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Piloting an adaptive research process to address farmer's information gaps

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Abstract

The project "Linking demand and supply of agricultural information" is piloting an adaptive research process in Tororo and Arua Districts that broadens research to include information such as economic benefits, risk assessment, labour considerations, input availability and markets. Four multi-institutional teams are involved. These address local priorities identified through NAADS. The process assesses available information against a check-list and farmer information demands, and addresses gaps through research with farmer groups. Comprehensive, user-friendly extension materials are then produced, incorporating the technical and socio-economic information required by extension service providers and farmers. Pigeon-pea pest management and marketing, and the uses and benefits of draught animal power, are taken as examples. For the case of pigeon pea, current extension materials recommend unavailable pesticides, and have no information on new varieties, botanical pesticides, marketing or location-specific agronomic practices. Information gaps include: efficacy of botanicals, economics of new varieties, international and local markets, soil management, storage methods and how to set up Producer Associations. A factorial trial with farmer groups, comparing botanical with inorganic pesticides, and a market investigation, have been initiated. For drought Animal power, information gaps include costs of DAP planting and weeding compared to human labour, local suitability of implements, mechanisms for group sharing of draught animals and implements, implement procurement costs and channels, training of animals and farmers, and impact of DAP on labour markets. To address these, two activities are underway: a) participatory on-farm trials to test DAP planters and the weeders; b) workshops with farmer groups to discuss sharing implements and draught animals. The work demonstrates many gaps in information available to service providers and farmers, and how these can be tackled. The process described can be applied across contrasting types of technology and ecological conditions. However, it requires rigour in its application, and resources for coordination, field supervision and documentation.

Key words: Extension materials, farmer participation, institutionalisation, technology options

Introduction

There is general agreement on the need to develop appropriate technologies in response to farmers' needs and opportunities. However, the results of most scientific research are dominated by technical considerations, and often do not include key information that farmers need in order to make informed decisions on uptake. Such information includes: the economic viability of a technology, the risk involved, the resources required to adopt the technology (land, labour, capital, materials, skills), the local availability of inputs, mechanisms for realising the benefits of technologies at a group level, and the availability and characteristics of local and distant markets.

The research project *"Linking demand for and supply of agricultural information in Uganda"* (see Box 1) is currently piloting a novel adaptive research process, in collaboration with Ugandan stakeholders, including Farmer Groups, NAADS, NARO, Makerere University, private-sector service providers, NGOs, and the COARD project, that identifies and addresses the gaps in the information that farmers need.

This paper describes the emergence of the process, its conceptual and methodological features, and the initial experiences and findings.

In Uganda, the Agricultural Research and Development Centres (ARDCs) under the Outreach programme of NARO had a mandate to test and adapt research outputs from the national agricultural research institutes to the conditions in each agro-ecological zone (National Agricultural Research Organisation, 2003). However, this adaptive research has been mostly limited to the testing of the biological performance of the technologies under local conditions. Similarly, under the new National Agricultural Research Policy (Government of Uganda, 2004), some ARDCs will be re-designated as Zonal Agricultural Research Institutes with the objective *"to manage and carry out agricultural*

Box 1 Basic features of the Linking project

Title:
Linking demand for and supply of agricultural information in Uganda

Lead agency:
Natural Resources Institute, University of Greenwich, Chatham Maritime, Kent ME4 4TB, UK

Duration and budget:
25 months (February 2003 – March 2005), 215,871 GBP

Main partners:

- NAADS (secretariat level, district and sub-county level in Tororo and Arua)
- NARO (secretariat level, Abi and Serere ARDCs)
- Makerere University (Department of Agricultural Extension Education)
- NGOs (Africa 2000 Network, CEFORD)
- Private service providers in Tororo and Arua districts
- CIAT, IITA and University of Reading, UK (advisory role and supervision of students)
- Farmer groups in Tororo and Arua Districts

Donors:

- Crop Protection Programme and Livestock Production Programme of DFID

Outputs:

1. Improved mechanisms for identifying **demand** from different types of agricultural users.
2. Improved tools and mechanisms to support the **supply** of appropriate information in forms useful to users.
3. **Validated technology** options, appropriate to local conditions and responding to farmers' needs.
4. **Institutional mechanisms** for integrating supply and demand for information
5. **Documentation and dissemination** of lessons learned to key target institutions within the national agricultural research and extension system of Uganda, and to interested parties outside Uganda

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agricultural research, whether applied or adaptive, for a specific agro-ecological zone".

Some researchers have recently produced extension materials based on their research in the form of flyers and posters with the assistance of the Agricultural Research Information Service (ARIS) and the Client-Oriented Agricultural Research and Development Project (COARD), but many of these materials lacked one or more key types of information needed by farmers.

Table 1 shows the different types of agricultural research currently carried out in Uganda, and the role of the different players. It demonstrates that the production of information materials from research outputs is currently not clearly assigned. The existing system is based on an implicit division of tasks between agricultural research organisations and development agencies, including public and private extension services. It is assumed that research will produce technologies, and document this process through academic papers, reports and journal articles, while agricultural departments, NAADS, the private sector, NGOs, farmers' associations and others will "translate" these findings into information materials for different types of users. This rigid division of tasks ignores the fact that agricultural research and extension are a continuum, and clear boundaries cannot be drawn.

A key challenge for NAADS is enabling access for private service providers to comprehensive, locally-relevant, user-sensitive and up-to-date information that they can pass on to farmers. To that end a cross-institutional (NAADS, NARO Outreach Partnership Initiative, ARIS, COARD, MUK, IITA, CIAT, "Linking" Project) Working Group has evolved to develop and test a set of headings that capture the different types of information that farmers need. However, an extension materials development process that relies entirely on project technical reports proved to be inadequate due to the serious gaps in information available from these sources.

Therefore the need for an adaptive research process emerged that can fill these gaps in knowledge and lead to the development of comprehensive, locally-relevant, and up-to-date extension materials for different types of clients.

Methods

The piloting of the adaptive research process has followed the preparatory steps outlined in Box 2.

Preparatory Step 1: Identification of the pilot topics for testing the process

The process is being tested in Arua and Tororo Districts, chosen because they are contrasting NAADS trailblazing Districts. NAADS has its own process for defining extension priorities. Farmer Groups identify their priority needs, and then these are amalgamated at sub-county level to give the priority enterprises for that sub-county. The project surveyed these priorities in Arua and Tororo Districts, and from them chose a contrasting set of topics that would rigorously test the versatility of the novel adaptive research process. Two livestock and two crop topics were selected, as follows:

1. Internal worm control in goats
2. Integrated pest management in Pigeon pea (Arua), and groundnuts (Tororo)
3. Draught animal power (DAP)
4. Sweet Potatoes (Arua only)

Preparatory Step 2: Formation of multi-institutional teams

Multi-institutional teams were drawn from public, private and NGO institutions and Farmer Groups, such that the resulting teams had a balance between relevant technical expertise, participatory approaches and local knowledge (see Table 2 for details of team composition):

1. The Goat De-worming team: Makerere University, Africa 2000 Network, MUK Veterinary faculty, NRI, Farmer Groups in Tororo and Arua
2. Integrated Pest Management team: Africa 2000 Network, District Agricultural departments, NAADS, CIAT, Farmer Groups in Arua and Tororo
3. Draught Animal Power team: SAARI, PLAN International, Private Service Providers, NARO (SARI), SAIMMCO and Farmer Groups in Arua and Tororo
4. Sweet Potato team: NARO (Abi ZARI), CEFORD, IITA, Farmer Groups in Arua.

Preparatory Step 3*:* Reaching a common understanding with team members on the reasons, aims and methods of the research. A workshop was organised by the Linking Project in December 2003 at Mukono ZARI to introduce and develop the pilot adaptive research process (see Box 3) with team members and other stakeholders. Subsequent to the workshop there was an iterative exchange of correspondence and ideas between project staff and team members that helped to refine understanding between players.

Preparatory Step 4*:* Development of workplans, budgets, reporting procedures and Memoranda of Understanding

At the workshop mentioned above, formats for developing workplans and budgets were introduced to the teams, who subsequently developed these in consultation with project staff. The budgets had a limit of 10 million Ugandan Shilling per technology per District per year. Memoranda of Understanding were drawn up between the project and collaborating institutions, so that the roles, responsibilities and benefits of each partner were clearly identified.

Implementation of a Pilot of the 9-step adaptive research process in Arua and Tororo District

Piloting of the process started in February 2004, and is due to run for the two rainy seasons of 2004. Each team has faced a unique situation, and had to adapt the application of the details of the 9-step implementation process (Box 3) to that situation. However, common methods used across teams are as follows:

1. Implementation Step 1: *Collect information/literature relevant to the technologies:* This was done through interaction with relevant researchers in national research institutes, interaction with backstopping advisers, review of research reports and other documents, and a search of recommendations available from the extension services.

2. Implementation Step 2: *Evaluation of information against fact sheet headings and identify any gaps in knowledge:* The set of guiding headings developed by the Working Group 4 of the Inter-Institutional Working Group on the Coordination of the Development of Agricultural Information Materials was used to evaluate the information gathered and to identify gaps in knowledge relevant to the agro-ecological and socio-economic situation in the two Districts. The fact sheet headings cover technical, social and economic aspects of the technology (including risk, economic benefits, and local market and input situations).

3. Implementation Step 3: Meet with a sample of farmers and service providers to further identify any other gaps in the information needed by them in order to assess and use the technology: Farmer groups were selected for inclusion in the pilot according to criteria that included:

1. They must have selected the topic as a priority enterprise
2. They must be reasonably accessible to enable good monitoring of the research process
3. They must be interested in working with the teams to evaluate the research process, and develop information about the technology

In most cases two farmer groups were selected per research topic per District. Focus group discussions were held with members of the farmer groups about the technology topic to identify gaps in their information.

Implementation Step 4: On the basis of the missing information, design activities that will provide information to fill the gaps (surveys, studies, on-station/on-farm trials

Table 1 Overview of main types of agricultural research activities in Uganda

Box 2 Preparatory Steps in piloting the adaptive research process

1. Identification of pilot topics for testing the process
2. Formation of multi-institutional teams
3. Reaching a common understanding with team members on the reasons, aims and methods of the research
4. Development of workplans, budgets, reporting procedures and memoranda of understanding

Box 3 Steps for implementing the adaptive research process

1. Collect information/literature relevant to the technologies
2. Evaluate that information against the fact sheet headings and identify any gaps in knowledge, bearing in mind that we want to be confident that our recommendations will be relevant to the conditions of the target area
3. Meet with a sample of farmers and service providers to further identify any other gaps in the information needed by them in order to assess and use the technology
4. On the basis of the missing information, design activities that will provide information to fill the gaps (surveys, studies, on-station/on-farm trials etc)
5. Conduct the activities, with the participation of relevant stakeholders
6. Provide feedback to farmer groups and confirm the results of the activities
7. Based on the results, develop draft extension materials in formats useful to service providers and different types of farmers
8. Test the extension materials with farmers and service providers, and modify as necessary
9. Finalise, print and disseminate extension materials

Table 2: Pilot adaptive research teams (team leaders are indicated in bold)

Name	Organisation
Integrated pest management (pigeon pea – Arua; groundnuts – Tororo)	
Dr Fiona Watta	**Africa 2000 Network, Tororo**
Mr Jeam Bamaru	District Production Co-ordinator, Arua
Ms Peace Kankwatsa	CIAT, Kampala
Mr John Ereng	Africa 2000 Network, Tororo
Dr Rob Delve (advisor)	CIAT, Kampala
Sweet potato (testing of new varieties and weevil control)	
Dr Gard Turyamureeba	**Abi ARDC, Arua**
Mr Moses Mbalule	Abi ARDC, Arua
Mr Dickens Agrau	CEFORD, Arua
Dr James Legg (advisor)	IITA / NRI, Kampala
De-worming of goats using Mucuna pruriens	
Dr Francis Ejobi	**Makerere University**
Dr Fiona Watta	Africa 2000 Network, Tororo
Dr Alex Candia	NAADS, Pajuru subcounty
Mr Czech Conroy (advisor)	NRI, Chatham, UK
Draught animal power (ploughing, weeding and transport)	
Mr Francis Agobe	**SAARI, Serere**
Mr Dominic Olege	PLAN International / SG2000, Tororo
Mr Livingstone Oba	Service provider, Offaka sub-county, Arua
Dr David Barton (advisor)	CPI Ltd, UK

etc): Having identified the gaps in information available from research, extension and farmers, one or more activities were identified that would result in the generation of information to fill that gap. In most cases on-farm trials are being used to test technical options under local conditions. The "Mother-baby" trial methodology (Snapp 2003) will be used in some cases. This methodology involves a researcher-controlled multi-treatment experiment conducted at the Zonal Agricultural Research Institute complemented by a series of smaller, simpler trials conducted in collaboration with farmers on their farms. Where the information gap is a social one (e.g. how to organise the rotation of the use of DAP equipment between farmer group members), then cross-visits to groups that have already some experience in sharing resources is appropriate. For financial gaps, surveys of costs, markets and inputs will be used to collect information for cost:benefit analysis and market-decision strategies.

2 Implementation Step 5: Conduct the activities, with the participation of relevant stakeholders: At the time of writing (mid-July 2004), locations and participating farmers have been selected with the community and the teams are in the middle of trials and surveys. Data collection is mainly by the community, with supervision by members of the team, backed up by visits by the specialist advisers to each team. Quarterly reports are provided by each team to the project according to a format that enables progress against the 9-steps to be monitored and assessed.

Results

The pilot testing of the new adaptive research process is ongoing. At the time of writing, the following progress has been made:

1. Sub-county farmer forum priorities surveyed in NAADS sub-counties of Arua and Tororo Districts
2 Four contrasting farmer-priority technical areas identified for piloting the adaptive research process (Worm control in goats, Pest management and market information in Pigeon pea (Arua) and groundnuts (Tororo), Draught animal power, Sweet Potatoes (Arua only)).
3 Multi-institutional teams formed that are drawn from NARO, Makerere University, extension, NAADS, NGOs and private service providers, and supported by international research organisations.
4. Implementation steps 1-4 of the adaptive research process completed and implementation step 5 ongoing.

In order to illustrate how Implementation Steps 1-5 have been carried out, one example from Arua (Integrated Pest Management and marketing of Pigeon Pea) and one from Tororo (Draught Animal Power use and benefits) are presented below:

Results to date from adaptive research on IPM for Pigeon Pea in Arua District

Pigeon pea (*Cajanus cajan*) is a common, but minor, crop in the drier Western part of Arua District. Farmers in Offaka and Uleppi sub-counties have selected the crop as a priority for private service advice. There is particular farmer interest in the yield and income-generating potential of new varieties of pigeon pea (Seppi 1 and Seppi 2), which are of medium-term maturity compared to their long-term local varieties.

Implementation Step 1: *Collect information/literature relevant to the technologies:*
The little literature (one workshop proceedings and one set of guidelines on sustainable agriculture) from in-country studies on Pigeon Pea IPM was collected, and complemented by literature from ICRISAT. The service provider for pigeon peas in Arua was a further source of information. As he highlighted, the currently available extension materials:
a) Still recommend old pesticides that are no longer available
b) Have no information on new varieties such as Seppi 2
c) Have no information on the use of botanicals to control pests
d) Have no information on marketing
e) Have no location-specific information on agronomic practices such as spacing for different soil/water regimes

Implementation Step 2: *Evaluation of information against fact sheet headings and identify any gaps in knowledge:*
The literature was evaluated against the fact-sheet headings, and the following gaps in knowledge short-listed for possible study:
1. Efficacy of locally-available botanicals to manage pests on pigeon pea (especially medium-term varieties)
2 Economic benefit of the new varieties (Seppi 1 and 2)
3. International markets for pigeon pea
4. Ways to access local markets (through marketing associations etc)

Implementation Step 3: *Meet with a sample of farmers and service providers to further identify any other gaps in the information needed by them in order to assess and use the technology:*
Two farmer groups have been selected from those who expressed pigeon pea as a priority enterprise for advice in Uleppi and Offaka sub-counties. These are Okuaria farmers group in Offaka and Muni Oyomva farmers group in Uleppi. Focus group discussions were held with each group to determine their experience and interests in the crop. Their gaps in knowledge included:
i) Correlation between pest damage and the causal agent
ii) Life cycles of pests
iii) Application of inorganic pesticides
iv) Reasons for increased pest damage during heavy rains and in ratoon crops
v) Soil management for high yields
vi) Storage methods for harvested seed
vii) Cooking qualities of new varieties
viii) Potential for the market of processed pigeon pea products
ix) Market information outside the local market

x) How to set up Producer Association for more effective marketing to local and external markets

Implementation Step 4: On the basis of the missing information, design activities that will provide information to fill the gaps. In order to address the missing information on varietal performance and the efficacy of locally-available botanicals, a trial has been designed by the Arua team leader (Jeam Bamaru). The trial is a 2 x 3 factorial design with 4 replicates per trial. Two varieties are being used (Seppi 1 and Seppi 2) with three pesticide treatments (no pesticide control, inorganic pesticide and botanical pesticide). The trials will produce seed that can be tested against local varieties for cooking and storage qualities. To date no methods have been identified to explore the market for pigeon pea, but consultations have started with FOODNET to get their advice.

Implementation Step 5: *Conduct the activities, with the participation of relevant stakeholders:*
Following discussions with farmers and their selection of sites and allocation of roles to farmer group members, two sites were prepared and the trials planted on farmer's fields. Observations are being taken by members of the farmer groups.

Results to date from adaptive research on DAP planting and weeding in Tororo District

In Tororo district there is a long history of using draught animal power for opening up land. A number of farmer groups, as well as many individual farmers, own trained bulls and ploughs. However, during the NAADS demand assessment process, timely planting and weeding emerged as a key constraint to increasing production of both food and cash crops, including groundnut (*Arachis hypogaea*) and maize (*Zea mays*). In response to this, the introduction and on-farm testing of animal-drawn planters and weeders with farmer groups in Mukujju sub-county is currently going on.

Implementation Step 1: Collect information/literature relevant to the technologies. A large amount of information is available on training animals and on ploughing, but less on planting and weeding. SAARI has been involved in an LPP funded project on DAP weeding, and the findings of this project are being used as a basis for extension materials. There is much less experience with DAP planting – a prototype has been developed by SAARI and is meant to be manufactured by SAIMMCO, but as a result of limited on-farm testing, SAIMMCO has not yet started production and sales of planters.

Implementation Step 2: Evaluation of information against fact sheet headings and identification of gaps in knowledge: The available information was evaluated against the fact-sheet headings, which resulted in the identification of the following gaps:

a) Costs of DAP planting and weeding as compared to costs of human labour
b) Suitability of the implements for agro-ecological conditions in Tororo district
c) Mechanisms of sharing draught animals and implements within farmer groups are not well documented and understood.
d) Impact of DAP planting and weeding on the local labour market for resource-poor farmers / day labourers is not well understood.

Implementation Step 3: *Meet with a sample of farmers and service providers to further identify any other gaps in the information needed by them in order to assess and use the technology:*
Several group discussions have taken place with farmer groups in Mukujju to discuss the potential of DAP planting and weeding, identify farmers' information needs, and plan field activities. A situation analysis of DAP in Tororo has been compiled, based on these initial discussions with the groups and other stakeholders in the district. So far farmers expressed a need for information on:
1. Procurement costs and channels for weeders and planters
2. Training of animals and farmers

Implementation Step 4: *On the basis of the missing information, design activities that will provide information to fill the gaps*
Two sets of interrelated activities have been initiated to address information gaps:
a) On-farm trials. It was decided to plant ¼ acre of groundnut (Serenut II) and ¼ acre of maize to test both the planter and the weeder.
(b) Focus group discussions with farmers. A one-day workshop with the groups is planned for late May / early June to discuss their experiences with and information requirements related to DAP in more detail. In particular, issues of sharing implements and draught animals will be discussed, as this important aspect of DAP has so far not been addressed sufficiently by the extension literature.

Implementation Step 5: *Conduct the activities, with the participation of relevant stakeholders:*
Farmers selected the on-farm trial site and planting was done in early May 2004. The trial is now well established and weeding has been done using the DAP implement. The planter, however, has not performed as per the expectations of the group and a staff member of SAIMMCO (the company manufacturing the planter) was invited to join farmers in the field and see for himself where the problem is. It is an important part of adaptive research to involve the private sector, ensure that feedback is given to them, and that improvements are made to the technology in response to this feedback.

Lessons learned

1. The process described above demonstrates that there are important information gaps beyond the technical and production aspects of agriculture that form the main preoccupation of current research. Markets and post-harvest issues, gender roles, economic benefit, risk, group organisation and effective use of locally available inputs are all examples of information that farmers need but have little access to at present.
2. The field trial is not the only tool for adaptive research. Surveys, workshops, semi-structured interviews with key informants (e.g. market traders) or the use of the Internet are all legitimate sources of potential information to meet a clearly identified information gap.
3. The adaptive research process described has used participatory processes, but has also tried to apply rigour in terms of the quality of that participation, the selection of farmer group, selection of trial locations and farmers, data collection and reporting formats. This all adds to field costs and staff time. The 1 million Ugandan Shillings per technology per District per year allocated for this pilot appears to be a realistic ballpark figure for such research.
4. Farmer groups are extremely enthusiastic about the process and have collaborated wholeheartedly, contributing time, labour, land, livestock and ideas. They are fully involved in the implementation and monitoring processes. Farmers were involved in the setting of the research agenda, as it was they who selected the priority enterprises under the NAADS system. They were also partners in identifying many of the gaps in available knowledge within those enterprises.
5. The involvement of the private sector (e.g. SAIMMCO) in the research has been valuable in addressing practical bottlenecks in the key areas of input supply and marketing.
6. Lessons learnt from this pilot should feed into the implementation of the new National Agricultural Research Policy of Uganda through the Ugandan Working Group on Coordination of Development of Agricultural Information Materials.
7. The adaptive research process described here should be considered as a methodology to be applied under the national and local competitive agricultural technology funds that are proposed in the new National Agricultural Research Policy (Government of Uganda, 2004).

The Linking Project will continue documenting the pilot processes in the two districts, and use the experiences gained to develop, in close interaction with the emerging NARS, guidelines and recommendations for the institutionalisation of adaptive research in Uganda.

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References

Government of Uganda, 2004. *The National Agricultural Research Bill, 2004*. Bill No. 8. Bills supplement 4 to the Uganda Gazette: 20:97. Government of Uganda, Entebbe

Ministry of Agriculture, Animal Industry and Fisheries, 2003. *The National Agricultural Research Policy.* MAAIF, Entebbe

National Agricultural Research Organisation, 2000. *The Outreach Initiative: responding to farmers' needs.* NARO, Entebbe

Snapp, S.S., 2003. Scaling up and out. In: Pound, B., Snapp, S.S., McDougall, C. and Braun, A. (eds), 2003: *Managing Natural Resources for Sustainable Livelihoods: Uniting Science and Participation*. Earthscan, London, UK and IDRC, Ottawa, pp. 67-87