetable growers, a constraint also highlighted by participants during the project stakeholder workshop in Calcutta. The input delivery and output marketing systems were inefficient, resulting in scarcities, or lack of inputs at critical times and with resulting high costs for farmers. A study was conducted (in 1994) to identify cultivation constraints in small-scale vegetable gardening, based on interviews with poor women, and group discussions with women volunteers in northwest Bangladesh. The criteria mentioned for crop protection technologies, and thereby also potential adoption constraints, were the need for availability (of technologies), low cost, no detrimental effects, and effectiveness (compared with pesticides).

In all three countries pesticide over-use and misuse is still widespread, mainly because pesticides are readily available through the extensive dealer networks that may also offer credit and 'advice'. A good proportion of the chemical pesticides

available is highly toxic and many products are of poor quality and even ineffective as formulated, resulting in such consequences as pesticide resistance, environmental and user contamination, and poisoning, in addition to ineffective pest control. From citations in the literature, the widespread, and often indiscriminate recourse to pesticides could be seen as a constraint.

Project review

While qualitative and quantitative tests to measure technology uptake and adoption have still to be developed and universally agreed, recent CPP projects do appear to be more able to involve farmers and to both encourage uptake of the outputs, and be able to demonstrate an 'impact' (i.e., in terms of demand for technologies or changes in farmer practices), even if the 'impact' is commensurate with temporal (project life) and monetary (manpower and resources) input levels.

Of the four commonest categories of current research identified in the literature review, the largest number of the recent and current vegetable projects (about 40%) fall in the optimising or evaluating existing chemical pesticides category, while the others are about equally represented (20% each) under plant-host resistance, integrated crop/pest management and alternatives to conventional chemical control. Although arguably minor contributions in relation to the overall problems and needs, these projects appear broadly to be addressing the main problem areas for which research is required in vegetable crop protection.

Stakeholder workshop

A summary report on the February workshop was produced and distributed to delegates for further feedback in April 2000.

The workshop participants drew up a list of 'Adoption constraints applicable to most technologies'. These were as follows (category number listed at the beginning of this Findings section shown in bold):

- Limited input availability, i.e., very few spare resources **1**
- Extension workers not provided with integrated pest management (IPM) information for transmission to farmers **2**
- No follow-up after IPM technology is advocated or recommended **3**
- Farmers are brain-washed by profit-orientated dealers to adopt spray solutions, rather than other methods **4**
- IPM technology not sufficiently market-orientated **5**
- Restricted access to market (growers) **6**
- Communication gap between stakeholders **2**

The communication gap between stakeholders, is categorised **2**, since poor communication may also include a lack of knowledge of crop protection methods, or indicate that the technology is still undeveloped.

The main findings of the workshop were:

- There are still too few effective crop protection technologies available or widely evaluated in the three South Asian countries. More need to be developed or improved/fine-tuned to be effective and to compete with pesticides
- Pesticides were seen as a constraint to the uptake of crop protection technologies because they can give, or appear to give, instant results and they are readily available through the ubiquitous local dealerships. These dealerships can be attractive because they often also sell fertilisers and are prepared to provide credit facilities to growers
- Economic factors such as price stability and marketing problems were seen as important constraints by the workshop participants

Field study and pilot field survey

The key findings from the Nepalese interviews were: there is broad family involvement in crop protection activities; information and advice are mainly provided by government extension services and NGOs, and are generally considered effective; almost half those interviewed had received neither information nor advice; 37 different vegetables are grown, the most important being the solanaceae, brassicas, and cucurbits; patterns of production, consumption, and marketing—marketing is very important, and almost all vegetables are marketed; major pest problems, the vegetables affected and grower response. The main constraints relate to availability and quality of inputs, although marketing problems and pests are also important.

The key findings from the Bangladeshi interviews were: husbands dominate crop protection activities; information and advice are again mainly provided by government extension services and NGOs, and were considered effective in all cases; almost half the growers had received neither information or advice; 14 different vegetables are grown, far fewer than in Nepal, the most important being different types of amaranthus, spinach, cabbage, brinjal, and radish. Marketing dominates consumption. The main constraints relate to availability and quality of inputs, although marketing and pests are also important.

Conclusions and implications

A large number of actual or potential technical, social, and economic uptake and adoption constraints were identified through the four study components but only the main ones have been mentioned here. The principal findings of the overall study were:

- There are still surprisingly few effective vegetable crop protection technologies developed or available in South Asia
- Pesticides are seen as an uptake constraint because they are readily available through local dealers and are seen as quick-acting and relatively simple to acquire and apply compared to the more benign and potentially more profitable, safer, crop protection technologies.

The vegetable sectors in the three countries are characterised by small-scale producers. Although the majority are homestead gardeners, most of the production comes from those growing for the market. There are also large-scale producers, particularly in India. The heavy use of pesticides on vegetables grown for market in all three countries has prompted concern amongst consumers and, although initially confined to higher income groups and expatriates, this concern is growing. This can be harnessed to encourage improvements in policy, regulation and availability of more benign technologies.

It is recommended that targetted further research be conducted to develop, refine, and test geographical integrity or applicability of crop protection technologies for control of major vegetables and their pests. These are: on brinjal (shoot and fruit borer, wilt), on tomato (fruit borer and leaf curl virus) and cabbage/crucifers (several Lepidoptera, including diamond back moth, sclerotium rot), on okra (yellow mottle virus and fruit borer) and on cucurbits (mainly fruit flies). There is also a need for research on pesticide availability and supply to encourage change in the types and quality of pesticides available. This could be achieved by improved regulation of pesticides and the dealer network, or encouraging training of dealers to provide more appropriate and better advice and materials to farmers. This needs to be done with local and national government help. There is scope for development of an alternative network of IPM-literate dealers for advice and sale of more benign products (viruses and other biorational agents, botanical products, and pheromones) on an affordable but commercial basis. Research is also needed to obtain a better understanding of marketing issues to encourage initiatives which will benefit resource-poor growers. More detailed research is still needed to characterise the nature and composition of constraints for particular areas in each country, as they are not common to all areas. Similarly, more research is required to understand the constraints faced by resource-poor vegetable growers, particularly any inherent social, economic, and technical factors preventing or discouraging participation. Resolution of such detail was beyond the capability of the current short project.

Discussion

Q. Are pesticides a constraint? If they are so pervasive why look for alternatives rather than complementarities?

A. Pesticides are a constraint because they are easily available through ubiquitous dealerships, whereas more benign technologies are less well known and are rarely available off the shelf. We are only interested in alternatives to highly toxic and persistent pesticides. Complementarities are not excluded, although most resource-poor farmers will not see a distinction between alternatives and complementarities. They just want an uncomplicated method that works.

Q. Are consumers unaware of the need for 'organic' produce?

A. Pressures from consumers are increasing, the Indian Government is concerned,

DFID is helping, but there is still an urgent need to increase awareness across a wide spectrum of consumers and better links to awareness groups are needed.

Q. Are farmers driven by markets?

A. Yes, but as in Kenya, the demand is so high that people will not take notice. Only if regulations are mandatory, e.g., for export markets will farmers follow them.

Q. Are farmers aware that if cheap sprays are applied every day, their total expenditure on pesticides is high?

A. Yes, but pest pressures are very high, there is a need for alternative technologies 'on the shelf' that can be adapted as new ones are required.

4. Factors affecting the uptake and adoption of outputs of crop protection research in maize systems in Eastern Africa

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Introduction

Study objectives

- Identify the key factors affecting the uptake and adoption of crop protection research in maize-based farming systems in Kenya and Uganda
- Develop recommendations to the Crop Protection Programme (CPP) to address potential uptake constraints and improve incentives for uptake of crop protection technologies from both current and recently completed projects.

Maize is a major component of rural peoples' livelihood strategies in Kenya and is increasingly important in High Potential areas of Uganda. It is cultivated for both direct home consumption and market sales, and faces a number of serious crop protection-related constraints to which research activities have been directed. The uptake and adoption of these crop protection recommendations is a relatively poorly researched area and the CPP is starting to address this through funding work on such areas as the factors affecting the uptake and adoption of herbicides in maize-based cropping systems. These issues are related to the general literature on technology adoption. This literature indicates uptake is a function of a wide range of factors: availability of capital, farm size, attitudes to risk, ability to mobilize sufficient labour supplies (at appropriate times), output and input prices (influence of pricing policy), multiple and conflicting objectives at household and intra-household level, credit availability, amount and quality of extension contact, input availability, quality of delivery systems, infrastructure (particularly in relation to ease of marketing), education levels, farmer age, membership of social

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DFID Crop Protection Programme Project R7489 (ZA0347).

OVERFIELD, D., PAGE, W.W., RUSSELL-SMITH, A., FARRELL, G., KISAUZI, D., KIBATA, G., KYAZZE, F. and NYAMUTALE, R.K. (2000) Factors affecting the uptake and adoption of outputs of crop protection research in maize systems in Eastern Africa. pp. 43–48, In: *Sustaining change: proceedings of a workshop on the factors affecting uptake and adoption of Department for International Development* (DFID) *Crop Protection Programme* (CPP) *research outputs*. Hainsworth, S.D. and Eden-Green, S.J. (Eds.). Imperial College at Wye, Kent, UK. 21–23 June. 2000. Natural Resources International Limited, Chatham Maritime, Kent, UK.

organisations, and farm household knowledge systems. This long list reveals the complex interaction of economic, social, and institutional arrangements affecting technology uptake. There are complex interactions between the demand for, and supply of, agricultural technologies which this study was concerned with trying to untangle.

Methodology

A literature review was prepared covering all recent/relevant work concerned with adoption and uptake of agricultural technologies. This included a review of all relevant international literature and grey literature specific to Kenya and Uganda, with specific attention paid to crop protection related interventions. It focussed on farmer constraints and such factors as extension and research management that affect uptake and adoption. Discussions were held with key stakeholders in Kenya and Uganda. A stakeholder workshop was held that focussed on developing recommendations designed to improve the uptake of appropriate interventions to increase the probability of uptake of programme outputs and future investments. The workshop was combined with the CPP study on 'Factors affecting the uptake and adoption of outputs of crop protection research in banana-based cropping system in Uganda' (reported pp. 49–64, these proceedings) and was particularly concerned with developing a checklist of generic factors (elements) influencing adoption.

The following key farmer factors were identified:

- Farmers play an important role as sources of technological information and transfer agents
- Farmers have multiple decision-making criteria
- Farmer perceptions about innovations are critical
- Farmers' levels of formal education are important as are the number of extension visits.

Stakeholder workshop

This was structured across a number of sessions with a wide range of stakeholders to achieve two aims:

1. Development of a set of generic elements underlying farmer adoption of crop protection research and recommendations
2. Synthesis of recommendations developed by the working groups for the CPP.

In order to achieve this the participants split into seven different stakeholder groups. They were asked to consider success and failure in adoption from a stakeholder perspective through 'case studies'. Their stories, definitions (success and failure), and other elements were used to construct a set of (17) generic factors influencing adoption.

Development of generic adoption elements

The first part of the workshop focussed on allowing stakeholder groups to analyse process of adoption and uptake of new agricultural technologies. This process was crystallised around the groups' definitions of success (and failure), and the elements underlying success (and failure). These definitions, and their underlying elements, were used to construct a set of 17 generic factors that influence the likelihood of adoption of a crop protection technology (or other new innovation). The elements covered:

1. Farmer/end-user demand assessment
2. Nature of technology, i.e., its complexity, cost
3. Return to investment (and perceptions)
4. The technology development process
5. Broader information/technology supply issues.

These five points were used as checklist/investment guides to the likelihood of end-user uptake**.** The 17 generic factors were then summarised in four categories: technology, outcome, process, and beneficiaries.

Technology

Cost — absolute price of technology
Affordability — price relative to what farmers can afford
Side effects — unintended effects either negative or positive
Cost efficiency — cost effectiveness
Adaptability — can it be adjusted to farmers actual environment?
Availability/distribution system — to end-users
Simplicity of solution — to end-user

Outcome

Market — good market for final product
Ability to meet expectations of end-users — all required characteristics
Sustainability of solution — will it last without donor input/other contact?
Time — from adoption to benefit realised
Importance of a commodity — from initial investment to realisation
Seriousness of constraint — from farmers and others perceptions

Process

Participatory development — proper partnerships developed throughout development and promotion stages
Targetting fast stream, slow stream — properly identifying target groups

Beneficiaries

Communication — of technology to the end-user
Strategy of introduction — whose strategy, management of stakeholder interfaces.

Relevance of generic factors

The results from the workshop indicated that a set of generic factors can be applied across a range of different potential interventions. These may represent a starting point in developing a means of systematically analysing potential technology investments for the CPP in terms of the likelihood of end-user adoption. This will require much further development and refinement — but may produce a means of scoring and ranking competing investment areas.

Knowledge systems, dissemination, and supply issues

- Knowledge systems are complex
- Links in the technology supply chain are often weak
- There is little that is unique as a collection of technologies
- Technology 'types' have rather different knowledge requirements
- There is a need for knowledge system audits.

Recommendations

The working groups at the workshop produced a number of different recommendations coming directly from the elements that were identified as leading to success and failure in the adoption of new agricultural technologies. Some of these relate to broad issues (i.e., for CPP/other donors in general), some to the nature of the technology, some to the process of technology generation, and some to *ex-post* evaluation and monitoring. They are concerned with both demand and supply issues.

- Investment in new technologies should be conditional on the importance of the commodity, the seriousness of the constraint, and the existence of a supportive policy environment. (Implied action for CPP: broad-based participatory needs assessments and policy assessment are required before investment decisions are taken. This should be programme/region/cluster-based rather than project-based)
- The intended and likely end-users of research outputs should be identified from the outset of the research. (Implied action for CPP: projects should have inception phases where these groups are clearly identified so they are properly targetted by the project)
- All interventions should meet user expectations. (Implied action for CPP: all farmer/consumer expectations of a technology should be addressed, e.g., not only yield or production cost, but also things like taste, ease of threshing, etc. Such factors should be addressed during the inception phases of projects)
- Technology development should be participatory and well-targetted, getting communities involved at inception in the process (Implied action for CPP: all projects concerned with technology generation should be conducted in

partnership with farmers and other relevant stakeholders, e.g., rural stockists, extension officers, community leaders, or other civil society institutions)

- There need to be broader and stronger linkages in the technology supply chain particularly those elements closer to end-users. (Implied action for CPP: programme and projects need to pay greater attention to dissemination in its broadest definition and may need it to be built into the management structure — address problems over who is responsible for this)
- More detail is required on how past investments have performed, as a guide to how to increase returns to new innovations in the future. (Implied action for CPP: needs to invest resources in *ex-post* evaluations of completed projects).

Conclusions and implications

Recommendations

These recommendations have implications for the allocation of resources at the CPP's disposal and may imply some shift between programme-wide and project spending that would need much greater consideration. In addition, the generic factors developed may provide a basis for investment decisions (subject to further development and refinement) based on likelihood of uptake. However these can only act as a guide — investments in areas that cannot show this uptake potential may also be important — they need to be judged on other explicit grounds. It was obvious that uptake and adoption are functions of three different areas**:**

1. End-user demand assessment
2. Technology development process
3. Dissemination and broader supply issues.

For successful uptake all three have to be addressed.

Endnote

The recommendations highlighted, principally an output of the stakeholder workshop, seem to place greater weighting on (end-user) demand than supply issues, particularly its effective establishment as a necessary condition for successful uptake. However, the long list of factors influencing uptake and adoption, identified by previous research, indicate complex interactions between the demand for, and supply of, agricultural technologies, broader livelihood structures, and general environment (including knowledge systems). The CPP is involved in this process as a supplier (and technology generator) at the initial stages of the supply chain. It must however ensure that the entire supply chain, beyond generation, is managed successfully if it is to reach end-users in an appropriate manner that encourages significant uptake. This has implications for how the CPP allocates the resources under its control in the ever-changing environment in Eastern Africa in which it seeks to provide a positive contribution to the elimination of poverty.

Discussion

Q. Who should articulate farmer demand?

A. Farmers! But collecting information on their demands is expensive. Some countries, e.g., Uganda have organizations that can audit knowledge information.

Q. Would you agree there is a need to spend money on finding out if a project has had impact, that it is up to DFID to disseminate information, and that to assess demand DFID should use any available information?

A. Yes, and we need to realize that sometimes it is the commodity itself that is the constraint — this became obvious when maize and banana projects were evaluated together at a single workshop.

Q. Can 'demand' be better defined?

A. If the real priority problems are identified.

5. Factors affecting the uptake and adoption of outputs of crop protection research in banana-based cropping systems in Uganda

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Introduction

Banana is the major staple food crop over much of Uganda. The country is currently the world's largest producer (9.0 million tonnes per annum in 1996), accounting for approximately 15% of total global yield. There has been a major decline in banana production in Uganda over the last 25 years. This has been reflected by a shift in production from the central region where production is estimated at 6 t/ha to the western region where it is 17 t/ha. The longevity of banana plantations has fallen from about 50 years to only 5–10 years in some areas.

During the colonial to early independence period (1920s to 1960s), banana weevil and weeds were ranked top among banana pest problems. Diseases were considered to cause severe losses only in localised areas, nematode observations were very limited and their importance was not reported. Cultural controls were recommended without reference to data on weevil ecology. These included: use of clean planting material, complete cover with mulch, split pseudostems and corms, trapping adult weevils, and compacting soil over the cut rhizome to prevent access by ovipositing weevils.

Intensive research on bananas in Uganda was only initiated in the early 1990s. A research agenda was developed by a consortia of international and national research institutions, namely the Uganda National Banana Research Programme (UNBRP), International Institute of Tropical Agriculture-Eastern and Southern Africa Regional Centre (IITA-ESARC), the African Highlands Initiative (AHI), and

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DFID Crop Protection Programme Project R7488 (ZA0346).

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the International Centre for Insect Physiology and Ecology (ICIPE). Other partners included the Natural Resources Institute (NRI), International Network for the Improvement of Banana and Plantain (INIBAP), Makerere University, the University of Reading, and CAB International (CABI). The research has focussed mainly on managing the plant habitat and developing resistant/improved varieties. The Uganda National Agricultural Research Organization (NARO) current priority area is stated as being the development, adaptation, and uptake of technologies by farmers.

Research led by the UNBRP suggests that a number of interrelated factors have contributed to the recent decline in production. These include: socioeconomic constraints, low genetic diversity, declining soil fertility, a pest complex involving banana weevils, parasitic nematodes, a number of diseases, and post-harvest problems. Socio-economic constraints, as perceived by farmers themselves, include labour, road accessibility, management options, and other sources of income. Rising population pressure, land use intensification, and diminishing farm size have resulted in, for example, shortened fallow periods, and have been key contributors to declining soil fertility. The genetic variability of bananas in Uganda is currently very limited and many of the preferred cultivars are susceptible to pests and diseases. Most of these constraints to banana production are not unique to Uganda but are of regional importance. However, the country's insecurity in the 1970s, and 1980s together with the impact of HIV/AIDS have exacerbated the situation.

A Benchmark Sites (BS) programme is being developed with the aim of accelerating the movement of promising and tested technologies along uptake pathways for promotion. These technologies include those aimed at directly or indirectly reducing the damaging effects of banana pests and diseases (e.g., improved organic and mineral fertiliser use and related cultural treatments to improve plant vigour, the selection and use of host-plant resistance, use of clean planting material, break crops, and weevil biocontrol agents). A number of these technologies have been developed and evaluated utilising funding provided by the Rockefeller Foundation and IITA, the Canadian International Development Research Centre (IDRC), and the UK Department for International Development (DFID) Crop Protection Programme (CPP) through the support of British agricultural research institutes (ARIs). Several technologies are at an advanced stage in that they are now undergoing on-farm evaluation at a number of BSs. Based on their performance and farmers' responses, those most suitable for the different agroecological zones and farming systems will be selected and their uptake facilitated.

The aims of the study reported here were to:

- Carry out an analysis of stakeholders and their involvement in banana research and development in Uganda
- Identify constraints and opportunities within the process of technology uptake
- Recommend means for improving the process of research and development for technology uptake.

Methodology

The study was led by a team from Reading University, CABI, NRI, and UNBRP. The study team aimed to make the process as inclusive as possible within the limits of time and resources available, striking a balance between the need for independent facilitation and inclusion of stakeholders to encourage ownership of the outcome. The approach taken involved the following elements:

Planning and developing methodology

Although the planning and design of the study had been broadly outlined, the approach taken required that the method used should be able to evolve with contributions from various key stakeholders. This was achieved through two main planning and design meetings involving participants from:

CARE International, the Buganda Cultural and Development Foundation (BUCADEF), CABI (Africa Regional and UK Centres), IITA-ESARC, UNBRP, NRI, PLAN International Uganda, Reading University, and The Ssemwanga Centre for Agriculture and Food Ltd.

Review of literature

A review of literature on banana research and uptake in Uganda was carried out, it included such topics as objectives, scope of literature available, bananas — origin and importance, banana production in Uganda, research interventions, pests of bananas, evidence of technology uptake, diseases of bananas, evidence of technology uptake, constraints to uptake/adoption — evidence from farmers and scientists, and conclusions.

Consultation with primary stakeholders (farmers)

Consultations with farmers took place at the current BS sub-counties in the districts of Luwero, Masaka, and Bushenyi, together with one other district— Mbale. At each BS individuals and groups of farmers were consulted for one day. Individual consultations were with 7 or 8 individuals per BS. These individuals were then brought together for group discussions (one female and one male group).

Consultation with secondary stakeholders

The design team identified a large number of stakeholders to be consulted. The consultation process aimed for each stakeholder to:

- Clarify perceptions of other stakeholders in banana research and development
- Identify the contributions of others in the research and development process
- Identify issues, constraints to, and opportunities for achieving uptake of banana (particularly crop protection) research outputs.

Although the aims were the same, the consultation approach varied according to the nature of the stakeholder. Non-governmental organisations (NGOs), community-based organisations (CBOs), district extension staff, local councils,

and training institutions were consulted as groups in one-day workshops. Other stakeholders were consulted on a quasi-group basis (e.g., UK-based researchers and CPP management) or as individuals, e.g., IDRC, Rockefeller Foundation, DFID (Kampala), Banana Research Network for Eastern and Southern Africa (BARNESA), traders, and processors. Primary and secondary consultations were carried out by two teams, each led by independent consultants comprising researchers and members of NGOs.

Stakeholder workshop

The outputs from the consultation process and the literature review were brought together with stakeholders in a one and a half day workshop held in Kakamega, Kenya, in March 2000. The aim of the workshop was to further analyse constraints and identify means by which uptake can be improved. To shift the emphasis away from the commodity to a more people-centred approach, the workshop was held jointly with the CPP study of 'Factors affecting the uptake and adoption of outputs of crop protection research in maize systems in Eastern Africa' (reported pp. 43–48, these proceedings).

Findings

The uptake process: farmers, the primary stakeholders

What are farmers currently doing in their banana fields and why?

A wide range of actions/ practices are being carried out (see Table 1 for examples of how information was collected), many of which can influence pest incidence and severity, but may or may not be implemented through a farmer's decision to better manage pests.

A farmer may be carrying out a particular action for one or more reasons and/ or a number of activities may be aiming to manage a particular problem e.g., one women carrying out six activities that she felt contributed to weevil control. Farmers' reasons for their actions in their banana fields (Table 2) varied from: an overall livelihood need (e.g., improve food security) to the specific (e.g., weevil control); crop based (e.g., soil fertility) to non-crop based (e.g., firewood or livestock feed), banana-based (e.g., improve banana vigour) to non-banana based (e.g., intercropping of annual crops). There is variation between locations and between men and women farmers. This is the complex context in which farmers are deciding how to manage their banana fields including whether or not to 'take up' research outputs.

What are the sources of information, how do farmers characterise and assess these sources?

Farmers reported a wide range of sources of information, that can be categorised as personal or private contacts, the public sector, the NGO sector, and the commercial sector. The only sources of information reported at all district sites were parents and neighbouring farmers. Through a comparison of sources, farmers in groups (women and men) were able to identify a number of attributes. Sources

Table 1. Example of what a farmer is currently doing and why; sources of information (Luwero district: Elderly, married woman)

Practice	Why?	Source of information	Other
Plans (has bought tin) to spray weeds between bananas (planted in 1982) and then plant beans—hoping bananas will recover	Doesn't have enough strength herself and cheaper to spray than hire labour Falling banana yield associated with weeds and weevils	Personal experience of labourers. Learned about herbicides 25 years ago from Government Extension staff	
Plant in lines *Kayinja* (beer bananas)	Obvious Poor soil Leaves for cooking *matooke* Sells fruit		
Short bananas (*Nakitlengu*) planted 1993/94	Bunch was very attractive After planting noticed that they don't blow over	Has seen on a number of occasions before acquiring from another district Kabaka's palace Neighbour (source)	In 1999 a burial group saw her bananas and took cuttings
Collect urine, keep 14 days, then add ash and red pepper. Applies around mats (particularly those bananas she likes)	To control weevils	Volunteer Efforts for Development Concerns (VEDCO) on NGO taught her neighbours (who pay a membership fee) and she learned from her neighbours	
Trees — provide poles to support bananas	Originally poles to make a cattle paddock — then took root		

that were close or within the community were preferred to those that were remote or outside the community. Practical, experiential learning involving demonstration was preferred to theoretical approaches (Table 3). In some cases, the source was associated with attributes of the technology/information that it provided. The most common attribute to emerge was the modernity of the technology. Current farmer practices are largely based on older knowledge, but not surprisingly, when assessing sources of information farmers value something new (from their perspective) if it is appropriate. Parents were reported by all groups and scored highly on such attributes as proximity (close/and within the community), method

Table 2. Farmers' reasons for what they are doing in their banana fields (% of responses)

Reasons for carrying out actions	Bushenyi	Masaka	Mbale	Luwero	Total responses
Soil fertility	12.2	8.3	23.2	11.1	13.2
Weevil control	14.4	17.7	8.7	9.5	13.2
Weed control	14.4	11.5	1.4	1.6	8.2
Moisture conservation/water supply	8.9	9.4	5.8	1.6	6.9
Soil conservation	3.3	5.2	11.6	3.2	5.7
Pests (general) control	4.4	7.3	2.9	3.2	4.7
Increase bunch size	4.4	1.0	4.3	9.5	4.4
Water + nutrient absorption	3.3	2.1	0.0	12.7	4.1
Land shortage	2.2	4.2	8.7	0.0	3.8
Wind damage	6.7	1.0	4.3	1.6	3.5
Banana vigour	5.6	1.0	2.9	4.8	3.5
Livestock feed	2.2	4.2	7.2	0.0	3.5
Black ant control	4.4	0.0	1.4	6.3	2.8
Human food	1.1	4.2	2.9	1.6	2.5
Provide mulch	2.2	2.1	1.4	1.6	1.0
Firewood	0.0	5.2	0.0	0.0	1.0
Shade for bananas	0.0	2.1	1.4	1.6	1.3
Crop doesn't compete with bananas	0.0	1.0	1.4	1.6	0.9
Clean plantation	0.0	1.0	1.4	1.6	0.9
Alternative income (to banana)	0.0	0.0	1.4	3.2	0.9
Not known	0.0	1.0	0.0	1.6	0.6
Space between plants/vigour	0.0	1.0	0.0	1.6	0.6
Remove diseased *bogoya*/ plant	0.0	0.0	1.4	1.6	0.6
Replace dying bananas (intercrop)	0.0	0.0	0.0	3.2	0.6
Bananas last longer	0.0	0.0	0.0	3.2	0.6
Encourage establishment	0.0	0.0	0.0	3.2	0.6
Avoid toppling (weak stems)	0.0	0.0	2.9	0.0	0.6
Soil can't support banana (coffee)	2.2	0.0	0.0	0.0	0.6
Encourage suckers	0.0	0.0	0.0	1.6	0.3
Re-habilitate land (fallowing)	0.0	0.0	0.0	1.6	0.3
Kayinja does better/better income	0.0	0.0	0.0	1.6	0.3
Kayinja too strong for other banana	0.0	0.0	0.0	1.6	0.3
Root penetration	0.0	1.0	0.0	0.0	0.3
Cigar end rot control	0.0	1.0	0.0	0.0	0.3
No energy to dig deeper ditch	0.0	1.0	0.0	0.0	0.3
Rat control	0.0	1.0	0.0	0.0	0.3
Market for cooking type	0.0	1.0	0.0	0.0	0.3
Money to pay workers	0.0	1.0	0.0	0.0	0.3
Reduce shade (of annual crops)	0.0	1.0	0.0	0.0	0.3
See if pests are present	0.0	1.0	0.0	0.0	0.3
Clean plant at start	0.0	1.0	0.0	0.0	0.3
To allow intercropping	0.0	0.0	1.4	0.0	0.3
Prevent (banana wilt) disease	0.0	0.0	1.4	0.0	0.3
Traders can count more easily	1.1	0.0	0.0	0.0	0.3
Low banana price (intercrop coffee)	1.1	0.0	0.0	0.0	0.3
Big banana fingers	1.1	0.0	0.0	0.0	0.3
Number of responses	90.0	96.0	69.0	63.0	318.0

of training (experiential/practical), and accessibility (Table 4). Neighbouring farmers were also reported by all groups, but overall did not score so highly. A major attribute on which parents (in particular) and neighbouring farmers would not generally score highly was the introduction of new or modern technologies. This may be a contributory factor towards organizations such as the Kawanda Agricultural Research Institute receiving a higher mean score than all other sources, but with very restricted coverage (in this survey only reported by men at the Masaka site).

Secondary stakeholders

Perceptions of stakeholders' role and place in the research and uptake process

All stakeholders perceived that farmers play a role in research, however, their perceived contribution varied from the provision of land, labour, or information, through to monitoring, validating, and conducting their own research. Public research and extension, community leaders, and the private sector were seen by most stakeholders as having a role in the process, whereas this was not the perception of most stakeholders with respect to NGOs, CBOs, and training institutions. However, public extension workers appreciated the much-needed facilitation provided by NGOs, reflecting the lack of public sector support. Donors were seen as providers of vital finance, but their visible influence on the research agenda was perceived both positively and negatively. Tables 5 and 6 provide examples of the responses from one group of stakeholders — CBOs.

Perceptions of the research and uptake process

There was both agreement and disagreement in stakeholders' perceptions of the strengths, weaknesses, opportunities, and threats (SWOT) with respect to the research and uptake process. Perceived weaknesses included: research top down/supply led, insufficient feedback from research (only if it is positive), poorly facilitated (public extension), and political and institutional divides. Perceived threats included: continuity/donor dependency (failure to look at a longer horizon), insecurity/civil conflict, and environmental factors. The strength of having many players was associated with weak linkages. It is widely perceived that demand for technologies exists, although this is tempered by CBOs' perception of the many obligations on a farmer's time and the low status of agriculture (Table 7).

Table 3. Major attributes of sources of information/ technology as reported by farmers in group interviews

Attributes[1]	Bushenyi[2]		Masaka		Mbale		Luwero	
	W	M	W	M	W	M	W	M
Sources of information/technology								
Proximity/location/closeness								
Near/ within[3] Far/outside			✔[4]	✔	✔	✔		✔
Method of training/ learning/delivery								
Demonstration/ experience No demonstration/ theory		✔	✔		✔	✔	✔	
Follow-up								
Follow up Does not follow up	✔		✔				✔	
Availability								
Available/frequently/seen Not available/not seen		✔		✔		✔		
Access/ accessibility to pathway								
Readily accessible Not readily accessible	✔	✔			✔			
Reliability of source								
Reliable Unreliable			✔		✔			✔
Expertise								
More expertise Less expertise				✔		✔	✔	
Formality/style of learning								
Informal Formal		✔				✔		✔
Interactive nature								
Interactive Non interactive	✔			✔				
Friendliness of approach/proximity								
Friendly/personal Unfriendly/impersonal			✔				✔	
Trustworthy								
Trusted/more trusted No trust/less trusted						✔		✔
Technology								
Modernity of technology[5]								
New/modern Old/ traditional	✔	✔	✔	✔		✔	✔	✔
Technology development								
Confirmed/developed Unconfirmed/developing			✔	✔				
Total number of attributes reported	6	5	12	6	7	9	8	5

1. Only attributes reported by more than one group shown.
2. W = women; M = men.
3. Farmer groups' preferred characteristic of the attribute shown to the left of the column, e.g., farmers prefer sources of information to be close or within the community.
4. ✔ = reported by the group.
5. See text.

Table 4. Sources of information; number of farmer groups reporting that source and the mean score[1] of each source according to farmers' preferred attributes[2]

Source	Bunshenyi		Masaka		Mbale		Luwero		Mean score	Groups reporting
	W	M	W	M	W	M	W	M		
Parents	4.3	3.4	4.3	4.0	4.3	3.6	3.7	2.5	3.8	8
Neighbouring farmers	4.5	3.4	1.8	3.5	2.4	2.8	3.7	2.7	3.1	8
Agricultural extension	3.7	3.2	4.6	3.6	3.1	3.2			3.6	6
Schools		2.2			3.0	3.3	1.4		2.5	4
Radio	3.0						2.5	3.8	3.1	3
Training centres					1.9		3.3	3.5	2.9	3
Self innovation					1.7	2.9	1.6		2.1	3
Trader/ input supplier	1.9	1.2					2.0		1.7	3
World Vision International			4.6	3.3					4.0	2
Extension			4.5	2.8					3.7	2
Makerere experts					2.6	3.6			3.1	2
Uganda National Farmers Association (UNFA)					2.8	2.1			2.5	2
Uganda Women's Tree Planting Movement (UWTPM)					2.6	1.8			2.2	2
Distant farmers							1.6	1.6	1.6	2
Kawanda				4.1					4.1	1
Kuyiya (Innovators)				3.3					3.3	1
Abakulembeze (Leaders)				3.1					3.1	1
Agricultural researchers					3.1				3.1	1
Colonial extension					2.7	-			2.7	1
Buwangwa (Culture)				2.3					2.3	1

1. Mean score = an indicative figure calculated as shown in the following example. Women in Bushenyi identified 5 sources of information. They then characterised their sources of information by identifying six attributes (the 4 most important are shown in Table 3). Each source of information was then scored against each attribute (on a scale of 1–5). Parents, for example, scored 5 on each attribute, except modernity of technology, where they scored only 1. This gives a mean score of 4.3. It should be noted that these figures are only indicative.
2. See Table 3

Table 5. Example of stakeholder response: community-based organizations' (CBOs') perceptions of stakeholders and research and uptake process

Processes (Stakeholders)	Problem identification	Sensitisation (Awareness)	Research	Mobilisation	Training	Demonstration	Adoption
Extension	Diagnoses diseased plants Report to higher authorities	Explains the problem in details	Link research with farmers and CBOs	Trigger the process through CBOs	Carry out training	Conducts demonstrations	Motivation: Certificates of recognisation Visits by other technical people Motivate through tours of adopters
CBOs	Report to community to identify possible solution Report to extension Verification of the problem Listens to community	Liaise with extension	Carry out trials	Report defaulters to local authorities	Provide food to participants Carry out training	Organise demonstration plots around homesteads	Motivation of farmers through gifts and parties Monitoring and evaluation
Community (farmers)	Report the problem to CBOs, researchers	Attend meetings	Carry out research Provide information	Inform fellow farmers Respond	Train fellow farmers Provide food for themselves Attend the training	Participate by providing labour sites and apparatus	Provide: input for technologies, finances, labour Practice the technologies
Local authorities Local Councillors Cultural leaders Church leaders Administrators	Solicit funds to solve the problem Hold meeting to discuss the problem	Pass information to the community	Authorize utilisation of land for research	Mobilise the people	Sponsor participants for training Participate as trainees Provide food to participants	Provide security for demonstration Authorise land (Public) Provide equipment needed in demonstration	Motivate farmers by lobbying for market infrastructure
Research stations	Diagnostic research	Pass on information to other areas	Develop new technologies Breed for new varieties	Finance information dissemination	Finance training Trainers Farmers CBOs Provide training (through expatriates)	Finance demonstration	Monitor whether problem is eradicated Impact assessment

Table 6. Example of stakeholder response: community-based organisations' (CBOs') strengths, weaknesses, opportunities, and threats (SWOT) analysis of research and uptake process

Strengths	Weaknesses
• Research stations are already in existence • CBO's are in existence as entry point to communities • Skilled personnel and other resources • Most government programmes are targetting the farmer	• It is slow in addressing problems • Majority of farmers are uneducated/illiterate • Uncoordinated efforts to control prices • Poor extension system — irregular, negligent • Conservative farmers • Researchers do not reach grass roots • Corrupt officials
Opportunities	**Threats**
• Farmers are already in place • Linkage between various stakeholders • Existence of bananas • There are some farmers willing to adopt new technologies	• Too many pests and diseases in banana farming communities • Farming is viewed as low occupation especially by educated people • Farming is a risky business (weather) • Instability (political) • Too many obligations taking farmers' time • Religious beliefs forbidding uptake of some technologies

The stakeholder workshop (Kakamega)

The outputs from the literature review and consultations were presented by the study team and stakeholder representatives to inform the workshop debate. Through the analysis of stories of success and failure, participants characterised elements of uptake and used these to develop recommendations for how the uptake process may be improved. Elements included:

- Seriousness of constraint
- Policy
- Accessibility and cost
- Returns in relation to cost
- Side-effects (positive and negative)
- Compatibility
- Simplicity
- Adaptability
- Markets
- Importance of commodity
- Time to benefit
- Expectations
- Sustainability of solution
- Targetting
- Communication and strategy of introduction.

Many recommendations emerged from the various groups (Table 8).

Table 7. Some stakeholder perceptions of the research and uptake process through strengths, weaknesses, opportunities, and threats (SWOT) analysis

Perceptions	CBOs	Community leaders	NGOs	Public Extension	Training institutions	UNBRP	United Kingdom Research Base (UKRB)
Strengths							
Skilled personnel	✔[1]			✔		✔	✔
Many channels/entry points	✔				✔	✔	
Banana is important crop				✔		✔	
Information/technology is available			✔	✔			
Weaknesses							
Weak links/liaison		✔		✔	✔	✔	✔
Weak information flow/feedback		✔	✔	✔			
Poorly facilitated Public Extension	✔	✔	✔				
Political wrangles/corruption / institutional disputes	✔	✔					✔
Top-down/supply-driven approach by research			✔		✔		
Opportunities							
Demand from farmers for technologies	✔Some		✔	✔	✔		
Government of Uganda/ DFID policies encouraging			✔	✔		✔	
Threats							
Continuity/donor dependency		✔	✔	✔	✔		✔
Instability/civil unrest	✔	✔		✔		✔	
Environmental factors	✔		✔	✔			
Other obligations on farmers time/ low status of agriculture	✔						

1. ✔ = reported by stakeholders.

Table 8. Mixed stakeholders group recommendations for improving uptake (from Kakamega workshop)

Group 1

The intended and likely end-users of research outputs should be identified from the outset of the research. This is based on our conclusion that the elements can only be specified with respect to a particular category of end-user, e.g., what might be affordable to a small-scale commercial farmer might be completely unaffordable to a subsistence household. Categories of end-user for CPP research outputs might include: subsistence farm households with little or no non-farm sources of livelihood, subsistence farm households with significant non-farm livelihoods, semi-subsistence farm households with an increasing market orientation, commercial small-scale farmers, local processors of farm produce, purchasers of, or traders in farm produce. With more time, we could have brought in examples from a wider range of the stories that the stakeholder groups produced on Day 1.

Group 2

1. The problem should justify intervention
2. Technology development should be participatory, well-targetted, and meet users' expectations. Stakeholders should be included in the research and development process
3. Technology should be simple and compatible with the existing farming systems
4. Technology should be accessible to the targetted users
5. Technology should have an economic advantage. It should be affordable, cost-effective, have no serious side effects. Duration to realise benefits should be reasonable
6. Enabling environment should exist including market availability and accessibility, supportive policy and efficient/effective dissemination systems
7. The proposal should identify the killer constraint if possible at the time of development
8. Different financiers should recognise the interface/complementarity of pre- and post-harvest crop protection.

Group 3

1. Priority setting for CPP/DFID interventions should be based on the importance of the commodity, seriousness of the problem and government policy
2. CPP should support development of affordable and cost-effective technologies targetting resource-poor farmers
3. Criteria for selection of a technology for dissemination should be that the technology is: simple, environmentally friendly, and cost-effective
4. CPP policy should always strive to strengthen linkages, collaboration, and information flow between researchers working on the same issues. Multi-disciplinary approaches to development of technologies are preferred
5. Planning and implementation of research projects should include certain elements in addition to the basic research
   - Participatory development of the technologies to ensure acceptability to target farmers
   - Collaboration with private sector/other partners to ensure availability of technology
   - Collaboration with extension and any other technology disseminators
6. Funding for impact assessment should be an integral part of funding for research.

Group 4

1. The CPP should carry out a participatory needs assessment study of the recommendation domain with stakeholders

2. The CPP should carry out a participatory technology development with stakeholders to identify the key generic elements and their relative importance to the technology in question
   Partners/Stakeholders
   Farmers — End-users
   Extension workers — Mobilisation, sensitisation and transfer of technology
   Community leaders — Mobilisation and sensitisation
   Researchers — Develop the technology and transfer it
   Input suppliers — Availability of inputs
   Commodity dealers — Give information on market dynamics.

Group 5

1. CPP should involve all stakeholders in problem identification (value of commodity, seriousness of problem)
2. CPP should involve the stakeholders in technology development to ensure the technology is appropriate for the target group (simplicity, affordability, sustainability, availability, farmer expectation)
3. For every technology developed, CPP should have an appropriate strategy for its transfer to the target group (packaging, communication, end-user training)
4. For each technology transferred, CPP should have an in-built mechanism for monitoring and evaluation (time taken to benefits, adaptability, etc.).

Group 6

1. CPP/DFID should provide the policy framework for the success of the technology regarding technical matters to stakeholders. This should be facilitated by involvement of stakeholders in policy formulation
2. In the development of technology the end-user should incur minimum cost in its uptake
3. Target groups/categories of farmers should be identified at the onset of research so that the research is appropriate and can be adapted to their actual farming system
4. There needs to be effective farmer demand analysis before areas of work are decided and projects are started (pre-call)
5. Technology information needs to be targetted effectively with the creation of community interest early on in the process
6. There need to be *ex-post* evaluations of CPP activities.

Conclusions and implications

Study methodology

An inclusive stakeholder approach attempted to reconcile an independent appraisal with the need for ownership of the outcomes. The approach has strengths in that it encourages ownership as the process goes beyond the production of a report, and weaknesses — it is difficult to keep stakeholders involved with many commitments, and the limitations on stakeholders' time resulted in the process being less participatory than planned.

All stakeholders can build on the consultation process to maintain and develop links/partnerships with other stakeholders. CPP Management can contribute to an enabling environment that fosters links/partnerships building on existing initiatives, e.g., by contributing to a Renewable Natural Resources Research Coordinator for Eastern Africa.

Farmer context

The complexity of the farmers' context creates a particular challenge for stakeholders involved in banana research. In order to understand the farmers' situation, researchers and other stakeholders need to work very closely with farmers. The process should be long-term and interactive. The UNBRP BS Programme provides a good basis (All stakeholders involved in banana research, e.g., UNBRP, CPP PLs). Funding, monitoring, and evaluation of banana research need to reflect the complexity of the situation (CPP Management, other donors, and other sources of funding).

Farmer uptake

Variations between and within sites result in different research needs, expectations of uptake (returns to research), research approaches, and appropriateness of information/technology.

Target groups need to be identified and characterised (with sufficient consideration of DFID's focus on poverty) building on existing information from, e.g., baseline surveys at the Luwero and Masaka BSs (all stakeholders involved in banana research UNBRP, CPP PLs). Research planning, implementation and outputs should be oriented towards targetted farmers (CPP Management, other donors, and other sources of funding).

Sources of information/technology and farmer characterisation of sources

There are many sources of information with varying degrees of farmer preference and actual sources will vary from site to site — except for parents and neighbouring farmers.

There is a need to work with farmers to identify current sources and decide if they are appropriate according to agreed criteria. If appropriate, work with those stakeholders to develop interventions and scaling up strategies (UNBRP, CPP PLs, and other stakeholders).

There are many attributes by which farmers characterise and assess sources and, therefore, there is a need to work with farmers to identify preferred attributes and use these to guide partnerships with farmers and other stakeholders (UNBRP, CPP PLs, and other stakeholders).

Farmers' preferences for technology attributes need to be considered, together with attributes based on perceptions and interests of other stakeholders (e.g., environmental concerns, input, and post-harvest issues). This may require negotiating with farmers and other stakeholders an agreed set of attributes for technologies and other interventions (UNBRP, CPP PLs, and other stakeholders).

The uptake process — secondary stakeholders

Many stakeholders have an interest in research and uptake process. Perceptions of the role and place of stakeholders in the research and uptake process varies. Public research and extension, community leaders, and the private sector were seen by most stakeholders as having a role in the process, whereas this was not the perception of most stakeholders with respect to NGOs, CBOs, and training institutions.

It would appear a reasonable hypothesis that: D*iffering stakeholders perceptions of the uptake process are a major constraint to achieving uptake*. Through a participatory analysis the reasons for, and significance of differing perceptions may be better understood and applied to improving partnerships between stakeholders (CPP Management, UNBRP, other stakeholders).

Discussion

Q. Is the reported yield decline in bananas location-specific to Uganda?

A. Throughout East Africa we are seeing new forms of diseases and viruses, and a worsening of the nematode (and weevil) problem. Associated with this is the decline in quality of crop management such as application of manures and mulches that affect soil fertility and structure, and thus indirectly the incidence and severity of the biotic constraints.

Q. If bananas are declining in yield and area what do farmers grow instead?

A. Banana is being replaced by such crops as cassava, sweet potato, and maize. However, the demand for banana is still high, and although still a staple crop in some areas, it is now a significant cash crop providing for urban and (in areas of decline) rural markets.

Because farming in developing countries is frequently mixed we should be looking at sustainable whole farming systems and interactions between crops.

Q. Does all 'pure' research need to include adaptation of the new knowledge it generates?

A. We need to balance 'upstream' and 'downstream'. The shift of emphasis to poverty issues should not be exclusive. Basic research cannot be neglected, its outputs are needed for adaptive research to continue. The need for integration outweighs the supply-driven issues.

6. Factors affecting the uptake and adoption of rice research outputs in Ghana, West Africa

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Introduction

Rice demand is growing faster in West Africa than anywhere else in the world, at around 6% per annum and annual rice imports to the region are now around 4 million tonnes , valued at US$1 billion. Around 20 million West Africans are rice farmers, most are women, and upland rice with low yields comprises around 40% of production. Clearly, there is a great need to support sustainable rice production in West Africa, particularly away from the coastal urban centres where imported rice is strongly competitive, and often actively promoted. Pests represent a major constraint to production in the region and pest management is currently addressed through a number of Department for International Development (DFID)-funded research programmes. The issue of uptake and adoption of these research outputs is extremely crucial in a region where state-funded research programmes have been extensively cut back over recent years. Imaginative solutions are required, and in many cases have been developed, to ensure research entails much closer interaction with farmers than used to be the case. There is real scope for the CPP to take these solutions on board in developing an integrated support strategy for rice development in the region.

Methodology

This project had two inter-linked components: a review of regional dissemination systems and their needs for pest management-related research outputs developed in collaboration with the West African Rice Development Association (WARDA), and a specific study of rice dissemination and uptake mechanisms and needs in Ghana, the priority country for DFID natural resources development assistance in West Africa.

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DFID Crop Protection Programme Project R7561 (ZA0367).

HOLDERNESS, M., SAKYI-DAWSON, O.A., SIMPSON, B., JONES, M., SERE, Y., KASSAM, A. and GUEI, R. (2000) Factors affecting the uptake and adoption of rice research outputs in Ghana, West Africa. pp. 65–73, In: *Sustaining change: proceedings of a workshop on the factors affecting uptake and adoption of Department for International Development* (DFID) *Crop Protection Programme* (CPP) *research outputs*. Hainsworth, S.D. and Eden-Green, S.J. (Eds.). Imperial College at Wye, Kent, UK. 21–23 June. 2000. Natural Resources International Limited, Chatham Maritime, Kent, UK.

Through an initial workshop involving the UK principal investigators of current and recent rice crop protection projects in West Africa, the study first reviewed the nature of anticipated outputs documented in recent project memoranda, and examined the uptake systems so identified. It was clear from this initial inquiry that the majority of recent strategic studies have been concerned with the use of pest characterisation tools, including molecular biological methods, to determine pathogenicity to rice and alternative hosts, and to determine sub-specific groupings relating to pathogenicity indices against a range of defined cultivars. These strategic projects all had their delivery end-points in incorporation of knowledge into rice breeding programmes in West Africa, of which that at WARDA is by far the largest. These programmes in turn feed into national breeding and selection programmes, and the local varietal release and dissemination systems clearly interact with the uptake and adoption of new varieties. Other DFID-funded projects, most notably in weed management, have been targetted more towards adaptive research to optimise weed management strategies for particular rice ecosystems in specific countries. These programmes have their end-points with WARDA regional networks and the national agricultural research and extension services (NARES), in delivering technologies that can be readily adopted in local research and extension programmes.

WARDA *component – methodology*

As the primary agency for introduction of new rice-based technologies in the region, WARDA has a clear regional mandate and mission, operating both as a research centre and as a research catalyst with the NARES of the region. Its unique status within the Consultative Group on International Agricultural Research (CGIAR) entails specific responsibility to its member countries and its policy of operating as an 'open door' research institute confers ready access for both strategic research outputs from UK researchers (in some cases through direct involvement via secondment to WARDA) and adaptive research by NARES scientists.

The study framework was developed with WARDA to cover all the areas relevant to WARDA's role in research output dissemination, including its collaborative structures. The pertinent crop protection linked research mechanisms within WARDA were reviewed through visits to WARDA; a week-long discussion visit with senior scientific staff, and subsequent attendance at the WARDA Regional Rice Research Review. These allowed the thorough discussion of key pathways and constraints involved in the uptake and adoption of WARDA's research outputs.

The review of WARDA-linked crop protection related activities established that different sources of DFID funding between them supported a very significant component of such research. These include core funding to the CGIAR, bilateral funding of specific programmes such as the International Network for the Genetic Evaluation of Rice (INGER) Africa programme and a range of specific component technologies supported through CPP, other research programmes of DFID, and DFID's Competitive Research Facility. Research included work on the management of weeds, nematodes, insects, and fungal and viral diseases.

The Regional Rice Research Review provided an excellent opportunity to interact with scientists from across the WARDA region to gauge their feelings about the efficacy of the different dissemination systems in the region. A questionnaire was specifically developed to obtain feedback from the participating NARS as to their evaluation of the WARDA Task Forces (TF), a key dissemination system that allows regional prioritisation of research programmes. Much pertinent information already exists in the form of TF documents and other review studies and these have been extracted, where appropriate, to address the specific issues. A study tour undertaken by Dr B. Simpson of WARDA as a component of this Project addressed opportunities for further technology development and transfer through farmer participatory research and for farmers' needs to more directly drive the research agenda. This specifically explored the prospects and opportunities for linkages between WARDA's research and integrated pest management (IPM) farmers field school (FFS) programmes in Ghana and Mali, with consideration also of FFSs in Côte d'Ivoire and Burkina Faso. Issues such as the long-term impact of the programmes after their termination in particular villages were addressed, as were the mechanisms for the uptake of research outputs and WARDA technologies, and the mechanisms by which knowledge gaps and needs identified through such participatory processes could be fed back into the formal research system.

Findings

The principal advantage of a regional rice research programme lies in resourcing the production and release of improved varieties and this has been a key feature of WARDA, notably with the production of O*ryza sativa* × O. *glaberrima* interspecific hybrids. These are particularly significant in the context of DFID's goals, as they combine the rapid early growth and weed competitiveness of the *glaberrima* types, suited to low-input production, with the flavour, yield, and harvest qualities of *sativa*.

It was clear that plant breeding for pest resistance was a key output focus of many DFID-funded projects, directly within WARDA, across the region through INGER-Africa and through the country-specific participatory variety selection processes developed in part through DFID funding. Many CPP projects are directed towards improved germplasm yet, with a few notable exceptions, there is a dearth of plant breeders in the NARS of the region. Efforts therefore need to be directed towards ensuring the value for, and uptake of, new and improved varieties by farmers in the region. One key issue identified has been that formal varietal release procedures, while ensuring the safe and assured release of varieties in each country, can delay the release of beneficial new varieties, often through themselves being inadequately resourced to function effectively. A mechanism actively pioneered in West Africa, through WARDA, to shorten the evaluation process required, is that of participatory variety selection (PVS). PVS involves subsistence farmers directly in the technology development process and facilitates rapid selection of varietal characteristics that directly suit the needs of resource-poor

farmers. Here, in the first year farmers are invited to evaluate varieties from a wide range in a rice 'garden' of many varieties. These are evaluated at several stages in the crop production cycle, a process that captures important parameters, such as flavour or weed suppressiveness, that would be lost in a single evaluation. In the second year, farmers are given seed of their favourite varieties to evaluate for themselves on their own farms, and in the third year, farmers are given the opportunity to purchase additional seed of those varieties they desired most.

Impact through uptake of new varieties has been spectacular in some cases, for example, 1300 Guinean farmers were involved in the programme within two seasons. The PVS system offers considerable flexibility and establishes key parameters for breeding and selection that inform breeding programmes and enhance uptake of new varieties by farmers. Nonetheless, it is also recognised that PVS is not a substitute for formal variety release and that attention is also required to other needs of formal evaluation systems, particularly in ensuring varietal purity through dissemination and in ensuring that varieties are rigorously evaluated against key pests before being generally promoted.

At the national level, a key mechanism in the movement of genetic material within the region, directly involving the NARES, is the INGER-Africa programme. This scheme, of which the WARDA activities are core-funded by DFID, enables NARES to obtain sets of varieties from WARDA, pre-selected for relevant characters such as blast or pest resistance, or drought tolerance, for evaluation under the conditions prevailing in different countries and ecosystems. The INGER scheme has been very successful, but it is also clear that the capacity of countries to take up and evaluate germplasm on offer is constrained by resources available to the NARES and the costs of establishing such trials, whether for observational trials or the multilocational trials required to evaluate varieties for full release. Thus, attention needs to be paid to complementary support for the NARES as well as to the core dissemination system if the programme is to achieve its full potential impact. DFID regional aid has met some of these needs, but the CPP should also consider supporting this area to optimise uptake and adoption.

Seed production and distribution form another bottleneck in the dissemination of new varieties and are being addressed through WARDA's support in the development of community-based seed production programmes, through which farmers multiply seed for themselves and their neighbours. This system again aims to shorten the time required for research outputs to reach farmers. In addition to ensuring varietal purity in such systems, there is clearly also an important research link with seed pathology, to ensure that seed remains as free as possible from seedborne pathogens.

In terms of the development of other pest management components, the major avenue for research programme dissemination between WARDA and the West African NARS is the Task Force (TF) system. This is a highly participatory system, supported by the United States Agency for International Development (USAID), through which the NARS members agree upon regional research priorities and submit competitive research proposals for funding. These research projects are then undertaken either across individual countries or groups of countries, to

evaluate particular technologies. The TF system is strongly appreciated by the NARS and WARDA and establishes considerable empowerment of NARS scientists, but faces a number of constraints; funding is very limited for each project ($55,000 available for the integrated pest management task force (IPMTF) in 2000–2001, with 52 project requests), priorities are regionally agreed by committee and may not represent the national priorities of individual countries or the views of other agencies in a specific country. The TF system has also been brought under increasing pressure by the logistics of operating a large number of themed TFs through limited resource personnel in each country and by the merger in 2000 with the Conférence des responsables de la recherche agronomique africains (CORAF) rice network, which has increased the number of countries involved without a concomitant increase in funding. Regional pest-monitoring tours, that provided a useful measure of changes in pest status and assisted regional integration and capacity-building, have also been suspended due to funding restrictions. In summary, the TF system is therefore also a potentially significant mechanism by which, through appropriate support, CPP could increase the regional impact of funded research.

The other area where participatory techniques have come to recent prominence is in the IPM FFS, that have operated in Ghana, Mali, Côte d'Ivoire, and Burkina Faso. The FFS are based on principles of farmer participatory research and discovery-based learning processes that directly involve farmers in determining priorities and evaluating intervention technologies under their own conditions. The FFS groups have considerable potential as participatory research groups, that are able to take up pest management technologies and evaluate them under farmers' own conditions and alongside indigenous technologies. Even where FFS programmes have finished, there is considerable scope for using the mobilised farmers to investigate potential interventions through farmer-participatory research.

A key issue identified throughout has been that extensive research has been supported by DFID and others through all the above mechanisms, yet there is no regularised system for capturing the knowledge produced and retaining it in a form that can be utilised by future research and extension operations. Even reports from previous DFID-funded projects can be hard to obtain. There is a need to address this issue within the CPP, through development of appropriate dissemination systems to ensure that useful knowledge is retained in a form accessible to the non-specialist, particularly across disciplines.

Ghana element – methodologies

In Ghana, there are specific issues that create blockages to the uptake and adoption of crop protection technologies and that must be addressed if uptake and adoption are to succeed. This study reviewed existing pest management technologies from the perspectives of the NARES, non-governmental organisations (NGOs), and farmers, and analysed dysfunctions between research outputs and farmer demands in both directions. The system used thus identified blockages to the uptake of research outputs at all levels in the researcher–farmer–researcher continuum.

The process comprised an initial scoping study involving all the research institutions working on rice pest management, then a farmer study in three regions of Ghana (Sahel, forest zone, and irrigated). At farmer level, this entailed description of the sources of crop protection information available to, and used by farmers of different status and gender, through methods for rapid assessment of agricultural knowledge. The blockages to adoption of specific pest management strategies were then assessed through a process (based on the theory of reasoned action) that examined and quantified the prevailing beliefs, pressures, and constraints affecting farmers' decisions in regard to these measures and sought to identify the key beliefs and factors that would need to be addressed to strengthen extension and adoption processes across different rice ecologies and social strata. The process entailed detailed interviews with 240 farmers and 60 researchers within the chosen geographic areas. Analysis of this quantitative data was used to determine the key factors influencing and determining farmers' actions and relative significance of blockages to adoption.

Findings

Some key issues that have emerged from the Ghana study include the fact that with the exception of the high-potential areas, rice production in Ghana is in decline while market demand increases. This clearly causes concern in terms of the rural economy and creates a requirement for attention to upland and more marginal lowland areas if DFID's goals of assisting the poorest rural sectors are to be met. A fundamental research constraint is the lack of finance presently available to research institutions. This immediately constrains off-station work, and so directly reduces contact with farmers.

The stakeholder workshop held in Ghana reviewed the study outcomes and involved 42 stakeholders, including representatives from farmers' groups and all the major research and extension organisations working on rice in the country. This workshop was welcomed by the participants as being the first of its kind in Ghana to bring together all key stakeholders in rice production. After technical presentations, working groups from each sector constructed causal diagrams to determine cause and effect relationships between the various constraints to production. These highlighted knowledge, credit, labour, and agrochemicals as the key deficiencies, with main constraining effects being seen as low prices and weeds, other pests being perceived as far less important. The groups listed known available technologies and it became clear that these were somewhat sparse, with, for example, very limited knowledge about varieties available elsewhere. Strategies for improving the situation were discussed subsequently and it became clear that communication issues constrain the outputs of institutional research from reaching the farmers. Research reports are passed to Ministry of Food and Agriculture (MoFA), but do not necessarily reach extension officers and may not be prepared in a form appropriate to do so. In the other direction, extension agencies are involved in adaptive research, but receive little feedback as to research outcomes and have few funds to promote their own measures. Until recently,

relatively little attention has been paid to the incorporation of dissemination and uptake in research programmes. This clearly requires some fundamental shifts within the system. There obviously needs to be greater emphasis on direct farmer involvement in research, rather than on-farm validation research if communication barriers are to be overcome and research is to have impact at farm level.

One significant constraint to rice research in Ghana is that agricultural research priorities are agreed through regional Research–Extension Linkage Committees (RELC). This is a highly democratised and comprehensive process, that allows regional priorities to be addressed through research. However, rice is at an inherent disadvantage compared with such dominant crops as cassava and maize; not only are upland rice farmers more scattered, but rice is often a secondary crop within their systems, a problem exacerbated by rice production needs being further differentiated by production ecology. As a result, rice will not be prioritised within this system, even though it is of great national significance. The RELC system is strong on identifying needs in other crops, but even here apparently lacks a mechanism for the dissemination of research outputs back down the chain. This is a real gap that could be usefully addressed by specific DFID support to rice, through a system separate from, but with parallels to the RELCs, that also incorporates an active dissemination mechanism. One possible avenue is to build on the dynamism created by this project workshop to establish a multi-stakeholder network, specifically to promote rice in Ghana.

Conclusions and implications

WARDA has expressed a strong desire that the CPP should incorporate this uptake study as part of a wider and high-profile development of rice IPM research in West Africa and as a contribution to the development of an integrated strategy for ensuring impact. At present, activities have little clear integration whereby DFID can clearly focus financial and institutional support on key components to best ensure research impact. There are a number of areas in which additional DFID support could play a valuable role in increasing research impact, including:

Regional

Support to the WARDA Task Forces and extension of these beyond the NARES

- Additional support to varietal evaluation (formal and non-formal) and seed dissemination systems
- Support to appropriate project knowledge capture and dissemination systems from DFID-funded (and other) work
- Farmer-participatory research that integrates resistant, weed-competitive varieties with adoption of other cultural practices to meet the different needs of the key rice production ecologies, focussing on each of these as separate considerations.

Ghana

- Support to a research–extension–farmer network specific to rice
- Support to farmer-participatory research processes in all projects
- Specific attention to areas of varietal introduction and dissemination and seed delivery systems
- Need for a production system-based integration of DFID-funded activities to optimise impact
- Support direct linkages between participatory research/experience-based learning in IPM extension activities and backstopping research on specific interventions.

Discussion

Q. Is it worth producing more rice if the price is low?

A. Prices are low in rural areas, but are higher near urban areas. Past studies have shown that locally produced rice can be very competitive with imports, particularly away from the coastal cities, provided production and milling quality are maintained. Imports to West Africa at present create a tremendous drain on foreign exchange.

Q. Why is the private sector not involved as 'clients' of research?

A. They are at the post-harvest (milling) stage, but during production the private sector is not as involved in the provision of advisory inputs in Ghana as they are, for example, in Asia. Agrochemical companies are a resource as a source of information, but in Ghana advice from the Government and NGO extension services is more trusted by the farmers.

Q. Do people have time to be involved in Task Forces?

A. The system is chaired by the NARS, WARDA acts only as a catalyst, but the system needs to be driven to be effective. The availability of staff from the NARS to attend Task Force meetings has been a constraint to their operation, reflecting the lack of resource personnel involved in rice research in the region and the need for capacity building in this regard. However, this does not reflect a lack of interest in or commitment to the Task Force process.

Q. Is AIDS having an influence on production?

A. Maybe on oil palm production, but not directly on rice, except that sources indicate that labour cost and availability is not presently being planned ahead to take account of possible effects of AIDS.

Q. Is there any potential in DFID supporting the CGIAR centres to work together with CPP and local institutions against a common theme?

A. Yes, there is both considerable potential and demand, and DFID's priorities in

addressing poverty issues would be compatible with work on rice IPM as addressing major production constraints for resource-poor smallholders and addressing a major staple food. There is much interest in such an initiative from the NARES, WARDA, and UK centres. However, it is also important for success that this process is driven and prioritised by the needs and demands of local and national stakeholders rather than international or external organisations.

Q. Could this be integrated with bilateral development schemes?

A. It depends on DFID's (or other donors) priorities in Ghana or the region and the expression of national priorities for sustainable rural development, e.g., in the promotion and development of rice to help reduce Ghana's import bills.

7. Factors affecting the uptake and adoption of outputs of research in rice systems in India

A. Cork and J.L. White

Introduction

Rice is the staple food crop for most of the world's poor. In India, rice production is the dominant component in the agricultural sector and it is grown over two seasons on 42 million ha. The national Government has invested enormous resources in the research, development, and dissemination of technologies concerned with improving rice production.

Agricultural practices in rice production are changing in India, driven by the rapid pace of economic development. Rice cultivation is labour-intensive, particularly at certain periods in the production cycle, such as transplanting and harvesting. However, with a booming economy and increasing urbanisation there is considerable demand for unskilled labourers in construction and other industries where they receive better and more regular employment than in rice-based agriculture. This has resulted in an overall shortage of labour in rice-producing areas that adversely affects both marginal and larger-scale farmers. The shortage of labour has intensified the urgency for strategic inputs, including improved pest-management strategies, that would enable poor rice farmers to sustain their livelihoods.

Crop Protection Programme (CPP) role

Despite considerable progress in the development of rice varieties resistant to pests and diseases, that have provided improvements in rice production, new strategies for crop pest management are constantly required. Over the past four years the CPP, in collaboration with national and international partners and farmers has been developing and promoting safe, sustainable, and environmentally benign pest-management strategies for major rice pests in India. This is work aimed to decrease losses, stabilise yields, reduce inputs, increase profits for small-scale producers, decrease prices for consumers, and provide a safer working environment for labourers. The CPP Management has expressed concern that new knowledge created through research projects funded by the programme is not achieving the impact originally envisaged.

Natural Resources Institute, Central Avenue, Chatham Maritime, Kent ME4 4TB, UK.

DFID Crop Protection Programme Project R7576 (ZA0379).

CORK, A. and WHITE, J.L. (2000) Factors affecting the uptake and adoption of outputs of research rice systems in India. pp. 75–80, In: *Sustaining change: proceedings of a workshop on the factors affecting uptake and adoption of Department for International Development* (DFID) *Crop Protection Programme* (CPP) *research outputs*. Hainsworth, S.D. and Eden-Green, S.J. (Eds.). Imperial College at Wye, Kent, UK. 21–23 June. 2000. Natural Resources International Limited, Chatham Maritime, Kent, UK.

During the next phase of its current programme, the CPP aims to validate and promote pest management strategies through participatory procedures and strengthen uptake pathways to intermediate target institutions and beneficiaries. This study was commissioned with the aim of informing that process.

Methodology

In order to explore the key factors and potential constraints to the uptake of specific rice research projects the researchers involved in the study decided to investigate the experiences and perceptions of a wide range of stakeholders, including those who had participated in CPP research projects. The key stakeholders and their principal characteristics are:

- Farmers
  - Rice production critical to livelihoods
  - Facing increasing constraints to rice production
- National Government
  - Sustained investments in rice production
  - Focus on increasing the productivity of irrigated rice farming
- Commercial sector
  - Good access to farmer and achieve high level of impact
  - Focus on agro-chemicals
- Non-governmental organisations (NGOs)
  - Small, but growing role in rice production
  - Act as 'intermediaries' — often have good access to farmers, though technical competence may be limited
- Donor agencies
  - Inject critical resources into the rice production sector
  - Have their own agenda, e.g., the Department for International Development's (DFID) poverty elimination and livelihoods focus.

The views of project leaders, project staff, representatives from different sectors involved in the research and promotion of rice technologies (government, commercial, and NGO), and the ultimate end-users — farmers were all sought, using a range of methods. These included:

- Exploration of the research process, including relationships and communication
- Learning from experiences and perceptions of different stakeholders
- Analysing the role of CPP in the research–to–adoption continuum.

Three research projects (all of which had completed research activities for at least six months) were analysed in-depth to provide case study examples of the CPP research process and possible factors affecting uptake. CPP project leaders, in-country collaborators (both government and non-governmental organisations) and farmers were interviewed.

The process by which the DFID bilaterally funded East India Rainfed Farming Project prioritised need and sought appropriate and sustainable means to improve the livelihoods of resource-poor, agriculturally based communities was studied.

A two-day workshop was held in Hyderabad where representatives of Indian and Bangladeshi government research and extension bodies, Indian university departments, local NGOs, and the national and international commercial sectors shared their views on the key factors affecting the uptake and adoption of new technologies in rice production,

A farmer survey was commissioned with the aim of exploring farmer awareness and uptake of new technologies relevant to rice farming. Four local NGOs working in Andhra Pradesh conducted the survey and provided an analysis of the results.

By pursuing these complementary methodological approaches, the study aimed to develop a rounded picture of the overall factors influencing uptake, validated by a number of different sources.

Findings

The findings of this study confirmed existing knowledge that the most common factors influencing uptake are:

- Whether a demand for outputs exists
- The nature of outputs (their relevance and appropriateness in relation to intermediate and end-users).

The mutual understanding amongst stakeholders of their respective roles in terms of project activities and promoting uptake, the nature of collaborative relationships, and the systems (or lack of systems) put in place for the commercial and other forms of uptake of outputs were identified as further factors influencing uptake.

The CPP projects reviewed revealed that the programme can play an instrumental role in promoting uptake by strengthening particular areas of the research–adoption continuum. CPP projects can play a 'catalytic' role in initiating new approaches to work, including developing and improving links between collaborating institutions and intermediary end-users.

The three projects reviewed were successful in achieving uptake in terms of promoting the exchange of diagnostic tools and participatory research methodologies between specialists. The transfer of knowledge between scientific institutions was particularly strong. However, the uptake of outputs by farmers and their promotion by commercial companies were areas that posed particular challenges.

By analysing the process of technology development, this study identified ways in which research projects such as those funded by the CPP can work more effectively to ensure that demand for outputs is confirmed, and that the appropriateness and relevance of planned outputs are analysed from the planning stages. As different types of research product serve different purposes, a clearer understanding of farmer and intermediary perspectives at an early stage could help ensure that the products developed by the research process are appropriate to the local resource base and

meet the needs defined by end-users. This increases the likelihood of new technologies competing more effectively with farmers' existing approaches, and thus enhances the potential for uptake. In most of the projects reviewed as part of this study, the collaborator was defined as an individual working in a scientific department within an institution. Furthermore, all of the local project staff interviewed described how they had very limited involvement in the planning of the project; they initiated the activities as defined by the UK-based project leader (PL) uncritically. This indicates that there is considerable scope for the development of a more participatory planning process involving staff from a range of disciplines from both UK and Indian institutions.

Conclusions and implications

Potential for improving the CPP research process to enhance uptake

Pre-project review missions are seen as a positive development by both past and present CPP PLs. They enable PLs and potential collaborators to clarify mutual expectations, confirm responsibilities, define the range of personnel who need to be involved, and develop joint project activities. This process can speed up work on the ground when the project is in progress.

In order to ensure that projects achieve the best possible outcomes there is a need for much closer scrutiny during the project cycle. This scrutiny needs to be both proactive and constructive by advising on logistics, promotion opportunities, or un-foreseen staffing issues. The current quarterly reporting system does not give adequate consideration to these topics, although they can have a significant impact on the delivery of the research outputs.

The CPP contract gives intellectual property rights (IPR) to the contractor, and expects these to be developed as necessary. The only proviso being the ultimate right of DFID to a royalty-free licence. Nevertheless, since the CPP identified the need for the outputs developed, has funded research to solve the problem, and has a stake in the uptake and adoption of the technology, it should be more proactive in development and exploitation of the outputs.

New collaborations

There is scope for new collaborations in the research process to improve uptake.

Collaboration with the commercial sector

The issue of commercial uptake needs closer examination, and more work could be initiated in this area. This may involve undertaking new collaborative relationships.

In the same way that there is a case for bringing end-users into the research process at an early stage, so there may be a case for engaging in dialogue with commercial companies at an appropriate stage of product development, as the commercial potential of outputs becomes clear. This dialogue would be useful for assessing market potential and, if the partnership proved successful, would

result in a wide distribution of outputs to end-users. This remains a difficult area for the CPP due to the ethics of engaging with the commercial sector, but for some products the development of relationships in this sector may provide the 'missing link' to uptake.

Future involvement of the CPP to promote uptake could take the form of licensing agreements and provision of technical assistance to help develop suitable products for commercialisation, such as diagnostic kits. Alternatively, agreements could be made with project partners and potential commercial partners to share ownership and the cost of development. Profits from commercial exploitation of research products could either be dispersed as profits to Natural Resources International Limited (NRIL) or fed back to research institutions involved in the project. Many universities now give a proportion of profits from patents and licensing agreements to researchers to encourage them to undertake adaptive research. However, it should be noted that this is an area not particularly favoured by researchers since it is often difficult to obtain peer recognition from such work and thus it has a negative impact on career advancement. DFID have already taken the first step in this process by awarding an annual prize for the best popular account of a research project.

The interface with farmers to achieve adoption needs closer examination. The fact that farmers receive most of their information on pest management from other farmers or pesticide dealers means that suitable approaches need to be developed for influencing farmer networks.

The fact that the CPP is willing to fund initiatives outside of formal calls provides considerable potential for more creative exploration of demand-led approaches, the development of new partnerships, and a better chance of uptake. For example, if development projects working with rice farmers have identified a particular pest problem that requires further work, then this demand could be channelled into CPP-funded research projects. The approach taken by the DFID-funded East India Rainfed Farming Project to identify demand may be a good case in point.

Collaboration with the NGO *sector*

A particularly valuable dimension that is offered by collaboration with NGOs is their knowledge of the specific location in which they work, and the long-standing relationships they often have with local farmers and communities. This means that they have a good understanding of farmer perceptions and priorities. The 'bottom-up' approach often pursued by NGOs means that farmer demand for inputs is verified at the outset of a project, and outputs are designed to specifically cater for farmers' needs. NGOs can therefore play an important role as intermediaries for the research and uptake of new technology and other innovations. This collaboration has more potential for success if planned research outputs are understood by the NGO in question to be appropriate to the local context, and the NGO philosophy and working practices are generally compatible with those of other project collaborators.

General points

Integrated pest management (IPM) provides an interesting case for exploring a range of issues related to uptake. The CPP has committed considerable funds to the development of component technologies of IPM for rice in India. However, while the IPM approach is widely regarded as the way forward for pest management in rice, and has been successful in India for the protection of certain cash crops, such as cotton, it is not clear that the same level of uptake will be achieved amongst rice farmers. Experiences of introducing IPM in rice in India need to be analysed more thoroughly so that IPM strategies can be adapted to meet the needs and capacity of end-users more effectively. It may be that for the IPM approach to be successful some new working relationships need to be established. An independent review of existing attempts to introduce this approach would be timely, and could be supported by the CPP.

Given the success of the commercial sector in promoting agrochemical technologies for the control of pests and diseases in rice in India, the same network should be exploited to promote IPM. However, this requires both commercial companies and pesticide dealers to adopt and promote IPM technologies. Such a change will not happen unless appropriate legislation is enforced, and companies and individual dealers feel able to achieve a good financial return for their investment. In a free market economy where resource-poor farmers are presented with a plethora of products, but do not have the capacity to make informed choices, the forging of new alliances between government and the private sector may be the only way to achieve significant impact of IPM in rice.

While some of the socio-economic factors likely to influence uptake, such as resource constraints, farmer education and literacy, communication networks, etc., may already be well understood, the links between gender and uptake have yet to be researched in significant detail.

Discussion

Q. Why is such a negative view expressed on the potential for IPM in rice in India?

A. IPM needs timely inputs and is labour-dependent, thus posing some constraints on adoption. Also, as our research has shown, farmers are highly dependent on pesticide dealers, and unless these stakeholders are promoting IPM approaches, they stand little chance of uptake.

Q. What is preventing local companies from commercialising IPM products?

A. There is a lack of cost-competitive, locally produced pheromones, in part because of uncertainty over government registration requirements. Egg parasitoid releases need to be timely, but the infrastructure to enable farmers to do this is not currently available. Resistant varieties are available, but farmers are not aware of them or their potential.

8. Analysis of farmers' decision-making in pest management

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Introduction

The Department for International Development (DFID) Crop Protection Programme (CPP) development study on 'Analysis of farmers' decision-making in pest management' was undertaken from November 1999 to April 2000. It was carried out by a multi-disciplinary and multi-institutional team from: the Farmer Participatory Training and Research Programme in CABI Bioscience; the Social Sciences Department of the Natural Resources Institute (NRI), University of Greenwich; and the Agricultural Extension and Rural Development Department (AERDD) of the University of Reading. Overseas collaborators from organisations in India, Uganda, and Kenya played an essential role in executing and informing the study.

The project was designed collaboratively with the aim of informing pest management research and dissemination strategy, through an analysis of farmer pest management decision-making processes and associated farmer-technology interfaces in a number of priority cropping systems and geographical areas where CPP is currently active. The study objectives were to:

- Synthesise current knowledge on farmer decision-making processes
- Develop and test methodologies for exploring pest management decision-making
- Provide recommendations for research managers and policy makers to improve integrated pest management (IPM) research and implementation

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DFID Crop Protection Programme Project R7500 (ZAO352).

LITTLE, A., ROBINSON, E., WILLIAMSON, S., LAMBOLL, R., MEIR, C., ACOLA, G., ALI, A., BAGIRWA, G., BOCKETT, G., KIMANI, M., MIRO, R., OTIENO ORUKO, L., SEKAMATTE, B., SERUBOMBWE, W. and SSEMWANGA, J. (2000) Analysis of farmers' decision-making in pest management. pp. 81-90, In: *Sustaining change: proceedings of a workshop on the factors affecting uptake and adoption of Department for International Development* (DFID) *Crop Protection Programme* (CPP) *research outputs*. Hainsworth, S.D. and Eden-Green, S.J. (Eds.). Imperial College at Wye, Wye College, Kent, UK. 21–23 June. 2000. Natural Resources International Limited, Chatham Maritime, Kent, UK.

- Disseminate user-friendly summaries of findings and recommendations.

This project focussed on the farmer rather than the uptake process, the main hypothesis was that a better understanding of farmer decision-making processes will improve:

- The farmer–research interface
- Understanding of how different farmer training models impact on farmer decision-making

And hence improve the uptake of pest-management technologies, and so improve poor farmers' livelihoods.

The project comprised two distinct components:

1. A team led by CABI addressed high-input cropping systems — cotton in India and vegetables in Kenya
2. A team led by NRI addressed low-input cropping systems — banana, cassava, and maize in Uganda.

Overall coordination and methodological guidance was provided by AERDD. The studies were designed to concentrate on process aspects of farmer decision-making and deliberately collected qualitative, rather than quantitative data.

Methodology

The CABI team undertook a review of published and grey literature on farmer decision-making with specific reference to pest management, and to the methods and potential of integrated pest management (IPM) training interventions to improve farmer decision-making. The team selected participatory farm management decisions tools, including causal diagrams and participatory budgets as potentially useful methods for exploring farmer decision-making in pest management with farmer groups. They used the experience of the team's consultant on farmer training assessment to develop tailor-made, open-ended interview guidelines for eliciting information on pest management perceptions and decision processes with individual farmers. Fieldwork was carried out, in collaboration with project staff and social science expertise, on cotton in India in December 1999, and on vegetables in Kenya in February 2000. At each location the teams worked with groups of trained and untrained farmers. The study used a combination of participatory tools: causal diagrams, participatory budgeting, and semi-structured interviews.

In India, the team visited former projects in two locations: Maharashtra and Tamil Nadu. The project in Maharashtra was managed by the Central Institute for Cotton Research (CICR) and NRI (R6760). As part of an insecticide resistance management (IRM) approach, economic thresholds for bollworm (*Helicoverpa armigera*) had been developed, and the use of particular pesticides had been

recommended at pre-determined levels of bollworm eggs and larvae. Farmers were trained to recognise pests, in particular the different stages of bollworm, and in scouting techniques. In Tamil Nadu, farmers had been trained in a farmer field school (FFS) IPM project in Tamil Nadu run by the NGO Voice Trust, and supported by the NGO Agriculture Man Ecology (AME). AME is an umbrella organisation, funded by a bilateral agreement between the Dutch and Indian Governments, that provides technical support to NGO networks. The training focussed on increasing farmers' knowledge and understanding of the agro-ecosystem, particularly with respect to pest management, with a view to strengthening decision-making to enable better crop management. IPM options included the release of *Trichogramma*, developing intercropping systems, and the use of botanical pesticides such as neem. In Kenya, vegetable farmers had also participated in a collaborative FFS project, involving the Coffee Research Foundation (CRF) and Ministry of Agriculture, Livestock Development and Marketing (MOALDM), Extension Division, Kenya Institute of Organic Farming (KIOF), an organic farming NGO, and CABI Africa Regional Centre. Training focussed on the use of alternatives to pesticides, particularly botanical extracts, and physical and cultural methods for management of pests.

The NRI team undertook a complementary literature review that addressed the different conceptual models that have been developed to explain or analyse decision-making processes. The review also informed the NRI team about different methodological approaches that could be employed for data collection. The NRI team carried out exploratory fieldwork with local research and extension collaborators in Uganda in November 1999. This exploratory fieldwork, using individual participatory farmer interviews, highlighted the impact of using different starting points — the pest, the crop, or the technology — for exploring crop management issues. The NRI team returned in March 2000 to carry out further fieldwork in more depth. The fieldwork focus was on dynamic decision-making 'processes' rather than the decision 'event'. The fieldwork relied on a collaborative approach in which the objective was to understand 'what farmers do' That is, a positive rather than normative approach was taken. A 'soft systems' approach was used to analyse the fieldwork. Soft systems rely on 'constructs … and are brought forward by an observer who has a unique experiential or cognitive history' (Ison *et al.*, 1997). Therefore, the individuals responsible for the analysis matter, and so it was essential for those involved at the farmer interface to undertake both the research and the analysis. The team that undertook the fieldwork was joined by non-government and private sector practitioners to analyse the raw data from the fieldwork during a brainstorming analysis workshop. A presentation was also made to the workshop held by the CPP Banana and Maize Research Uptake and Adoption studies (R7488 and R7489), in which Reading University also participated. The NRI study did not attempt to come up with a predictive tool (as might an econometric analysis of decision-making or uptake), since the purpose of the research was to improve the research–farmer interface through a better understanding of decision-making processes.

Findings

High-input systems in India and Kenya (CABI-led component)

In India, cotton pest management in Maharashtra is heavily reliant on pesticide application against bollworm. Pest-management decisions are largely a matter of deciding whether or not to apply which pesticide, and when. Decision-making in pest management is more complex in Tamil Nadu, because there are several key pests and more mixed cropping systems. FFS-trained cotton farmers used several tools to make decisions on timing of control and choice of method, including trap monitoring (using pheromone and light traps) and field assessment of pests and natural enemies. Cotton intercropping systems are also exploited as a pest and natural enemy manipulation method.

Kenyan vegetable farmers use a mixture of cultural and chemical control methods, but rely on preventative and curative applications of fungicides to manage blight in tomato. Farmers trained in FFS employ a greater range of non-chemical methods and rely more on their own and group experience rather than on extension advice.

Among untrained farmers at all three locations, perceptions that fast-killing (powerful) products were most effective, conviction that pesticides are necessary to produce a profitable crop, and the desire to keep fields 'clean' are important. Financial constraints prevent some farmers from buying sufficient pesticides or applying them at optimum timing. Untrained cotton farmers rely heavily on pesticide dealers, who recommend a particular chemical, based on farmers' description of the symptoms.

Most FFS-trained farmers appear to be more confident in their pest-management capability, especially those in Kenya, who seem to rely more on their own knowledge or on their group to solve problems than before they were trained. Farmers trained in IRM are no longer so reliant on pesticide dealers for advice, but this seems to some extent to have been substituted by reliance on project staff for advice. Decision-making for all cotton farmers is strongly influenced by local supply providers in both choice of product and timing of applications. All trained farmers claimed that they had reduced expenditure on pesticides substantially. IRM-trained farmers said that their yields had also increased significantly and, combined with the savings on pesticides, their incomes were improved. This was the major factor in the decision of IRM-trained farmers to take up the project recommendations, rather than the need to delay or prevent the development of resistance to pesticides, which was one of the main objectives of the project. In Tamil Nadu, yields were significantly (up to 50%) lower in IPM-managed fields. Savings on pesticide inputs compensated for this reduction, but the reduction in pesticide use did not provide a clear financial incentive to adopt an IPM strategy. The perceived benefits were improved health, and reduced labour. The latter was important in Tamil Nadu, because water for spraying had to be carried to the field by women, from wells up to 3 km away.

Kenyan women farmers are solely responsible for decision-making in vegetables. For cotton in India, decision-making is shared by both men and women, even though women do most of the work.

Low-input systems in Uganda (NRI-*led component*)

Farmer decision-making processes were found to be highly complex, which raises the question of whether they can be sufficiently understood to improve the research–farmer interface. Even without 'external influences' the process is complex, involving feedback mechanisms via new 'events'; information seeking; knowledge updating; action and reflection; and improvisation. Lack of adoption of pest control methods does not mean that farmers are irrational. For example, farmers have a wide range of options and opportunities that may not, from a researcher's perspective, appear pest-related. Farmers' inputs should therefore be incorporated into all stages of research.

Collaborative analysis of the fieldwork in Uganda using 'soft-systems' methods generated seven key hypotheses and observations about farmer decision-making processes:

1. Apparent passive behaviour towards pest management (such as not 'bothering' to do anything about what might be termed by scientists a serious problem) may not necessarily relate to the farmers themselves, but may also be a reflection of the importance of the crop, environment, or pest. If behaviour is seen to be 'passive', then it is essential to investigate the type of 'passivity'.
2. Farmers are often influenced by many different people, such as leading farmers, extension staff, politicians, parents and relatives, and local councillors, in addition to their own experiences, experimentation, and expectations. Researchers should understand with whom they are 'competing' to reach farmers, and how much influence each has. Researchers should either work with those 'closest' or try to get 'closer'.
3. Farmers' decisions on whether to implement pest management 'technologies' are strongly influenced by market access. At one extreme, if farmers grow a crop for a particular purchaser at a pre-determined price, such as tobacco for British American Tobacco (BAT) they will typically follow prescriptive, often costly, precautionary pest management practices with little decision-making once the initial decision to grow the crop had been made. At the other extreme, farmers are often reluctant to use purchased inputs or labour-intensive inputs on crops destined primarily for home consumption.
4. To understand decision-making for a particular crop or pest it is essential to take an holistic approach. For example, several farmers commented, 'why control pests if soil fertility is low?' thus recognising interactions between different problems.
5. The clarity of outcome when using a pest and disease control method influences farmers' decisions to control pests and diseases. Banana, with particularly complex pest and disease problems and lengthy time to harvest, requires technologies that are either low in both cost and labour demand, or have a high payoff.

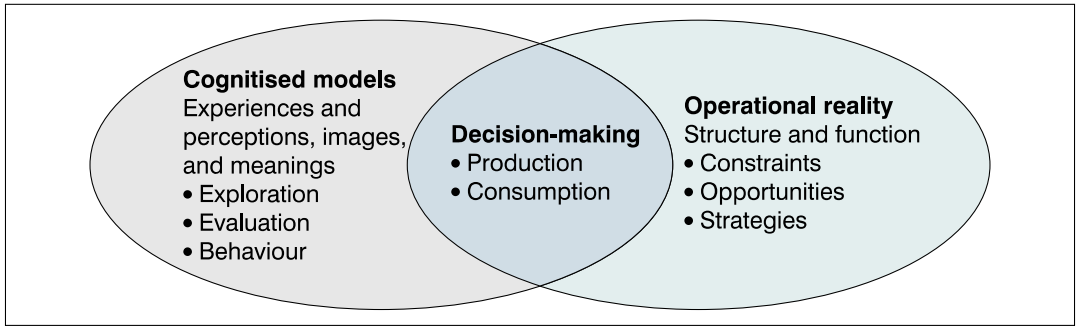
6. Credibility, both of sources of information, and the technologies themselves, affects farmers' willingness to adopt new technologies.
7. Farmers do not have to deal directly with a pest or disease but can switch crops, or the location of the crop, an option that researchers may not take into account when considering the costs and benefits of a particular pest-management technology.

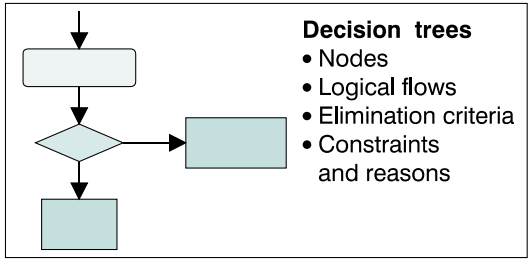
Key factors affecting farmer decision-making are summarised in Table 1.

Conclusions and common implications

Decision-making processes

- Much of the literature that purports to be about decision-making processes in fact focusses on the identification of factors that correlate with a decision to adopt a new technology, rather than the processes over time that lead up to that decision. More recently, the decision-making literature has moved away from models based on scientists' normative perceptions of how farmers should arrive at their adoption decisions towards attempts to build up a picture of farmer decision-making processes from an understanding of what farmers actually do. Examples of different approaches to analysing decision-making are summarised in Figure 1.





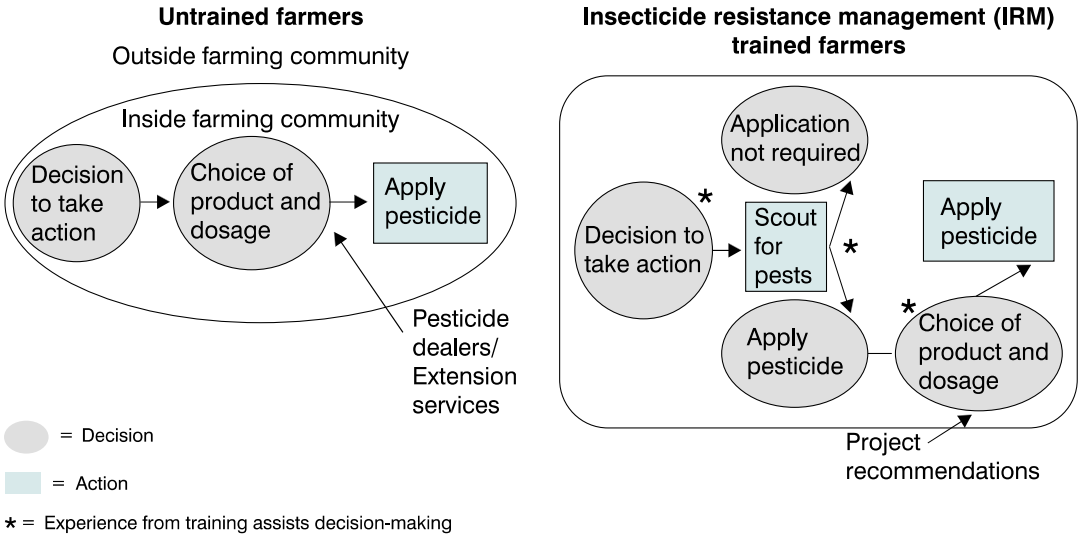
Dependent	Adopt	
Price	0.560	–
Extension	0.762	*
Risk	-1.240	**
Yield	2.170	–
Income	-0.435	–
Age	-0.230	***

Econometric
- Event not process
- Data intensive
- Typically only one dependent variable

Figure 1. Examples from the literature that illustrate different approaches to analysing decision-making.

Table 1. Selected outputs from participatory analysis

Issue	Why this is important for understanding farmer decision-making process	Why important for the research–farmer interface	Implications	Whose role to make this information work
Farmers exhibit both 'passive' and 'active' behaviour with respect to pest management	Apparent passive and active behaviour can relate to person, crop, environment, or pest	If passive, should investigate which type of passivity. If active, already have a good base for interface	Need early thorough investigation to classify. Build on what farmer is already doing	Characteristics to depend on professional background discipline, on-going commitment
There are many external influences on farmer decision-making		Researchers need to understand who they are 'competing' with to reach farmers and how much influence each has	Characterise external influences, establish relative importance. Work with those 'closest' or try to get 'closer'.	
The complexity of enterprise and importance attached to each matters for decision-making	Banana: Complexity of banana makes it difficult to determine whether a particular innovation pays off Maize: Only weakly fits into the staple cropping system	Requires clearer priority setting for research. Any technology promoted has to be of low cost and less labour-demanding or have very high payoff	Technology transfer has to take systems approach and more intensive interaction Target areas where crop is important and problem severe	All stakeholders including farmers, researchers, NGOs, and extension
A holistic approach needs to be taken	Farmers use alternatives to research-derived methods that are equally valid in farmers' perceptions	A more holistic analysis improves communication of ideas between farmers and researchers	Policy, such as change in problem identification	Ministry, research, NGOs
Credibility of both technology and sources of information is important to farmers	Lack of information, misuse, or adulteration of the product, undermined credibility of pesticides	Need for more effective communication	Quality assurance critical. More training for information dissemination	Manufacturers, suppliers, inspectors, NGOs, extension
Farmers have alternative strategies to deal with pest problems	Lack of adoption does not mean farmer is irrational. Demonstrates that farmers have a wide range of options and opportunities	Farmers' input should be incorporated into research. The payoff of the technology should be substantial	Change in policy required, e.g., change in problem identification	



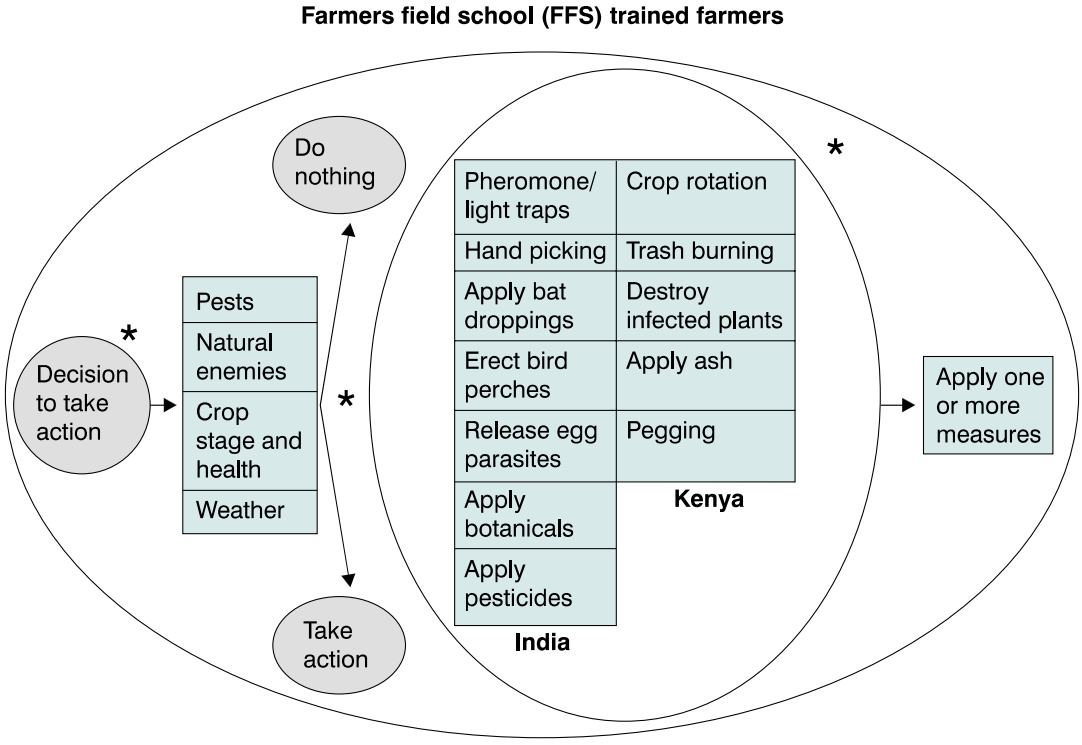


Figure 2. Flow chart summarising the decision-making processes in pest management for untrained, IRM-trained, and FFS-trained farmers.

- It is inappropriate to assume that all farmer decision-making can be reduced to a single model. A single generic model would be too general to provide any useful guidelines for action in a specific instance. Nor are processes immutable. Decision-making can change as a result of training. In the CABI study, 'trained' and 'untrained' farmers reported very different processes. These processes are summarised in Figure 2 for untrained, IRM-trained, and FFS-trained farmers.
- Access to information is a key factor in farmer decision-making. Availability and variety of sources of information, their reliability and farmers' confidence in them are issues which research and intervention projects need to take into account
- Context affects farmers' priorities and decision criteria, their access to sources of information and advice, and the availability of inputs. For this reason, it is appropriate that future research on farmers' pest management decision-making be based within projects, where the context can be clearly defined.

Circumstances under which it is important to understand decision-making processes

- Increasingly, pest-management interventions seek to influence decision-making processes. An explicit principle of FFS is that farmers should develop the confidence and understanding to be able to base their decisions on their own analysis of the status of the crop and the pest, rather than on a routine response or by copying what their neighbours are doing. In planning and evaluating interventions of this kind, it is therefore relevant to explore why and how farmers make pest-management decisions, not just to ask what decisions and actions they take.
- A better understanding of farmers' decision-making should improve all aspects of the pest-management research cycle, from problem identification to evaluation. It should also help improve the effective dissemination and uptake of research outputs. If we know what information farmers find helpful in reaching a decision, we can try to make that information more readily available. If we know what sources they regard as credible, we can channel promotion activities through them.
- Better understanding does not, however, necessarily lead to better interactions between extension and research staff and farmers. Researchers may have a mind-set that does not value time spent with farmers, while if extension staff are working within a top-down ethos they may find it difficult to provide responsive advice and support which facilitate decision-making processes.
- An hypothesis suggested by these studies is that the greater the influence of farmers on the research agenda, the less important it is to understand decision-making processes, because an awareness of process automatically informs problem identification and priority setting.
- Those involved in designing and implementing pest-management interventions need greater understanding of decision-making when there is not a simple message with easily observable results. In these situations, farmers need more information in order to reach decisions, and an understanding of how they weigh up alternative courses of action will help fine-tune the intervention.

- Investing resources in training farmers how to make optimal or more appropriate decisions may not be cost-effective where farmers' freedom to decide is restricted by contractual arrangements or monopolistic structures, or by political or economic constraints.

Methodological implications

- Short interactions with farmers by outside researchers do not produce complete and accurate accounts of decision-making. The present studies allowed only short periods of fieldwork. Longer-term interaction is needed to explore processes fully.
- The time-period of the study was too short for the researchers and farmers to get to know each other, and the methods being used sufficiently. This was one factor in the difficulties in using Scored Causal Diagrams in the CABI study, and in the multi-stakeholder workshop for analysis of empirical data in the NRI study.
- Who does the analysis affects the outcome of soft-systems research approaches. Different perspectives and implicit conceptual frameworks are brought to bear by researchers, trainers, extension workers, and farmers. This study was enriched by wide stakeholder involvement in analysis and interpretation.
- In places where pest management research and interventions are concentrated, 'survey fatigue' may affect interactions between farmers and researchers. As far as possible, learning about farmer decision-making should take place as part of activities that will contribute to farmers' livelihoods.

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ISON, R.L., MAITENY, P.T. and CARR, S. (1997) Systems methodologies for sustainable natural resources research and development. *Agricultural Systems* **55**: 257–272.

Discussion

Q. Should farmers decide what is, and is not, a researchable problem? Can farmers recognize a research problem?

A. No. Researchers ultimately decide what is possible to research. However, farmers need to be involved as partners in making that decision, and if a problem is not researchable, it is important farmers understand why this is the case.

Q. Who can identify a problem and how much farmer's time does this take?

A. 'Participation' can be used too loosely, it involves several issues, but farmers must be able to trust the information they are given – and have long-term contact with the information providers – if they are to remain credible sources to the farmer. These sources vary, in some places they are the providers of credit facilities, in others they are the pesticide dealers. Often farmers have lost confidence in the extension services.

General discussion

- The Kenya maize study indicated a wide spectrum of agreement on the lack of coordination. Although regional coordinators could deal with the CPP projects, there is still a need to coordinate among donors
- The lack of synergy between agricultural programmes, the CGIAR centres, and education and health projects is an important issue, more lateral thinking is needed, some programmes have done this successfully, e.g., livestock projects are using school books to reach a wide audience in East Africa, but many more such efforts are needed
- More use should be made of nodal agencies, e.g., All India Coordinated Projects and such networks as the Association for Strengthening Agricultural Research in Eastern and Southern Africa (ASARECA)
- Research is now on the UK Governments' development agenda, but there are too many projects and centres
- There are many types of information, farmers don't hold all the answers, market intelligence is needed, as is the type of information gathered by NGOs, extension services, and the public and private sectors. All data needs to be shared in mutual trust for the benefit of the target groups
- In order for the CPP not to be constrained by its perceptions, we must be able to move into 'people' systems. The CPP tends to be judged on the output from farmers' fields. But the CPP can only produce optimal inputs for various components of complex systems. The solutions are not clear-cut, and DFID tends to be naive in thinking they are. DFID has tended to be focussed on problem-solving research, what is needed is output-generating research.

Note Following this discussion each participant was asked to write on 'Postits' the three main issues that emerged from the Part 1 presentations. These were then rationalised by facilitators to produce the list of 51 issues that were used throughout Part 2.

Part 2

Introduction

The first task for each participant was to keep track of important issues and themes as they came up during the presentations in Part 1 and then, after the presentations and general discussions that followed them, to record what they considered to be the three most important issues onto 'Postits'. These Postits were given to the facilitators who carried out an initial sort, removing obvious duplicates. This narrowed the list down to 51 (numbered) issues, a fairly daunting prospect for the working groups to tackle at the beginning of Part 2.

Throughout Part 2 participants worked in groups. Working group memberships were decided in advance by the facilitators and were selected to make best use of the different ranges of skill, experience, and expertise amongst the participants, and to enable people to express their views freely. The original plan had been to have three groups composed mainly of natural scientists, social scientists, and management. Each group was to have one or two people from outside their own area of expertise to 'keep them on their toes'. However, participants decided there was more to be gained by keeping each group 'pure' for the first day of group work and this was done.

Most participants were happy with their designated memberships, but one or two changed group at their own request before the discussions started. These groups were maintained throughout Activities 1 and 2, but were reshuffled into four randomised groups for Activities 3 and 4 in an attempt to achieve consensus. At a certain stage overseas participants were given the option of forming a group of their own, but they declined, preferring to contribute to their designated disciplinary or randomly selected groups.

Working group membership

Natural Scientists

F.A. Andan
A. Cork
G. Farrell
S.R. Gowen
M. Holderness
L. Kenyon
F.M. Kimmins
N.R. Maslen
W.W. Page
W.K. Tushemereiwe

Facilitator C. Poulton
Note-taker A.E. Christophers

Social Scientists

J.F. Asaba
M.J. Iles
H.M. Kindness
L. Otieno Oruko
D. Overfield
E. Robinson
O.A. Sakyi-Dawson
B. Sekamatte
R. Tripp
J.L. White

Facilitator A. Dorward
Note-taker K.L. Wilkin

Management

M. Blackie
A.G. Cook
M. Jeger
K. Krishnaiah
J.M Lenné
A. Martin
G. Rothschild
J. Terry
J.M. Waller

Facilitator P. Norrish
Note-taker A.F. Ward

Each group was assigned one of the facilitators and a note-taker. The groups appointed their own rapporteurs for feedback to plenary sessions. Both kinds of recording/reporting contributed to the final report. Facilitators held frequent meetings throughout the workshop to review the process and to feed in ideas and suggestions.

Facilitator presentations

The programme included two presentations intended to stimulate and broaden discussion in working groups. The first presentation introduced the broad concepts underlying New Institutional Economics (NIE) and suggested that a better understanding of how institutions affect different stakeholders' incentives may allow technological and institutional modifications that encourage greater dissemination, uptake, and impact. The second presentation examined uptake and adoption from a communications perspective to draw out lessons for the way that research projects may work, again to encourage greater dissemination, uptake, and impact.

The link between the presentations and the group activities was that the themes and issues emerging from the presentations would form the basis for the working group activities.

Note-takers were kept busy recording all the group activities

Plenary sessions held participants' attention

9. New Institutional Economics: insights on innovation dissemination and uptake

A. Dorward, J. Kydd, J. Morrison, C. Poulton and L.Smith

Introduction

There is increasing recognition of the importance of the effects of laws and behavioural norms on economic activities and performance. This paper briefly introduces some of the main elements of the 'New Institutional Economics' (or NIE) theory and its potential relevance to understanding technology development, dissemination, uptake, and impact. Central to NIE is recognition of 'transaction' costs incurred in reducing risks of contractual losses or failure. Institutions (defined as rules governing behaviour) are critical determinants of transaction costs and risks, and when institutions are weak, competitive markets may not be viable. Non-market, non-competitive forms of exchange may then be preferable to market failure. This needs to be recognised and addressed in technology screening, development, and promotion. Similarly, costs for poor rural people in gaining technical and market information about innovations need to be weighed against the risks they face in uptake with less than full information. NIE can also yield insights in organisational links and management in technology development and promotion. The paper suggests a range of institutional factors affecting innovation uptake, and argues that NIE provides a framework integrating these with more conventional technical and financial considerations.

What is NIE?

NIE may be seen as an attempt to apply economics in the real world where people and organisations engage in both transaction (contracting and exchange) and transformation (production) activities. Transactions require information and incur costs in order to reduce risks, including costs involved in searching for and screening other parties, and in subsequently monitoring and enforcing contracts. Higher investment in these transaction costs should reduce the risks of opportunistic behaviour by other parties in a contract or transaction (opportunistic behaviour may include shirking or other changes in behaviour 'taking advantage' of a contract). High transaction costs may make some activities or opportunities non-viable, unless corresponding returns are very high.

Within NIE, the term 'institutions' has a particular meaning and describes 'the

Department of Agricultural Economics and Business Management, T.H. Huxley School, Imperial College at Wye, Ashford, Kent TN25 5AH, UK.

DORWARD, A., KYDD, J., MORRISON, J., POULTON, C. and SMITH, L. (2000) New Institutional Economics: insights on innovation dissemination and uptake. pp. 97–103, In: *Sustaining change: proceedings of a workshop on the factors affecting uptake and adoption of Department for International Development* (DFID) *Crop Protection Programme* (CPP) *research outputs*. Hainsworth, S.D. and Eden-Green, S.J. (Eds.). Imperial College at Wye, Kent, UK. 21–23 June. 2000. Natural Resources International Limited, Chatham Maritime, Kent, UK.

rules of the game'. Examples of institutions might be land tenure arrangements, laws, or procedures adopted for approval and release of new crop varieties. Institutions are distinguished from 'organisations', that are the 'players in the game'. Another important distinction is made between the 'institutional environment' and 'institutional arrangements' (Davis and North, 1971). The institutional environment describes the set of institutions within which particular parties or groups operate. As such it is critical in determining the way that markets, exchange, and institutions develop. Institutions and the institutional environment can be both formal (for example, formal laws) and informal (for example, customary ways of doing business). Powerful groups may be able to modify the institutional environment, and often do so to pursue their own interests. As a result, changes in the institutional environment generally benefit more powerful groups, but it is sometimes in the interests of such groups to introduce changes that benefit the poor: an important insight from NIE is the importance for searching for such win-win opportunities.

Institutional arrangements, on the other hand, describe specific mechanisms for exchange and for coordination in an economy. Exchange may be conducted through markets or through other channels, and may involve formal or informal contracts, agreements or understandings. Similarly coordination may be formally or informally established, and may be achieved through market mechanisms, within firms, or through state or collective actions. Both the form (or structure) of agreement or understanding between parties, and the terms of the agreement are negotiated between parties according to their respective preferences (which depend on transaction benefits, costs, and risks), and power. Transaction risks, and hence transaction costs decrease with a developed institutional environment, but increase with market arrangements, with investments in fixed or specific assets, and with the scope for opportunism by other parties. Where there are significant transaction risks and one or more parties are risk averse, then market arrangements may not be viable, and in that situation non-market arrangements could be preferred. This is an important insight that can often be overlooked in analysis conducted from a more traditional neo-classical analysis, which often stresses the benefits of competitive markets without proper understanding of the costs and risks that parties may face in such markets.

NIE places considerable emphasis on understanding the incentives to different parties that engage in productive activities. This involves consideration of financial and non-financial benefits and costs, allowing for transaction and transformation costs and risks. For production and trade to occur, there must be incentives for both producers and traders. NIE also offers insights into the behaviour of organisations, as there must be incentives for the staff and groups within an organisation to behave in ways that align with organisational objectives. Thus in considering the incentives for organisations to behave in particular ways (for example, promoting technology uptake), accountability to clients and competition with other organisations for resources may be considered as providing external incentives, while organisational culture and staff incentives provide internal incentives.

Incentives for organisations and individuals within them are affected by the nature of the goods and services being produced and/or exchanged. High incentives (and low transaction costs) are found with 'private goods' where quantities and quality of good or service are relatively easy to screen and monitor, and where individuals and organisations can capture the benefits of their actions (but incentives are low and transaction costs high with 'public goods' and with activities where other parties directly benefit or suffer from individuals' activities).

The relevance of this discussion to the uptake and impact of technology development is illustrated in Figure 1. Various aspects of the environment, of commodity and technology characteristics and of players' characteristics affect players' preferences for and negotiations over the institutional arrangements for exchange and coordination. The negotiated form and terms of exchange and coordination then affect the incentives for different players to take up new technology, and hence determine its impact.

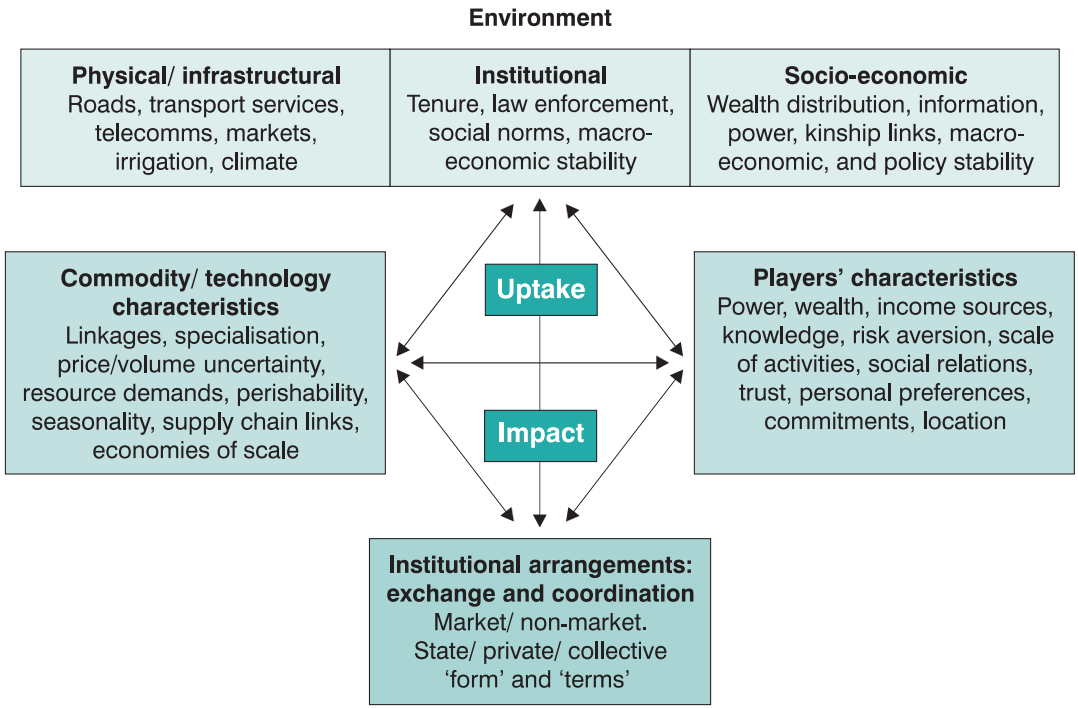

Figure 1. Factors affecting uptake and impact.

We will return later in the paper to consider more specific ways in which NIE may provide insights into the constraints on and conditions for technology development and uptake. First we consider ways it may support and contribute to livelihoods analysis.

NIE *and livelihoods analysis*

NIE can provide a framework for 'opening up' and exploring critical elements of the sustainable livelihoods framework (Morrison *et al.*, 2000). Most obviously it provides tools for analysing the effects of policies, institutions, and processes (formerly labelled 'transforming structures and processes') in terms of institutional interactions between assets, activities, and outcomes; the effects of power and processes and incentives for institutional and technical change; and the reasons for, and effects of, current institutional arrangements. With regard to assets, it can be used as a framework for analysing institutions as an important part of social capital, for examining access and returns to assets and activities, and for identifying the benefits of information and infrastructure. NIE also enables the analysis of the institutional causes and effects of vulnerability, highlights the development of institutional arrangements as an important activity, and provides a framework for investigating the institutional requirements and context of technological change (Figure 2).

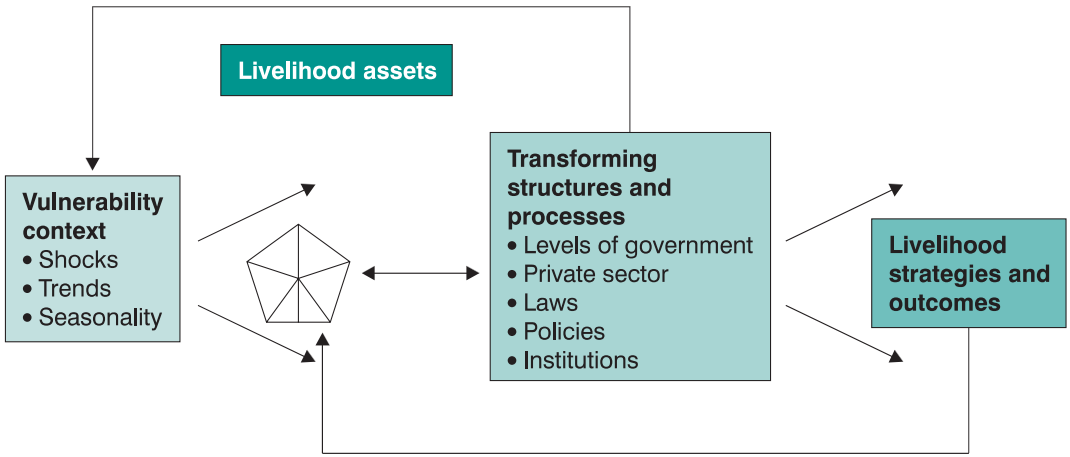

Figure 2. New Institutional Economics (NIE) and livelihoods analysis.

NIE *and technology development, dissemination uptake and impact*

NIE offers insights into processes of technology development, dissemination, uptake, and impact through its emphasis on information costs and benefits, on institutional constraints and technology 'fit', on property rights and collective institutions, and on organisational 'fit'.

NIE recognises that transaction costs, that are largely made up of information costs, are important determinants of net benefits to producers. When faced with a decision about taking up a new technology, increased information about that technology will reduce the perceived risks of failure, but acquiring that information

incurs costs. This is illustrated in Figures 3a and 3b. These illustrate perceived gross benefits and risks that may be associated with different amounts of information about the adoption of an innovation. The two figures differ in the way that the costs of information (or transaction costs) vary. Figure 3a shows low costs of acquiring information except at a critical point where there is a large step. Figure 3b shows transaction costs steadily increasing with higher levels of information. Although these figures are merely illustrative, the effects of these different transaction cost curves on net benefits is striking, illustrating the importance of considering the costs farmers may incur in acquiring critical amounts of information, and the effects of their risk aversion and access to information on uptake decisions.

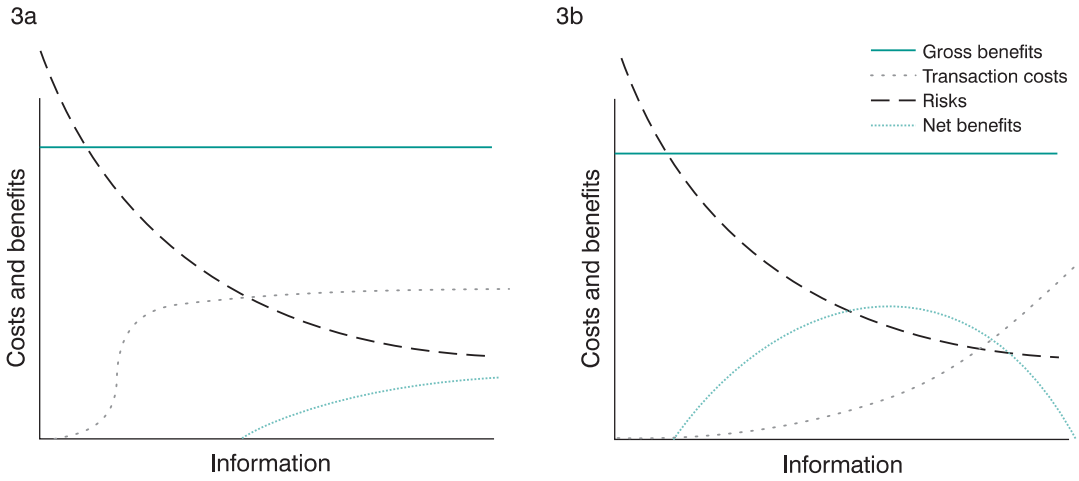

Figure 3a shows low costs of acquiring information except at a critical point where there is a large step. Figure 3b shows transaction costs steadily increasing with higher levels of information.

Figure 4 illustrates how the uptake of technology may be affected by its 'linkage intensity' and the institutional environment. Technologies with low 'linkage intensity' do not require very much in the way of resources brought into the farm, and do not depend upon sophisticated market chains to reach consumers (subsistence crops are an extreme example, indicated by point A in Figure 4). Technologies with high 'linkage intensity', on the other hand, require resources to be brought into farms and rely on market and processing chains to take them to consumers (high input cotton production might be an example of this, indicated by point B in Figure 4). Figure 4 suggests that under conditions of high institutional development, a wide range of technologies may be possible, with trading of inputs and outputs in competitive markets. However, where institutions are less developed (and hence traders and producers face greater risks of opportunistic behaviour and greater costs of screening, establishing, monitoring, and enforcing

contracts) then independent, impersonal competitive markets may not be effective, and more personalised arrangements with vertical linkages may be necessary to reduce transaction costs and risks. At low levels of institutional development the transaction costs and risks of high linkage intensity technologies may be too great, and market failure occurs. The (obvious) lessons from this are (a) that technologies must 'fit' the institutional environment of farmers for whom they are intended, and (b) there may be scope for attempting to modify the institutional context to enable more productive innovations to 'fit' (this is shown by the arrow above point C in Figure 4). Such modifications are unlikely to involve perfectly competitive markets, indeed some of the parastatal marketing agencies that were common in Africa but have now been swept away by market liberalisation represented attempts at such institutional modification (Dorward *et al.*, 1998).

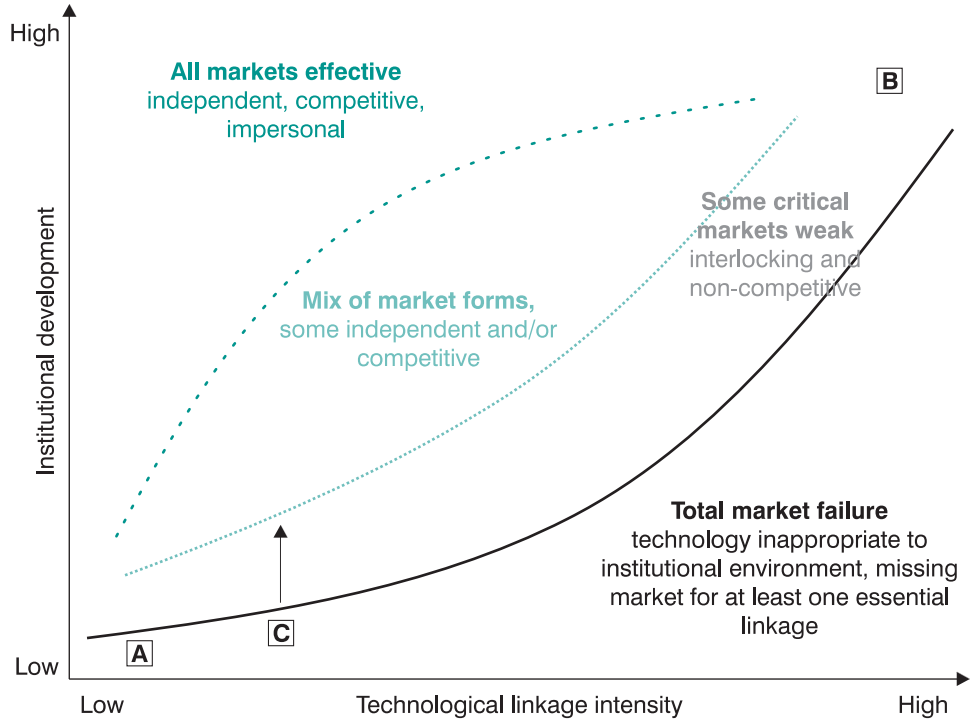

Figure 4. Technological linkage intensity, markets, and institutional fit.

This discussion of 'institutional modification' to match technology characteristics and the institutional environment is an example of a wider need for 'institutional fixes' to problems of technology development, dissemination, uptake, and impact. Thus information flows and associated transaction costs may be eased by institutional fixes that seek to promote the low cost flow of information. 'Institutional fixes' may also be developed to reduce the costs of exchange between producers and traders (as discussed in the context of Figure 4), to reduce the

costs of coordination and management of shared or dispersed resources, or to encourage organisations to work together in the process of technology development, dissemination, and support. Such 'institutional fixes' will seek to develop a wider institutional environment or specific institutional arrangements that provide incentives for participation in technology dissemination and uptake. These fixes may involve service delivery, financing or regulation to influence state, collective or market action in exchange or coordination. However, lessons from such action suggest that any institutional fixes must be carefully designed to take account of the need for them to be efficient, equitable, sustainable, and compatible with existing institutions from which they can develop future institutions to which they may need to evolve.

Conclusions

How can these insights from NIE be applied to improve the processes of research planning, management and dissemination?

The most obvious and general conclusion is that greater prominence should be given to understanding the role of institutions and to the scope for complementary technological and institutional 'fixes' to ensure that new technologies and institutions are compatible. NIE can provide a framework to assist in this, for example, by linking more conventional technical and economic issues and analysis with broader concerns in policy, institutions, and governance.

More specifically, institutional innovation itself needs to be recognised as an important and valid (if difficult) research subject and output. Both the institutional environment and institutional arrangements need to be investigated as researchable constraints, and the scope and means for innovation and change in these investigated. Investments may be required to develop and disseminate more equitable and efficient institutional innovations. This is likely to involve greater emphasis on networking to share information about institutions that work in different parts of the world and about key elements in their success. The various stakeholders concerned must themselves then consider and negotiate how existing institutions may evolve or change for mutual benefit. Bringing institutional change into research in this way presents a challenging agenda, but it should not be ignored.

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10. *Communication perspectives on uptake and adoption*

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Introduction

This presentation explores communication perspectives that can improve our understanding of the processes of uptake and adoption of research outputs. These can help us answer *ex ante* questions in a specific situation and so take action to improve the chances of uptake, to plan promotion and dissemination activities throughout the life of a research project, and carry out *post hoc* evaluations of uptake to learn lessons for future projects.

Firstly, a challenge: how good are we at learning from each other? This workshop is a unique opportunity for social and biophysical (natural) scientists to share ideas and understandings. But after the workshop, we will all return to institutional environments where such cross-disciplinary interaction is constrained. A brief reading of the summaries of the presentations for the workshop suggests that several of the findings of the uptake and adoption studies commissioned recently by the Crop Protection Programme (CPP) confirm what is already known. The Natural Resources Systems Programme (NRSP) has funded the production of a series of *Best Practice Guidelines*, based on NRSP research, for use by research project teams: they include guidelines on dissemination pathways (Garforth, 1998; Norrish *et al.*, in press) that emphasise several of the key conclusions of the studies being reported at this workshop. These include: the fundamental requirement that technologies are appropriate to farming and livelihood systems; the need for user-participation at all stages in research, the importance of reviewing uptake from previous related projects, the need to plan for uptake right from the start of a research project, the potential of market mechanisms for facilitating dissemination, uptake and adoption; the relevance of the institutional context which facilitates or constrains farmers' access to resources; and the idea that a basket of options is more helpful to end-users than a single recommended practice or technology. Perhaps we should spend some time considering how to ensure a more effective sharing of existing research-based understanding of uptake and adoption.

To return to exploring the communication perspectives — we need to consider the question 'Where do uptake and adoption begin?'. In order to answer this we need to consider uptake and adoption in terms of supply and demand.

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Supply involves the need to consider three activities:

- Promotion—encouraging people to use a technology
- Dissemination—spreading information about a technology
- Delivery—passing technology to an uptake pathway.

Demand can be used to help us define:

- Uptake—as and when people begin to use a technology
- Adoption—as and when technology is integrated into farming systems after experimentation and adaptation.

If we now go further and consider uptake as a research issue, it will involve us in looking beyond outputs and, in terms of the Department for International Development (DFID) agenda, considering:

- Poverty—who takes up research outputs?
- Livelihoods—what impact do research outputs have on their lives?
- Gender—is there differential uptake and impact between men and women?

We have heard that there are renewable natural resources (RNR) programmes that are looking to 2005 when they must be able to demonstrate impact in these key areas (poverty, livelihoods, and gender). Recent activities include this CPP workshop on 'Factors affecting uptake and adoption' and recent calls for bids by the Livestock Production Programme (LPP) and Animal Health Programme (AHP) that have focussed on communication and dissemination, and that of the NRSP that is looking at 'demand for technologies'.

Exploring communication perspectives

Overall, there are five complementary communication perspectives to be considered.

1. Where do farmers and other stakeholders get information?
2. How do farmers make decisions?
3. How do farmers evaluate technology?
4. Which factors affect uptake/adoption, to both the intermediate users, and the end-users?
5. How does technology develop?

1. Where do farmers and other stakeholders get information?

It is only by understanding how and why farmers and other stakeholders obtain and use information that we can supply the kind of information, and support for the use of information that they need. In other words we need to understand the Agricultural Knowledge and Information System (often referred to as AKIS). In order to do this we need to characterise and access the communication context,

i.e., the sources and channels of communication available to, and used by, intermediate and end-users, policy makers, and the commercial sector (Norrish *et al.*, in press). One formalised method for helping to do this is a participatory method that facilitates an understanding of networking and communication which can be used to improve the generation and use of knowledge and innovation. It is generally known as the Rapid Appraisal of Agricultural Knowledge Systems (RAAKS) and the underlying concepts, case studies, and detailed methodology can be found in *Facilitating innovation for development: a* RAAK *resource box* (Engel and Salomon, 1997). Once this context is understood, it will be easier for researchers to get research-based information in an appropriate form into channels that farmers can access, for different kinds of decisions, and for different targets.

Previous research (Norrish *et al.*, 2000; Norrish and Lawrence, 1997) shows that stakeholders and beneficiaries:

- Are exposed to multiple sources of information
- Live in an environment of increasing media pluralism and access
- Use different sources for different purposes
- Are active seekers of information.

It also shows that the main source of information for most farmers is still likely to be other farmers, with radio coming second, and that men and women have different sources for information. For example, in Uganda, a 1997 study in four parishes found that other farmers were the most commonly used source of information, men had more overall access to information, they listen to the radio, and meet input dealers, but that women get their information through non-governmental organizations (NGOs) and women's groups (Mulhall and Garforth, 2000). Such detail needs to be known for each project as early as possible.

2. *How do farmers make decisions?*

By understanding how farmers or farm households make decisions, we should be in a better position to provide information and support to facilitate decision-making (Meir *et al.*, 2000). Some researchers approach this through socio-economic models of the farm — by asking, for example, whether farmers are more concerned with maximising profits, minimising risks, maximising food availability in dry seasons, or minimising labour input. More recently, models that consider the role of farm production within the overall livelihood strategy of the household have been seen as particularly relevant. A different tack is taken by cognitive models that explore the conscious and sub-conscious thought processes that underly decision-making. Of these, models based on the Theory of Reasoned Action (including the study on 'Factors affecting the uptake and adoption of rice research outputs in Ghana, West Africa', reported pp. 65–73, these proceedings) have been used to explore the relative influence of perceived cultural norms and perceptions of the views of others on farmers' decisions. Both theoretical approaches highlight that decision-making and the factors that influence it are complex and situation-specific; and that there are likely to be differences in process and factors for

different types of technology. This being so, we need early identification of the type of research output that is likely to be generated so that we can plan for its dissemination, promotion, and support.

Perhaps we need to sound a word of warning here. The rise of the use of information and communication technologies (ICTs), using electronic means of communication, has led some to suppose that providing databases of technologies will help intermediaries and farmers in their decision-making, and thus will increase the impact of research outputs. But information alone is not enough, it needs timing and reinforcement, farmers need training, either message-based or learner-centred, and they also need access to the inputs to this information, and credit to buy these inputs. Because of these factors, databases of technologies should include information on their context of use, the support needed, and local availability to provide it, together with evaluative information from a user's perspective. Only then will they be really useful.

3. *How do farmers evaluate technology?*

Technology evaluation is a vital part of the process of adoption and uptake. The extent to which farmers are involved in the evaluation process will have an effect on the usefulness and usability of the technology. Involving them early in this process will produce appropriate outputs and options.

For evaluation to be useful it needs to consider farmers' multiple criteria against scientists' single criterion, for example, scientists can produce cassava with resistance to cassava mosaic virus, but does the end-product taste good enough for farmers to grow, sell, and eat it? Setting criteria against which farmers will judge technologies needs to be developed by and with the farmers, and they need to be actively involved in the evaluation process.

Farmers consider their subsistence needs versus market criteria, and gender differences strongly affect a product's acceptability (and should be explored at an early stage), as does its compatibility with the mixtures of crops grown.

4. *Which factors affect uptake/adoption?*

Adoption studies such as those presented at this workshop can be used to evaluate uptake and impact after an event and so inform those undertaking future research. These studies have identified farm and farm household characteristics, the typology of farmers, their innovativeness and capital endowment, the complexity of their decision-making processes, and their links to sources of information and training (formal and informal, government and NGO). They have also considered the nature of technology and the economic and policy environment. What they show is the complexity of factors that affect uptake and adoption, and the need to consider this complexity from the inception phase of projects.

5. *How does technology develop?*

Researchers have offered different descriptions and explanations of the process by which technology develops. A traditional linear model is McDermott's (1987)

Technology Innovation Process, in which the contributions of scientists, extension agencies, and farmers are mapped onto a sequence of basic, applied, adaptive research, followed by the incorporation of technologies into farming systems. Stephen Biggs offered his Multiple Sources of Innovation model in 1990, emphasising that farmers rarely experience a single linear line of development of a technology they end up using. Recently emphasis, in both theory and practice, has been on participation by farmers in the development of technology, with various models of Participatory Technology Development, Farmer Participatory Research, and Farmer-Led Research being advocated.

Implications for ways of working

What does all this mean for research projects? Taking uptake seriously means that we must :

- Analyse the livelihood and economic context of farmers and farm households
- Identify the nature of a research output
- Create an environment for uptake through communication activities that raise the awareness and interest of the target recipients
- Enable participation in all stages of technology development and its evaluation
- Involve ourselves in dialogue with stakeholders so that we learn of early warnings of constraints to uptake
- Ensure that communication activities and dissemination are thought of from the inception phase of a project
- Involve farmers in the planning and design of communication activities and products to ensure that they are relevant to the needs and the particular communication environment within which people live and work.

Dissemination is a vital part of the whole process and one in which project leaders (PLs) need help in the form of guidelines and tools. Programmes need to ensure that where such help exists it is drawn to the attention of PLs and made available to them. In planning for dissemination PLs need to determine:

- What needs to be communicated
- For whom?
- How?
- Who will do it?

This last question 'Who will do it?' raises a major issue about the wider responsibilities of dissemination of project outputs, i.e., is it the project? the programme? DFID? bilateral programmes? or other actors? who are responsible. Who makes that decision and who will finance appropriate 'packaging' of project outputs for different audiences, who will be responsible for ensuring distribution and tracking use? Unless these decisions are made, dissemination will continue to be a hit and miss affair, leaflets will be written but never produced and

distributed, manuals will run out rapidly with no thought to possible further production runs, and the need for the adaptation of training manuals and information for farmers in different contexts from that of the original research will go unrecognised.

Only once all these issues have been considered and determined can the uptake pathways be cleared for adoption of research outputs to take off.

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Activity 1

The facilitators posed the following question to all groups:

Question 1. What common factors affecting uptake of research have emerged from the studies?

In order to answer this question within the three preassigned working groups, participants were asked to prioritise the 'top ten' issues from the 51 listed below that, if addressed, would substantially improve uptake and adoption, and to justify their choices.

Working groups got down to business in Activity 1

Issues that emerged from Part 1

1. Should project leaders (PLs) be trained in dissemination/promotion issues?
2. Who decides on appropriate/inappropriate dissemination media, are schools a useful route?
3. Is the CPP exploiting innovative and new technologies?
4. Should the CPP fund promotion projects?
5. When should the dissemination audience and strategy be identified?
6. How can information on existing outputs and projects be made available to researchers and others?
7. Does the CPP appreciate the importance of farmer-to-farmer communication?
8. Should end-of-project demonstrations be a requirement for all projects?

9. Uptake is a factor of demand, so do we need to focus on demand to achieve uptake?
10. How are projects identified?
11. Is demand-driven research always appropriate?
12. Is the best way of ensuring uptake for research to generate solutions in anticipation of problems arising?
13. Do we ignore indigenous knowledge?
14. Are commercial links important for uptake, e.g., to strengthen technology supply?
15. What are the importance of market conditions and associated incentives?
16. What is the importance of institutional capacity?
17. What is the importance of policy environment, e.g., farm size?
18. How do we measure uptake?
19. How do we measure adoption?
20. How do we measure impact?
21. What mechanisms could be used to monitor and evaluate uptake?
22. What impact can be seen from CPP research to date?
23. How effective are networks — are they past their prime?
24. How can effective partners/collaborators be selected?
25. How do we enhance institutional synergy/what is the most effective structure, e.g., consortia or task forces?
26. What is the effect of proliferation of actors and resulting problems of coordination?
27. How should agenda conflicts be resolved?
28. How can we improve linkages between bilateral donors and research programmes?
29. How can we improve interactions with non-target crops?
30. What is the effect of weak links between farmer, extension, and research?
31. How can two-way communication with farmers be improved?
32. What are the costs/benefits of different approaches to uptake?
33. Who are the poor — at what level should the CPP focus, e.g., on innovative farmers, or on the landless?
34. Should the CPP foster relationships between private and national agencies?
35. What should be the boundaries of CPP involvement in the institutional aspects of research output uptake?

36. Is the pre/post-harvest divide artificial?

37. Do uptake and adoption need to be addressed at the generic level?

38. Who will pay for/carry out pre-project investment in needs assessment, relationship building, and identification of factors affecting uptake?

39. Is the CPP management structure a constraint to uptake?

40. What is an effective level of participation?

41. Should project logframes include outputs and indicators relating to uptake and other aspects of the process?

42. Should the programmes influence policy conducive to dissemination of outputs, e.g., pesticide regulation and registration?

43. Should there be incentives for researchers to achieve uptake, i.e., peer reviewed versus downstream dissemination?

44. Is new knowledge the key constraint for the poor, or is access to existing knowledge or the ability to translate it into livelihood improvements more important?

45. Sources must be credible — how do we identify such sources?

46. Must new technologies be better than old technologies?

47. If factors for dissemination are location-specific, how can we scale up?

48. Is there a conflict between the dual mandate to produce impact (in a specific locus) versus the need for generic results?

49. The poverty agenda is donor-driven but 'Poor people also want to have TV, access to the internet, and a good life' how can this be resolved?

50. Must uptake pathways take account of other components of livelihood strategies?

51. What is uptake?

Weighing up the priorities

No instructions were given on how to carry out the Activity, and groups worked in different ways according to methods which suited them. Prioritising was largely carried out by some kind of voting procedure. Groups were free to add to the list of issues if they felt anything vital was missing. Only one group took advantage of this opportunity and added one more issue. Group presentations of the 'top ten' issues were made in a plenary session, numbers in bold indicate the issues and some of the reasons for their selection by the groups.

Natural Scientists

1. Should the CPP fund promotional projects? CPP should have a direct role, since this offers opportunities for more variety of outputs.
   4

2. The selection process for areas of research is not transparent, and how collaborators are identified needs to be made clear, CPP needs be more involved and play a direct role
   9, 10, 11 (linked issues)

3. Selection of effective partners/collaborators, CPP should have direct role, such partners should include NGOs and CBOs, and their work should continue after the project ends
   24

4. Improve links between bilateral donors and research, the role of CPP Management is crucial, as is the need to strengthen links
   28

5. Weak links between farmers/extension/research, communication should improve and CPP should help to facilitate directly and through advocacy
   30, 31

6. CPP must start looking at livelihoods, to determine efficacy of outputs. Outputs are no use if farmers cannot take them up. CPP's role is both direct and as advocator
   50

Minor points

7. CPP should look at existing evidence linked to issues **22/44**, and exploit on-the-shelf technologies
   6

8. Institutional capacity is very important, it will dilute uptake if it is inadequate
   16

9. During projects networks are set up, there is a need to link them with bilateral donors to keep such networks going after projects end. We need to establish and maintain trust
   25
10. Who are the poor, at what level should CPP focus?
    33

Social Scientists

This group did not discard any issues, but collated them into priority groupings.

1. Organisational structures, and uptake methods. CPP should look at partnerships, networks, and methods of dissemination
   30, 16, 47, 50
2. Project identification and demand
   35, 38, 9, 10

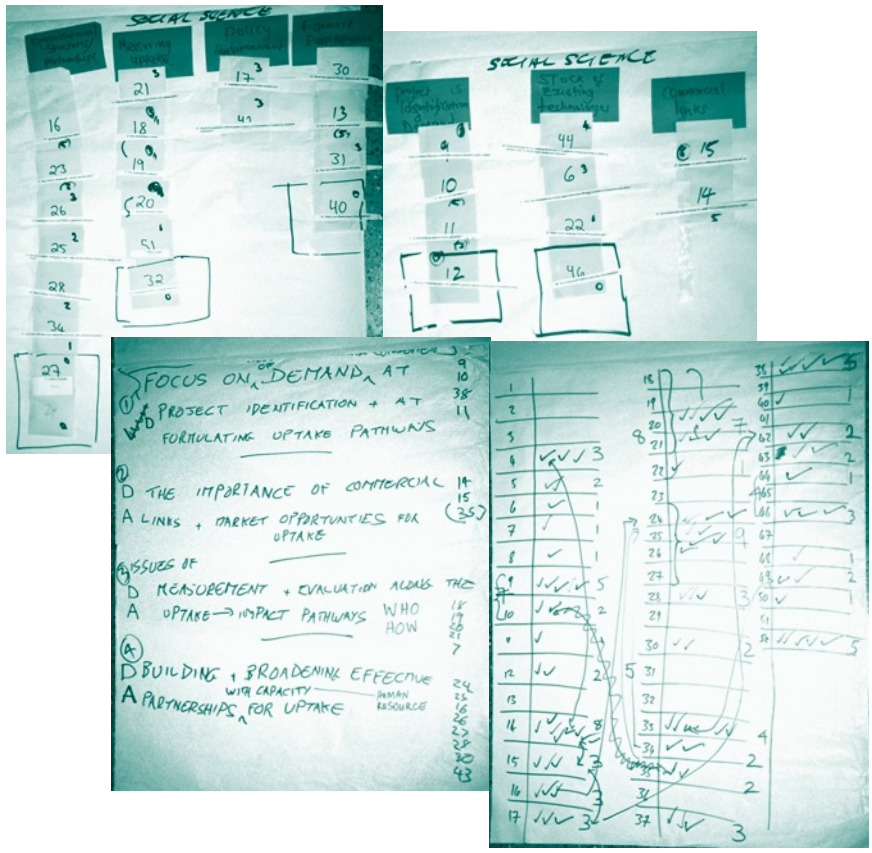
   Need farmer participation in the process
   30, 13
3. CPP should manage and structure the process
   24, 36
4. Commercial links
   15, 14
5. Existing technologies — need to be analysed
   44, 6
6. Policy environment focus
   17, 42
7. Poverty focus
   33
8. Measuring uptake
   21, 18, 19, 20

Management

This group aggregated all the issues into 8 'super topics'. They also added an additional issue **(52).**

1. Enhance focus on issues of demand at project identification and at formulating uptake pathways
   9, 10, 11, 35
2. The importance of commercial links and market opportunities for uptake
   14, 15, 55

3. Issues of measurements and evaluation along the uptake – impact pathways
   18, 19, 20, 21, 7
4. Building and broadening effective partnerships with capacity for uptake and to attract funding
   15, 16, 24, 25, 26, 27, 28, 30, 37, 43
5. Recognition of importance and influence of consumers on uptake (new issue)
   52
6. CPP focus and impact on poverty
   33, 49, 50
7. Need to influence the policy environment agenda through the uptake pathway
   17, 42, 38
8. Balance between new knowledge generation and promotion of existing information
   6, 44, 46



Groups used various ways to record their groupings of issues

The different approaches taken by each group made matching issues across groups a difficult task. However, it led to a fruitful discussion and an eventual consensus that there was a commonality of themes. After the group presentations the facilitators worked on the group reports, issues were matched and sorted to determine the degree of agreement across groups. The following lists of preliminary findings resulted.

All groups agreed

Issue	*Topic*
6,44	Utilising existing knowledge
9,10,11	Demand-driven research
16	Institutional capacity
24	Selection partners
30	Farmer–extension–research linkages
33,50	Poverty and livelihoods focus

Facilitators grouped the issues to determine the extent of agreement between groups

Common to Social Scientists and Management

14, 15	Commercial and market links (consumers)
18,19,20,21	Measuring uptake
38	Who will pay for pre-project development
17, 42	Influencing policy environment
28	Improving links with bilateral donors

Natural Scientists only

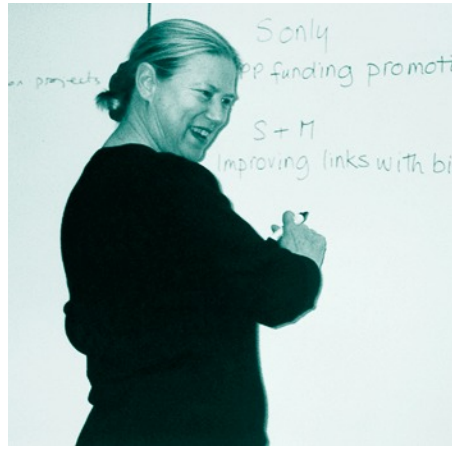
4 CPP funding promotion

Social Scientists only

13	Indigenous knowledge
35	How far should CPP go with uptake
36	Pre/post-harvest division is artificial
47	Scaling up location-specific technology

Management only

7	Farmer-to-farmer communication
25, 26, 27	Coordination amongst farmers
43	Incentives facing researchers
46	Superiority of new technologies
49	Poverty agenda is donor-driven
52	Consumer effect on uptake



Identifying the groups' findings during Activity 1

Activity 2

The same three working groups were asked to answer:

Question 2 Which of the issues (that are common to two or more groups) is the CPP in a position to address?

The groups needed to answer this by categorising the lists in three ways:

- Which issues can CPP tackle directly and what measures should it take? (Code **D** for Direct)
- Which issues need action by others, by whom? what type of action is needed? and where would advocacy from CPP be useful? (Code **A** for Advocacy)
- Which issues should CPP take into account when projects are being set up? (Code **AA** for Awareness and Advocacy).

Shared experiences helped to enliven the discussions

The groups presented the results of their deliberations in plenary session.

Natural Scientists

CPP *to take direct action* (D)

- Concept notes (CN) should be reviewed in-country
- Better links with Plant Sciences Research Programme (PSRP) are needed, farmers prefer host-plant resistance as a pest management strategy
- Village-level production of biological control agents could provide alternative income for the landless poor

- Commission small business advice
- PLs and collaborators should be encouraged to be entrepreneurs, this might also make research more attractive
- Training commercial operators and NGOs in use of technologies developed is needed
- Database of experience with IPM (and other ?) technologies should be assembled
- There should be more transparency in generating calls
- Clear terms for working with partners, e.g., Memoranda of Understanding (MoU) over intellectual property rights (IPR)
- Initiate participatory farmer training programmes at cluster, programme, or Renewable Natural Resources Research Strategy (RNRRS) level?
- Regional Coordinators—should be considered but Management should take care this does not mean extra bureaucracy!

CPP *advocacy for others' action* (A)

- DFID should relax the country focus for dissemination of results, so the most appropriate countries can be targetted
- Push for stakeholder needs analysis (country level)—by DFID, other donors, RNRRS
- Collate information on partners in a database
- Establish venture capital fund—at RNRRS level, fund capacity building, and look for small business experts to develop bio-rational products
- DFID to promote and expand the Natural Resources Information System (NARSIS), its database of project information
- DFID to provide support to in-country development of concept notes
- RNRRS programmes should be allowed to fund PhDs
- Create stakeholder needs analysis and sharing of results by DFID, after donors, and RNRRS programmes
- The RNRRS and DFID bilateral research agendas need to be harmonised

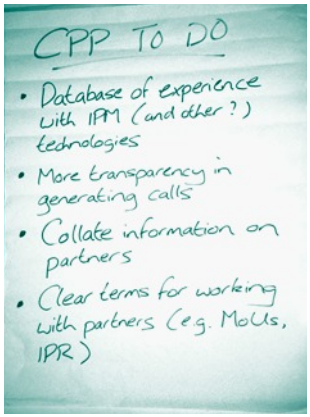
CPP *to take into account* (AA)

- Employment generation opportunities linked to technology, e.g., entomopathogenic virus production for biological control of insect pests

Social Scientists

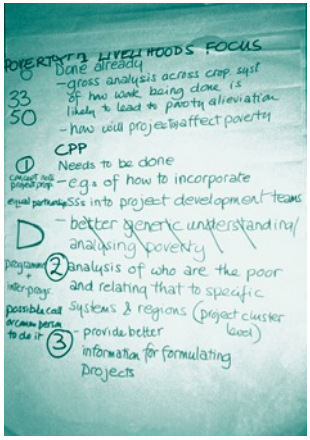
Action	D	A	AA
Utilising existing knowledge, including indigenous knowledge			
Build on existing knowledge when commissioning work			
Promote existing knowledge on specific research topics/problems developed by a range of actors			
Facilitate access to knowledge, including indigenous knowledge, e.g., make final technical reports (FTRs) more accessible, set up databases (or facilitate access to existing databases)	X	X	
CPP should evaluate access to existing knowledge and its utilisation by stakeholders	X		
Demand-driven research			
Carry out pre-call and pre-project identification of demand and resource; formulate transparent policy and resource it. Clarify the nature of what should drive the research, have a transparent policy and resource it properly. Is it consumer-driven, science-driven, market-driven, collaborator-driven or, farmer-driven — does it vary from case to case?	X		
Review how prescriptive calls should be	X		
Determine whose demand is important in different circumstances	X	X	
Support to articulating and developing a demand especially amongst farmers and consumers with active involvement	X	X	X
Institutional (organisational) capacity			
Capacity-building should be allowed/encouraged as an output, for example PhDs and formal training; and project resources should be allocated appropriately	X	X	
Projects should be longer to enable capacity building and partnerships to develop			
Projects should be sustainable, i.e., facilitate continuity and integration	X	X	X
Consider incentives for partners' involvement at organisational and individual levels	X	X	X
Encourage bilateral donors to build capacity	X		
Realign country focus to match that of bilateral donors	X	X	X
Determine if extra resources for capacity building might be available (from DFID) and lobby for them	X	X	
Improve access for partner organisations to capital equipment	X	X	
Look for joint funding for capacity building	X	X	
Be clear which institutions should build capacity	X		
Selection of partners			
Assess and allow for existing capacity and organisational culture	X		X
Accommodate the necessary range of research collaborators in relevant disciplines	X	X	
Consider how to engage more with the private sector and NGOs	X		X
Encourage in-country led proposals	X	X	
Encourage partners to select CPP	X		
Consider the nature of appropriate partnerships for uptake (i.e., appropriate to the type of technology and its context)	X		
Build CPP-stakeholder partnerships or facilitate stakeholder-to-stakeholder partnerships (whichever is more appropriate in the context of an individual project)	X		
Form links with partners supported by bilateral programmes	X	X	
Consider competitive bidding for uptake activities	X		
Review the role of CPP within the in-country research and development (R & D) system	X		
Cross-cutting issues			
Cross-sectoral and cross-programme collaboration should be encouraged	X	X	

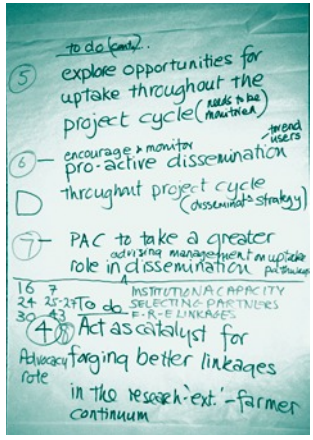
Action	D	A	AA
Farmer–extension–research links			
Mass media should be used to stimulate			
• Farmer-to-farmer communication			
• Articulation of demand by farmers			
• Policy development	X	X	
Multiple channels should be used to disseminate outputs	X	X	
Participatory research should be used to stimulate/facilitate linkages and communication	X	X	
Constraints to private sector (all levels) involvement in producing pro-poor research should be assessed, e.g.,			
• Economics of packaging small quantities			
• Poor knowledge of potential markets among smallholders			
• How to create or stimulate markets.			
Then the researchable issues should be identified, solutions piloted, and results used to advocate action by policy makers	X	X	X
Contracts should be drawn up addressing the uptake and output stages of research, specifying performance criteria	X		
Memoranda of Understanding should be drawn up with different sectors	X		
Consideration should be given as to whether it is more appropriate to specify partners or to leave this to project leaders	X		
Perceptions of the research and uptake process need to be understood, variations assessed, and taken into account	X	X	X
Consider a permanent presence in target countries, e.g., appoint a Regional Coordinator or someone within the bilateral office dedicated to research/development links.			
Evaluate costs and benefits of crop post-harvest programme's (CPHP) decentralisation	X	X	
Calls should be distributed more widely			
• Within target countries			
• To social science research groups	X		
Poverty and livelihood issues			
Develop a clear and transparent statement about which types of poor people are being targetted as beneficiaries of CPP research (producers, consumers, labourers, etc.)	X	X	
Livelihood dependence on agriculture needs to be analysed before committing research funds (this data already exists in many cases)	X		
Consider reformulating strategy with a people/livelihoods focus as opposed to a commodity focus, to be consistent with DFID policy	X	X	
Take account of, and act to improve consumer awareness	X	X	X
Fund investigation of and allow for institutional constraints to uptake			
Pilot 'institutional fixes' to use for advocating action on a larger scale, e.g., by policy makers	X		X
Advocate restructuring the RNRRS away from sectoral divisions to better reflect DFID's own livelihood approach	X		
Acknowledge that all projects need to have appropriate social science expertise	X	X	
Support interdisciplinarity: e.g., through jointly led socio-economic and technical specialists			
Make calls for proposals more accessible.	X		
Compare the contribution of various disciplines to uptake and adoption	X		
Clarify how CPP uses certain terms, e.g., uptake, adoption, collaborator, target institutions, for the sake of project leaders	X	X	
Assess the extent to which the current competitive research bidding process, i.e., encouraging inter- and intra-country competition, contributes to poverty reduction	X		



Natural Scientists presented a short list of their findings

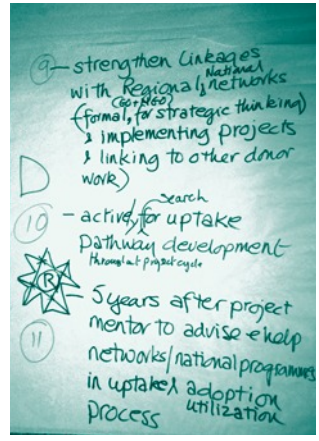
Social Scientists' ideas spread far and wide





The Management group elaborated earlier findings on their 'super topics'

A 'brain wave' emerged during the Management group discussions



Management

This group decided to adapt the instruction and further discuss their 'super topics'. They presented a reprioritised listing with indications of what needed to be done about each topic and who should do it.

Poverty and livelihoods focus

1. Need to incorporate equal partnerships with social scientists into project development teams **D**
2. Analysis of who are the poor and relating that to specific systems and regions (project cluster level) **D**
3. Provide better information for formulating projects **D**

Demand-driven research

1. Advertise that funding is available for pre-project stakeholder meetings, etc., if recommended by Management **D**
2. Explore opportunities for uptake throughout the project cycle (needs to be monitored) **D**
3. Encourage and monitor pro-active dissemination for end-users throughout the project cycle (dissemination strategy) **D**
4. Programmme Advisory Committee (PAC) to take a greater role in advising Management on uptake dissemination pathways **D**

Institutional capacity/selecting partners/farmer–research–extension linkages.

1. Act as a catalyst to forge better linkages in the research–extension–farmer continuum. **A**
2. Strengthen linkages with regional/national networks (formal governmental organisations and NGOs for strategic thinking — implementing project-linking to other donor work) **D**
3. Actively search for uptake pathway development throughout project cycle **D**
4. Appoint a mentor to advise and help networks/national programmes in uptake and adoption/utilisation process for 5 years after project ends (I*nnovative idea generated during discussion*) **D**
5. Identify opportunities for enhancing and promoting farmer–to–farmer communication of CPP work **D**
6. Enhance farmer-research communication and feedback **D**
7. Contribute to building capacity using different mechanisms in institutions to contribute to the uptake process through project work **A/D**

Activity 3

For this Activity, following a short presentation by Professor Kydd, that explained the logic behind the steps to be taken, the participants were reshuffled into four randomly chosen groups by the facilitators. Within these new groups participants were asked to answer the supplementary question:

Question 3a. Which of these issues, if addressed, would have a high chance of succeeding, and would benefit uptake and adoption?

This question was approached through a specific 3-step method.

Step 1. Groups were asked to write each activity/issue from the list onto different coloured Postits:

- Yellow for activities that could be carried out directly by the CPP
- Green for activities that the CPP would advocate other organisations should carry out.

Getting the issues onto 'Postits' prior to making a matrix

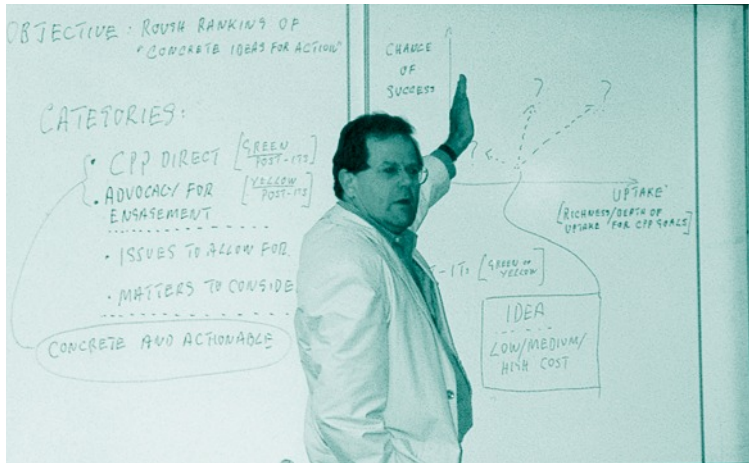
Step 2. The Postits were to be placed by groups on a matrix with a vertical axis labelled 'Chance of success' and a horizontal axis labelled 'Uptake'. 'Uptake' signified the group's perception of the impact that a successful addressing of the issue (or implementation of the change) would have on uptake of CPP research findings by target beneficiaries (either intermediate or end-users). 'Chance of success' represented the group members' subjective assessment of how likely it was for a particular issue to be successfully addressed. For example, specific suggestions might be judged as having a better chance of success than general 'wishes', matters largely within CPP's control might be judged as having a better chance of success than initiatives that depended on securing the cooperation and commitment of other players, but where the cooperation of other

Reshuffling the groups led to lively discussions

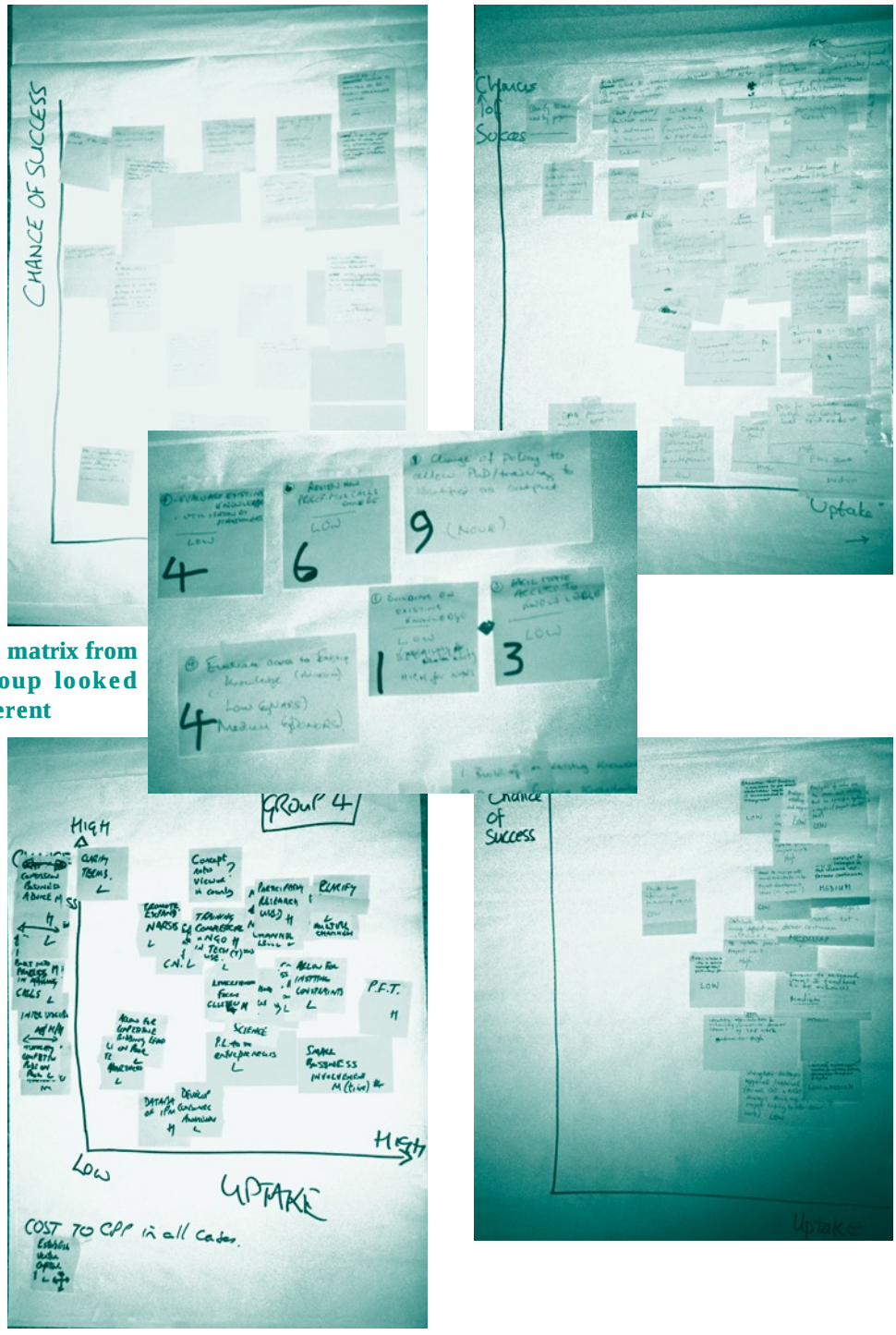
players was required chances of success might still vary with the strength of perceived interests or difficulties that had to be overcome. This Activity led to a rough and ready clustering of activities/issues. Those which were clustered in the top right hand corner were the ones considered by group members to be worth immediate consideration for action. However, in introducing the exercise, Professor Kydd noted that, in other organisations where the technique was used, managements had learnt not to ignore activities or suggestions just because groups had discarded them in the bottom left-hand corner of the graph. Occasionally, the most innovative and fruitful suggestions had met with considerable scepticism during such exercises!

Step 3. Groups had to decide which things were in the top right-hand corner of the matrix. Because boundaries were fuzzy, some groups might have had nothing very clearly in the top right-hand corner, but they had to decide on importance for action and 'draw the line'.

Once the decision had been made groups could proceed to Activity 4



Explaining the theory behind the matrix



The final matrix from each group looked very different

Facilitator activity

The facilitators collected each group's top right-hand corner Postits and determined whether there was any degree of consensus appearing. The facilitators' analysis was presented in a plenary session.

Facilitators overview of all the 'top right-hand' corner issues from the Postit matrices, with indications of the level of costing (in bold) likely to be involved.

Topic	Costs	Postits		Times mentioned by groups
		Green	Yellow	
External relations/partners				
Contribute to building capacity, using different mechanisms in various institutions, to contribute to uptake through project work, PhDs, etc.		x	x	3
Advertise funding available for pre-project stakeholder meetings	**Low**	x		2
Encourage partners to select CPP	**Medium**	x		1
Employ a mentor (Regional Coordinator) to help and advise networks/ national programmes in adoption/utilisation for 5 years after a project	**High**	x		1
Set up and promote access to databases on particular problems	**Medium**	x		1
Programme development				
Realign country focus to match that of bilateral donors		x	x	1
Incorporate social scientists into teams as equal partners		x		1
Allow for institutional constraints to uptake; fund investigation of institutional problems; pilot institutional fixes for possible scaling-up		?	?	1
Analyse who are the poor, and relate this to specific systems and regions		x	x	1
Fund pre-call identification of demand (e.g., needs assessment, programme development)	**Low/Medium**	x		
Develop clear statements about the types of poor people being targetted as beneficiaries of CPP research (consumers, labourers, producers, etc.)		x		1
Specific measures to improve uptake				
Mass media to be used to stimulate farmer/farmer communication, articulation of demand by farmers, and stimulation of policy development		x	x	1
Participatory research should be used to stimulate/facilitate linkages and communication		x		1
Build on existing knowledge, promote existing knowledge, facilitate access to knowledge		x	x	1
Act as catalysts to forge better linkages in the research–extension–farmers continuum		x	x	1
Wild card				
Provide venture capital				

Activity 4

Within the same groups the participants then proceeded to answer the final question:

Question 3b. What specific measures can the CPP take to address the issues identified as needing immediate consideration for action?

The groups looked at the issues/activities they had identified and made detailed proposals for action on individual issues. These proposals were presented and briefly discussed in a final plenary session.

Pulling the threads together in the final group discussion

Group 1 Proposals on individual issues

Analysis of who are the poor

Approach

- When — pre-project and during project
- By whom — CPP and original or secondary sources (CPP to coordinate)
- How — monitoring by project
  - — use of indicators (need criteria)
  - — by assuming eligibility for technology
  - — are the poor able to adapt their pest-management techniques

Build on existing knowledge and facilitate access to knowledge

- Assess information needs and availability
- Ensure that partners, networks and disseminators know what is available from existing publications and indigenous knowledge
- Invest in presentation of information, particularly local presentation capacity

Act as catalyst to forge links in farmer-extension-research continuum

- Sensitisation of extension and research administrators
- Analysis of links is important criterion for project operation
- Farmer participatory research

Projects should be longer (and better integrated)

- Improved monitoring will be required
- Transparency in the competitive tendering process must be maintained
- There will be implications for funding procedures
- Encourage phasing of projects
- CPP needs to take long-term strategic view
- Issue is not timing, but rather sustainability

Group 2 Proposals

Use of multiple channels of communication

- CPP and projects to encourage use of local radio, press, TV (ensures local language dissemination)
- Regional Coordinator to provide information on media contacts
- Make reporting requirements part of projects
- Provide media consultants to advise at various stages of projects

Participatory research

- Provision of farmer field schools at project cluster level
- Provide PLs with guidelines on existing participatory tools
- Facilitate linkages

Provide contracts for uptake

- There is in-country capacity for this work, that should be considered for commissioning

Regional Coordinator (or similar mechanism)

- Terms of reference need to be developed

Terms of reference for each project should include uptake issues

In-country concept notes

- One-off training in how to prepare is not enough
- Long-term support from Regional Coordinator is needed

Provide training for commercial operators and NGOs in use of new technologies

Look for opportunities for collaborative projects with commercial sector and NGOs

Group 3 Proposals

- Although funding is already available for pre-project development, many PLs are unaware of it. Funding should be made more widely understood
- Databases should be established to share information
- PLs should be better informed about how demand is identified before calls are sent out
- Project Mentors should be commissioned to take on responsibility for promoting research products after the end of a project in some cases. Possibilities may be a Regional Coordinator/communication experts, or draw-down contracts. Mentors might also assist in needs identification.
- Exploit intermediate partners for the CPP, particularly through greater collaboration with bilateral projects, as generators of demand, sources of information and users of CPP outputs.
- CPP should seek further crosscutting opportunities with other DFID RNR programmes, e.g., between CPP, the Crop Post-Harvest Programme (CPHP), and the Plant Sciences Research Programme (PSRP).

Group 4 Proposals

Planning poverty targetting

- There would be a higher chance of successful poverty targetting and impact from closer coordination between DFID, CPP, and country programmes
- Determine the unit of analysis, e.g., geographical or some other system?
- Determine criteria: can existing projects be used?
- Involve separate project(s) linked to CPP and other institutions, e.g., International Centre for Research in Agroforestry (ICRAF) and International Service for National Agricultural Research (ISNAR)
- Outcome — identification of CPP impact on poor

Commission business advice

- Use previous experience, e.g., successful commercialisation of nuclear polyhedrosis virus (NPV) for control of lepidopteran pests in South Asia

Establish venture capital fund

- DFID is already involved
- CPP to consult DFID and other donors with experience in this field

Facilitate project leaders

Cross-cutting factors for all projects

- Ethical issues
- Pro-people issues
- Gender issues

Use mass media/multiple channels to disseminate outputs

- Get PLs and others to coordinate and interact with mass media and other channels (needs analysis of target groups, e.g., the BBC have very detailed knowledge of their different listener groups, may be something could be learned from them). Match this with other donors' efforts
- Training/incentives/milestones/choice of partners
- CPP to consider formalising communication advice, e.g., by providing guidelines or consultants to projects

Participatory research methods

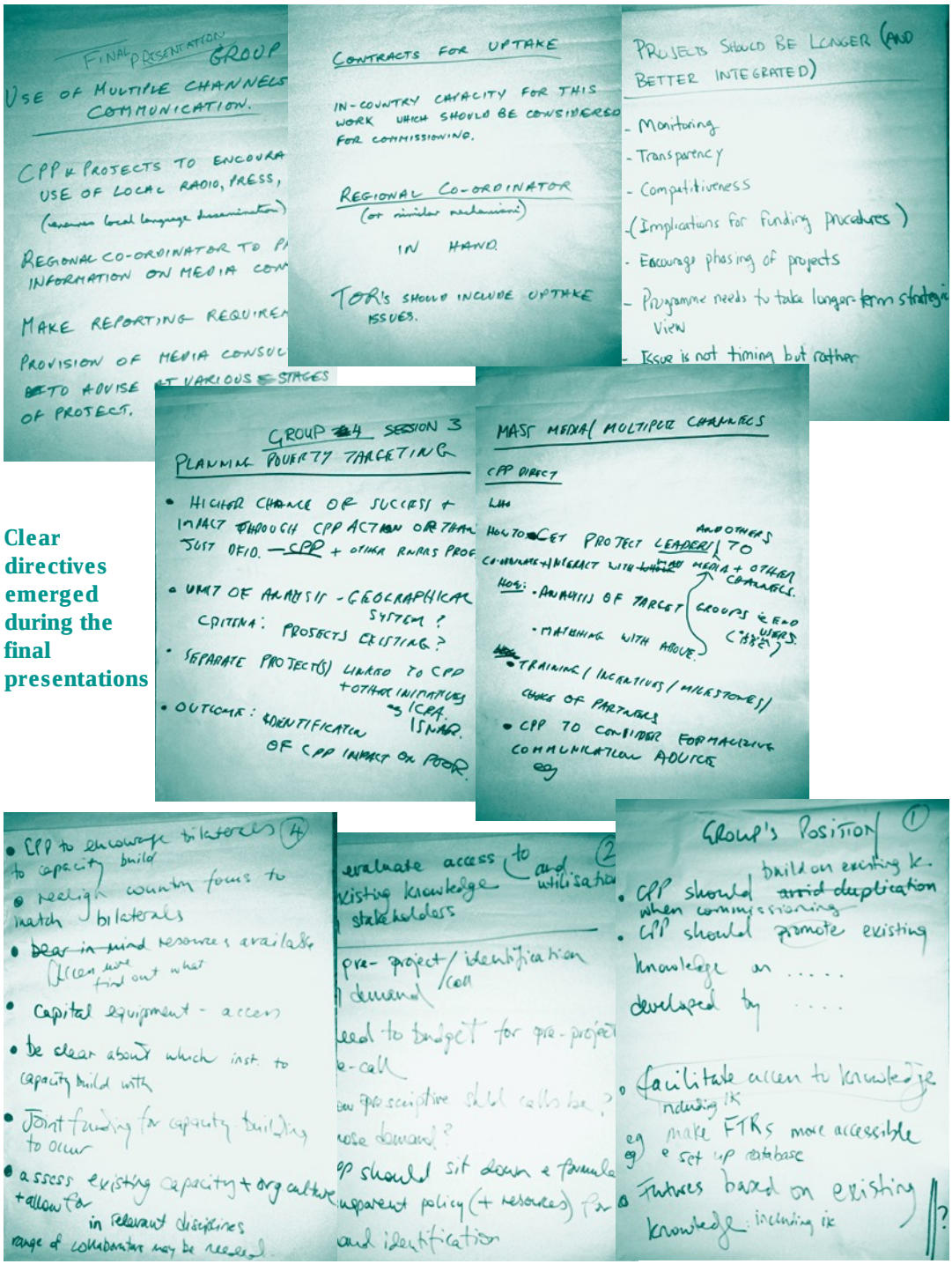
- Best practice guidelines for terminology are needed
- Ensure people skills in project teams
- Develop people skills in project teams (implication/for long-term budget and commitment)
- Choice of appropriate partners (process management not to be underestimated)

Participatory farmer training

- Needs CPP direct action
- Linked to participatory research
- Validation of approach
- Can amalgamate knowledge outputs from many projects/sources
- Local engagement vital
- Involve those with good track records.

Final group discussion in Activity 4

Clear directives emerged during the final presentations



Closing address

S.J. Eden-Green

Friends and colleagues, thank you all for your very active participation in this workshop and for the efforts that many of you put into the specific uptake studies that provided much of the groundwork for our deliberations. The meeting produced many interesting ideas and useful suggestions and our next task will be to consider how to take this forward, both in terms of actions that we can implement within the Crop Protection Programme (CPP) and ways that we can try to influence others — towards addressing factors too often consigned to the important assumptions column of programme and project planning frameworks.

It seems to me that there are three areas where we can attempt to implement conclusions from this workshop:

- Actions to improve promotion of existing programme outputs
- Actions to improve uptake/impact of existing projects
- Actions to improve/influence new or pipeline projects or calls for proposals.

The last point is more strategic and is where I would see the greatest need for the CPP and others to respond to advocacy actions and recommendations.

It is important to recognise that the CPP is essentially a single-sector programme charged with delivering specific knowledge and promoting its application to crop protection problems affecting development. Maybe this narrow focus on pest management needs to change and we need to become more people- and livelihood-focussed, in which case we shall look to further interactive processes, of which this workshop is the start, to provide strong advocacy messages both for programme management and for others.

I think the others are particularly important, as I am conscious that the CPP has limited resources and specialist skills. The concept of a strategy for renewable natural resources research, if it is still valid, is to integrate sectoral skills and knowledge to produce impact on developmental goals. We recognise that successful uptake, i.e., the achievement of impact depends not only on the effective identification of demand and generation of appropriate knowledge, but also on the many other pressures, constraints, and priorities that affect the daily lives of those who stand to benefit from it. Are the individual component research programmes necessarily best placed to achieve uptake?

Considerable efforts are going into livelihoods analyses and to the identification and analysis of poverty issues, and perhaps these will translate into projects that seek to take a more holistic approach to address constraints that contribute to poverty. I believe that the research programmes can be more effective if we can

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all relate to such initiatives and ideally can respond to common demands. Thus we need not only to better communicate what we have to offer, but also I think, to send clear messages to those able to take a more holistic view of livelihoods and how to improve them.

I recall one of my earliest experiences of working overseas more than 25 years ago, when I attended an annual meeting of a growers' organisation in which the majority of participants were smallholder farmers. I was there as part of a team that was trying to control a disease that was threatening, quite literally, to wipe out their crops. The local Minister of Agriculture rather proudly drew attention to the skill with which his department had been able to attract considerable external resources to work on the problem. Having heard him, with well practiced rhetoric, work up his audience to express their appreciation for these efforts to contain the disease, imagine our dismay when cries of, 'Give us better roads, better schools, better prices', went up from the back of the hall! For me, the message from this very early induction into livelihoods analysis was clear. Successful uptake of research is most likely to occur when issues such as roads, education, and markets can also be addressed. But had we waited for this happy coincidence of events, the cause of that disease would still be unknown and the (ultimately successful) efforts to develop and promote disease-resistant varieties that allowed farmers to continue in production might never have taken place.

Conclusions

From the final plenary session the following themes emerged, many of which are applicable across the DFID Research Strategy programmes, and are not exclusive to CPP.

- Value of the research programmes contributing to capacity building of institutions through formal and informal training
- Value of clear availability of funding for pre-project preparatory / stakeholders meetings
- Economies of scale that could be gained with better access and exchange of information with geographic programmes and other players (to include databases)
- Agreement that many outputs and much existing knowledge (indigenous and otherwise) are already available and should be further promoted
- Enthusiasm for some form of regional representation to promote closer links with in-country demand, uptake pathways, and monitor post-project sustainability
- The need for some form of venture capital to be made available for start-up costs of small businesses as uptake pathways for research outputs (or better links to existing initiatives within DFID)
- The scope for cross-programme (Geographic — Research Strategy) cooperation in identification of demand.

Outcomes

J.M. Lenné

Introduction

Following the meeting Crop Protection Programme (CPP) Management made a presentation at the Department for International Development (DFID) Natural Resources Advisers Conference (NRAC/2000) held in London, 10–14 July. This was the first time that research was on the agenda in a session entitled, 'Challenges for the RLED professional group: what are they and how will we meet them?'. Under the theme 'How to improve uptake and impact of the RLD research programme' J.M. Lenné and J. Palmer made the following presentation on uptake and promotion.

Presentation to NRAC/2000 on factors affecting the uptake and adoption of crop protection research outputs

Background

The Revised DFID Research Strategy places greater emphasis on promotion of research outputs. Towards these ends, the CPP commissioned seven short uptake studies in late 1999 in priority cropping systems in South Asia and Sub-Saharan Africa. These studies were presented and discussed at an interactive, multidisciplinary workshop in June 2000.

Main aims of workshop

- Identify common factors affecting uptake of research outputs
- Assess which factors the CPP could realistically address
- Formulate specific measures for the CPP to enhance uptake of research outputs

General observation

Main factors affecting uptake were relevant across research programmes.

General issues

How to enhance the focus on poverty alleviation?

- Analyse how different technologies benefit the poor
- Identify which categories of the poor can access and are likely to use pest management technologies
- Determine the role of research in livelihood programmes—poverty mapping and monitoring

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Presently International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patanacheru 502 324, Andhra Pradesh, India.

How to build and broaden effective partnerships for uptake?

- Foster an uptake environment (awareness, interest, etc.) from project initiation
- Expand use of participatory research techniques
- Develop systems for monitoring uptake–adoption–impact pathways, determine the role of research programmes
- Learn from successful and unsuccessful examples
- Contribute to capacity building through formal and informal training
- Act directly or as catalysts to foster better linkages along the research–extension–farmer uptake continuum
- Establish regional coordination mechanisms for promotion across DFID programmes with common geographical focus
- Analyse institutional constraints to uptake including the role of research programmes

Critical issues

Expected balance between knowledge generation and promotion of existing knowledge

- Enhance efforts to promote appropriate existing knowledge at the expense of generating needed new knowledge?
  — Re-package and promote existing knowledge
  — Integrate existing with new knowledge for enhanced uptake
- What are the boundaries to research programme involvement in promotion?

How to develop appropriate commercial links and identify marketing opportunities for uptake?

- Develop operational guidelines for private–public sector partnerships
  — role of research programmes?
- Establish venture capital funds for start-up costs for small businesses as part of uptake pathways
- Link with entrepreneurs and partners with understanding of market mechanisms
- Identify opportunities for technology development that do not conflict with and/or stimulate rural employment

How can research programmes influence the policy agenda?

- Identify key linkages for influencing policies affecting poor people's access to research outputs
- Develop recommendations for changes in policy—role for research programmes?

What are the best mechanisms/tools for enhancing uptake of research outputs?

- Analyse how farmers gain access to knowledge in order to enhance project targetting and uptake
- Build field demonstrations, school visits, community theatre, etc., into projects
- Encourage projects to develop culturally appropriate media (local language posters, leaflets, comics, songs, etc.)
- Use mass media (newspapers, radio, television) to promote research outputs.

Task Force

During the June meeting participants recognised that, because of time limitations workshop facilitators were able to summarise only a few of the actions that were regarded by all the groups as having both the highest chances of success and greatest impact on uptake. Others were not discussed in detail, and these needed to be re-examined. CPP Management thus decided to commission a Task Force that would translate the main conclusions of the workshop into an Action Plan that would enable them to take practical steps to improve uptake and impact.

The objectives and terms of reference for the Task Force were:

- To review and summarise the issues arising from the CPP workshop. The proceedings and the flip charts will be available to the Task Force. Consultation with key personnel, and in particular CPP Management, will also be required.
- To identify and prioritise practical recommendations/actions which can be taken by the CPP in the short to medium term (2–5 years)
- To identify and prioritise practical recommendations/actions that will require advocacy to other agencies (i.e., DFID, Ministries, other Donors, etc.)
- To prepare a summary of the first two points together with a detailed and costed Action Plan on each of the key issues that can be used by the CPP
- Indicate concrete opportunities for uptake for 5–6 projects (possibly following up the Uptake Studies)

Proposals for the Task Force were subsequently invited from all the participants under a call that went out in July. One multipartner proposal was received and the Task Force is expected to report early in 2001.

Appendix 1. Further reading

This section lists the Final Technical Reports for each project presented at the meeting, copies of which can be obtained on application to:
The Programme Manager, Natural Resources International Limited, Pembroke, Chatham Maritime, Kent ME4 4NN, UK.

Authors were invited to propose ten key references pertinent to their projects. These are presented as an alphabetical listing. They include a number of unpublished internal reports, copies of which can be obtained from the authors.

Note Coloured numbers after each entry denote the relevant project presentation.

Final Technical Reports

R7504 (ZA0354)

KENYON, L. and FOWLER, M. (2000) Study of factors affecting the uptake and adoption of outputs of crop protection research on yams in Ghana. Natural Resources Institute (NRI), University of Greenwich, Chatham, UK. **1**

R7512 (ZA0357)

ASABA, J.F. (2000) Factors affecting uptake and adoption of outputs of crop protection research in peri-urban vegetable systems in Kenya. CAB International, Africa Regional Centre, Nairobi, Kenya. **2**

R7513 (ZA0358)

MASLEN, N.R. and ILES, M.J. (2000) Factors affecting uptake and adoption of outputs of crop protection research in vegetable systems in India, Bangladesh and Nepal. Natural Resources Institute (NRI), University of Greenwich, Chatham, UK. **3**

R7489 (ZA0347)

OVERFIELD, D. (2000) Study of factors affecting the uptake and adoption of outputs of crop protection research in maize systems in Eastern Africa. Natural Resources Institute (NRI), University of Greenwich, Chatham, UK. **4**

R7488 (ZA0346)

GOWEN, S., ARINAITWE, M., ASABA, J.F., BAGAMBA, F., LAMBOLL, R., ROBINSON, E., RUTHERFORD, M., SSEMWANGA,J., TUSHEMEREIRWE, W., KATUNGI, E., APOLO, K. and SALI, M. (2000) Study of factors affecting the uptake and adoption of outputs of crop protection research in banana-based cropping systems in Uganda. The University of Reading, Reading, UK. **5**

R7561 (ZA0367)

HOLDERNESS, M. (2000) Factors affecting the uptake and adoption of crop research in rice systems in West Africa. CABI Bioscience UK Centre, Egham, UK. **6**

R7576 (ZA0379)

CORK, A. and WHITE, J. (2000) Factors affecting uptake and adoption of outputs of research in rice systems in India. Natural Resources Institute (NRI), University of Greenwich, Chatham, UK. **7**

R7500 (ZA0352)

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AIYEDUN, E. and ATOBATELE, J. (1995) Multivariate probit analysis of selected factors influencing technology adoption among farmers in Kogi and Kwara States of Nigeria, *Agricultural Systems in Africa* **5**: 51–56. **1**

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CHAMBERS, R., ARNOLD, P. and THRUPP, L.A. (Eds.) (1989) *Farmer first: farmer innovation and agricultural research*. Intermediate Technology Publications Ltd., London, UK. 218 pp. **2**

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DASGUPTA, P. and STONEMAN, P. (Eds.) (1987) *Economic policy and technological performance*. Cambridge University Press, Cambridge, UK. **2**

DAVIS, J. (1999) Study of factors affecting the uptake and adoption of outputs of crop protection research in maize systems in Eastern Africa: literature review. Report R7489. Natural Resources Institute, Chatham, Kent, UK. 39 pp. (Unpublished) **4**

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Appendix 2. Acronyms

AERDD	Agricultural Extension and Rural Development Department (University of Reading, UK)
AHI	African Highlands Initiative
AHP	Animal Health Programme (DFID)
AKIS	Agricultural Knowledge and Information System
AME	Agriculture, Man, Ecology (Netherlands/India)
ARI	agricultural research institute
ASARECA	Association for Strengthening Agricultural Research in Eastern and Southern Africa (Uganda)
BARNESA	Banana Research Network for Eastern and Southern Africa (Uganda)
BAT	British American Tobacco
BCKV	Bidhan Chandra Krishi Viswavidyalaya (India)
BS	benchmark site
BUCADEF	Buganda Cultural and Development Foundation (Uganda)
CABI	CAB International (UK)
CAPSARD	Community Action Programme for Sustainable Agriculture and Rural Development (Ghana)
CBO	community-based organisation
CEAPRED	Centre for Environmental and Agricultural Policy Research, Extension and Development (Nepal)
CGIAR	Consultative Group on International Agricultural Research (USA)
CIAT	Centro Internacional de Agricultura Tropical (Colombia)
CICR	Central Institute for Cotton Research (India)
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo (Mexico)
CIP	Centro Internacional de la Papa (Peru)
CN	concept note
CORAF	Conference des responsables de recherche agronomique africains (Senegal)
CPP	Crop Protection Programme (DFID)
CPHP	Crop Post-Harvest Programme (DFID)
CRF	Coffee Research Foundation (Kenya)
CRI	Crops Research Institute (CSIR, Ghana)
CSD	Crop Services Department (MoFA, Ghana)
CSIR	Council for Scientific and Industrial Research (Ghana)
CWS	Centre for World Solidarity (India)
DAE	Department of Agricultural Extension Services (MoFA, Ghana)
DBM	diamond back moth
DDS	Diocesan Development Service (Nigeria)
DFID	Department for International Development (UK)
FAO	Food and Agriculture Organization of the United Nations (Italy)
FAOR	Food and Agriculture Organization (Regional Office for Agriculture)

FFS	farmer field school
FLS	front line staff (DAE, Ghana)
FORIG	Forest Research Institute of Ghana
FRI	Food Research Institute (Ghana)
FTR	Final Technical Report (DFID programmes)
GAEC	Ghana Atomic Energy Commission
GBPUAT	G.B. Pant University of Agriculture and Technology (India)
GDP	gross domestic product
GGDP	Ghana Grains Development Project
GoK	Government of Kenya
GoU	Government of Uganda
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (Germany)
ICAR	Indian Council of Agricultural Research
ICIPE	International Centre for Insect Physiology and Ecology (Kenya)
ICM	integrated crop management
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics (India)
ICRA	International Centre for Development-Oriented Research in Agriculture (Netherlands)
ICRAF	International Centre for Research in Agroforestry (Kenya)
ICT	information and communication technology
IDRC	International Development Research Centre (Canada)
IFAD	International Fund for Agricultural Development (Italy)
IITA	International Institute for Tropical Agriculture (Nigeria)
IITA-ESARC	International Institute for Tropical Agriculture-Eastern and Southern Africa Regional Centre (Uganda)
INGER	International Network for the Genetic Evaluation of Rice (Philippines)
INIBAP	International Network for the Improvement of Banana and Plantain (France)
IPGRI	International Plant Genetic Resources Institute (Italy)
IPM	integrated pest management
IPMTF	integrated pest management task force (WARDA)
IPMWG	integrated pest management working group (WARDA)
IPR	intellectual property rights
IRM	insecticide resistance management
ISNAR	International Service for National Agricultural Research (Netherlands)
ITK	indigenous technical knowledge
KARI	Kenya Agricultural Research Institute
KEPHIS	Kenya Plant Health Inspection Service
KIOF	Kenya Institute for Organic Farming
KNUST	Kwame Nkrumah University of Science and Technology (Ghana)
LC	local councillors (Uganda)
LPP	Livestock Production Programme (DFID)
MEIST	Ministry of Environment, Industry, Science, and Technology (Ghana)
MoFA	Ministry of Food and Agriculture (Ghana)
MOALDM	Ministry of Agriculture, Livestock Development, and Marketing (Kenya)
MoU	Memorandum of understanding

NARES	national agricultural research and extension service
NARO	National Agricultural Research Organisation (Uganda)
NARS	national agricultural research system
NARSIS	Natural Resources Information System (DFID)
NARSP	National Agricultural Research Strategy Plan (Ghana)
NGO	non-governmental organisation
NIRD	National Institute for Rural Development (India)
NIE	New Institutional Economics
NRI	Natural Resources Institute (UK)
NRIL	Natural Resources International Limited (UK)
NRSP	Natural Resources Systems Programme (DFID)
ODA	Overseas Development Administration (now DFID)
ODI	Overseas Development Institute (UK)
OPRI	Oil Palm Research Institute (Ghana)
PAC	Programme Advisory Committee (DFID programmes)
PCPB	Pesticide Control Products Board (Kenya)
PCSS	Project Completion Summary Sheet (DFID programmes)
PGRC	Plant Genetic Resources Conservation Unit (Ghana)
PL	project leader
PMF	Project Memorandum Form (DFID programmes)
PPMED	Policy, Planning, Monitoring, and Evaluation Department (Ghana)
PPRSD	Plant Protection and Regulatory Services Department (MoFA, Ghana)
PRA	participatory rural appraisal
PRP	Policy Research Programme (DFID)
PSRP	Plant Sciences Research Programme (DFID)
PVS	participatory variety selection
RAAKS	Rapid Appraisal of Agricultural Knowledge Systems
RELC	Research–Extension Linkage Committee (Ghana)
RKM	Rama Krishna Mission (India)
RKMLSP	Rama Krishna Mission Lokasiksha Parishad (India)
RNR	renewable natural resources
RNRKS	Renewable Natural Resource Knowledge Strategy (DFID now RNRRS)
RNRRS	Renewable Natural Resources Research Strategy (DFID)
ROCARIZ	Réseau ouest et centre africain du riz (West and Central Africa Rice Research and Development Network) (Côte d'Ivoire)
RPF	resource-poor farmer
RPG	resource-poor grower
SACDEP	Sustainable Agriculture and Community Development Programme (Kenya)
SARI	Savanna Agricultural Research Institute (CSIR, Ghana)
SRI	Soil Research Institute (CSIR, Ghana)
SUP	Safe Use of Pesticides (Kenya)
SWOT	strengths, weaknesses, opportunities, and threats
TA	technical advisor
TF	task force
UCC	University of Cape Coast (Ghana)

UDS	University of Development Studies (Ghana)
UKRB	United Kingdom research base
UNBRP	Uganda National Banana Research Programme
UNDP	United Nations Development Programme
UNFA	Uganda National Farmers Association
USAID	United States Agency for International Development
UWTPM	Uganda Women's Tree Planting Movement
VEDCO	Volunteer Efforts for Development Concerns (Uganda)
WARDA	West African Rice Development Association (Côte d'Ivoire)
WB	World Bank

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The Research Project Cycle

Identification of demand Confirmation of demand by Programme Management Team, in response to beneficiaries or representative organisations.

Call for proposals issued If appropriate to the objectives of the programme, a call for proposals is issued by the Programme Manager (PM). Call sent to a register of institutions in UK and overseas; call announced on the Natural Resources International Ltd. (NRIL)/Crop Protection Programme (CPP) website and through other media.

Concept Notes submitted Proposers submit a Concept Note (CN) by a deadline specified in the call. CNs must be endorsed by project partners and supported by appropriate evidence of demand.

Concept Notes reviewed Programme Management Team screens proposals (including any outside of calls) for basic acceptability, technical soundness, and appropriateness to the call. Acceptable CNs sent to appropriate Technical Advisor(s) (TAs) for comments. All acceptable CNs and TAs' comments sent to appropriate members of the Programme Advisory Committee (PAC) for peer review. Where there is any doubt as to how Programme Management should proceed a decision is postponed pending discussion at the next PAC meeting (generally PAC meetings are held four times a year).

Proposers notified Programme Management, guided by PAC's advice and the programme's objectives, approves appropriate CNs. Programme Management then informs successful proposers, providing them with either copies of reviews or a summary of the reviewers' comments and inviting them to submit a detailed Project Memorandum Form (PMF) by a deadline. Unsuccessful applicants are notified in writing.

Project Memorandum Forms submitted Proposers respond to reviewers' comments and submit detailed proposals (PMFs) to the Programme Manager by a specified deadline. PMFs require evidence that social science, biometrics, environmental as well as technical issues have been addressed, and that the necessary agreements will be in place between the project partners.

PMFs reviewed Programme Management send the PMF together with a summary of the reviews of the CN to PAC members or external reviewers requesting a further review. If a consensus is not achieved Programme Management will raise for discussion at the next PAC meeting.

Proposers notified Programme Manager, guided by PAC's advice and in consultation with TAs, will take the final decision on approval and level of funding. Project memoranda may be returned for revision and are sometimes sent for further review. Projects assigned to appropriate TA for technical monitoring.

Contracts issued Final agreement on budget, activity schedules, costings etc. by the Project Management Office (PMO).

Project begins The Project Leader is contractually accountable for delivering project outputs within agreed budget and timetable (though project design can be renegotiated during the project through discussion with TAs and Programme Manager).

Milestones and Spending Forecast Form submitted A schedule of activities (milestones) and spending forecasts is agreed with the Programme Manager for the first quarter ahead, within 2 weeks of contract being signed. Milestones and forecasts copied to TAs for technical monitoring.

Quarterly Reports submitted Project Leaders must submit very short quarterly reports against the milestones. This allows any implementation problems to be addressed as early as possible. PMO and TAs monitor reports and interact with management to support progress.

Annual Reports submitted Project Leaders submit annual reports against their output and purpose indicators. The project logframe may be renegotiated at this time with the Programme Manager, in consultation with TAs.

Project Completion Summary Sheet and Final Technical Reports submitted At the end of the project, Project Leaders submit a Final Technical Report (FTR) which details the research activities, the outputs of the project, uptake pathways and any follow-up action /research needed to promote the research findings. Projects submit a short Project Completion Summary Sheet (PCSS) summarising key end-of-project information for administrative purposes. FTRs are reviewed by TAs, PM and/or independent reviewers and after amendment are sent to DFID, to project partners and others recommended by project partners and reviewers. Copies of FTRs provided to others on request.

Note: This is an idealized version of the cycle, in reality there are many more potential feedback loops, e.g., external expert consultations, Project Leader changes to proposals, resubmission to PAC, etc.

DFID Department for International Development

CPP Crop Protection Programme

With compliments from the
DFID Crop Protection Programme

This publication has been provided free with funding from the UK Department for International Development (DFID) under the Crop Protection Programme (CPP) or other donors.
In order to maintain this service we would appreciate your views on the value of this publication and, where appropriate, or the project(s) to which it relates.

Publication title

Sustaining change: proceedings of a workshop on the factors affecting uptake and adoption of Department for International Development (DFID) Crop Protection Programme (CPP) research outputs

Publication number ISBN 0-9539274-0-7

Reader's Questionnaire

We would be grateful if you would take time to complete the following short questionnaire or pass it on to colleague(s) who may find the publication useful.
Completed copies should be returned to:

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Crop Protection Programme
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Further information about the CPP can be found at: www.nrinternational.co.uk

1. Name ..... (M/F)

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3. Institution/Company/Organisation .....

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   Phone ..... *Fax* .....

   .....

5. Type of organisation

   International NGO ☐ *Education* ☐ *International Institute* ☐

   National / Local NGO ☐ *Government* ☐ *National / Local Institute* ☐

   Other (please specify) .....

6. What are your main roles and responsibilities?

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   Other (please specify) .....

7. What is your main area of interest?

   Applied Crop Protection ☐ *Other Scientific Research* ☐

   General Agricultural Development ☐

   Other (please specify) .....

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   Other (please specify) .....

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Yes ☐ *No* ☐

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Yes ☐ *No* ☐

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15. How do you think that the work described in this publication is likely to have impact on the problem(s) to which it relates?

Little or not at all ☐

Helps improve awareness of problems ☐

Provides information that may be useful to scientists or development specialists ☐

Provides practical suggestions or solutions for farmers or consumers ☐

Provides practical suggestions for policy makers ☐

Other (please specify)

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