CROP PROTECTION PROGRAMME

Linking the demand for and supply of agricultural information in Uganda

R8429 (ZA 0658)

FINAL TECHNICAL REPORT

ANNEXES

1st April 2005 – 31st December 2005

Barry Pound
The Natural Resources Institute
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Acronyms

AHI	African Highlands Initiative
CBF	Community Based Facilitator
CBO	Community-Based Organisation
CEED	Christian East African and Equatorial Development Trust
CPHP	Crop Post-Harvest Programme (of DFID)
CIAT	Centre Internacional de Agricultura Tropical
COARD	Client-Oriented Agricultural Research and Development
FG	Farmer Group
IARCs	International Agricultural Research Centres
ICRA	International Centre for development-oriented Research in Agriculture (Wageningen / Netherlands)
IFPRI	International Food Policy Research Institute
IITA	International Institute for Tropical Agriculture
INSPIRE	Integrated Soil Productivity Initiative through Research and Education
IPM	Integrated Pest Management
LPP	Livestock Production Programme (of DFID)
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries (of Uganda)
M&E	Monitoring and Evaluation
NAADS	National Agricultural Advisory Services (of Uganda)
NARO	National Agricultural Research Organisation (of Uganda)
NGO	Non-Government Organisation
NRM	Natural Resources Management
MUK	Makerere University Kampala, Uganda
PCC	Parish Coordination Committee (of NAADS)
PDC	Parish Development Council
PPP	Participatory Planning Process (of NAADS)
PSP	Private Service Providers (under NAADS)
R&D	Research and Development
S/C	Sub-county
TD	Technology Development
TOR	Terms of Reference
ULAMP	Uganda Land Management Programme
ZARI	Zonal Agricultural Research Institutes (of NARO)

ANNEXES

ANNEX ONE

WORKING DOCUMENT ON

Integrating Natural Resources Management considerations into the NAADS participatory planning process – review of status quo and proposed Linking Project activities

Barbara Adolph[1], Barry Pound [2] and Jovia Manzi[3]

CPP Project R8281, NRI project A1164

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[1] *Social scientist, CPP/LPP project "Linking demand for and supply of agricultural information in Uganda"*
[2] *Project leader, CPP/LPP project "Linking demand for and supply of agricultural information in Uganda"*
[3] *Uganda project manager, CPP/LPP project "Linking demand for and supply of agricultural information in Uganda"*

Acronyms

CIG	Common Interest Group
CPP	DFID Crop Protection Programme
CPHP	DFID Crop Post-Harvest Research Programme
DFID	United Kingdom Department for International Development
FF	Farmer's Forum
GoU	Government of Uganda
ICRA	International Centre for development-oriented Research in Agriculture, Wageningen, the Netherlands
IITA	International Institute for Tropical Agriculture
LC	Local Council
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
NAADS	National Agricultural Advisory Services
NARO	National Agricultural Research Organisation
NGOs	Non-governmental Organisations
NRI	Natural Resources Institute, University of Greenwich
PPP	Participatory Planning Process
PSP	Private Service Providers
PRA	Participatory Rural Appraisal
TDS	Technology Development Site (under NAADS)
ULAMP	Uganda Land Management Project

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Purpose of this document

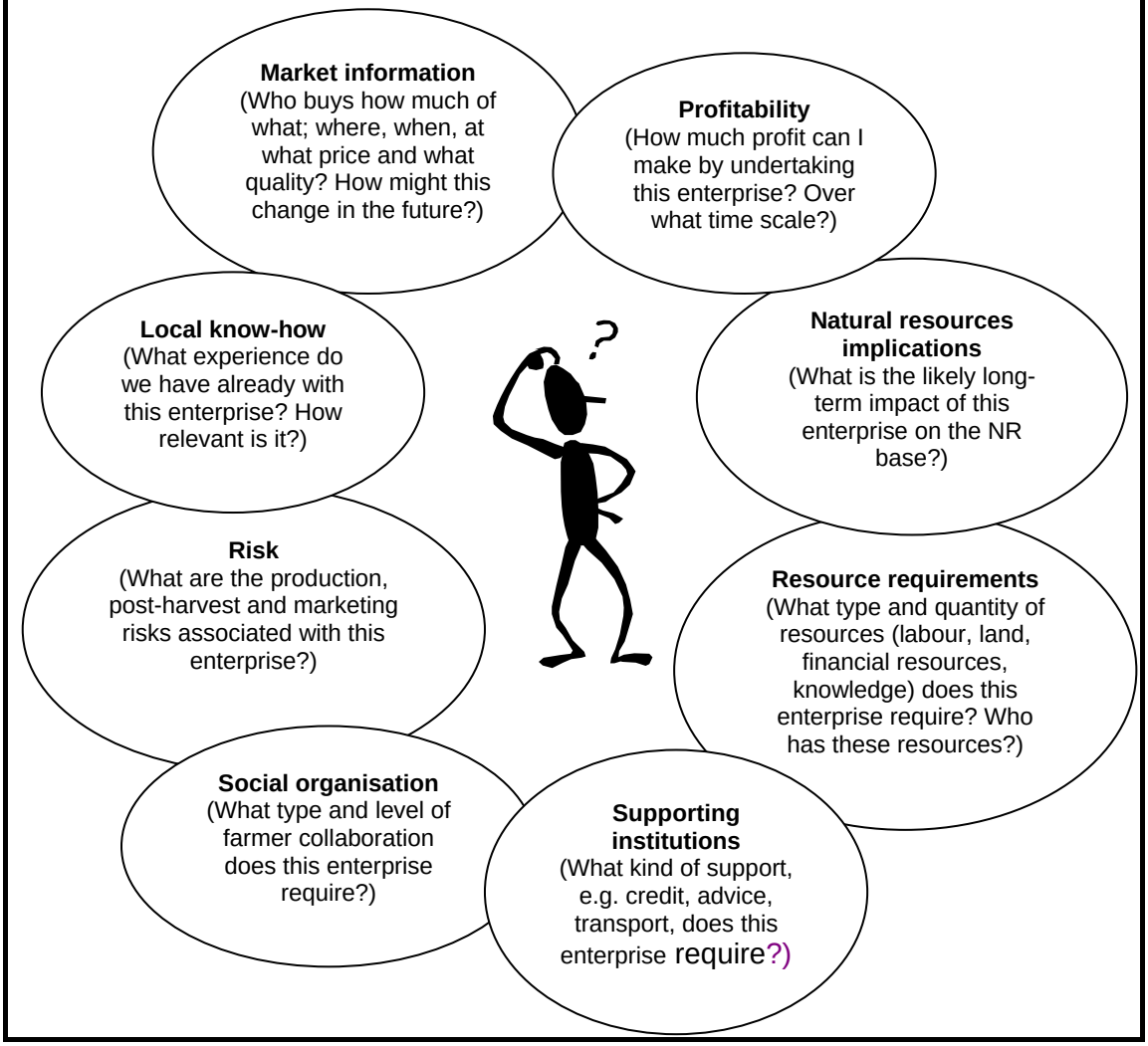
This document is meant to clarify the current status of integration of NRM considerations in the NAADS participatory planning process, based on discussions with NAADS staff at secretariat, district and sub-county level, NGOs and farmer fora. Based on this analysis, gaps in the process can be identified and ways of addressing them can be explored. This will help to clarify the scope of activities to be undertaken by the Linking Project from June to December 2005 in order to ensure that the outputs of the Linking Project provide useful tools and insights for NAADS.

Background

The NAADS process empowers farmer groups to select commercially viable agricultural enterprises and to contract advisory services in order to address the enterprise-related constraints and opportunities identified. The participatory planning process (PPP), as outlined in the NAADS implementation guidelines, includes a facilitated (by NGOs, and farmer group facilitators and sub-county coordinators) enterprise selection exercise at group, parish and sub-county levels. This is followed by a constraint and opportunity identification exercise, the outcome of which forms the basis for the formulation of terms of reference for advisory service providers. The planning process takes place at the end of the financial year (April to June), in order to enable the tendering process for advisory services to start early on in the new financial year.

Selecting viable enterprises is a big challenge, as it necessitates the integration of – often conflicting – criteria (see Figure 1). The likely impact of an enterprise on the environment, and specific environmental management requirements associated with the enterprise, are clearly not the only considerations. The challenge for NAADS is to empower farmers to assess these aspects in a participatory and systematic way, and to integrate their findings with the numerous other considerations, in particular economic returns. Considering, however, that the PPP is at the heart of the NAADS process, it is paramount that enterprise selection is based on a considerate and well informed process that includes a range of criteria – even those that are difficult to quantify.

Figure 1 Farmers' considerations in enterprise selection and development



NRM in the NAADS enterprise selection process

Review of NAADS documents

To "ensure sustainable management of natural resource productivity" is one of the NAADS principles (NAADS 2001: 8). This means specifically (see http://www.naads.or.ug/principleDetails.php?title=Managing%20Natural%20Resource%20Productivity&id=32&category=Managing%20Natural%20Resource%20Productivity):

"By transforming agricultural production and productivity without degrading the environment, by supporting farmers to manage agricultural activities while maintaining the productivity of natural resources for both the present and future generations.

- *natural resources include forests and trees, fish, wetlands, lakes and rivers, soil, grasslands and other productive ecosystems. Natural resources provide productive services to agriculture and they support livelihoods in themselves (often for the poorest and most marginalised, serving as important safety nets in difficult times)*
- *sustainable natural resource management in NAADS covers on-farm issues (eg. soil and water management, appropriate agrochemical use, conservation tillage, organic farming, etc) and off-farm issues (eg. forestry, fisheries, beekeeping, etc). On- and*

off-farm issues require fundamentally different approaches to advisory services and involve addressing different kinds of challenges

This is being done through:

- *implementing a strategy that ensures that natural resource management issues are incorporated into NAADS work plans. "*

In its NRM strategy, NAADS specifies 16 outcomes, against which the success of NAADS in promoting sustainable natural resource management will be measured:

Table 1NAADS NRM Strategy outcomes

Outcomes	Indicators
1. Different types of farmers have equitable opportunities to form, join and sustain farmers groups	• Number of different types of registered farmer groups in a sub-county in relation to the prevalence of different types of farmers in the sub-county. • % of women, men, youth and vulnerable groups represented in farmer groups. • Number of registered farmer groups accessing NAADS services and carrying out • other group activities after their registration /establishment.
2. Effective, inclusive, transparent and accountable farmer institutions are in place.	• Presence of farmer groups; Farmers' Fora & procurement committees at sub-county, district, and national levels with basic knowledge and skills (including in crosscutting issues) to carry out the collective responsibilities and functions. • Number of different types of registered farmer groups represented on the farmer fora n relation to the prevalence of different types of farmers in the sub-county/district.
3. Farmers are knowledgeable about natural resource issues in relation to NAADS	• Number of men, women, youth, & PWD who are knowledgeable about NAADS principles, objectives and cross-cutting issues
4. Farmers have effective access to and understanding of information about the economics, alternatives and markets for sustainable natural resource management in agriculture.	• No. of farmers accessing and using information provided by NAADS about specific cross-cutting issues.
5. Farmers are able to demand for agricultural advisory services on sustainable natural resource management	• No of sub-counties with a prioritised list of natural resource, gender, and poverty issues raised for each selected priority enterprise
6. Sub-county and district NAADS work plans are integrated with priorities and plans for environmental and natural resource management.	• No. of sub-counties where advisory service programs under NAADS are fully articulated in the sub-county and district development plans and ascribed to by all key stakeholders in implementation of NAADS at sub-county and district levels.
7. Contracts for agricultural advisory services address sustainable natural resource management issues.	• % of TOR and contracts issued which specifically address cross-cutting issues.

Outcomes	Indicators
8. Agricultural advisory service providers have capacity to provide quality services related to sustainable natural resource management	• No. of service providers meeting standards and regulations for sustainable natural resource management.
9. Agricultural service providers have effective access to and understanding of information about the economics, alternatives and markets for sustainable natural resource management in agriculture.	• No. of service providers with improved skills and knowledge on cross-cutting issues.
10. Government extension workers for off-farm natural resources (particularly forestry and fisheries) have equitable opportunities to become private sector agricultural advisory service providers	• No. of former forestry and fishery extension workers receiving retooling support from NAADS.
11. Sufficient quality and quantity of private agricultural advisory service providers exist to meet demand for natural resource advisory service needs.	• No. of specialist sustainable agriculture, forestry and fishery service providers registered with NAADS
12. Farmers use more sustainable natural resource technologies and management practices in their agricultural activities	• Numbers of men, women, youth & PWD farmers in different well-being categories using sustainable farm & natural resource management technologies and management practices
13. NAADS Board has sufficient capacity in natural resource issues to support, supervise and guide on natural resource issues in NAADS	• NAADS Board has adequate skills and responsibility to provide support, supervision and guidance on cross-cutting issues
14. NAADS Secretariat has sufficient capacity to manage and mainstream activities in relation to sustainable natural resource management.	• NAADS Secretariat has adequate skills and responsibility to manage and mainstream activities in relation to cross-cutting issues
15. Activities carried out by other organisations related to natural resource issues in agricultural advisory services are harmonised with NAADS activities	• No. of plans being implemented for harmonisation with organisations carrying out activities on cross-cutting issues relevant to NAADS
16. NAADS effectively monitors and evaluates its impact on sustainable natural resource management.	• Sufficient information provided on a regular basis to enable monitoring and evaluation of progress on addressing cross-cutting issues

Source: NAADS 2003: 12ff

These outcomes and indicators are of a very general nature, and it is not clear how they will be operationalised. At the time of writing this report (June 2005), NRI did not have access to any monitoring data that might have been collected to measure the progress of the indicators specified above. Therefore it is not possible to assess to what extent the outcomes have been achieved.

Furthermore none of the indicators is directly related to the enterprise selection process – it is perhaps assumed that farmers that are knowledgeable about natural resource issues in relation to NAADS (outcome 3) will "automatically" select sustainable enterprises. According to the "Vision of promoting sustainable natural resource management" (NAADS 2003: 11), sustainable NRM will be achieved though *"farmers and service providers with effective access to and understanding of information about the economics, alternatives and markets for sustainable natural resource management in agriculture"*. The NRM monitoring and

evaluation framework further states the need to *"include natural resource issues in market studies (e.g. market for products from sustainable agriculture, costs and benefits associated with sustainable natural resource management)"*. Similarly, the framework identifies under *"Market information collection, packaging and dissemination"* a process whereby *"In collaboration with relevant partners, provide a menu of opportunities for natural resource-based enterprises and sustainable NRM approaches in on-farm enterprise"*. All this implies an integration of both market and NR considerations, presumably already at the enterprise selection stage.

However, the four criteria provided in the NAADS implementation guidelines (NAADS 2004), namely:

1. Profitability of enterprises.
2. Availability of markets,
3. Financial outlay,
4. Risks / vulnerability in the context of: shocks, trends and seasonality,

in addition to production knowledge of enterprise, are primarily economic indicators, even though risk could well include environmental risks. It is only at the next stage, when constraints and opportunities related to each chosen enterprise are recorded by farmer groups, that environmental issues might emerge. Even if they are not mentioned by farmers during the PPP, subject matter specialists at sub-county and district level generally include a clause in each advisory service contract, stating that NRM considerations need to be addressed by the service provider.

In the context of the 4 criteria, one could also consider NR as a component of financial outlay. E.g. where fodder trees for livestock or bees are already present, then the financial outlay for feeding could be less. Thus natural resources can contribute to the successful outcome of a technology and give one place that has an abundance of a particular NR a comparative advantage over another. NR is thus seen in a positive light rather than from only a negative conservationist viewpoint.

Role of technology development sites

Technology development sites (TDS) are meant to be used for increasing access to foundation technology, identify and develop solutions to address local production problems, adaptive research, awareness creation and capacity development (NAADS 2004: 103). The question *"What impact will the new technology have on surrounding natural resources"* is mentioned specifically in the NAADS implementation Guidelines as an issue to be addressed by TDS.

A recent study by Ecotrust has explored ways of using TDS for demonstrating, testing and adapting NRM practices. Their final report is expected in the next weeks.

NRM in the technical manuals developed by NAADS

The technical manuals (handbooks for service providers) commissioned by NAADS generally include chapters on environmental issues – for example, the "Pig production manual") http://www.naads.or.ug/manualsLists.php?category=Pig%20Production%20Manual(includes a chapter on "Pig waste management" (which unfortunately is not available for downloading from the NAADS web site). The chapter on "Management of goat waste and environment" of the "Goat production manual") http://www.naads.or.ug/manualsLists.php?category=Goat%20Production%20Manual(discusses the benefits of goat manure for soil fertility management and fertilisation of fish ponds, but does not address issues of damage from grazing / browsing.

The manuals will potentially play an important role in developing the capacity of private service providers. They will be complemented by other NRM training materials, to be developed by Ecotrust and others.

Shortcomings of the current system in relation to NRM

Conceptual considerations

In line with the commercial orientation of NAADS, the enterprise selection process is currently skewed heavily towards economic criteria. NRM considerations do not feature until later in the process, when particular environmental constraints related to an enterprise are identified by farmers, or even only at the TOR stage. As a result, a number of difficulties might result in the long term:

- Farmers might select enterprises that are not particularly well suited for their environment, or which have a negative impact on the natural resources base.
- By comparing each enterprise separately, synergies between enterprises and the overall balance of the farming system are ignored (e.g. the effect of legumes on soil fertility, which benefits subsequent crops or intercrops).
- NRM considerations that affect a range of enterprises and therefore require a coordinated approach (e.g. soil and water conservation) are generally not covered by service contracts. The list of key issues for NAADS in the NAADS NRM strategy (NAADS 2003: 9ff) does mention *"Enabling farmers to demand for advisory services on land issues"*, *"Providing advisory services on soil management issues"* and *"Providing advisory services which promote agro-biodiversity conservation and use"*, but few examples are known of advisory services contracts that cut across enterprises.
- Similarly, NRM issues that cut across farm boundaries are difficult to address through the NAADS, especially when neighbours do not belong to the same farmer group, or are not members of any NAADS groups at all. Non-members are still in the majority (on average around 60% of farmers in NAADS sub-counties at the time of writing) and can therefore influence NRM related decisions in their favour. The NAADS NRM strategy mentions *"Enabling NAADS structures to deal with common property and transboundary resources"* as a key issue for NAADS (NAADS 2003: 9), but does not elaborate how this could be achieved.
- NRM issues need to be addressed in conjunction with market information at enterprise selection, so that farmers can assess the trade-offs between profitability and sustainability. If NRM considerations are only brought in at a later stage, after enterprises have been decided, this opportunity is lost.
- By undertaking the participatory planning process as a one-off exercise towards the end of the financial year, and at a time when farmers tend to be very busy with field work, undermines the scope for a more detailed situation analysis that takes into account "real" NRM issues, as experienced by farmers throughout the seasons.
- Even if short-term environmental and NR isuues are considered in relation to selected enterprises, longer-term, non-enterprise-specific issues might still not be included in any discussions.

The following section summarises how these concerns are perceived by the facilitating NGOs, farmer groups and farmer fora, and district staff.

Field observations

In order to find out how the constraints identifies above are perceived by stakeholders in the districts, discussions were held in Tororo and Arua districts in February and April 2005, with district level staff (NAADS, MAIF), NGOs, farmer fora and farmer groups. The main purpose

of these interactions was to find out how NRM issues are addressed during the participatory planning process. It appears as though in most sub-counties NRM is not addressed systematically during enterprise selection. However, there were many examples whereby NRM was part of a service contract, and farmers obtained some training in NRM related practices.

In Tororo, some of the facilitating NGOs were aware that NRM is one of the cross-cutting issues to be addressed by NAADS. However, no systematic method is used to assess the environmental impact or sustainability of an enterprise during the participatory planning process, or if the NR available in the village/parish favours a particular enterprise. Furthermore, the emphasis given to NRM depends very much on the preferences, background and knowledge of the facilitator. The stakeholders consulted made the following comments:

- NRM is not taken into consideration in the enterprise selection process in a systematic way, with the exception of Mazimasa, where NEMA had encouraged farmers to grow upland rice on their farms instead of wetland rice in the swamps in order to preserve wetlands. However, this was the result of long-term interactions between farmers and project staff, and required a period of sensitization. Addressing NRM issues seems to require intensive training, such as through FFS (to introduce SFM and IPM) and projects such as NEMA.
- In some areas, there have been no problems with the sustainability of NAADS enterprises, because they have started only recently, and so no longer-term impact on the NR base has been observed so far.
- Producing the same crop year after year can deplete the soil, or lead to the build up of pests if appropriate steps are not taken. NAADS can help farmers diversify into new enterprises.
- Possibly the GMA (gross margin analysis) from NAADS could also be used to assess the benefits and costs of different NRM options – e.g. compare use of pesticide with use of cultural control, etc.

In Arua, a similar picture emerged. Farmers in several sub-counties reported soil fertility decline and deforestation as major NR problems that have increased during the past 15 years. One enterprise particularly affected by NR issues was apiary, and farmers complained about the cutting of trees through tobacco growers, which results in insufficient feed for bees. The main points that emerged from Arua were as follows:

- Local bye-laws are in place in some sub-counties as part of the local government mandate to conserve the natural environment. These bye laws are usually a local initiative, but their enforcement depends on the political will of the local community.
- Some NR problems are due to private enterprise (e.g. deforestation in Lobule s/c is due to fuel wood used in tobacco curing and making charcoal making for sale). This has reduced food for bees. Farmers felt that there was no forum for discussing these issues between the stakeholders (farmers, extension staff, environmental bodies, NR users).
- Some NR problems may be acute in one parish, but not over a whole s/c. Therefore these issues are not being selected.[1]
- Similarly to Tororo, the extent to which NRM consideration are incorporated into the enterprise selection process depends on the capacity of the facilitating NGO. Some organisations undertake transect walks and rank the importance of environmental risks.
- Some examples of good practices exist, often based on the commitment of local government staff. In Logiri sub-county, soil management was covered to some extent in the PSP advisory services. PMA and ACAV have nurseries in the parishes of the s/c to help address deforestation in the area. Local resource maps identify where to plant

[1] However, there are provisions in the NAADS NRM strategy to address "minority enterprises" – see NAADS 2003:8

woodlots in a few communities. The s/c chief is encouraging communities to make these resource maps a part of development planning.

- Causes for environmental degradation at farmer level that were mentioned included:
    - Traditional practices, in particular bush burning
    - Low literacy of farmers preventing a better understanding of NRM issues
    - High levels of poverty forcing farmers to adopt unsustainable practices that yield immediate return (e.g. charcoal production)
    - Influx of refugees increases the pressures on the NR base
    - Social structures: ownership of land by clan reduces individual responsibility and brings historical clan traditions
- Suggested ways of addressing these farm-level issues were:
    - Sensitisation to consequences of poor NRM
    - Identification of alternatives to unsustainable practices, especially finding more viable alternatives to tobacco
    - By-laws need to be enforced by local government and supported by elders
    - Strengthening of NRM at enterprise selection by giving it its own category rather than hiding it in cross-cutting issues
    - Follow up on implementation of soil and water conservation (SWC) and afforestation advice given by PSPs
    - Provide more funds for demonstrations (the 200,000 Shillings in contracts were considered insufficient for agroforestry demonstration)
    - Cross visits to other sub-counties would be good, but people claimed that there are no good examples of NRM in Arua District!
- Causes for environmental degradation at NGO level that were mentioned included:
    - Poor coordination between NGO activities
    - Conflict of interests between development/environmental aims of NGOs and commercial aims of BAT
    - Capacity: low numbers of NGO staff trained in NRM
    - Finance: NGOs are only given 3-4 months to cover all advisory work in s/c, which is too short to effectively address NRM issues as well. Similarly, PSP contracts generally focus on technical issues, and do not address farming in a holistic way (to include markets and NRM).
    - Information gap, especially on alternatives to “bad” practice
- Suggested ways of addressing these NGO-level issues were:
    - Bring NGOs together in a forum
    - Provision funding for more in-depth advisory work and follow-up
    - Develop alternative practices and train NGO staff in their application
    - Network NGOs better (NB CEFORD is trying to strengthen the capability of smaller NGOs; there is no competitiveness in terms of knowledge – they share)

Initiatives undertaken by NAADS to address these shortcoming so far

NAADS has long realised the importance of NRM as a key component for building a thriving community of commercially oriented farmers in Uganda. In order to specifically address NRM issues, NAADS decided to incorporate the lessons learnt from ULAMP (the SIDA funded Uganda Land Management Project) into its programme. To facilitate this process, Mr Anthony Nyakuni was sub-contracted from ULAMP to NAADS with SIDA facilitation.

At the same time, Ecotrust, a Kampala based environmental NGO, was contracted by NAADS with the overall goal “to mainstream integrated natural resource management and

conservation based farming into the NAADS program in the districts of Bushenyi, Busia, Kabale and Mbarara". The final outcome of this contract is awaited in the next few weeks; it will consist of training materials for the integration of NRM in farming, capacity building of NAADS staff and partners in integrating NRM in farming, and the promotion of conservation-based farming in highly degraded farmlands.

As part of NAADS' NRM strategy, an NRM task force had been established. However, it is not known whether this is still operational and what its activities have been.

Initiatives by other actors in Uganda

The ULAMP extension process

ULAMP has used an NRM focused extension approach that is well document in Nyakuni et al. 2001. The process starts with a reconnaissance survey, during which information is gathered about the various NRM aspects of an area, using participatory methods. The approach then moves towards the formation of CIGs (Common interest groups), which are *"groups of farmers who share common problems or aspirations"*. These groups are not permanent and can dissolve once their aspirations are met – for example, a particular erosion problem has been addressed. In a way the CIG are similar to NAADS enterprise groups in that they focus on a common interest – the difference is that the interest is not usually an enterprise. However, the two approaches appear sufficiently complementary to explore synergies – it appears that this is already happening (see previous section).

Another characteristic of the ULAMP approach is the existence of platforms at different levels (group, parish, sub-county, district and national) to coordinate activities and share lessons learnt. Again this is similar to the NAADS setup.

Natural Resource Visioning

A situation analysis of existing resources is used for the visioning approach (Lightfoot et al. 2000 and 2001). A short summary of the approach is given in Sellamna et al. (undated). It is based on the development of desirable scenarios that emerge from the visions of rural people and other stakeholders. Table 2 shows the steps involved in a simplified way. This process is comparable to the ULAMP reconnaissance survey in that it gathers information about existing resources – however, it goes beyond this by asking people to visualise what they would like their environment to be like in the future.

Table 2 Operational guidelines for farmer empowerment

Steps	Guiding questions
Clarify the guideline and outputs expected	• Do you understand the guideline we have to follow? • Are the outputs expected clear?
Prepare a map of the present situation in the area indicating the main physical features as well as the roads, houses, clinics, schools, etc on the map.	• Where is the boundary line of our community area? • What are the geographical features and where are they located?
Locate on the map each important natural resource area.	• What are the natural resource areas? • How do we use these natural resource areas?
Prepare a second map starting with the future infrastructure, new roads, houses, clinics, schools, etc.	• What is the period of time in which we can have a practical and realistic vision? • What do we want to have in our place to support growing population, especially the poor?

Draw how each natural resource area will be used in future.	• What should the natural resource area look like in ten years time? • How will degraded natural resources be rehabilitated and the environment protected?
Record and document results in two maps one for the present and one for the future and a table that shows for each natural resource area what the future vision will be.	

Sources: Lightfoot 2001: 27

This process has been used in Uganda by NARO to develop strategies and work plans for the agro-ecological zones and ARDCs (see Anguzu 2004 and Akullo and Opondo 2004). The advantage is that it builds on opportunities rather than on problems, and aims at achieving a shared vision of key stakeholders on the way forward. The process is relatively time consuming and requires good facilitation – a capacity that is currently being built in Uganda with support from ICRA (the International Centre for development-oriented Research in Agriculture) in Wageningen, the Netherlands.

Identification of gaps and potential scope for the Linking project

Emerging from the analysis of NAADS documents and discussions with stakeholders in the field, a number of issues or gaps emerge in the way NRM issues are addressed at NAADS. This section attempts to highlight these gaps and identify possible solutions. The scope of Linking project activities will be discussed with NAADS secretariat staff in July. To a large extent it will depend on the outcome of the Ecotrust contract, which has not yet been made available to NRI.

Overall there appear to be two levels for intervention:

(a) From the policy side: Explore the option for a more systematic situation analysis that involves the whole community, as part of the NGO intervention (possibly including a more permanent role for group facilitators)
(b) From the operational side: Develop tools that can be used by NGOs and group facilitators to undertake situation analysis, including both the identification of constraints and opportunities related to particular enterprises and cross-cutting NRM issues.

However, there might well be limited scope for the use of additional time and resources to facilitate a more elaborate situation analysis, which integrates both NRM and market issues. One could envisage a situation analysis that includes a systematic assessment of both the natural resource base with particular opportunities and constraints, and the market opportunities for particular products, and that involves not only NAADS group members. Such a process would require longer engagement with communities to build capacity and continuous growth. The group facilitators could potentially play a much larger role in their communities, provided resources were made available to pay for their inputs (through transport allowances or similar incentives). Figure 2 and Figure 3 show how such a component could work, as compared to the existing participatory planning process.

Figure 2 (Simplified) Current participatory planning process

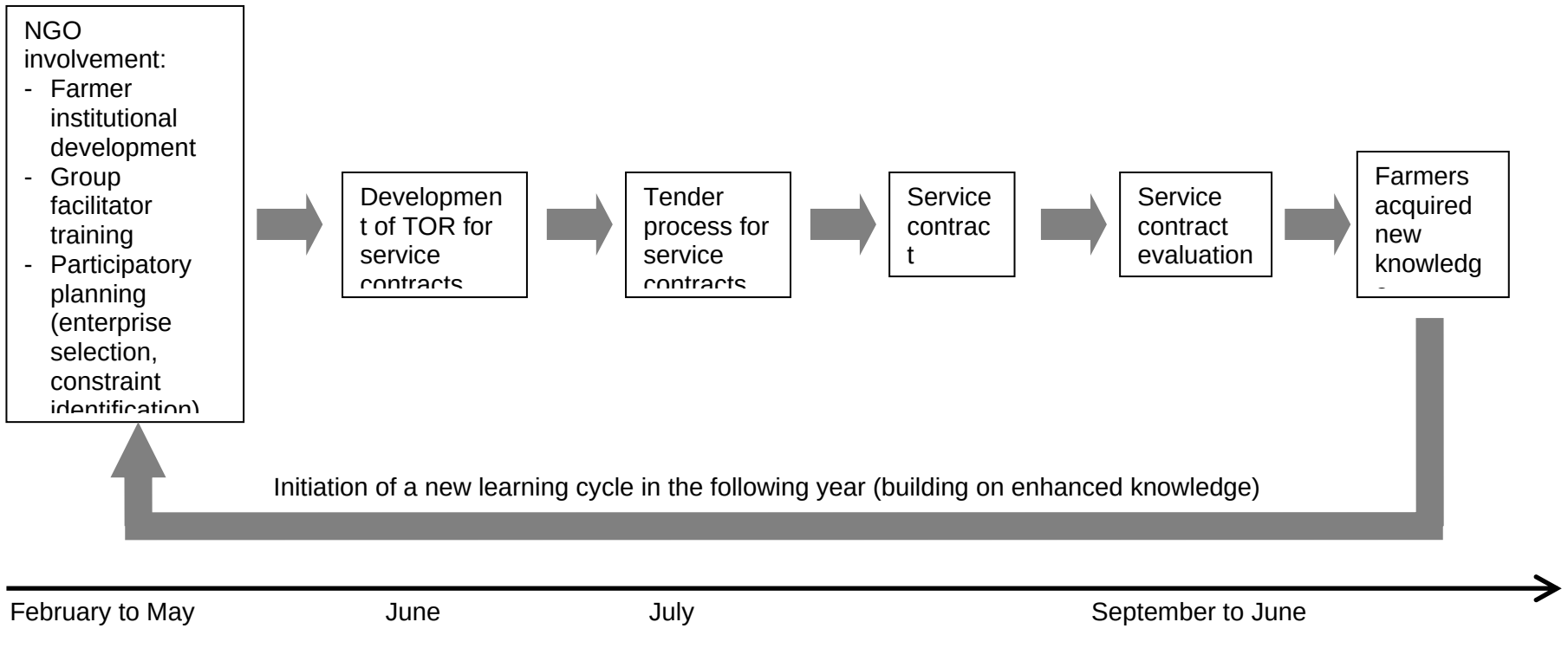
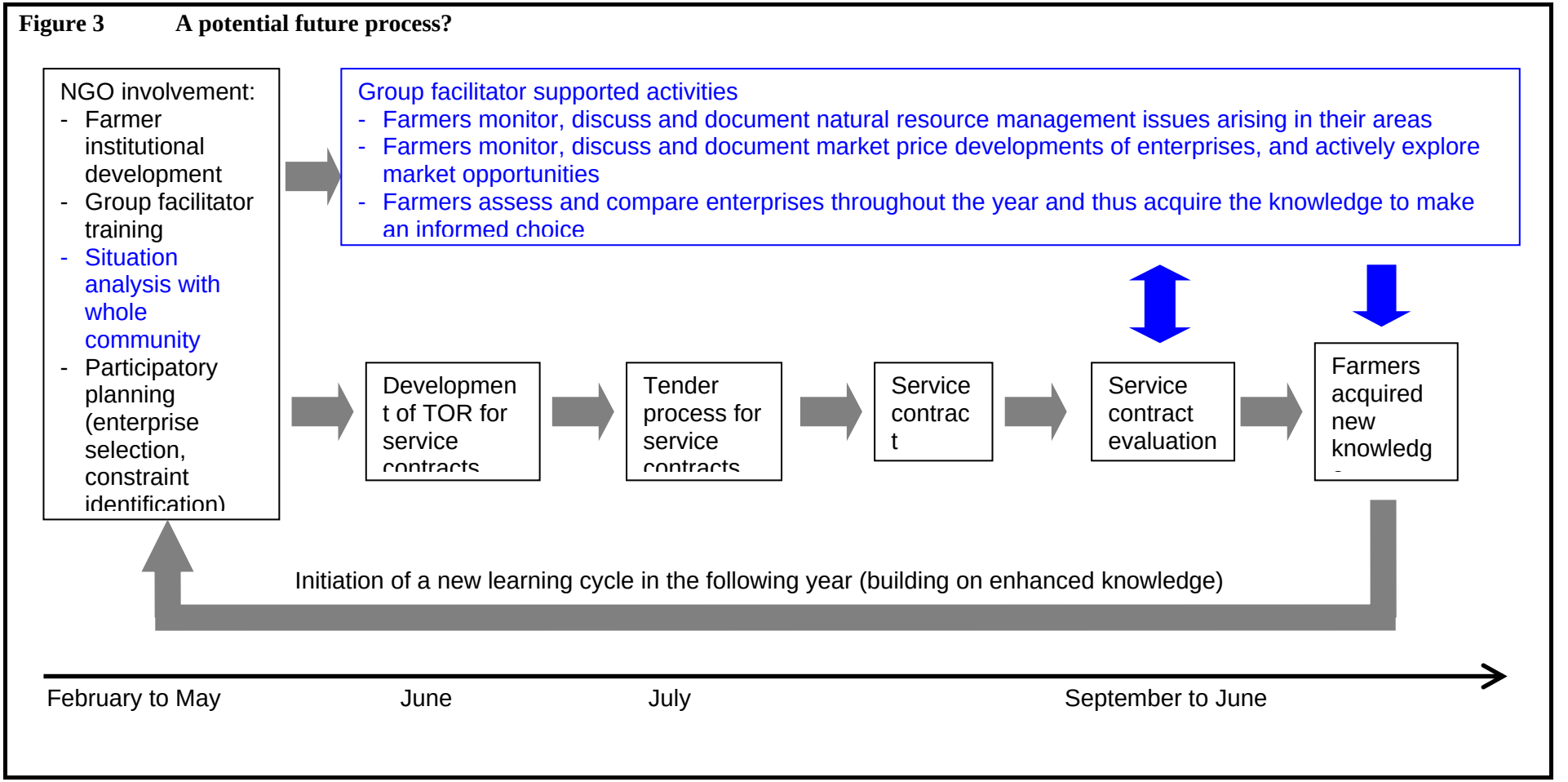


Figure 3 A potential future process?



The following Table 3 summarises some of the gaps identified, and possible intervention options.

Table 3 Gaps in the integration of NRM considerations in the participatory planning process, and suggested responses

Gap	Suggested responses
(1) Enterprise selection process	
Short time available during the participatory planning process at farmer group and parish levels to discuss the enterprise selection criteria or to do meaningful comparative analysis of enterprises (environmental impact, as well as profitability and markets).	• Discuss with NAADS at Secretariat and District levels to see what can be done about these bottlenecks • For common enterprises, there could be a set of guidance notes on NRM aspects (e.g. maize high nutrient demand, needs to be planted across slope, stover can be good mulch or used in trash lines, should be rotated with root and legume crops…)
Economic criteria are (over) emphasised during the NAADS participatory planning process – NRM considerations only come up at a later stage	• Build NRM into the enterprise selection process from the beginning, not only at the stage of constraint identification. • Include separate category for NRM in enterprise selection process
By comparing each enterprise separately, synergies between enterprises are ignored (e.g. the effect of legumes on soil fertility, which benefits subsequent crops or intercrops)	• Ensure the selection process explores synergies between enterprises and with the overall farming system (e.g. between crops, livestock and forestry activities and resources) – not each enterprise separately.
Service contracts are tied to enterprises and it is rare to find service contracts that cover cross-enterprise NRM issues	• Actively encourage the contracting of NRM related service contracts, if and when such cross-cutting NRM concerns emerge during the PPP
Some NRM problems are only issues in a few communities and therefore are not selected as sub-county priorities	• Make use of provisions in the NAADS NRM strategy to address “minority enterprises” – see NAADS 2003:8
The participatory planning process comes at the beginning of one the rainy seasons, and therefore clashes with a busy period in the farming calendar, and at a time when decisions on what to plant may already have been taken.	• Discuss with NAADS at Secretariat and District levels to see what can be done about this bottleneck. Can farmer groups undertake enterprise planning during the lean season / after harvesting the crop from the long rains?

Gap	Suggested responses
(2) Capacity of various stakeholders	
Low level of natural resource management knowledge among staff at District, sub-county, NGO, service provider levels, and within farmer fora, group facilitators and farming families Lack of practical skills in the use of improved NRM skills	• Adapt existing training materials (e.g. ULAMP extension guide, ICRA materials), and use tailor-made versions of these as the basis for ToT training (theory and practice) for District staff, selected NGOs and PSPs[2] • Training of trainers in NAADS Disticts, to result in improved capacity of staff at District, sub-county, NGO, service provider levels, and within farmer fora, group facilitators and farming families • Agree on a training cascade so that this ToT training reaches farmer fora, group facilitators and farming families • Should have been partly addressed by Ecotrust • Cross-visits between new groups wanting to learn about NRM and groups managing their resources successfully • Increased emphasis on NRM issues in PSP service contracts
Procurement committees do not know of availability of specialist NRM skills among private service providers and NGOs	• Ensure FF procurement committees know of specialist NRM skills among PSPs and NGOs
(3) Operational aspects of advisory services contract delivery	
Lack of time in PSP service contracts to cover NRM issues adequately – in particular for long-term enterprises, such as agroforestry	• Discuss with NAADS at Secretariat and District levels to see what can be done about these bottlenecks (need to go with some options);
Little experience of collective action to address NRM issues. ULAMP has worked on soil and water conservation measures that cut across boundaries – but this requires intensive interaction and facilitation.	• Explore how situation analysis can include the whole community, not only NAADS groups. Situation analysis with whole community should identify positives (e.g. presence of NR that favour particular enterprises) as well as negatives (actual environmental problems or potential ones that would be exacerbated by particular enterprises or practices) • Review current expertise (ULAMP, AHI…) • Finance cross-visits between new groups wanting to learn about collective action and successful NRM groups.

[2] Any training carried out by the project (with the collaboration and approval of NAADS) would be part of action research as we are not a development project. Our aim is not to train as many people as we can, but to use the training process as a means of developing, testing and fine-tuning training materials and guidelines how to use / institutionalise them in the NAADS context

Gap	Suggested responses
No databases of gross margins of main enterprises under different management systems – probably needed at sub-county level as suggested by Hugh Bagnall-Oakeley. Therefore difficult to assess whether NRM measures are cost effective.	• Develop a process that results in a dynamic database of gross margins for the main enterprises (under different management systems) at sub-county level • For each enterprise, appoint individual farmers / group members to keep detailed record of their costs and returns, to be shared with the whole group. Monitor how this works.
Awareness raising about NRM issues could use drama and song more effectively (two sets of drama scripts available)	• Use of drama – need to look for appropriate sources of scripts.
Some FM radio stations (e.g. Voice of Life and Pacis in Arua) have a development agenda which is sympathetic to helping small farmers and reducing poverty. More effort is needed to work with these stations as partners in dissemination of entertaining messages using drama, song, phone-ins, soaps etc	• Link training with radio broadcasts (radio drama, phone-ins, debates, radio clubs/discussion groups…) and live events in villages (e.g. drama, song – in Arua have drama groups that were formed by the Community Action Programme and Women's Empowerment Programme…) • Work with popular non-commercial FM stations as partners in dissemination of entertaining NRM-related messages using drama, song, phone-ins, debates, radio clubs, soaps etc
Group facilitators are a potential resource for passing on training from NGOs to the rest of the group. Their temporary status reduces that potential.	• Use group facilitators more effectively as links between NGOs, PSPs, s/c officials, FF on the one hand and farmer group members on the other. • Improve group facilitators' continuity /security of tenure.

Next steps

Share this draft with partners and collaborators; refine draft; define work plan and action. Make recommendations, and discuss with NAADS and others.

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ANNEX TWO

Strengthening Natural Resource Management in NAADS: A strategy document

Barbara Adolph, NRI, January 2005
with inputs from Barry Pound, Rob Delve, Anthony Nyakuni, Jovia Manzi, Chris Garforth, Hugh Bagnall-Oakeley and James Legg

Objectives

This document is written for NAADS secretariat, district staff and donors, to inform them about the key challenges and opportunities for improved integration of natural resource management (NRM) concerns into the NAADS process. Specifically, it attempts to address ways to:

- Ensure enterprise selection criteria include the sustainable and equitable use of natural resources in the community;
- Explore how the NAADS process can contribute to maintaining or improving the overall NR base.
- Identify capacity building opportunities to ensure the inclusion of cross cutting NRM issues in service provision contracts

The challenges

Many of the natural resources available to farmers are influenced by agricultural activities, for example, conservation of soil fertility, efficient use and management of water for agriculture and domestic uses, management of common property resources and important ecological sites (such as wetlands), safeguarding of animal and plant biodiversity, management of pests and diseases and the maintenance of tree cover for agricultural, fuel, building and other purposes, such as conservation of fragile and or degraded land, and protection of watershed/catchment areas.

Sustainable natural resource management is a key principle of NAADS, but the NAADS NRM strategy also acknowledges that there is some risk that natural resource issues could be sidelined within NAADS, as the system is enterprise-focussed and promotes short-term gains (NAADS 2003:2). While there is a policy and legal framework in place for promoting sustainable NRM management within NAADS, the challenge is to put this framework into action.

Currently contracts do not stipulate that Service Providers need to have received training in NRM, or to have experience with implementation of NRM issues. This is a major weakness of the current system and one area that needs review. Also, the enterprise selection process of NAADS makes the inclusion and operationalisation of NRM considerations very difficult, as it disintegrates and compartmentalises farming systems into a commodity approach, rather than seeing it as a production system, which almost automatically leads to the neglect of concerns and opportunities that span across enterprises or across farms and common property resources in the community. It also takes production on a season by season basis, or worse, on a three month contract basis, whereas NRM requires longer term continuity of planning.

The NRM strategy specifies 16 outcomes (Table 1), against which the success of NAADS in promoting sustainable NRM will be measured (NAADS 2003: 12ff). Reviews of NAADS implementation is questioning the success of including these cross-cutting issues in its program. For example, a recent IFPRI survey (Benin et al. 2005) in NAADS and non-NAADS sub-counties, prepared for the NAADS mid-term review, found that access to information on technologies and markets increased with NAADS, knowledge of soil fertility management practices and other NRM practices, such as agro-forestry, were lower in NAADS sub-counties than in non-NAADS sub-counties. The study highlighted the risk of increased nutrient mining to future productivity among

adopters of new technologies[3]. As farmers commercialise, this risk increases, unless they are trained and supported in using sustainable soil management practices. An increasing risk is that the entry point of NAADS being enterprise selection will prejudice NRM in the future and lead to increased exploitation of the resource base as farmers commercialise their production. Considering the large and constantly increasing number of registered farmer groups under NAADS (around 13,000 in September 2005) it is not surprising that most of them have not yet been exposed to improved NRM practices – the challenge is to ensure that processes and systems are in place quickly to ensure they will be exposed in the next one year, through inclusion of NRM issues in all future service provider contracts.

Based on a review of NAADS documents, studies, and discussions with NAADS secretariat staff and stakeholders in two districts, the specific challenges shown in

[3] A recent study by Ssali et al (2005) found that the average nutrient mining per farmed hectare in Uganda is 97 kg of N, 31 kg of P and 90 kg of K per year. These figures are higher than other studies undertaken in Uganda to date.

Table 4 have been identified in relation to the achievement of the NRM strategy outcomes at group, parish, sub-county and district level. These challenges have three main causes:

1. At the policy level, the enterprise focus favours short-term profit maximisation[4] rather than long term sustainability.
2. At the operational level, the shortage of capacity at all levels (farmer group, CBF, PCC, sub-county farmer forum, sub-county procurement committee, sub-county NAADS coordinator, NGOs, private service providers) impedes the effective integration of NRM into the NAADS process.
3. There are numerous ongoing or recent NRM-related initiatives in most of the Districts in which NAADS operates (NGOs, churches, donor projects etc.), but these are not well integrated with NAADS.

[4] For a variety of reasons (including unavailability of credit for agricultural inputs, poor marketing systems, and low coverage of training), significant increases in income are rarely achieved in the short term.

Table 4 Challenges in achieving NAADS NRM Strategy outcomes

Outcomes	Challenges identified[5]
1. Different types of farmers have equitable opportunities to form, join and sustain farmers groups	• In NAADS sub-counties, less than 40% of farmers are members of farmer groups. This makes it difficult for NAADS institutions to address NRM issues that are caused by and affect the whole community (e.g. deforestation, encroachment of wetlands, soil erosion) • The Parish Coordination Committees (PCC) represent only those farmers who are members in NAADS groups
2. Effective, inclusive, transparent and accountable farmer institutions are in place.	• Institutions are in place, but not skilled and experienced in addressing NRM issues. Community-based facilitators (CBFs) and PCCs are yet to be trained.
3. Farmers are knowledgeable about natural resource issues in relation to NAADS	• The IFPRI survey indicates that this outcome has not been achieved. • This is a direct consequence of shortcomings in achieving outcome 8, 9 and 11. • The PPP does not consider NRM as a criterion for selection, and gives preference to enterprises that yield quick returns
4. Farmers have effective access to and understanding of information about the economics, alternatives and markets for sustainable natural resource management in agriculture.	
5. Farmers are able to demand for agricultural advisory services on sustainable natural resource management	• Currently the Participatory Planning Process (PPP) results in the selection of an enterprise. NRM topics are generally not commissioned as service contracts or included as component parts of the enterprise contracts. • No situation analysis is undertaken during the PPP.
6. Sub-county and district NAADS work plans are integrated with priorities and plans for environmental and natural resource management.	• This integration does not happen at sub-county or parish level due to weak institutions and lack of knowledge about NRM issues (many Parish Development Councils – PDCs - are not active) • Lack of proper situation analysis and needs assessment makes it difficult to identify NR issues that should be integrated in the workplans
7. Contracts for agricultural advisory services address sustainable natural resource management issues.	• The TOR might include NRM, but in practice contracts rarely address wider NRM issues or alternative production technologies. • The TORs are not sufficiently specific for addressing the prevailing NRM issues
8. Agricultural advisory service providers have capacity to provide quality services related to sustainable natural resource management	• Most service providers do not have the capacity to provide such services. This brings to question their suitability to implement these contacts successfully

[5] These were identified through a number of documents, studies, field visits and discussions with stakeholders, and compiled by the authors of this report.

Outcomes	Challenges identified[5]
9. Agricultural service providers have effective access to and understanding of information about the economics, alternatives and markets for sustainable natural resource management in agriculture.	• Up-to-date sources of information on NRM that are accessible and affordable for private service providers are limited. • Even where such knowledge exists, the amount of funding for demonstrations within service contracts, and the length of time of those contracts limits the demonstration of good NRM practices.
11. Sufficient quality and quantity of private agricultural advisory service providers exist to meet demand for natural resource advisory service needs.	• The quality and quantity of PSPs with the required skills, knowledge, experience and attitude is inadequate.
15. Activities carried out by other organisations related to natural resource issues in agricultural advisory services are harmonised with NAADS activities	• There does not appear to be a clear policy and practice of integrating existing NRM expertise of farmers and other stakeholders, and of utilising existing project sites for demonstrations and learning (e.g. ULAMP, NGOs, AHI). Although cross visits between villages and even between Districts takes place on an informal basis, this is not coordinated or integrated into a formal programme by NAADS.
16. NAADS effectively monitors and evaluates its impact on sustainable natural resource management.	• This information does not appear to be collected and assessed systematically.

The opportunity

The following section outlines an approach to address these challenges through interventions that can be integrated into the existing NAADS process. It does not challenge the NAADS focus on commercially-oriented farming.

The NAADS NRM strategy focuses primarily on the inclusion of NRM in the TOR of service providers, which is expected to result in appropriate knowledge at farmer level. It does not consider NRM during other stages, in particular during needs assessment and the enterprise selection / participatory planning. As the participatory planning process is the starting point of the NAADS process, it is essential to include NRM considerations during the PPP in order to address some of the inherent shortcomings of the enterprise focus. If NRM considerations are only brought in at a later stage, after enterprises have been decided, this opportunity is lost. NRM issues need to be addressed in conjunction with market information at enterprise selection, so that farmers can assess the trade-offs between profitability and sustainability and make truly informed decision about which enterprise to enter into. The interventions outlined above require capacity at different levels. Currently this capacity is not available throughout NAADS; therefore leveraging the existing capacity and experiences of projects and programmes could well be a key strategy for NAADS. Considering that NAADS is now operating in 37 districts, a phased approach could be used, which develops and tests tools and methods in a few sub-counties, before scaling out to other districts.

The following section presents a number of options for NAADS to consider. These are based on experiences of NRM initiatives in Uganda (primarily ULAMP and INSPIRE), and elsewhere, as well as, discussions with many stakeholders at various levels.

1. Capacity development of CBFs, PCC, farmer fora and NAADS coordinators at sub-county level in NRM.

While some expertise is available within the NAADS system (e.g. district or sub-county coordinators with a general knowledge and some experiences in NRM through previous jobs), most of the implementers of the NAADS process within the district are not in a good position to ensure an integration of NRM considerations into the process. They require targeted training, exposure visits/field trips and ongoing support (e.g. in the form of mentors, similar to NARO Outreach programme), in order to develop their understanding of NRM and to equip them with practical tools, skills and methods to assess both the impact of enterprises on the natural resource base, and the potential for enterprises based on an assessment of the NR base. Projects such as INSPIRE and AHI can play a role in this.

Table 5 Roles and responsibilities for NRM at different levels

Level	Current responsibilities	Additional potential role
Individual farming household	Farm in an environmentally responsible and sustainable manner	• Adapt NRM technologies • Monitor impact of NRM technologies on farm level
Village	Enforce local by-laws	• Undertake situation analysis of NR base • Make village by-laws for protection and or proper utilization of NRs bases.
LC1	Enforce local by-laws, village development plans	• Sensitize community members on NRM
Farmer group	Enable farmers to access advisory services on sustainable agriculture	• Support members in adoption of NRM technologies (social capital) • Monitor adoption and impact of NRM • Insist SPs deliver NRM advice as per their contract
Group-based facilitator	'To advise on the integration of cross-cutting issues in group activities and processes', including NRM	• Train FGs in integrated NRM
Parish Development Committee	Agreement on and enforcement of local by-laws, contribute to parish development plan	• Sensitise community • Monitor implementation process
Secretary for production and environment (within PDC)	Intervene if local by-laws are not followed or NR challenges occur	• Spearhead integration of NRM
Parish Coordinating Committee	M&E of group activities (including NRM?)	• Link FGs with SPs, NGOs and sub-county technical team
LC2	Parish development plan	
Sub-county farmer forum	Ensure service contracts address NRM issues	• Sensitize FGs and promote integration of NRM
Sub-county procurement committee		• Development of TORs • Selection of suitable SPs
Sub-county NAADS coordinator	Support farmer fora in evaluating and commissioning service contracts that address NRM constraints and opportunities	• Guide development of TORs
Sub-county	Responsible for supervision of	• Monitoring of agricultural development and

Level	Current responsibilities	Additional potential role
secretary for production and environment	NRM integration	marketing activities • Promote harmonized approach to NRM among different projects, NGOs etc operating in the sub-cpounty
Sub-county subject-matter specialists	Advice on inclusion of specific NRM issues in service contracts	• Quality assurance and participatory M&E
LC3	Sub-county development plan	• Spearhead integration of NRM through political support
District NAADS coordinator	Ensuring a balance between NRM and production considerations	• Identify suitable SPs • Supervises NRM the integration process
District farmer forum	Ensure service contracts address NRM issues	• Ensure exchange of information with existing NRM projects and programmes at district level
District Environmental officer	Advice the district on all matters relating to NRM	• Support NAADS coordinator in ways of addressing NRM issues in service contracts
District Production Coordinator	Ensuring holistic and integrated approach of NRM by key stakeholders and institution.	• Supervise NRM integration process
District Forestry Officer	Ensure sustainable utilisation of forest resources in the district Enforce national level conservation policies	• Spear head and advise on integration of Agroforestry practices and technologies.
LC5	District development plan	
NGOs involved in the NAADS participatory planning process	Guide farmers in selecting profitable enterprises	• Guide farmers in undertaking an assessment of the environmental challenges and opportunities in their area
Other NGOs Churches Projects and programmes	Support government agencies, CBOs and other stakeholders in NRM / sustainable agriculture; training and capacity development Initiate environmental activities (e.g. planting trees, soil conservation)	• Capacity development of private service providers and farmer groups • Providing training materials and publications for district resource centres
NEMA	Enforce government regulations on NRM	• Provide guidance on integration of NRM by different sectors
Line ministries at national level	Develop national level policies on NRM	• Promote NRM in respective line ministries.

2. Developing PCC as a bridge between NAADS and the wider community

Currently only about 40% of farmers in NAADS sub-counties are members of NAADS groups. The remaining 60% are not represented in the PCC, unless the LC1 and LCII chairperson are on the committee (this is currently optional). In addition, the TOR of the PCC currently do not contain specific responsibilities in terms of NRM. Creating a new committee at the village level through the PCC has missed an opportunity to use the existing PDC to ensure all the community is involved in understanding NRM issues and in the protection and improved management of natural resources. The

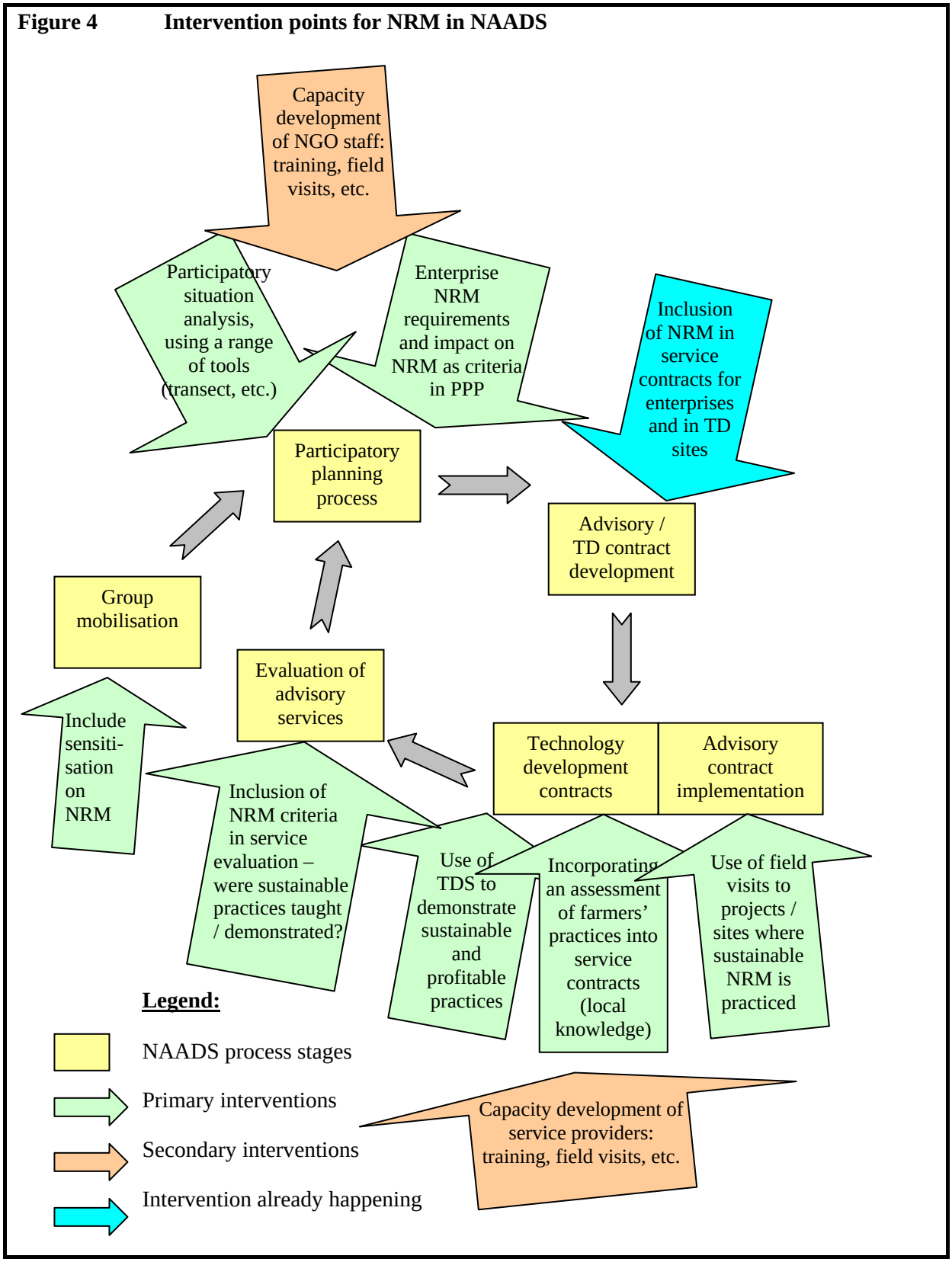
PDC should be the body to play the key role in promoting and lobbying for crosscutting, trans-boundary NRM considerations.

3. Support / guidance to private service providers in NRM.
The procurement committee at sub-county level evaluates tenders and are meant to assess whether service providers have the skills, knowledge and experiences to fulfil the terms of reference of their contracts. NAADS policy has been to screen service providers at the contract awarding stage, and not to engage in direct capacity development of these private entrepreneurs. This is in line with the overall paradigm of NAADS, which assumes that the demand created through the NAADS process will led to efficient and equipped service providers to compete for contracts. However, service providers need clearer guidelines on NRM integration, access to good quality publications and materials on relevant NRM issues, and participatory monitoring and evaluation through the PCC and the sub-County and District NAADS coordinators.

4. Storing / archiving NR related information in appropriate formats at the right level.
To support service providers and decision makers at district, sub-county and parish level, information about NRM needs to available and accessible to them. District resource centers are being developed, and have the potential to stock publications and training materials on NRM. However, location specific information needs to be kept at the sub-county level, to include records of previous situation analyses.

5. Making better use of existing NRM experiences.
There have been a range of programs and projects in Uganda that addressed NR constraints by developing, testing and validating NRM measures, including INSPIRE, AHI, CEED and others. Some of these also looked at the institutional requirements for effectively addressing NR constraints. It would be useful to develop a strategy that promotes systematically learning from these experiences, for the benefit of NAADS. This could possibly be initiated by commissioning a review of what has been done by and learned in these various programmes and projects. The review could be followed by a series of workshops for the people and institutions identified in Table 5, who are responsible for ensuring that NRM gets its proper focus in NAADS processes. At the district level, active linkages between service providers, farmer forum members and project staff (or, in case projects have ended, farmers involved in them) should be encouraged, e.g. through study tours to (former) project sites.

Figure 4 Intervention points for NRM in NAADS



6. Inclusion of NRM considerations during PPP.

The participatory planning process currently does not consider NRM specifically – it is only indirectly included by considering risk (which includes both production and marketing risk). Simple, easy to use tools need to be developed to enable NGOs and farmer groups to undertake a situation analysis of NR

problems and opportunities in their location. Based on the ULAMP experience, such tools could include community meetings, transect walks and community mapping. However, these will definitely increase the duration of the PPP and will require adequate facilitation and analytical skills of NGO staff and group based facilitators (see point 1). Considering that the PPP is the 'back bone' of the NAADS process, it appears justified to spend resources on 'getting things right' at this early stage. NAADS would need to make a commitment to the PPP and ensure that resources are available for a more inclusive process that considers technical, economic, social and environmental considerations.

Examples

There are many examples in Uganda where farmer groups have successfully increased their production and sale of agricultural products, while at the same time maintained or even enhanced the natural resource base. Two of these are summarised below, but many more exist, and should be documented and made available to service providers, farmer groups, NGOs and NAADS staff at district and sub-county level. Better still, these groups can speak for themselves and receive study tours in order to share their learning and experiences.

Growing potatoes sustainably: The Nyabyumba Farmers' Group in Kabale

The Nyabyumba Farmers' Group was formed in 1998, with 40 members. The Group, supported by Africare (an international NGO), focused on producing improved potatoes from clean seed provided by the National Agricultural Research Organisation (NARO). In 2000, the Nyabyumba Group formed a farmer field school to improve their technical skills in potato production and increase yields. In 2003, equipped with the necessary skills for producing high quality potatoes in large quantities, the group decided to increase their commercial sale and requested support from Africare, NARO, the Regional Potato and Sweetpotato Improvement Network in Eastern and Central Africa (PRAPACE), and CIAT.

Through this consortium of partners, the Nyabyumba Group received training in identifying and analysing market opportunities and developing a viable business plan for the potato enterprise. From the market study, the group identified Nandos, a fast-food restaurant based in Kampala, and local wholesale markets, also in Kampala.
The Group set up a series of committees to manage, plan, and execute their production and marketing processes. To provide a constant supply, the farmers set up a staggered planting system to ensure that as much as 5-10 tons of potatoes were available each month, from which they then selected the best quality tubers to send to the Kampala markets. To date, the Group has supplied more than 76 tons of potatoes to Nandos and a similar amount of lesser quality tubers to wholesale markets.

Improved natural resource management became a key issue for the group. They needed improved access to water for off-season irrigation of the potatoes to ensure year round production. The group also invested in research into planting times, density and varieties, as well as improved use of inorganic fertilizers. This in turn led to improved soil conservation and maintenance of terraces to protect their investment in improved production technologies.

The Group has been receiving a steady income and now has savings of nearly 1 million Ugandan shillings (US$600). These funds are being used to build a store and buy irrigation equipment to expand the business. The Group's success is based on (1) long-term support from a consortium of research and development partners, (2) increased technical skills in potato production and marketing, and (3) collective marketing.

(Case study supplied by Rob Delve, CIAT / INSPIRE)

Common Interest Groups in Yivu, Arua

This case study gives an example of how the ULAMP extension approach was used to organize farmers in Arua to enable them attract services and achieve their aspirations. The area described is Yivu parish in Pajulu Sub-county, Ayivu County, on the West Nile plateau. In 1998 the parish included about 4000 people in 670 households. The population density was 350 people per square kilometre, and most land-holdings varied from 0.5 to 1.0 hectare. The rainfall is 1400 mm per year. The soils are light sandy loam with low fertility.

The main crops grown are cassava, beans, sorghum, sweet potatoes, maize, millet, pigeon peas and vegetables. Most households plant a few fruit trees and coffee bushes. The average household income is 250,000 shillings per year, earned mostly from selling farm produce. Other sources of income include the sale of local brews, brick making, stone quarrying, harvesting of sand, petty trade, and labouring.

ULAMP developed a common interest group (CIG) in the parish through a process of data collection, consultations and meetings involving subject-matter specialists, composed of district and sub-county staff, community leaders and farmers. A reconnaissance survey / situation analysis was undertaken to assess the environmental and production issues in the community, followed by a community meeting to discuss these. The meeting explored the problems and issues in more detail, which were then prioritised by gender-and age disaggregated farmer groups. Subsequently, the group analysed causes and effects of the problems, going into some level of detail of analysing NRM issues.

Participants then brainstormed solutions related to farm production and the environment. They listed possible enterprises that might improve income and minimize poverty. The subject matter specialists made contributions, taking care not to impose their own suggestions. Participants were then asked to select enterprises they wanted to try out. Core staff facilitated members to form interest groups around these preferred enterprises. A total of 21 CIGs were formed.

One of the active CIGs focused on tree growing. This group established a nursery during the dry season when crop production work was slack. The CIG held three meetings. The first was to identify what tree species to plant and to select a site for a nursery.At their second meeting, the CIG chose sources for seeds and determined how to acquire them. They drew up roles and a duty roster for members, and agreed to establish rules to guide management. They agreed to pay a membership fee and make monthly contributions to establish a development fund. These funds were to buy inputs and refreshments during communal work.

The third meeting was held when the seedlings were ready for planting. This meeting planned how to allocate the seedlings to members and what to do with excess seedlings.
The following agreements were made:

- Each member would plant 100 seedlings.
- Excess seedlings would be sold and the proceeds ploughed back into the group
- account.
- The group would meet once a month.

Members said that by working together in a group, they were able to achieve more. The following were some of the main problems this CIG encountered:

- The source of water for the nursery dried out during an extended dry spell.
- Some members did not follow the duty roster.
- There was a poor turnout for some of the communal work.
- It was difficult for members of more than three CIGs to comply with agreements, especially because of timetable clashes.

The CIG members decided on the following solutions:

- Part of the group funds could be used to hire labour to fetch water.

- Members who failed to report for communal work would be fined 500 shillings for each day missed.
- Joint meetings should be held with other CIGs to co-ordinate activities, enabling people in more than one CIG to participate in all activities.

(Case study taken from ULAMP extension manual, Nyakuni et al. 2001)

Conclusions

This document analysed how Natural Resource Management considerations could be integrated more effectively into the NAADS process. Starting from the NAADS NRM strategy and its outcomes, it assesses the challenges in achieving these outcomes, and outlines a number of actions that could be taken to address these challenges. In particular, it emphasises the importance of capacity development of service providers, as these are currently not in a good position to provide the required advice to farmer groups on ways of enhancing agricultural productivity through sustainable use of natural resources.

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ANNEX THREE

Proceedings of the workshop on

Adaptive Agricultural Research in Uganda

Organised by the NAADS / NARO/ NRI / CPP / LPP research project:

"Linking demand for and supply of agricultural information in Uganda"

UWEAL Building, Plot 38, Lumumba Avenue, Kampala
17th - 19th November 2005

Barbara Adolph and Barry Pound, NRI

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Summary

This stakeholder workshop forms part of the DFID-supported project "Linking demand for and supply of agricultural information in Uganda"[6]. The project is a collaboration between NRI, NAADS, NARO, Makerere University, Ugandan NGOs, and farmer groups. It has looked at the demand for information by NAADS farmer groups, the supply of information (particularly by international and national research programmes), the use of information by NAADS-registered private service providers, and the validation of research results using a novel adaptive research process.

The novel adaptive research process was piloted with three "technology teams" in Arua and Tororo Districts in 2004. Part of the purpose of this workshop was to institutionalise the process into NAADS and NARO.

The overall objectives of the workshop were to: a) explore relevant approaches to adaptive research in Uganda; b) validate the adaptive research process piloted by the Linking project, and c) develop recommendations for the implementation and institutionalisation of the process within the Ugandan NARIS (National Agricultural Research and Innovation System)

The 21 participants came from diverse practitioner organisations: NARO (Secretariat and ARDCs), NAADS, Local Government, Makerere University, NGOs and the African Highlands Initiative. Two farmers from Tororo also participated. The workshop was facilitated by "Linking" project staff.

The workshop started by attempting to characterise adaptive research. The key concepts that emerged were that adaptive research is:

- Participatory testing of existing technology for local fit; adjustment of technology for specific circumstances; provision of technology that is relevant, responsive to people's needs, and improves their livelihoods. The process should be a partnership between end users (farmers, processors, traders), intermediate users (service providers), researchers and the private sector. It should also be inter-disciplinary, based on an action-reflection cycle, usually demand-driven and decentralised, and involve situation analysis, on-farm research, on-station research, surveys and monitored demonstrations.

Participants were asked to discuss how they carry out adaptive research in their work. They recorded that **demand** is identified through situation analysis, using stakeholder consultations / stakeholder workshops and surveys (farming systems and livelihoods analysis, agro-ecosystem analysis), through government policies and initiatives – often donor-driven - , through the NAADS demand identification process (which is sometimes in conflict with that of NARO), and through self interest and organisational mandates.

Information for developing adaptive research activities comes from primary sources, such as situation analysis, discussion with key informants, agricultural shows and study tours, and networking, and secondary information from Production department reports on demography and production statistics, district profiles, NGO / CBO / farmer group reports, journals and the media.

It was clear that adaptive research is not limited to bio-physical processes, but also considers: Markets, social and cultural aspects, infrastructure, relevance, acceptability, affordability, costs and benefits, access to inputs, environmental impacts and policy, influences and impacts, opportunities for value addition, existing knowledge about this technology in the community and risks (market risk, production risk and environmental risk).

[6] "This publication is an output from a research project funded by the United Kingdom Department for International Development for the benefit of developing countries. The views expressed are not necessarily those of DFID." Research project R8429, funded by the Crop Protection Programme and Livestock Production Programme.

Participation is a key concept in adaptive research, including at the planning, implementation and monitoring and evaluation stages of the process. It is important validate technologies that are suitable for commercial **and** resource-poor farmers.

Participants acknowledged a general skills and systems weakness in the area of documentation, sharing and dissemination of the results from adaptive research.

The novel adaptive research process piloted by the Linking project was discussed. The process, as piloted, had the following 9 steps:

1. Collect information/literature relevant to the technologies from a range of sources, including farmers
2. Evaluate that information against the fact sheet headings and identify any gaps in knowledge
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

Three case studies of the use of the adaptive research process were presented:

- Dr Francis Ejobi: De-worming of goats with *Mucuna* in Tororo and Arua
- Dominic Olege: Draught Animal Power adaptive research team, Tororo
- Barbara Adolph (for Africa 2000 Network): IPM for groundnut production

These were then analysed to learn lessons from the experience of the case studies, with specific reference to: a) Which stakeholders were involved, and which ones were left out; b) The good points and bad points for each of the 9 steps; c) The constraints faced in achieving the objectives, and d) The outcomes of the process (tangible and non-tangible)?

The constraints were then discussed to find potential solutions.
Florence Oumo presented the experiences of the national inter-institutional working group for improving the quality of research dissemination materials. This working group has adopted the check list of headings for dissemination materials developed in collaboration between COARD and the Linking Project. A CPHP-funded (Crop post-harvest programme of DFID) research project recently explored the feasibility of a market place for agricultural information in Uganda. The project involves Africa 2000 Network (Paul Nyende), and findings can be found at www.mpaisuganda.com.

Participants then brainstormed the question: “What are the elements of the institutional environment that need to be in place for the adaptive research process to work?” The responses were clustered into 9 groups: Effective communication; mind-set; partnerships; recognition of performance; expertise; financial resources; facilities and transport; monitoring and evaluation; and clear, non-contradicting policies. These were discussed and expanded in groups.

Participants with expertise on the Competitive Research Fund spoke about the National and Zonal Competitive Research Funds. The latter will be piloted in Abi (West Nile), Kachekwano and Serere. 3 broad priorities have been identified for each pilot zone, and it is expected that adaptive research will be appropriate for research under the Zonal Fund.

The importance of socio-economic differentiation of farmers as clients for the outputs of adaptive research was stressed. Wealth grouping was illustrated as one tool for differentiating farmers. Generally, researchers do not undertake such socio-economic differentiations systematically – perhaps

because of a lack of skills to do it. Extension staff / service providers also tend to present only one solution to farmers' constraints, even though that solution might not be appropriate for resource-poor farmers.

A session was held to explore the objectives for adaptive research of two contrasting research scenarios in Uganda, and to assess how the novel Adaptive Research Process can be adapted to the needs of a) research under the zonal competitive research grant, and b) under the NAADS technology development sites. Under the former it would be necessary to modify the adaptive research process to: i) identify zonal priorities; ii) archive results such that they could be easily accessed by interested stakeholders; iii) simplify the process by combining some of the steps, and iv) integrate M&E into all steps. Under the technology development sites the process would need modification at the start to do wealth ranking, social and economic analysis and stakeholder analysis.

The **recommendations** arising from the workshop are given in detail in the full proceedings. The main ones are that:

- The adaptive research process should be adopted by NARO, NAADS and partners, but adapted to specific objectives and conditions
- Adaptive research, basic research and extension services should work together harmoniously to produce technologies relevant to the agreed needs and carefully analysed situations of Ugandan farmers
- The adaptive research programme should have flexibility to follow up secondary constraints and opportunities
- There is a need to enhance institutional memory – all projects and organisations must ensure that the research outputs they produce are documented, archived and easily accessible to interested stakeholders
- NARO and other organisations should train its staff in communication skills to better equip them to communicate research outputs to intermediate and end users
- Extension materials need to be quality controlled. A mechanism for this was proposed by the Working Group and needs to be followed up.
- AR includes studies on marketing, social, economic, environmental and policy issues as well as bio-physical ones. This requires expertise across a wide range of non-traditional disciplines
- Stakeholder analysis, identification of partners, partnership building, M&E and reflection and learning all need to be part of the adaptive research process, and resources need to be allocated for this
- Capacity building of partners can go hand in hand with adaptive research so as to decentralise research capacity and technical expertise
- Adaptive research should use tools and methods to differentiate needs on social and economic grounds, and produce technologies relevant to men and women farmers with differing access to assets.

An evaluation of the workshop was carried out before final closure.

Welcome and introductions

Barry Pound welcomed the participants. Each participant then said their name, their organisation, and their particular interests in terms of agricultural research and extension. See Annex 2 for details:

Introduction of workshop objectives:

- Exploration of methods and approaches for adaptive research
- Validation of the adaptive research process piloted by the Linking project
- Development of recommendations for implementation and institutionalisation of the process within the Ugandan NARIS (National Agricultural Research and Innovation System)

Expected outcomes

- Assessment of the strengths and weaknesses of the new adaptive research process
- Assessment of the cost effectiveness of the process
- Assessment of the compatibility / complementarity with existing research processes of key NARIS partners
    - Competitive agricultural technology fund (NARO)
    - Technology development sites (NAADS)
- Participants are able to explain the adaptive research process and associated methods / tools to others
- Specific steps for implementation

Discussion:

Q: How does the questionnaire distributed to participants relate to the workshop objectives?
A: The questionnaire covers different elements / stages of the adaptive research process. We would like to know which stages participants are already experienced with, in order to understand the background of the people who are there, and to be able to design the workshop accordingly (programme for day 2 and 3 is not yet finalised).

Q: Francis Ejobi: Can this workshop also be used to develop an exit strategy for the Linking project, as it is ending in the end of this year? Need a forum for linking different actors in this.
A: This is a good idea. Florence Oumo can talk about the working group / fora that exist currently in Uganda to bring the different stakeholders together. This will be done on day two.

What is adaptive research, and how do you do it in your zone?

What is adaptive research?

Participants brainstormed on the elements of adaptive research. The outcome was as follows:

- Technology that already exists somewhere and has been released, but needs to be tested to see whether it fits a particular situation. Might need adjustment to the technology.
- Participatory evaluation of a particular technology.
- Technology that is taken to a particular community should be relevant, respond to people's needs, and improve their livelihoods
- Should be done in partnership, and be inter-disciplinary, based on an action-reflection cycle, and usually involve on-farm research
- Research that is conducted within the context and conditions of the intended end users, so that the end users benefit from the results
- Decentralised research
- Demand-driven
- Area-based or location specific

Who should take part?

- Partnership of beneficiaries / end users (farmers, processors, traders), service providers (intermediate users), researchers (MAK, NARO, NGOs, farmers) and the private sector (e.g. implement manufacturers)

Where?
- On-farm, on-station, in workshops, in laboratories, under specific agro-ecological conditions, in the market place, under particular socio-economic and cultural situations

How?
- Situation analysis / continuous process; field assessment, surveys and discussions
- On-farm trials, on-station trials, demonstrations (get feedback from them)
- The process should be participatory and reflective
- There is a continuum between farmer-driven and researcher-driven activities, depending on the objectives of the adaptive research

How do you undertake adaptive research in your organisation / zone?

Participants were asked to discuss in three groups (see Annex 2): How do you carry out adaptive research in your zone? Think along the following stages / aspects:

1. Demand identification: how are the topics for research identified. How are the clients of research identified
2. Sources of information used: what information is used/gathered in order to identify what is already known and what more needs to be generated through adaptive research
3. What aspects of the technology are considered in research beyond bio-physical technology performance
4. How are technologies validated under farmers conditions and to meet farmers needs for all the different types of information that they require
5. Dissemination of results: how are the results of research documented and "packaged" and disseminated in order to reach the target farmers

Outcome of the discussions (merged for the three groups):

Question 1: Demand identification: how are the topics for research identified? How are the clients of research identified?

Demand identification
- Identify priority enterprises (or themes – can be x-cutting, such as soil fertility management) through
    1. Situation analysis, using stakeholder consultations / stakeholder workshops, surveys (farming systems and livelihoods analysis, agro-ecosystem analysis), prioritisation of constraints (using factors / criteria / weights for prioritising them), identification of opportunities, possible interventions, i.e. research needs. Researchers synthesise information and re-prioritise
    2. Government policies and initiatives – often donor-driven (might constrain options)
    3. Political and opinion leaders influence the priorities
    4. Emerging issues – global and local – influence priorities (e.g. bird flu)
    5. Local government planning process
- Identify intervention areas (communities / geographical areas)

Client identification:
- Approach the district production officer to link with NGOs, CBOs etc. working in the area
- Contact the NGOs, CBOs, contact farmers and farmer groups / communities

- Situational participatory diagnostic with these
- Characterisation / typologies of clients
- Special / common interest groups, e.g. livestock farmers
- Niches – biophysical etc., e.g. highlands, swamps – paddy /rice
- Multi-stage sampling with participation of extension agents, local leaders and service providers

Other factors influencing topic selection:
- Researchers' personal interest and experience
- Mandate of the institute (e.g. coffee research institute only works on coffee)
- NAADS process (but is often in conflict with the NARO process, as different criteria and weights are used, and not all sub-counties and districts are covered) – SARI made an effort to include NAADS priorities in the agenda

Question 2: Sources of information used: what information is used/gathered in order to identify what is already known and what more needs to be generated through adaptive research

- Primary information: from diagnostic study done under question 1, surveys on e.g. indigenous knowledge, discussion with key informants, such as researchers), agricultural shows and study tours, identification of constraints and opportunities, networking / sharing of information / feedback, e.g. through joint planning of adaptive research activities
- Secondary information: Production department reports on demography and production statistics, district profiles, NGO / CBO / farmer group reports, journals, media: e.g. New Vision's supplement on agriculture on Wednesdays, Soroti Plant Clinic

Question 3: What aspects of the technology are considered in research beyond bio-physical technology performance

- Market / marketability of produce
- Social and cultural acceptability, e.g. norms, gender, taboos, religion
- Infrastructure: Roads, transportation, agro-processing infrastructure
- Applicability
- Affordability / costs and benefits of the technology
- Environmental effects / impacts
- Palatability / taste of produce
- Policy (e.g. land tenure: Might exclude certain technologies, e.g. if tenants are only allowed to grow annual crops.
- Availability of production inputs (seeds, implements)
- Opportunities for value addition
- Existing knowledge about this technology in the community
- Ease of use of the technology
- Other options / substitutes / complementarity
- Risks: Market risk, production risk, environmental risk

Question 4: How are technologies validated under farmers conditions and to meet farmers needs for all the different types of information that they require

- Through participatory evaluation with farmers and with indigenous technologies
- Participatory planning
- Participatory monitoring and evaluation and reflection and then re-planning
- Addressing researchers and farmers criteria (both bio-physical and markets, costs and benefits etc) – e.g. Bulindi did market assessments with farmers, and as a result farmers changed their priorities
- Data collection – both farmers and researchers
- Survey of availability of inputs
- Validate technologies against alternative technologies that are suitable for resource-poor and commercial farmers

Question 5: Dissemination of results: how are the results of research documented and "packaged" and disseminated in order to reach the target farmers

Documentation:

- Farmers, researchers and other stakeholders take notes during technology evaluation
- Photographs, video and SMS records
- Evaluation reports
- Sharing and documenting experiences

Dissemination:

- Demonstrations, field days/open days, Agricultural Shows
- Farmer exchange visits
- Posters, brochures, leaflets, calendars
- Audio visual documentaries
- Media (radio, TV, Newspapers)
- Workshops
- Monitoring visits (civic leaders, CAOs etc)
- Hands-on participation in on-farm work
- Feedback meetings
- "Packaging" e.g. seed + fertiliser + herbicides + husbandry practices

The Linking Project adaptive research process

Farmers' expectations

Mr Osere Asuut on agronomic practices:

- Farmers grow maize, rice, groundnuts, pigeon peas, cassava, soyabeans
- These crops are grown for food, but mainly for sale
- Livestock: Goats, sheep, poultry (local birds, not exotic ones)
- Farmers want more technical knowledge about farming.
- Problems:
    - Land shortage / fragmented land
    - Sandy soils with low fertility (need to add something to the soil)
    - Weather is the main problem (drought, rains, flash floods)
    - Agro-processing: SG2000 group was trained in producing groundnut paste
    - Maize: Prices are low after harvesting (300 shilling to 100 shilling per kg)
    - Markets are very competitive due to the nearby border – can result in giveaway prices
    - Seed selection: Farmers don't have enough knowledge on seed selection
    - Weeding: there is a labour shortage after the first rain.
    - Storage and drying: capacity problem, and lack of knowledge for bulking / packing
    - Livestock: Pest control knowledge is not widely available
    - Poultry: will pick on local grains put to dry, but if chased away, birds will get killed by wild animals
    - Poultry housing: needs technology (birds are now kept in the house)
- Suggestions:
    - Water harvesting to capture flash floods
    - Need for technology for groundnut processing
    - Need for processing / milling of maize, technologies
    - Need training on weed management / e.g. herbicide application
    - Need training on soil fertility management, including choice of fertilisers and application
    - Some farmers can be trained, then others will follow
- Discussion

  Q: What are the main problems in goat keeping?

  A: Worms and feeding are the main problems

C: Dr Ejobi: MAK is writing a manual on indigenous fodder trees for goat feeding. Mulberry tree is one of the trees suitable for this. Fennel leaves are also included. This will be done in Masaka.
Q: Mango trees are suitable for feeding goats – use prunings for feeding (xxx ? not quite clear)
Q: Florence Oumo: Networking is important. DATICs have developed a poultry manual for local birds (feeding, housing, marketing).

Mr Okany Patrick on information materials:

- Problems: Farmers who are illiterate cannot easily understand messages
- NAADS comes to talk in English to farmers. Farmers are giving up – they are not used to write, but are given a notebook
- There is a need to change the strategy: Use pictures instead of text. Use posters with pictures – they can be understood. Lecturing alone is not useful – especially if it is in English
- Radios are widely owned – need more and better radio programmes on farming, for example in drama mode /play to capture people's interest. Need to make people laugh. Use of video is also very important.

- Discussion:
  C: Exchange visits are very important to share information. Farmers learn a lot more from this then from extension materials. E.g. animal traction: People from Mbarara learnt from farmers in Tororo about it – could not believe it before.
  C: Extension staff do not learn all they need in school. For example, turkeys and ducks, not one trained extension staff on this. Staff in the field do not have up-to-date information, e.g. green gram, cassava varieties.
  C: Institutional memory at community level: Farmers want posters, video, radio programmes etc. Someone in the village should be responsible for these resources and keep them safely. Packaging and dissemination of research outputs needs to be better organised.

Presentation on the adaptive research process

See text of slides in presentation in Annex 4.

Discussion on adaptive research process as presented

- Disadvantages of technologies are generally not mentioned in extension materials. However, they should be mentioned, so that farmers can make an "objective" choice between different options (e.g. an introduced technology might perform technically better than a local practice, but might be more labour intensive. Improved cassava varieties resistant to CMD might produce bitter tubers on some soil types). It is important to test technologies on farm, and then document any disadvantages that might arise.
- If possible, one can test new technologies alongside farmers' practices, and test different technologies (e.g. high / low input) on farm, then let farmers chose between these options.
- The process looks good on paper, but can it be applied in practice? For example, Florence is writing a groundnut manual and found it difficult to move past step 2, because a lot of important information is not available, and it is not possible to undertake on-farm research activities this year, as the budget and workplan for the year have already been decided,
- It is important to identify what needs to be in place to make the process work.
- The process takes long, and by the time it is completed / step 9, the farmer has lost interest – between farmer demand and step 9 it takes too long
- Is it possible to integrate basic and adaptive research, so that they don't both have to be done end to end?
- NARO is trying to document technologies on the shelf in a useable form. Sometimes gaps can be filled without going back to the field to do adaptive research – just by talking to researchers that were involved in the original work.
- Sometimes one has to go to the field again, if key information (e.g. labour requirements) were not recorded.

- Problems of language in dissemination (e.g. IPM – what exactly does it mean?)

Presentations from team leaders

1. Francis Ejobi: De-worming of goats with *Mucuna (pruriens?)*

(text below was taken from March 2005 Linking Project Final Technical Report).

Goat De-worming technology team. This team was responding to the farmer-identified priority of intestinal worms. Farmers recognise that intestinal worms reduce productivity and income, but commercial drugs are expensive, sometimes ineffective, and not always available. Therefore, many farmers do not treat their animals. It was decided to test a low-cost, potentially locally available botanical remedy to see if it worked under local conditions. The technology was developed by an LPP-supported project in the Dharwad District of India, where the trichomes (hairs) of the pods of *Mucuna (pruriens?)* are mixed with water and fed to goats. Before the treatments were administered a survey of goat husbandry was carried out in selected areas, and the baseline prevalence of intestinal parasites determined.

In addition, farmers were asked what information they would need to know about the Mucuna technology for them to be able to adopt it with confidence. The following were raised:

- Ignorance of the technology and its practical application
- Cost- benefit analysis of the technology (economic viability i.e. use of Mucuna viz- a- viz use of de-worming drugs)
- Labour requirements
- Supply and availability of Mucuna (not grown in the area)
- Alternative uses of Mucuna
- Other available options for de-worming of goats
- Use of the technology on other livestock species; i.e. cattle, sheep (since in most rural settings they are grazed together)
- Comparison of the technology with indigenous technical knowledge

After growing Mucuna (which took some 6-months), the trichomes were tested on selected goats owned and managed by four farmer groups (two in Arua and two Tororo District).

The results were statistically analysed using SPSS programme to test if there were significant differences in the faecal egg counts between the treated and control groups. The analysis considered individual species of parasites, as well as groups of parasites (i.e, tapeworms, flukes and round worms). The results did not show a consistent pattern in the faecal egg counts in the treated and control groups, and no statistically significant differences in the faecal egg counts could be demonstrated. Two reasons could explain this observation: First, there were many missing variables for individual parasites, hence the power of the test was weak for statistical analysis, and second, some farmers especially in one trial site had de-wormed their trial goats with chemical commercial de-wormers without letting the researchers know. There was a significant (P>95%) reduction in tapeworms. However, it was not felt that extension materials can be produced on the basis of inconclusive single season results, and a Concept Note request for funds to extend the testing during 2005 has been put to LPP. If results are clear and positive, and the technology has practical application, then extension materials will be produced.

Discussion

- Time: Takes long to do these trials – farmers are waiting for results
- Should have done on-farm testing in Uganda to see whether this works at all with Ugandan Mucuna species

2. Dominic Olege – animal traction / Draught Animal Power adaptive research team, Tororo

The adaptive research was in response to prioritised technology demands from NAADS farmers in Tororo District. The research followed the 9 step process:

Step 1: Collection of information and literature from: The District Agricultural Office, SAARI, farmers and service providers.

Steps 2/3: Seven gaps were identified; mostly related to economic, social and inputs access aspects of DAP, rather than the technical aspects

- Gaps identified included:
  1. DAP was not used much for planting and weeding (farmer knew only about ploughing)
  2. Cost / benefit analysis (trials with maize and groundnuts – do c/B on those)
  3. Group approach to the management of the implements (district budgeted for planters, ploughs and weeders – needed help with guidelines)

Steps 4/5: Design and implementation through field testing of implements, crop production comparing labour and cost of hand versus animal technology; discussion and consultation meetings

Steps 6/7: Feedback to farmers, draft extension materials

- Other problems: Land fragmentation. DAP will reduce labour requirements, so will impact on poor people who rely on labour wages?
- Feedback: Not enough feedback was given to farmers – problems with time shortage.

Steps 7/8/9: Field testing and modification; development of training materials; printing and distribution

- Even though NAADS is being implemented in Tororo, most service providers don't know about DAP. Some don't speak the local language. Service providers do not do follow-up on DAP training.
- Training materials were distributed and disseminated. The training material focused on the gaps in knowledge which are preventing uptake of the DAP technology, so it did not include issues covered by other types of extension materials

Stakeholders contributing to different Outputs were:

- Farmer Groups: Gaps, strategies and cost:benefit analysis
- Researchers: DAP technology, literature
- Manufacturer: Implements
- Stockist: Available implements
- Service providers: Training programme
- District agricultural staff: Capital investment, cost:benefit analysis
- Linking project: Adaptive research process; funding

The adaptive research team for DAP had components in Arua and in Tororo Districts. The two sub-teams worked closely with two farmer groups in each District, using an action-research approach in which the animals and group members were trained in the use of DAP implements, and trial crops were cultivated to expose any problems in production and transport of crops. Through consultations with the farmer groups at the start of the process, the following information gaps were identified:

- How to train animals to use seeder, plough, and weeder
- Field adjustments of planter for different crops
- Field preparations for efficient planting
- Field adjustments for different types of weeders for different agronomic spacings
- Feeding of animals during scarcity of pastures
- Muzzle making for covering the muzzle during weeding.

Fields for trials on planting and weeding were prepared and these were planted in April 2004 with maize and groundnuts. The planter purchased failed to perform well, and the manufacturer (SAIMMCO) was consulted for modification on a number of points:

- The planter lacked a seed agitator and had problems dropping seeds
- The gap between seeder and soil surface was too shallow thus blocking the seeder
- The seed cover performed poorly
- The planter lacked a system for lifting the planter when turning to next run or row
- The ox-cart wheels were too narrow, causing it to sink into soft ground.

Exchange visits were organised to DAP-active areas in September 2004. Farmers learned a lot, including:

- DAP technology can be a commercially viable enterprise
- Group members benefit rotationally through ploughing their own fields and sharing the money generated by animals; some of the money is used for buying spare parts
- Group members contribute their own animals without external support even for purchase of implements
- Two pairs of trained animals can plough half an acre in a day in heavy soils and 1 acre in light soils a day
- Trained animals can work for more than ten years if well managed
- Supply of implements and spare parts a common challenge
- Ox-ploughs are the only DAP implement commonly used
- Application of DAP technology stops at field preparation stage due to absence of additional implements like planters, weeders and ridgers
- Farmers in some areas use DAP technology for ridging sweet potato heaps before laying the vines and complete the process by hand hoe
- A programme of artificial insemination introduced under PMA to improve breed of animals.

Recommendations made by the DAP technology team include:

- More time needed for adaptive testing of technology especially for field trials on planting and weeding
- Need to train more artisans to forge implement spares
- Regular exposure visits for farmers (very effective)
- Provision of Agricultural Credit
- Cost-sharing within farmer groups to strengthen ownership and easy adoption of technology.
- Make extension materials and literature on DAP technology available to farmers and service providers instead of keeping them in archives of NARO.
- Farmers to commercialise DAP technology as an option to hand labour, to increase production and to reduce household poverty.

Draft extension materials have been produced by the DAP team. These contain

- Introduction tom DAP in Arua and Tororo Districts
- Information gaps
- Available DAP implements in Uganda
- Who DAP is appropriate for
- Training needs assessment for DAP
- Profitability of DAP for different operations compared to hand labour
- Management options for DAP, and their advantages and disadvantages
- Strategies for using DAP in farmer groups
- Key steps in the use of DAP implements
- Cost:benefit analysis for adoption of the complete DAP package
- Cattle suitable for DAP

- Environmental impacts of DAP
- Risks involved with the DAP technology

3. Barbara Adolph (for Africa 2000 Network): IPM for groundnut production

The background and problem

- Farmers are growing groundnuts as a food and cash crop (NAADS priority enterprise in most sub-counties in Tororo)
- Insect pests reduce yields
- Some farmers do not have the financial resources to purchase pesticides, and are not used to spraying their g'nut crop (any more)
- A2N has been working with Farmer Field Schools in the district on Integrated Nutrient Management

The IPM team

Dr Fiona Watta - team leader	Africa 2000 Network, Tororo
Mr Jeam Bamaru	District Production Co-ordinator, Arua
Farmer groups	Arua District
Ms Peace Kankwatsa	CIAT, Kampala
Mr John Ereng	Africa 2000 Network, Tororo
FFS groups	Tororo District
Dr Rob Delve (advisor)	CIAT, Kampala

Step one: Collect information about the technology

Sources consulted:

- CIAT scientists in East Africa
- Extension materials on IPM produced by CPP (Crop Protection Programme of DFID)
- NARO scientists in Serere (but no follow up)
- Internet

Step two & three: Evaluate information against factsheet headings

Emerging gaps:

- Inputs (equipment and materials) for different IPM methods and different resource levels of farmers
- Where to access inputs
- Application rates, frequency, time of day for spraying
- Cost:benefits for different methods of pest management
- Labour requirement (including which work can be done by men, and which by women)

Step four: Design activities to fill gaps

Activities:

- Further literature review – ongoing throughout
- Agro-ecosystem analysis with FFS
- On-farm trials with botanical concoctions, synthetic pesticides, and control (no application)

Step five: Conduct activities with FFS
Agro-ecosystem analysis
The ingredients of the concoction

Step six: Provide feedback to farmer groups
Feedback meetings were held with all groups to discuss results
Problems:
Not enough replications for conclusive data?
IPM is more than just use of botanicals – but not enough time and resources to try out more treatments

Step eight: Pre-test extension materials
- Pre-testing done with farmer groups and service providers
- Difficult to get feedback from non-A2N staff (e.g. private service providers)
- Materials were NOT sent to experienced scientists in NARO
- Feedback from farmer groups was incorporated

Step nine: Finalisation and distribution of extension materials
Brochures were produced and distributed

Recap of day 1 and programme for day 2

Barry Pound summarised the outcome of day one and explained the programme for day 2.

Group work: case study analysis

Participants were asked to form three groups (same as on day one) and analyse the three case studies on adaptive research process presented on day one:

1. Which stakeholders were involved in the adaptive research process, and how were they involved? – use resource persons.
2. Which ones were left out, but should have been involved?
3. For each step in the adaptive research process:
   - Identify good points and bad points in the implementation
   - What are the constraints faced (which might have resulted in the bad points)?
4. What were the outcomes of the process (tangible and non-tangible)?

"Red" group / Groundnut IPM

Question 1: Which stakeholders were involved?

Stakeholder	Type of involvement / role
Two farmer groups	- Testing of technology on IPM - Pre-testing of extension material - Translation of extension material from English to local language
A2N	- Implementers of the research process (coordinating the activities) - Farmer mobilisation - Drafting and developing of extension material
CIAT	- Backstopping he research process (concoction, application, efficacy, etc. -
NRI	- Backstopping - Following, financial and technical accountability

NAADS / service providers / government extension workers / NGOs	- Users of the outcome of the research (extension materials) - Were consulted on extension material

Question 2: Who should have been involved?

Stakeholder	Expected role
Local government extension	- Scaling out the findings - Ensure sustainability of the technology
Local councils	- Mobilisation of farmers to accept botanical concoction - Resource mobilisation to support scaling up - Advocacy to other NGOs
Other NGOs	- Dissemination of findings
National research / NARO	- Technical advice and backstopping - Support on emerging issues (g'nut leaf miner)

Question 3: Analysis by step

Step	Good points / strengths	Weak points / weaknesses
1	- Were able to use information generated by NAADS on priority enterprises and key constraints - Use of CIAT network and NRI network to access literature	- Literature in Uganda on groundnut IPM was not assessed - Documentation of research findings from NARO is not done in an easily accessible format (poor information management system in Uganda)
2	- Intervention areas were identified…	- Factsheet heading list is not easy to use – can we make it more accessible / better illustrated / use examples to make it user-friendly? - Documentation of research outputs is poor – therefore the gaps are larger than necessary (researchers have more information in their head than what they write down)
3	… together with farmers	
4	- on-farm trials were designed…	- number of sites not sufficient - key stakeholders did not fully backstop as expected (CIAT, SARI) - no attempt to getting replacement - problem with status differences and communication gaps between research and extension - Reason for this: Researchers bring funds to extension from their projects (pay extension allowance etc.) – rarely the other way around
5	…and implemented	
6	- Done well (easy – sites were few) - Reflection took place	- Could have organised feedback to other stakeholders (e.g. field day) - Resources limited – means that remaining gaps were not identified and addressed (e.g. leaf miner) - Weak backstopping from researchers, especially on emerging issues

7	- Was done – brochures developed, pretested, translated and distributed	- Only printed materials were produced because of limited resources - No other promotion pathways explored (TODIFA newsletter)
8		- No feedback from extension staff who were asked for comments on extension materials (perhaps because they were not involved earlier?)
9		- Quality of art work was poor (drawings)

Question 4: Outputs of the project

Tangible output:

- Brochures produced and distributed

Likely outcomes:

- Reduced pesticide use, increased yield, increased income (if technology is applied – no evidence)
- No M&E or follow up done – not clear whether technologies were adopted – should there be a tenth step on M&E

Intangible:

- Enhanced knowledge and capability of group members
- Enhanced knowledge and capability among A2N staff on IPM and extension material development
- New partnerships are developing (e.g. Gatsby funded project on NRM involving CIAT, A2N and NRI)

"Blue" group / de-worming of goats

Question 1: Which stakeholders were involved?

Stakeholder	Type of involvement / role
District NAADS (Tororo and Arua)	- Problem identification - Contracting service providers
MUK veterinary faculty researchers	- Research experience in design and planning - Coordination - Baseline survey - Sourcing of technology - Sample analysis (lab and statistics)
Linking project	- Provided funding
NGOs: A2N	- Growing of mucuna in Tororo
Abi ARDC	- Growing of mucuna in Arua
Indian NGO (BAIF – Bharat Agro-Industry Foundation)	- Development of technology in India - Backstopping
Sub-county NAADS service providers	- Mobilising - Background survey - Experiment management and supervision - Sample collection

Question 2: Who should have been involved?

- Local leaders – normally they have an influence on farmers
- No information on involvement of district production department

- The different stakeholders that were involved came in when need arouse, but not in planning

Question 3: Analysis by step

Step	Good points / strengths	Weak points / weaknesses
1	- Literature on technology obtained	- No systematic evaluation of technology based on fact sheet
2	- Evaluation was by team of experts - Research based on farmer demands	
3	- Farmers were involved and identified gaps	
4	- Process was participatory - 2nd round of experiments designed now included more concerns	- Only biological concerns were taken care of - Farmers not involved in experimental design
5	- Experiment was conducted under farmer conditions	- Farmers dewormed their goats without researchers' knowledge
6	- Feedback encouraged farmers to participate in 2nd round	

Constraints: See aggregated points below (across all groups)

Question 4: Outputs of the project

1. Baseline information about goat husbandry and Mucuna technology generated
2. Capacity of farmers to participate in research enhanced
3. Stimulated thinking about Mucuna as a (potential) dewormer
4. Lessons learnt from first set of trials were used to improve 2nd set of trails – other parameters were now included.

"Black" group / DAP

Question 1: Which stakeholders were involved?

Stakeholder	Type of involvement / role
Research (Abi ARDC, SAARI, Namalere)	- Technical backstopping - Training of service providers - Providing and collecting information - Identifying gaps - Provided linkage to manufacturers of implements - Production of training manuals - Design of implements (Namalere) - SAARI / COARD: Design of fact sheet headings
Service providers (NAADS)	- Collected information from relevant sources - Testing of technology - Trained farmers - Procurement of trial materials - Production of training manuals - Demonstration
Four farmer groups	- Provided information - Identified gaps - Provided land, animals and labour - Participated in o Testing and demonstration of the technology o Production of extension materials

Stakeholder	Type of involvement / role
	- Enterprise selection - Participatory M&E - Modified machine design
District production staff (NAADS, extension)	- Mobilisation - Enterprise selection - Provision of information and gap identification - Participated in M&E - Production of training materials - Testing of technology - Demonstration
Donors (DFID – CPP and LPP)	- Provided funds
Linking project	- Coordination - Technical backstopping - PM&E
Stockists	- Sale of implements and inputs (e.g. planters, seeds, fertilisers) - Provided information on prices
Manufacturers	- Fabrication of implements - Provided technical information on implements - Participated in evaluation

Question 2: Who should have been involved?

- Civic leaders and political leader
- Religious leaders, cultural, opinion leaders

Question 3: Analysis by step

Step	Good points / strengths	Weak points / weaknesses
1	- Involvement of relevant stakeholders - Demand-driven - Information collected was relevant - Use of already existing institutions	- Other assignments outside the project (too many commitments)
2	- Good team work - Easy access to literature and information enhanced evaluation and gap filling	- None
3	- Farmers were interested - Technology was in existence already (farmers' experiences)	
4	- Adequate involvement of stakeholders	- Delay due to many commitments
5	- Farmers had sense of ownership - Roles clearly defined and understood by all stakeholders	- Defects in the technology
6	- Farmers gave feedback - Results of the entire activity were confirmed	- Delayed feedback from manufacturers
7	- Participatory production of extension materials	- Service providers didn't have adequate skills causing delays
8	- Participatory testing, modification and translation	- Translation was difficult due to too many local languages
9	- Material available in different languages	- Editorial problems

	- Materials were modified to suit farmers' situation	

Question 4: Outputs of the project

1. Farmers' capacity enhanced
2. New knowledge acquired
3. Training materials developed and made available
4. Linkages and partnerships developed and strengthened
5. Implement improved
6. Farmers became trainers
7. Farmers are generating income out of DAP

Plenary discussion on case studies

Outputs and outcomes – compiled across case studies

Tangible outputs:

- Extension / training materials produced and disseminated to other stakeholders
- Baseline information available on worms in goat (survey done in Arua and Tororo)

Tangible outcomes:

- (assuming that the technologies are being adopted by farmers): increased yield of groundnut, reduced use of pesticides, reduced production costs through use of DAP
- Feedback to implement manufactures to enable them to produce improved implements
- Trainers trained to promote technology in the future

Intangible outcomes:

- Enhanced capacity and knowledge of farmers, NGO staff and NRI staff
- Partnerships developed
- Awareness of new technologies promoted

Table 6 Constraints in the implementation of the ARP and suggested ways of addressing them (across all three case studies)

Constraints	Ways of addressing them

Constraints	Ways of addressing them
- Documents (research outputs) of NARO and other organisations are not easily accessible (linked to documentation, storage and accessing of NARO information) - Accessibility includes various aspects: 1. Outputs / results are not documented at all 2. They are documented, but in a format that is difficult to use for extension staff (e.g. peer reviewed international journals) 3. They are documented in appropriate forms, but the documents are not physically available.	- There is a need to enhance institutional memory – all projects and organisations must ensure that the research outputs they produce are available / archived - This issue needs addressing at country level. For example in NARO, scientists lack the competence and training in communication issues to document and publish research outputs in appropriate formats. There should be targeted recruitment of people who have these skills. - The same problem exists in most NGOs and other organisations. - NARO is currently understaffed – therefore dissemination of outputs receives low priority - There are incentives for the production of referred journal articles (100,000 Shilling per article), but not for other types of outputs. - Sometimes credit for technologies is not given to those who produced them – this can be a disincentive for promoting technologies - There should be recommendations made to the variety release committee to ensure that information about varieties includes all the socio-economic aspects on the factsheet list.
- Lack of adequate skills in developing dissemination materials	
- Editorial problems with dissemination materials	
- Fact sheet headings are not user-friendly	- This needs further exploration. Participants will think about it and there will be a short session on Saturday to collect ideas on how to improve the list.
- Resource constraints to CIAT backstopping: Stakeholders had other commitments, leading to delays and being unable to fulfil their roles	- An MoU with key stakeholders can be useful to get their commitment.
- Insufficient resources for replications of trials, or for on-station trials – e.g. on goats (Linking project: 10 Million shillings per team for 18 months, including all expenses)	- Integration of the adaptive research process into the mainstream R&E system - Add M&E as a separate step?
- No monitoring of outcomes / follow up of research and partnerships	
- Limited types of dissemination materials	- Link types of dissemination material to situation analysis (e.g. availability of radios in the area). - Also needs to link to available experiences and skills.

Constraints	Ways of addressing them
- Some stakeholders not involved from the start. This resulted in lack of follow-up and institutional partnerships - E.g. Civic, religious, cultural leaders - District production coordinators and staff	- Stakeholder analysis, identification of partners and team / partnership building (agreement on a common purpose) need to be part of the process. - Resources need to be allocated for this. - Perhaps have an additional step in the process that covers this at the beginning? - Partnerships need to be both between individuals and institutions. Institutions can benefit from partnerships in adaptive research by charging overheads for their services, and individuals can benefit from rewards (recognition of contributions) - There needs to be an open, transparent process to agree on who does what in the partnership – not just bosses telling their staff to do it (on top of other duties)
- Delayed feedback from manufacturer (DAP)	
- Farmers withheld information from researchers (goats)	
- May local languages make production of printed extension material expensive	
- Incorporation of gender aspects weak	
- Logistics: Large distance between project implementers and farmers (Arua – Kampala)	- This can be addressed through capacity development (e.g. as done by the DAP team – SARI staff trained Abi staff). This way decentralised capacity is generated.
- Fact sheet headings not fully evaluated or incorporated into the activities (goat deworming)	- Means the development of dissemination materials becomes more expensive - Nothing much can be done about that
- Focus on biological performance of technology (goats)	- Give more emphasis on multi-disciplinarity within the research teams to address non-technical issues
- Defect in technology (DAP implements, mucuna species)	
-	- This is not a problem/ constraint, as the whole purpose of the adaptive research process is to identify such defects

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Institutionalisation of the process

Presentation on the activities of the inter-institutional working group on packaging research outputs (Florence Oumo)

Florence presented the experiences of the group as shown in Annex 5, followed by a discussion.

It was stressed that there is a need for improved quality control of service providers. Because of the decentralisation to sub-county level, several service providers might train farmers in different sub-counties on different technologies for the same enterprise. This can cause confusion. There is a need for better quality control and streamlining of service provision. There might be books / manuals etc. from NARO and NAADS, but are they up-to-date, and do service providers have them? Not clear.

A CPHP-funded (Crop post-harvest programme of DFID) research project recently explored the feasibility of a market place for agricultural information in Uganda. The project involves Africa 2000 Network (Paul Nyende), and findings can be found at www.mpaisuganda.com. The problems is that it takes a long time for researchers to respond to the queries posted there by extension staff.

Plenary and group session on institutional environment for ARP (Barry Pound)

Participants brainstormed on the question: "What are the elements of the institutional environment that need to be in place for the adaptive research process to work?" The results, after clustering, are shown below. The group then split into three to discuss:

(a) Which one of those are new / different from what is in place already?
(b) Identify which of these are (1) essential, and (2) desirable?
(c) What is the likelihood of these elements to be made available?

"Red" group feedback

Effective communication

- Effective communication system – efforts are being made on this, and capacity is being developed in terms of personnel and resources
- Sharing of information with stakeholders
- Technologies available should be published
- Good coordination from national to farmers
- Use of all languages in communication
- Case studies of success

Problem: communication responds more to needs of donors than to needs of en-users
Facilities are still limited, and capacity to use them is loose, costs of maintenance and operation is high.

Mind-set

- Recognise the source of the idea
- Credit sharing
- Open mindsets
- Harmonising research process
- Team spirit
- Involvement in activities like meetings, planning
- Culture
- Community surrounding
- Willingness to delegate responsibility

Still requires a long work. Changes in attitude need a lot of time. Money can divide partners – e.g. if people contribute to proposal, but then don't get funds. Budgets are cut at times, and then activities cannot be completed on time.

Partnerships

- Multi-disciplinarity – is recognised
- Gender – is recognised
- Encourage partnerships
- Linkage of key stakeholders – has been weak
- Networking
- Partnership linkage
- Coordination – problem with involvement of all partners
- Cooperation
- Sharing
- Spirit of working with the community
- Free partnership
- Partnership policy – is coming up / initial stages (meeting planned for next week)

Problem is putting the above into practice. Mind sets need to come first. All three are essential and desirable. Policy: NARO has now a policy to focus on specific areas.

"Blue" group feedback

Recognition of performance

- Motivation
- Job assurance in extension
- Commensurate reward
- Recognition for achievements
- Recognition for output
- Feedbac

Clear, non-contradicting policies

- No political interference

Facilities

- Facilitation (transport, allowances)
- Facilitation
- Facilities available

1. Recognition of performance

Topic	New	In place	Essential	Desirable
Rewarding (e.g. publication) – needs improving		X	X	
Recognition of outputs (LG)	X		X	
Feedback (weak)		X	X	
Recognition of achievements (increasing)		X		X
Policy analysis (conflicting)	X		X	
Political interference (varies)		X		

2. Facilities and facilitation (in place, but inadequate and essential)
    - Laboratories
    - Vehicles
    - Facilitation (remuneration)

3. Likelihood of these elements to be made available – yes, but with the proposed changes in NARS act:
    - Better remuneration

- Efficiency in the system
- Facilities
- Integration
- Empowerment
- Feedback and linkage in new themes
- New staff to be recruited

"Black" Group feedback

Expertise

- Designation of SMS at district level
- Capacity building of service providers
- Good communication skills
- Technical knowledge and skills
- Monitoring and evaluation

Funding

- Budgetary system
- Flow of funds
- Institutional support
- Adequate money / funds for input made in adaptive research
- Adequate resource allocation to field staff

a) Budget system (which was previously block funded)

- What is new?
    - Competitive funding at National and Zonal levels (see separate account)
    - Innovation fund
    - Trust fund
    - Continuing core funding

- Budgetary system
    - In future there will be different partners involved in budgeting
    - There will be a move towards decentralised and semi-autonomous budgeting

- Flow of funds
    - There needs to be direct disbursement of funds, and support to specific projects (e.g. similar to the activities under the Linking Project)

b) Participatory M&E

- There is expected to be a move towards decentralised PM&E, rather than relying on the NARO M&E department
- More embedded training in M&E

c) Expertise

- Is needed in PM&E
- And in the adaptive research process
- In production of extension materials – vital
- In innovation processes

All are essential.

Competitive Research Fund (information from Diana Akullo, Imelda Kashaija, Julius Okwadi and Julius Mukalazi)

With the reorganisation of the NARS, there is also a change in funding mechanisms. While core funding will continue, there is also an element of competitive funding. There will be a National Competitive Fund as well as Zonal Competitive Funds. The former is for national level priorities, and the latter for priorities identified in each specific Zone, tailored to meet the needs of local stakeholders.

A zonal competitive fund manager has been identified. At Zonal level, there is a Zonal Competitive Fund Committee, comprising:

- LC2 Fund Manager/Secretary
- 4 x farmer members (of which 2 are female)
- NGO rep
- Private sector rep
- One District Production Coordinator
- One NAADS Coordinator
- CAO
- 2 x scientists

The secretariat is at the ARDC. The Committee is independent of NARO, but there is a scientific committee that will vet the proposals.

The Fund is due to start in December. The amount of the Zonal CF is way above the amount of the National CF.

The three pilot zones are: Abi (West Nile), Kachekwano and Serere. The Fund is open (e.g. to MAK, AHI etc.), but must include the key partners to get the work done. Each project will be 3 years maximum, and a max of 50 million Ug Sh.

3 broad priorities have been identified for each pilot zone. There will be further refinement of these topics to specific themes that will be the subject of 2 calls per year.

Socio-economic differentiation

Barbara presented some ideas on the importance of socio-economic differentiation of farmers, based on resources available to them. She explained how to do wealth grouping (see Annex 7) as one tool for differentiating farmers. Main points:

- Farmers own, have control over, and access to different types of resources: Natural, physical, social, human and financial resources (see sustainable livelihoods framework)
- Differences in resource control, access and ownership result in differences in values, preferences, livelihood strategies, capacity
- These differences are important for researchers undertaking adaptive research, because the needs of these different types of farmers will vary, and their ability to adopt a technology
- Dimensions of differentiation that are relatively easy to identify for researchers are ethnicity (tribal affiliation), social relations and conflicts (requires careful observation of and good interactions with communities) and wealth.
- Wealth categories can be identified using farmers' own criteria.

Discussion:

- A concern is whether farmers will be honest – they might think that the information is used e.g. for taxation, and therefore they will withhold information. – This could be avoided by explaining to people clearly what the information will be used for, and by using local spokespeople who are known to the community

- People might not feel comfortable to put names against wealth groups – but one can use methods that only explore the distribution of wealth, without putting anyone in particular into a category. For example, one could just ask how many (proportion) farmers are in each wealth category to get an idea of the overall distribution of assets
- Wealth categories vary between villages / sub-systems; one needs to do a thorough analysis of sample communities in each sub-system in order to get a clear picture. This can take a lot of time and resources, but it might well pay of – in particular if one intends to work in the same community for a longer period of time.
- Overall it is important to adapt the methods / tools and level of detail to the research / extension requirements. A general overview of wealth distribution might be enough for some purposes.
- Within the adaptive research process, this can be done under step 1 – situation analysis.
- Generally researchers do not undertake such socio-economic differentiations systematically – perhaps lack of skills to do it? Even extension staff / service providers tend to present only one solution to farmers' constraints, but this solution might not be appropriate for resource-poor farmers.

Scenarios for adaptive research

The purpose of this session was to explore the objectives of different types of research scenarios in Uganda, and to assess how the ARP can be adapted to the needs of these processes. Two scenarios were considered: Research under the zonal competitive research grant, and under the NAADS technology development sites (TDS).

NAADS technology development sites

THE CURRENT STATUS OF TECHNOLOGY DEV'T SITES UNDER NAADS AT SUB-COUNTY LEVEL
LIRA DISTRICT AS AN EXAMPLE
Oremo Opio, M, LDLG

TECHNOLOGY DEVELOPMENT NOTION
A strategic activity aimed at:
- Meeting technology needs,
- Increasing Productivity and
- Profitability of farmer selected enterprises
- Create demand for technologies
- Increase adoption of technologies

TECHNOLOGY MAY BE:
- Product (s)
- Knowledge or techniques
- A Tool (s)

ASPECTS OF TDS
- Increase access to foundation technology
- Identification and dev't of probable sol'ns to address production constraints
- Adaptive research (for newly released technologies)
- Awareness creation and capacity dev't

TDS PROCESS
- Development of TOR
- Procurement of necessary Goods and Services
- Site selection and Implementation of assignment in TOR

- Monitoring and Evaluation
- Stage wise Technical Audit of activities
- Review of Performance, documentation of challenges, lessons learnt and problems
- Higher level review and harmonization for better implementation guideline & strategies

STAKEHOLDERS
- Farmers working in groups/ Fora
- S/c Tech staff & Local leaders and CSOs
- District Pdn and community dev't, Political leaders
- NAADS SEC & Sister Org'ns
- NGOs/ CBOs
- Contracted private service providers
- Business community

PROCESS SUPPORT TO ADAPTIVE RESEARCH
- Encourage and work with stakeholders of different background
- Ownership of the technology becomes the responsibility of end user immediately
- Explores and expose any unforeseen constraints or challenges faster and seeks immediate solution often got by doing

Limitation
- Resource availability in adequate amount
- Guiding policies on resource use
- Limited personnel and lack of skills amongst the existing few
- Attitudes and cultures (Poor collaboration between tech source, pathway and end user)
- Many specific home-grown technologies are not available

Advantages
- Builds capacity as implementation goes on
- The process of adoption takes shorter time
- Some technologies are taken wholesome without pretest in environment

Disadvantages
- Lack of basic data about various localities we operate
- May conflict with some policies
- Overlap of responsibilities amongst implementers especially those with technical knowledge

Discussion:
Q: Why are NARO scientists not involved? NAADS and NARO don't work together effectively.
Q: Cross-cutting issues are big (gender, HIV, NRM) – is that capacity available at the district level
Q: Who insures quality for procurement? In Hoima, some service providers procured planting material for cassava that was of poor quality.
Q: Diffusion of technology is short-term, but adoption is a long-term process
Q: The TDSs seem to mostly be managed by the farmers in charge, with little involvement of other farmers.

Answers:
- It is true that NARO scientists are not involved directly, but NAADS Lira goes to the research stations / specific officers to get new knowledge on relevant technologies. The poor linkages are a historical fact and it will take time to improve.
- There is an accelerated rate of change – even in non-NAADS areas – partly in response to the market pull.
- Capacity at district level: there has been a lot of training and the capacity has increased to tackle the cross-cutting issues. Some people even paid for it from their own pocket.
- For procurement, specific guidelines exist and procedures are followed as per the contracts.

Group work on two scenarios

Group discussions on the following topic:

- What are the objectives of doing adaptive research in each of those scenarios?
- What modifications of the generic ARP are required to fit the different specific objectives of the two scenarios?

Feedback from groups 1 – NAADS group / TDS

Objectives of TDSs:

- Helps to equip service providers with confidence in what they offer to farmers
- Helps to develop training materials relevant to the farmers (participatory approach)
- Easy to modify a given technology
- Helps to create awareness in the community
- For easy observation by the community, before the technology is taken up
- Helps to develop research agenda for further proceedings
- Marketing of the technology and subsequent outputs

How to modify ARP to meet the objectives:

Step	Modification
Step 1a – situational analysis	➢ Including wealth ranking ➢ Social and economic status ➢ Stakeholder analysis
Step 1b – Collecting information	➢ Do not need modification
Step 2	
Step 3	➢ Should cover both public and private sector (involve all stakeholders)

The remaining steps were not covered because of shortage of time.

Feedback from groups 2 – Zonal competitive research fund

Objectives of AR in this context:

- To cater for location-specific problems in response to needs identified in the zone
- To encourage pluralism in research service provision
- To enhance partnerships in the research process (stimulate researchers working together)
- To improve the quality of research services (effectiveness, accountability, efficiency)

How to modify ARP to meet the objectives:

Step	Modification
Preparation phase	➢ Access information about o zonal priorities o concept calls and guidelines ➢ Assembling the research team (includes analysis) ➢ Reflection and re-design
Step 9	➢ Archive and store results / outcomes in a form that can be shared with others
Overall	➢ Steps should be reduced ➢ M&E should be built into and ongoing throughout the process

Assessing and prioritising recommendations

Throughout the workshop, a number of recommendations were made by participants on ways to undertaking adaptive research in Uganda. The facilitators compiled a list of these recommendations and asked participants to indicate

1. Whether or not they agree with these recommendations, and
2. What priority the recommendation should have.

The outcome is shown in the table below.

Table 7 Prioritisation of recommendations for adaptive research

Recommendations	Agreement			Priority to be addressed		
	Agree fully	Agree partly	Don't agree	High	Medium	Low
Institutionalisation / integration / general recommendations						
The adaptive research process should be adopted by NARO, NAADS and partners, but adapted to specific objectives and condition	**18**	**0**	**0**	**17**	**0**	**0**
There should be integration of the adaptive research process into the mainstream R&E system	**16**	**0**	**0**	**16**	**0**	**0**
The adaptive research process used will depend on the objectives, clients and location of the adaptive research	**13**	**1**	**0**	**13**	**0**	**1**
AR should develop technologies that are relevant to peoples needs and improve their livelihoods	**17**	**0**	**0**	**16**	**0**	**0**
The ARP should be compatible with the mandate of the lead and partner organisations involved	**12**	**2**	**1**	**11**	**3**	**0**
Adaptive research, basic research and extension services should work together harmoniously to produce technologies relevant to the needs and situations of Ugandan farmers	**14**	**3**	**0**	**14**	**2**	**0**
New technologies (e.g. those originating outside the country) should be tested on-station, if possible, before going on farm	**14**	**2**	**0**	**14**	**3**	**0**
There should be flexibility in the AR programme and resources to enable the teams to follow up on secondary constraints and opportunities	**14**	**0**	**0**	**14**	**0**	**0**
NAADS and NARO are not working effectively together. This needs to be resolved!	**13**	**3**	**0**	**16**	**1**	**0**
Demand identification						
There is an apparent conflict between farmer priorities as identified through NAADS processes and through NARO processes. This should be resolved	**15**	**2**	**0**	**16**	**0**	**0**
Information management						

Recommendations	Agreement			Priority to be addressed		
	Agree fully	Agree partly	Don't agree	High	Medium	Low
There is a need to enhance institutional memory – all projects and organisations must ensure that the research outputs they produce are available / archived	**16**	**0**	**0**	**15**	**0**	**0**
NARO should train its staff in communication skills to better equip them to communicate research outputs to intermediate and end users	**17**	**1**	**0**	**17**	**1**	**0**
NARO should undertake targeted recruitment of people who have such communication skills.	**10**	**9**	**0**	**9**	**10**	**0**
Incentives for information sharing	**13**	**3**	**2**	**13**	**3**	**2**
It is important that credit for technologies is given to those who produced them as an incentive for them to promote these technologies	**15**	**2**	**0**	**16**	**1**	**0**
Inclusion of non-technical information						
There should be recommendations made to the variety release committee to ensure that information about varieties includes all the socio-economic aspects on the factsheet list.	**12**	**3**	**0**	**12**	**3**	**0**
AR includes studies on marketing, social, economic, environmental and policy issues as well as bio-physical ones	**13**	**2**	**0**	**13**	**1**	**0**
The fact sheet list should be improved to make it more user-friendly	**7**	**8**	**2**	**2**	**11**	**3**
Partnerships and capacity development						
Where necessary MoUs can be used to define the interests, roles, responsibilities and contributions of the main partners in AR	**7**	**5**	**1**	**6**	**6**	**0**
Stakeholder analysis, identification of partners and team / partnership building (agreement on a common purpose) need to be part of the adaptive research process, and resources need to be allocated for this. This should be done at the beginning of the process in order to do planning together, instead of bringing in stakeholders later on	**17**	**0**	**0**	**16**	**1**	**0**
There needs to be an open, transparent process to agree on who does what in the partnership – not just bosses telling their staff to do it (on top of other duties)	**14**	**3**	**0**	**13**	**1**	**0**

Recommendations	Agreement			Priority to be addressed		
	Agree fully	Agree partly	Don't agree	High	Medium	Low
Partnerships need to be both between individuals and institutions. Institutions can benefit from partnerships in adaptive research by charging overheads for their services, and individuals can benefit from rewards (recognition of contributions)	**7**	**7**	**1**	**6**	**8**	**0**
More emphasis should be given to multi-disciplinarity within the research teams to address non-technical issues	**16**	**0**	**0**	**16**	**0**	**0**
It is important to include local leaders (political and religious leaders) in the adaptive research process, as they are able to mobilise farmer	**3**	**12**	**0**	**4**	**10**	**1**
It is important to include local government in the adaptive research process, as they are able to scale out the findings	**10**	**5**	**0**	**9**	**4**	**1**
The perceived status differences between researchers and extensionists need to be overcome in order to improve communication and partnerships	**12**	**2**	**0**	**13**	**2**	**0**
Capacity building of partners can go hand in hand with adaptive research so as to decentralise the research capacity and technical expertise	**9**	**6**	**0**	**8**	**7**	**0**
M&E						
AR should incorporate a reflection and learning cycle	**15**	**0**	**0**	**17**	**0**	**0**
M&E could be added to the process as a separate step, including feedback to the research system	**0**	**0**	**14**	**0**	**1**	**2**
Dissemination materials and methods						
Link types of dissemination material to situation analysis (e.g. availability of radios in the area).	**16**	**1**	**0**	**15**	**2**	**0**
Also needs to link to available experiences and skills.	**11**	**3**	**0**	**8**	**5**	**0**
Dissemination outputs from AR should be in local languages (in addition to English) nd use pictures or diagrams to illustrate the technologies and their use.	**15**	**1**	**0**	**13**	**3**	**0**
Extension materials need to be quality controlled. A mechanisms for this was proposed by the Working Group and needs to be followed up.	**15**	**1**	**0**	**15**	**1**	**0**
Farmers respond better to practical,	**17**	**0**	**0**	**17**	**0**	**0**

Recommendations	Agreement			Priority to be addressed		
	Agree fully	Agree partly	Don't agree	High	Medium	Low
experiential learning rather than classroom lectures						
Radio is a good medium for dissemination to farmers, and plays have the ability to capture and hold farmers attention	**3**	**12**	**1**	**3**	**11**	**1**
Exchange visits are an effective way of sharing experiences between farmers	**17**	**1**	**0**	**8**	**9**	**0**
Extension materials arising from AR should mention the disadvantages of the technology as well as its merits	**8**	**8**	**0**	**2**	**14**	**0**
Differentiation						
AR should use tools and methods to produce technologies relevant to men and women farmers with differing access to resources	**13**	**1**	**0**	**8**	**8**	**0**
People involved in AR should know the categories of people they are dealing with, as there are different technical options for different people. This also applies to service providers when they are promoting technologies to farmers.	**15**	**1**	**0**	**11**	**4**	**0**
Recommendations added on day 3:						
Include M&E in all steps	**15**	**0**	**1**	**15**	**0**	**1**
Add step on situation analysis	**16**	**0**	**1**	**16**	**0**	**1**
Reduce number of steps in ARP	**5**	**5**	**8**	**5**	**3**	**6**
Include explicit feedback lop: Reflection after feedback step 6 – then back to step 2	**14**	**2**	**0**	**15**	**1**	**0**

The table shows that most participants agreed fully with a large proportion of the recommendations. The only recommendation that most participants disagreed with was the one saying that "M&E could be added to the process as a separate step, including feedback to the research system" – most participants were of the view that M&E should be an integral part of the process in every step.

Closing session

Participants were asked to evaluate the workshop, by writing their views on post-its and sticking them to a board under the following headings:

- What you liked,
- What you did not like,
- What is the most important thing that you will take from the workshop
- What was missing

What am I taking home:

- New strategies and skills
- Presentational skills

- Importance of socio-economic differentiation
- The ARP and its steps
- Importance of participation of stakeholders
- TDS process
- New partnerships
- Situation analysis is key to all stages of research and development process
- Wealth ranking
- Facilitation skills
- Use of fact sheets in the ARP
- Participatory planning and use of stakeholders at various levels
- Recommendations

What was missing
- Bags for carrying handouts
- Pockets for keeping papers
- Cold water
- High room temperature
- Social evening
- Energisers after lunch
- Variety in food
- Expected to learn more about the production of dissemination materials
- Representation of service providers
- Involvement of participants in shaping the workshop programme
- Linking to IAR4D mentors
- Mentoring training that was in the invitation letter

What did we like
- Active participation
- Transparent participation
- Interaction among participants
- Openness during the discussion
- Meeting friends
- Good facilitation; mode of facilitation
- Free deliberation without bias or concealment
- Freedom of expression throughout sessions
- Presentations
- The ARP steps
- Constraints to AR

What I didn't like
- Training reflected less of what was communicated
- ToR for participation not clear, especially transport and out of pocket expenses
- Out of pocket expenses not clear
- Insufficient night allowance
- "Fuel" not disclosed
- Lack of cooling in the room
- Workshop and meals all in the same room – monotonous
- Eating near the toilets
- Noises behind the meeting venue

It was agreed that the facilitators will email the full proceedings to participants within the next two weeks. Those who do not have email will receive a hard-copy by post.

The facilitators thanked the participants for their active participation and enthusiastic contributions.

Annex 1 List of participants

Name	Organisation	Address	Phone / fax	Email
Workshop participants				
Akello Beatrice	NARO – Mukono ARDC	PO Box 164, Mukono	077 480482	bakello@naromukono-ardc.org
Akongo Graceline	NARO – Ngetta ARDC	PO Box 52, Lira	077 342974	gracelinako@yahoo.com
Akullo Oyena, Diana	NARO – Secretariat		077-465103	diana.akull@wau.nl, dianaoyena@yahoo.co.uk
Ayo Ogwal George	Lira District Local government	Box 49, Lira	077 872274	ayowa2003@yahoo.com
Birungi Pauline	NARO – Bulindi ARDC	PO Box 101, Hoima	077 617082	birungipolly@yahoo.com
Ejobi Francis	Faculty of Vet Med, Dept of Public Health, Makerere University	PO Box 7062, Kampala	256 41 531869 077 492236	ejobifrancis@yahoo.com, ejobi@vetmed.mak.ac.ug
Imaikorit-Oumo Florence	NARO – SAARI	Soroti	078 125900	imaikorit@yahoo.co.uk fioumo@narosaari.org
Kashaija Imelda N	NARO - Kachwekano ARDC	PO Box 421, Kabale	0486 26492 077 465070	kachwekanoardc@yahoo.com, ikashaija@yahoo.co.uk
Mukalazi Julius	NARO – Abi ARDC	Box 219, Arua	077 676477	Julius_Mukalazi@yahoo.co.uk
Nguma Richard	CEFORD Arua	Box 303 Arua	077 464131	Ceford_ug@yahoo.com
Nsubuga Mutaka R C	NARO - Mbarara ARDC		077 427412	mutakarc@yahoo.co.uk
Okanya Patrick	Farmer	PO Box 287, Tororo	-	-
Okech Sam G	Makerere University, Faculty of Vet Medicine	PO Box 7062, Kampala	077 605586	sgokech@vetmed.mak.ac.ug
Okwadi Julius	NARO – SAARI	Soroti	077 823854	jokwadi@narosaari.org, okwadi@yahoo.co.uk
Olege Dominic	Tororo Local Government	PO Box 625, Tororo	077-348148	Podofa2004@yahoo.com
Opondo Chris	AHI	Kampala	077 978237	c.opondo@cgiar.org, cjopondo@yahoo.com
Oremo Opio M	Lira District Local government	Box 49, Lira	077 316489	oremoopio@yahoo.com
Osere Asuut	Farmer	PO Box 287, Tororo	078 971921	-
Otim Okello F	NAADS Soroti	PO Box 61, Soroti	075 669875	francisotim@yahoo.co.uk
Ruhesi Hilda	Mbarara District Local Government		077 442059	hildaruh@yahoo.com
Tumwizere Emmanuel	Dept. of production – agric. Extension	P.O. Box 270, Mityana	077 439270	
Project team				
Manzi Jovia	Linking Project	Until 12/2005: First Floor, Plot 38, Lumumba Ave, Box 24649, Kampala	077 447280	ugandalinking@yahoo.co.uk
Pound Barry	NRI / LIG	Central Avenue, Chatham Maritime, ME4 4TB, Kent, UK	UK office: +44 1634 883067, UK fax: +44 1634 883377, Mobile / Uganda: 077-926966	B.Pound@gre.ac.uk
Adolph Barbara	NRI / LIG		UK office: +44 1634 883177, UK fax: +44 1634 883377, Mobile / Uganda: 078 702616	B.Adolph@gre.ac.uk, barbara_adolph@yahoo.com

Annex 2 Participants, organisations, interests and group allocations

(in alphabetic order)

Group	Name	Organisation	Interest
3	Akello Beatrice	Mukono ARDC	FSR, upland rice, marketing (interests determined by farmers)
1	Akongo Graceline	Njetta ARDC	Understand the process of technological development and use (through to application)
1	Akullo-Oyena Diana	NARO Secretariat	Institutional innovation
1	Ayo George	Lira local government	Increase income at household level through production at reduced costs
3	Birungi Pauline	Bulindi ARDC	Soil fertility management
2	Ejobi Francis	Makerere University	Medicinal plants and indigenous knowledge for animal health
3	Kashaija Imelda	Kachwekano ARDC	Goat improvement and many other topics
1	Mukalasi Julius	NARO Abi ARDC	Adaptive research for the West Nile FS, partnerships and linkages
3	Mutaka Robert	NARO Mbarara	Farmer participatory research, livestock health and production
1	Nguma Richard	CEFORD Arua	Marketing
2	Okany Patrick	Farmer, Tororo	Animal traction
1	Okech Samuel	Makerere University	Animal health
2	Olege Dominic	Tororo Local government	Draught animal power, adoption and impact
2	Okello Francis	NAADS Soroti	Marketing, livestock improvement
2	Okwadi Julius	NARO SARI	Adoption, impact, livelihoods
2	Osere Asuut	Farmer, Tororo	Animal traction
1	Opio Moses	NAADS Lira	Upland rice production
3	Opondo Chris	AHI	Participatory approaches to and up-scaling of Natural Resources Management
2	Oumo Florence	NARO SARI	Translating technologies into messages for farmers
3	Ruhesi Hilda	Mbarara Local government	Animal health and production
3	Tumwizere Emmanuel	Local government Mukono, working Mukono ARDC	Technical guidance to farmers
Project team			
	Adolph Barbara	Linking project / NRI UK	Linking demand for and supply of agricultural information. Technologies: Control methods for cassava mosaic and sweet potato virus diseases
	Manzi Jovia	Linking project	How research can have more impact
	Pound Barry	Linking project / NRI UK	Linking demand for and supply of agricultural information

Group 1 = black group, Group 2 = red group, Group 3 = blue group

Annex 3 Workshop programme

Day 1

9.00 – 9.45 Session one: Welcome and introductions
- Welcome, purpose of the workshop and background to the project
- Introduction of participants and organisers

9.45 – 10.00 Session two: What is adaptive research?

10.00 – 11.15 Session two: Group work: How do you carry out adaptive research in your zone?

(Tea break during group work)

11.15 – 11.45 Session two continued: Feedback from group work and discussion

11.45 – 12.30 Session three: The Linking project adaptive research process

12.30 – 13.30 Lunch break

13.30 – 14.00 Session three: Farmers from Tororo explain what type of information / advice they want on agricultural technologies and in what format

14.00 – 15.00 Session four: Presentations from team leaders of adaptive research process
- Francis Ejobi, Makerere University: Goat deworming
- Dominc Olege, Local Government Tororo: Draught Animal power
- Barbara Adolph for John Ereng, Africa 2000 Network Tororo: Groundnut IPM

15.00 – 15.30 Tea break

15.30 – 16.15 Session five: Group discussion on strengths and weaknesses of the new adaptive research process *(postponed to day two)*

16.15 – 16.45 Session five continued: Plenary feedback *(postponed to day two)*

16.45 – 17.00 Wrap up and synthesis

Day 2

9.00 – 9.15 Session five: Recap of day 1 and programme for day 2

9.15 – 10.30 Case study analysis – three teams
1. Goat de-worming – blue group
2. DAP – black group
3. Groundnut IPM – red group

10.30 – 11.00 Tea break

11.00 – 11.45 Plenary discussion
- Feedback from groups
- Outcomes – what was achieved, what wasn't, and why
- Possible solutions to constraints identified

11.45 – 12.00 Session six: Presentation on the activities of the inter-institutional working group on packaging research outputs (Florence Oumo)

12.00 – 13.00 Plenary work:
(a) What are the elements of the institutional environment that need to be in place for the adaptive research process to work?
(b) Which one of those are new / different from what is in place already?
(c) Identify which of these are (1) essential, and (2) desirable?
(d) What is the likelihood of these elements to be made available?

13.00 – 14.00 Lunch break

14.00 – 15.00 Group work by organisations (NAADS & NGOs & LG / NARO & MAK): How can the adaptive research process be institutionalised within NARO (via competitive research funds) and NAADS (via technology development sites)? – draw on your experiences with these (postponed to day 3)

15.00 – 15.30 Feedback from group meetings (postponed to day 3)

15.30 – 16.00 Tea break

16.00 – 16.45 Session seven: Socio-economic differentiation and how to do it (postponed to day 3)

16.45 – 17.00 Wrap up and programme for Saturday

Day 3

9.00 – 9.15 Recap of day 2 and programme for day 3

9.15 – 9.45 Session seven: Socio-economic differentiation – why it matters, and some ideas on how to do it

9.45 – 11.00 Session six: Group work on two scenarios for adaptive research:
1. Technology development sites
2. Adaptive research as part of research funded by the zonal competitive research fund

Discuss:
- What are the objectives of doing adaptive research in each of those scenarios?
- What modifications of the generic ARP are required to fit the different specific objectives of the two scenarios?

(Tea break during group work)

11.00 – 11.45 Session eight: Plenary discussion
- Feedback from groups
- Sorting of recommendations and prioritising

11.45 – 12.30 Closing session: Wrap-up and way forward, workshop evaluation:
- What you liked,
- What you did not like,
- What is the most important thing that you will take from the workshop
- What was missing

12.30 Lunch

Annex 4 Presentation on adaptive research

What do farmers want to know about agricultural technologies?

- Technical information (how does it work, what does it do – as compared to what I am using now, what are potential side effects)
- Economic information (inputs required and their availability, costs involved, expected returns, support available, etc.)
- Social information (need for collaboration / group action, potential conflicts of interest etc.)

=> **Assess suitability of the technology for different types of farmers**

Adaptive research process

- Tested on three technologies (DAP, IPM, goat deworming)
- Designed to generate information that farmers really need
- Links up with output 2 – information supply in the right format
- Presentations today from these teams:
    - Paul Nyende, A2N Tororo: Groundnut IPM
    - Francis Ejobi, MAK Kampala: Goat deworming
    - Dominic Olege, LG Tororo: Draught animal power

Most agricultural extension materials address only / mostly technical aspects!
Reasons for this:

- Socio-economic knowledge is largely **location and context specific** (therefore more difficult to generalise) – e.g. prices of agricultural inputs
- Socio-economic knowledge is often **tacit / intangible** and difficult to capture for researchers
- There is often a **communication gap** between research and extension organisations, and farmers / farmer groups

So what could be done about that?

- **Use of factsheets as a basis for extension material development:**
- **Factsheets** are information sheets about agricultural technologies that cover technical, economic and social aspects relevant to farmers.
- **Factsheet headings** are used to structure the information and to provide a checklist for an adaptive research process.

The process in detail

1. Collect information/literature relevant to the technologies from a range of sources, including farmers
2. Evaluate that information against the fact sheet headings and identify any gaps in knowledge
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

Successes / achievements

- For three pilot technologies, the adaptive research process has been carried out and documented.
- The factsheet system could be institutionalised in Uganda through a working group comprising key stakeholders (NARO, NAADS, Makerere etc.)

- Awareness has been raised with key stakeholders in Uganda on the importance of including non-technical aspects in extension materials

Challenges and gaps

- The adaptive research process is lengthy and relatively expensive (high transaction costs) – alternative institutional mechanisms need to be explored (e.g. use of NAADS / NARO technology development sites)
- It is still a challenge to address the needs of different types of farmers – emerging extension materials do not differentiate sufficiently.
- Financial sustainability: Who is going to fund the production and distribution of extension materials originating in the process?

Annex 5 Procedures for packaging research outputs - Florence Oumo, SARI

***"A major challenge facing the agricultural knowledge and information system (AKIS) in Uganda is how to bring together those who seek information to respond to farmers demands, together with those who design and provide agricultural information in order for them to work out together the real opportunities, address transaction costs, and negotiate agreements to overcome barriers to information flow"* (NAADS Communications Strategy 2003).**

NAADS implementation depends upon private advisory service providers' ability to seek & access agricultural information, and translate it into useful forms for provision of advice to farmers and farmer groups. This means that there is a need for some element of quality assurance, so that the service providers and farmer clients can be sure that the information is relevant for their farming systems. Therefore NAADS has to play a role in capturing, cataloguing, reproducing, adapting and making available existing information of agricultural technologies. However NAADS cannot make definitive decisions about these issues on its own. Inter-institutional partnerships are required to ensure all parties agree on common approaches. With this in mind, Linking Project, NARO, & NAADS appointed a small working group to examine these issues in December 2003.

The working group consisted of representatives of NARO, NAADS, MAK Department of Agricultural Extension, Linking Project, Uganda National Farmers Federation and the Private Sector Foundation, and was facilitated by the COARD project. It considered issues of mechanism of coordination of information production amongst multiple service providers; storage & archiving; coordinated use of web-sites; and the form and information required from researchers by advisory service providers. Key points for institutionalizing the packaging and dissemination of research outputs in a farmer-driven situation that have emerged from the experiences and lessons learnt of the COARD project and others include:

- There are already several government and non-government organisations interested and active in the development of agricultural information for advisory service providers.
- Just as most research services should be based on farmer-demand, so should the production of information materials on particular technologies, and the media in which they are produced. Most research currently carried out is based on farmer-demand, and should be packaged in forms useful for the participating farmers and service providers. But the further production and dissemination of these materials should ideally be upon demand from uptake pathways.
- "Information suppliers" (*especially* researchers carrying out farmer-demanded participatory research) also have a role in marketing or promoting their information – to address the problem of "how can farmers know what it is they don't know?"
- The Uganda's revised extension services expects that contracted extension workers actively seek out for information from the national research system and elsewhere; and this information is expected to be readily available at strategic points in a form useful for the extension worker to re-package into forms useful for the farmers that have hired the extension worker to provide information (NAADS, 2003).
- Advisory service providers, farmers, and suppliers of agricultural information need some quality assurance mechanism to make sure that the information they provide does not have technical mistakes. Similarly, there should be a mechanism(s) by which service providers and farmers can assure themselves that the information they access is correct and appropriate for their farming environment.
- The skills of most intermediaries wishing to provide information services to farmers in the finding and re-packaging of information for their clients are weak, and considerable effort will be needed to up-grade these;
- Information describing technologies should cover all aspects of the technology, and a set of check-lists would greatly assist researchers and participatory research projects in ensuring that

they collect adequately comprehensive data-sets that will facilitate the dissemination of their research outputs;

- There may be an interim short-term need to provide information materials in "farmer-friendly" forms, until intermediary organisations can up-grade their skills to do these themselves.

After consideration of various options, the working group recommended:

- That NARO and NAADS establish a joint Standing Committee to coordinate and oversee quality assurance of agricultural information materials for service providers and end-users. Membership of the Standing Committee should include MAAIF, NARO, NAADS, Makerere University, NGOs, Private Sector Foundation, UNFEE, ASARECA and relevant projects like Linking Project. The Terms of Reference for the Standing Committee should include:
  - To coordinate, promote and support the development of agricultural information materials for farmers and service providers;
  - To vet and approve all information materials that will be facilitated through this initiative;
  - To oversee the management and the operation of a common website dedicated to agricultural information materials for farmers and service providers.
- That NARO & NAADS establish a common web-site for approved agricultural information materials. All interested parties should have access and be able to post materials on the web-site, subject to the quality assurance of the committee's approval. The web-site should be housed in and managed by NAADS, but overseen by the above quality assurance committee.
- That the "Factsheet" format developed by COARD and the Linking Project (based on FAO guidelines) should be officially adopted and promoted by NARO and other research institutions for summarising research outputs for service providers and farmers.

Annex 6 Excerpt from NAADS guidelines 2004

8.0 Guidelines for Technology Development

8.1 Introduction

These guidelines have been developed for use by the NAADS Coordinators, Technical Officers of district production departments, service providers and Farmer Fora executive, to provide information, advice and guidance on the technology development process and the utilisation of technology development funds.

8.2 What is technology development?

During enterprise selection and participatory needs assessment, constraints and opportunities are identified. Analysis of these constraints and opportunities generates technology and/or advisory service needs. Technology development is a key activity to meet a technology need, and increase the productivity and/or profitability of the farmer selected enterprise. The technology to be developed may be: an item or product; knowledge or technique; and tool(s). Availability of technology and its use is an important ingredient for increased productivity or reduction in cost of production.

Technology development is aimed at creating demand for technologies and increasing adoption.

8.3 Box 1. Different activities that comprise technology development

Technology development may include the following activities or processes:

(i) Access to foundation technology: multiplication of a new technology that is not available in sufficient units to increase its availability e.g. Seeds/planting/stocking material of a new plant variety or improved animal breed.
(ii) Identification of and development of solutions to address or minimise local production problems
(iii) Adaptive research: a newly released technology that has performed well in on station and on-farm trials can be fine tuned by farmers and researchers through participatory technology development, to better suit local conditions making it more appropriate.
(iv) Awareness creation and capacity development: Introduction of a new technology (in a new or old enterprise) and increasing farmers' capacity to use and benefit from the technology.

8.4 Who are stakeholders in technology development and what their roles?

Stakeholders in technology development include:

- ***Farmers: responsible for enterprise selection, and constraints and opportunities identification. Participate in technology development activities and adoption***
- ***Farmer fora executive: prioritise selected enterprises, and working with technical teams translate farmer identified constraints and opportunities into technology needs. They also approve procurement of technologies (use of technology funds)***
- ***Sub-county technical team: Working with the farmer forum executive, facilitate identification of technology needs, and develop terms of reference (ToR) for procurement of the enterprise (technology) development service provider.***
- ***Sub-county NAADS Coordinator: Constitutes the technical team. When necessary he/she will source research scientist(s) to constitute the technical team***

- ***Service providers: This may be research scientists or private sector service providers. They are responsible for servicing the enterprise (technology) development contract***
- ***NGO or Farmer institution development service provider: Facilitate identification of constraints and opportunities.***

8.5 Technology Development Funds

Technology development funds support the enterprise development and promotion process. This is achieved through procurement of foundation technologies; contracting service providers to facilitate technology development process; and source for new technologies to address a production, a market (or marketing) constraint or add value to a product, which will ensure marketability or optimise profit.

8.6 Box 2. What specifically, can technology development funds be used for?

There will be a lot of reasons to use technology development funds, some of the more common ones are:

- Procure a foundation technology to multiply and make more accessible to farmers
- Through demonstrations, create farmer awareness of and demand for a previously "unknown" technology.
- Through a technology development contract, increase farmers' capacity manage and sustainably use a technology to develop their enterprise
- Develop a solution to an identified production constraint
- Through on farm adaptive research, adapt technologies to better suit local production conditions (soil, labour, level of current knowledge, market), and generate relevant management information
- Identify market and production opportunities. Technology development funds can be used to meet the cost of farmer representatives' visit to places of technology interest. In this way farmers can be better informed and make more informed decisions
- Enterprise development. A farmer forum can use technology development funds to pay or contribute to the cost of:
  - Developing a current enterprise to improve its profitability e.g. post harvest handling or processing to improve quality or value
  - Introducing a new enterprise that has never before been tried in the district or sub-county. A few questions to answer;

- **The Technology Development Site is the entry and departure point from where a technology is developed and disseminated for adoption**

- **Technology Development creates demand for advisory services**

Annex 7 Wealth grouping as a tool for socio-economic differentiation

Wealth grouping

Purpose: To find out how representative farmer research group members are in relation to the whole community

Materials needed: A list of heads of household in the village (obtain from LC1 chairperson)
Papers / cards and marker pens

People needed: A group of farmers who know the village well and have time to discuss for 2-3 hours (depending on village size)

Steps involved:

(1) Explain the exercise and its purpose to the villagers and find out whether they are willing to participate

(2) If they do, ask someone (could be the LC chairman or a school teacher) to write the names of all the village household heads on pieces of paper or cards (often such lists already exist).

(3) Start by discussing the different types of people in the village, for example:
"Are all people the same in this village?"
"If not, can you describe the different categories of people in this village, such as the better-off and the poor people? What are the poor people like? How do they live?"
"And what about the better-off ones? What are they like? What distinguishes them from those who are poor?"
"Is there anyone in between, those who are not very poor and not well-off? What are they like?"

(4) Try to identify 3-5 wealth groups, based on the characteristics provided by the villagers. Write "Group 1" "Group 2" etc. on papers and put them on the floor. Agree on how to rank the different groups and which one is which (e.g. group 1 are the best off, group 4 are the poorest households).

(5) Take the pile with the cards of names of the household heads and go through them one by one. Read out the name on each card and ask the villagers to which wealth group this household belongs. Ask also whether the household is member in the farmer group. Place the card on the paper with the corresponding group number (so all best-off households go on the paper with "group 1").

(6) Once all cards with household members have been allocated to a group, double-check by taking each wealth group pile in turn and read out all the names. Villagers might decide to change households to a different group.

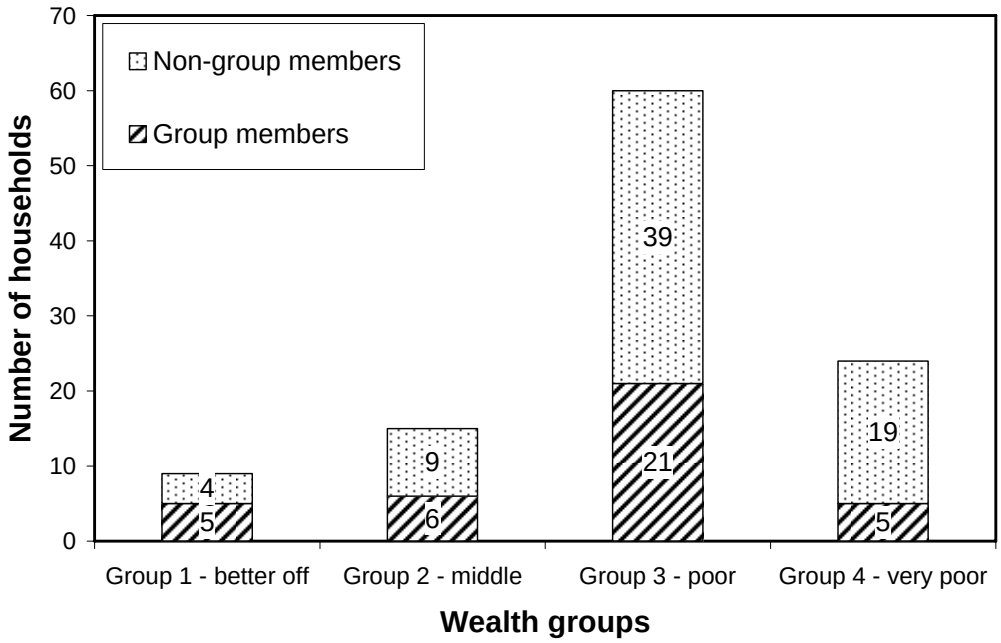
(7) Count the number of households in each wealth group, both group members and non-group members.

(8) Draw a bar chart or pie chart with the results, showing the proportion of households in each wealth group that are member of a farmer group.

(9) If the distribution of group members is skewed, discuss with farmers the reasons for this. For example, the poorest households are often underrepresented in the groups. Why is this? What are the implications? What could be done to change it?

Example of wealth grouping process and outcome:

After wealth groups have been identified and characterised, community members allocate all households to a group (symbolised by the pink cards on the ground). This usually involves lively discussions. The outcome is discussed – for example, reasons why few members of wealth group four joined the group.



ANNEX FOUR

Efficacy of Trichomes of *Mucuna species* against Natural Mixed Infections of Internal Parasites in Goats in Uganda

A Report by Dr Francis Ejobi

Team Leader, Goat Deworming Project
Faculty of Veterinary Medicine, Makerere University
P.O Box 7062 Kampala, Uganda. Tel: +256-77-492236
E-mail: ejobi@vetmed.mak.ac.ug

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Executive Summary
The study was conducted in the district of Arua, Uganda. Our main objective was to test the efficacy of trichomes of Mucuna species against mixed natural internal parasites of goats in Uganda. The study was carried out under farmer's own conditions of management of goats.

A total of 109 goats were recruited to the study. The goats were allocated into three experimental groups, using age and weight as blocking factors. Group 1 (n=40) received Mucuna trichomes treatment at a rate of 40mg/kg body weight as a single oral dose, group 2 (n=31) was untreated (positive controls), while the third group (n=38) of goats was treated with Albendazole 10% (Vermiprazol®) at a dosage of 0.5 mls per 10 kg body weight and given orally in as a single dose. The outcomes measured were total faecal eggs per gram counts and weight gains. The faecal samples were collected on days 0, 15 and 21, while the weights in kilograms were recorded on days 0, 14, 28, 42 and 56. The faecal samples were analysed using the modified MacMaster technique. Data were statistically analysed using general linear model (repeated measures) on SPSS® program for windows version 12.0.

There was no significant difference in the mean faecal eggs per gram counts between goats that were untreated (positive controls) and those that were treated with Mucuna trichomes in the subsequent periods ($p>0.05$). Similarly, no significant difference in mean weight gains was found between consecutive periods ($p>0.05$) in the goats that received Mucuna trichomes and those that were untreated (positive controls).

We conclude that the trichomes of the Mucuna species used in the study do not have any effect on internal parasites of goats. This major drawback of the study was that species of Mucuna used in the study was not *Mucuna pruriens*, the premise of the study. We recommend an up-scaled further study using authentic *M. pruriens* trichomes from India. Authentic seeds of *M. pruriens* could be imported to Uganda from India and grown for the experiments, and later multiplied for distribution to farmers.

1. Background
The study was conducted as part of the extension of the LPP funded project - "*Linking demand and supply of agricultural information in Uganda" – R8281*. The study formed part of a wider adaptive research process that is responsive to farmers own priorities and that leads, where appropriate, to the production of extension materials that answer farmers needs for information on both technical and managerial (social, economic) aspects of technology (Pound *et al*., 2004).

The farmers in study area had already identified goat enterprises as a priority area for research and extension support through the National Agricultural Advisory Services (NAADS), and internal parasites as a main area of concern. This study therefore sought for affordable alternatives for resource poor smallholder goat keepers to control internal parasites in their animals. The study

henceforth tested the efficacy of trichomes of Mucuna *species*[7] for this purpose under Ugandan farmer's conditions. This was against the background that earlier studies conducted in Dharwad District in India demonstrated that trichomes of *Mucuna pruriens* were effective against internal parasites in goats (Conroy and Joshi, 2002).

The present study attempted to redress some of the weaknesses of a previous study conducted under the same project. The previous study design had considered only faecal eggs counts as the outcome for statistical analysis. From a practical point of view, farmers easily appreciate and adopt a technology if they can see tangible outcomes like live weight gains, reduced kid mortalities, improved birth weights of kids, and reproductive parameters (like shorter kidding intervals, improved twining rates, etc). These parameters were not considered in the previous study design because of the timeframe in which it was conducted.

In order to draw from experience from a similar study conducted in India, Mr. Y.A Thakkur, a respected scientist from BAIF Development Research Foundation in India was invited and co-opted into the study team. Mr. Thakkur had conducted a similar study in India. He guided the design and implementation of the study, especially with regard to selection of the goats recruited to the study, and verification of the species of Mucuna used in the study.

2. Study objective

The main objective of the study was to test and validate use of trichomes of *Mucuna spp* for controlling internal parasites in goats as an affordable and environmentally friendly technology to be disseminated to resource poor goat keepers in Uganda.

3. Methods

3.1 Study sites

The study was conducted from October through to December 2005 in the parishes of Urugbo and Yivu, Pajulu sub-county, Arua district. Two farmer groups, namely Aliangaka and Monzokokoba participated in the study. Dr Alex Candia, the area Veterinarian, selected these farmer groups. These groups had participated in a similar earlier study.

3.2 Experimental goats

The study was carried out under farmer's own conditions of management of goats. The farmers provided the goats for the study. A total of 109 goats were recruited into the study; 52 were from Aliangaka farmer's group, and 57 were from Monzokokoba farmer's group. The goats were allocated into three experimental groups, using age and weight as blocking factors. Group 1 (n=40) was assigned to Mucuna trichomes treatment at dosage rate of 40mg/kg body weight and administered as a single oral dose, group 2 (n=31) was untreated, and group 3 (n=38) was treated with Albendazole (Vermiprazol®) at a dosage rate of 0.5 mls per 10 kg body weight and administered orally in a single dose. Appendix 7 shows details of the treatment allocation as well as disaggregation by farmer group. The goats were identified using coloured ear tags; yellow for group 1, orange for group 2 and red for group 3. The goats were weighed using a spring balance (Salter™, Model 235). They were tethered on natural pastures during the day and housed at night by the respective owners. The ages of the study goats ranged from 3 to 36 months, while their initial weights ranged from 7 to 25.4 kilograms.

3.3 Preparation and administration of trichomes of Mucuna

The goat owners scrapped off the trichomes of Mucuna using razor blades. Mature pods of Mucuna were obtained from Abi Agricultural Research and Development Centre (ARDC), Arua. A levelled teaspoonful (equivalent to about 800mg) of Mucuna trichomes was used as a unit of measure[8].

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[7] Mr. Thakkur established that the species of Mucuna used in the study was **NOT** *Mucuna pruriens*. The species of Mucuna tested could not be ascertained in the period of the study

[8] The average weight of a-levelled teaspoonful of trichomes of Mucuna was prior determined at the Faculty of Veterinary Medicine, Makerere University

The corresponding amount of Mucuna was put in a glass, and lukewarm water was added. The mixture was then stirred vigorously with a spoon. One teaspoonful of brown sugar, and another of honey were also added to the mixture and stirred until it was homogenous. The mixture was then transferred to a bottle, and administered orally to the goat as a single dose. Half to 1.5 teaspoonfuls of Mucuna trichomes were administered to the goats according to their respective weights.

3.4 Collection of faecal samples and weighing schedule

The faecal samples were collected per rectum and preserved in 10% formalin until analysed. The faecal samples were collected on day 0 (before treatment), day 15 and day 21.The goats were weighed on day 0, and thereafter fortnightly (i.e., on days 14, 28, 42 and 56). Each participating goat owner was provided with an exercise book in which he/she was required to daily record observations made on the study goats. Appendix 6 shows the layout of format for recoding daily observations.

3.5 Determination of faecal eggs counts

The faecal analysis was done in the Preventive Medicine Laboratory of the Faculty of Veterinary Medicine, Makerere University. The faecal eggs per gram (epg) counts were determined using the modified MacMaster technique (Coles *et al.,* 1992). Both sedimentation and floatation tests were performed. The eggs were enumerated and recorded according to species of parasite found.

3.6 Data analysis

The data on faecal eggs per gram (epg) counts were entered in Microsoft Excel® 2002 program. Since the data on the distribution of faecal eggs counts showed skewness, a log-transformation was carried out (Snedecor and Cochran, 1989). Percent efficacy of the treatments was computed as: (P-T)/P x 100, where, P= faecal eggs count before treatment (day 0), and T = faecal egg count after treatment (days 15 and 21). The data were then subjected to general linear (repeated measures) model analyses using SPSS® program for windows version 12.0. Independent T-test at 5% level of significance was used to test for differences in the treatments and time periods. Descriptive statistics were also computed. The analyses considered total faecal eggs counts and weight gains. The prevalence of flukes, protozoa, and tapeworms was very low, therefore, the treatment effect on individual groups of parasites was not considered in the statistical analyses. Content analysis was performed on the observations recorded by the farmers and salient ones were tallied and tabulated.

4. Findings

4.1 Observations of goat owners

Some goat owners did not fill in the record books consistently, while others did not record any observations at all. Generally, the goat owners did not record any dramatic differences in goats among the three treatment categories studied.

4.1.1 Goats treated with Mucuna trichomes

Table 1 presents the salient observations of goat owners for goats treated with Mucuna trichomes. Most goat owners recorded that the goats were healthy. There were a few records of diarrhoea, and one goat owner recorded abortion.

Table 1: Goat owner's observations on goats treated with Mucuna trichomes

Observation	**Number of times mentioned**
Goat looks healthy	58
General weakness	3
Drinks more water	1
Eat more than it used to	3
Normal pellets	6
Grazes and drinks well	3
Diarrhoea	3
Goat kidded	1
Abortion	1

4.1.2 Observations on untreated (control) goats

Table 2 presents the salient observations of goat owners for goats that were not given any treatment (controls). Most goat owners recorded that the goats looked healthy. There were records of diarrhoea and coughing in some goats.

Table 2: Goat owner's observations on untreated goats

Observation	Number of times mentioned
Goat looks normal	42
Drinks more water	1
Coughing	1
Goat looks sickly	3
Goat looks weak	1
Diarrhoea	4
Goat on heat	1
Normal pellets	1

4.1.3 Observations on goats treated with Albendazole

Table 3 presents the salient observations recorded by owners for goats that received Albendazole treatment. Like for other treatment groups, most goat owners recorded that the goats looked healthy. There were isolated records of diarrhoea and goats looking sick.

Table 3: Goat owner's observations on goats treated with Albendazole

Observation	Number of times mentioned
The animal looks normal	40
Grazes well and drinks a lot of water	3
Normal pellets	1
Goat Looks sick	1
Diarrhoea	1

4.2 Total faecal egg counts

Table 4 presents the mean faecal egg counts for the different treatment groups at day 0 (before treatment), day 15 and day 21. Statistical analyses found no significant difference in the mean epg counts in the subsequent periods between the goats that were untreated (controls) and those that were treated with Mucuna trichomes. That is, after the 15th day (p-value = 0.482) and after the 21st day (p-value = 0.611) (Appendix 1). However, there was a significant difference in the mean epg count between the goats that received Albendazole and those that received Mucuna trichomes. That is, after the 15th day (p-value = 0.000) and after the 21st day (p-value = 0.000) (Appendix 2). Similarly, there was a significant difference in the mean epg count between the goats that received Albendazole and those that were not treated (controls). That is, after the 15th day (p-value = 0.000) and after the 21st day (p-value = 0.000) (Appendix 3).

Table 4: Mean total faecal counts on days 0, 15 and 21 of treatment

Treatment Group	Time	Mean epg counts	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Untreated (Positive controls)	Day 0	680.8	204.8	271.1	1080.5
	Day 15	717.3	135.0	447.1	987.5
	Day 21	723.1	118.1	486.8	959.5
Mucuna	Day 0	773.5	253.2	266.8	1280.2
	Day 15	629.4	167.0	295.3	963.5
	Day 21	619.4	146.1	327.0	911.8
Albendazole	Day 0	821.1	239.5	341.8	1300.3
	Day 15	0.0	157.9	-316.0	316.0
	Day 21	0.0	138.2	-276.6	276.6

4.3 Goat weight gains

Table 5 presents mean weights of the goats in the three treatment groups at days 0, 14, 28, 42 and 56, while Appendix 7 shows weights of individual goats on the respective days. Statistical analyses showed no significant difference in mean weight gains between consecutive periods (p-values > 0.05) in the goats that received Mucuna trichomes and those that were untreated (Appendix 4). There was, however, a significant difference in mean weight gains between goats that received Mucuna trichomes and those that received Albendazole for only the period between day 0 and day 14 (p-value = 0.040) (Appendix 5).

Table 5: Mean weights of goats on days 0, 14, 28, 42 and 56

Treatment	Time	Mean Weight (kg)	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Control	Day 0	17.279	0.935	15.423	19.134
	Day 14	17.546	0.915	15.732	19.364
	Day 28	18.311	0.954	16.418	20.204
	Day 42	17.871	0.942	16.003	19.740
	Day 56	18.829	0.976	16.492	20.365
Mucuna	Day 0	17.377	0.792	15.805	18.949
	Day 14	17.789	0.775	16.249	19.325
	Day 28	18.556	0.809	16.952	20.160
	Day 42	18.326	0.798	16.743	19.909
	Day 56	18.831	0.827	17.190	20.471
Albendazole	Day 0	15.783	0.825	14.147	17.419
	Day 14	16.883	0.807	15.282	18.484
	Day 28	17.158	0.842	15.489	18.828
	Day 42	17.606	0.831	15.958	19.253
	Day 56	18.117	0.861	16.409	19.824

5. Drawbacks of the study

The drawbacks of the study were:

- According to Mr. Thakkur, the species of Mucuna used in study was clearly **NOT** *Mucuna pruriens*, the species that was experimented in India. This was the major drawback of the study. The species of Mucuna used in the study could not be readily established. According to Mr. Thakkur, it could be *Mucuna deerigiana* or *Mucuna conchichinensis* or a cross between *Mucuna pruriens* and wild Mucuna species. According to Mr. Julius Mukalazi, The Manager of Abi ARDC, the seeds of the Mucuna multiplied at the Centre were obtained from

Namulonge Agricultural and Animal Production Research Institute (NAARI), one of the National (Uganda) Agricultural Research Organisation (NARO) Institutes located near Kampala. We were unable to establish from NAARI the source and species of this Mucuna. The taxanony of the Mucuna available at Abi is not clear at the moment. An Agronomist at Abi ARDC mentioned that the different types of Mucuna at Abi (that is those with white/gray, black or multicoloured seeds) could be different varieties of *Mucuna pruriens.*

- In Monzokokoba farmer's group, bees stung some study goats, and some goats were withdrawn for payment of bride price.

- Some goat owners were illiterate. Such goat owners requested their literate neighbours to assist them in daily recording of observations of their goats. Records from these households were often incomplete.

6. Conclusion

We conclude that the trichomes of the Mucuna species used in the study do not have any significant effect against internal parasites of goats. Based on these findings, were cannot advise goat keepers to use it for deworming their goats.

7. Proposed way forward

This study has raised enormous expectations of goat keepers for affordable solutions for controlling internal worms in goats. The Mucuna study was well acclaimed and embraced by the goat keeping communities that participated. However, the present findings do not provide any evidence for a solution as per their expectations.

This study has established a network and a template for further collaborative linkages between respected scientists in BAIF (India), NRI (UK), Makerere University (Uganda), and Abi ARDC (Arua, Uganda). We propose, as a way forward, a collaborative and an up-scaled study on *Mucuna pruriens* (and possibly other natural products) as affordable alternatives to be adopted for deworming goats by rural resource limited smallholder farmers in Uganda. The collaborating institutions in the proposed follow-up study would include BAIF (India), NRI (UK), Makerere University (Uganda), and Abi (Arua, Uganda). We propose that authentic seeds of *Mucuna pruriens* should be imported from India to Uganda. The seeds would then be multiplied in Uganda for experimentation and eventual distribution to the farmers. Mr. Thakkur from India has expressed willingness to provide the seeds and further technical guidance. The standard regulations for importations of plant research materials to Uganda will be followed. Designated scientists from NRI would provide technical assistance and supervisory roles, while Makerere University and Abi would provide on-ground synergy and day-by-day running of the experiments. The studies would begin with on-station studies, followed by on-farm and socio-economic and technology adoption studies.

8. Acknowledgements

We are grateful to LPP for funding the study. We thank the management of the *Linking Project*, namely, Barry Pound, Barbara Adolph and Ms Jovia Manzi for giving us the opportunity to participate in this study. We are greatly indebted to Mr. Y.A. Thakkur for his contribution to the study. We thank all the goat keepers who actively participated in the study.

9. References

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Appendix 1: T-Test results of comparison of mean epg counts between goats that received Mucuna trichomes and the untreated ones (positive controls).

Group Statistics

	Treatment	N	Mean	Std. Deviation	Std. Error Mean
tmepg	Control	27	711.1111	981.00550	188.79460
	Herbs	18	738.8889	1064.75012	250.96401
tmepg2	Control	27	762.9630	996.39664	191.75662
	Herbs	18	605.5556	472.13186	111.28255
tmepg3	Control	26	723.0769	841.09818	164.95292
	Herbs	17	619.4118	482.73272	117.07988

tmepg = total mean egg counts at day 0 (before treatment)
tmepg2 = total mean egg counts at day 15
tmepg3 = total mean egg counts at day 21
herbs= Mucuna treatment

Independent Samples Test

		t-test for Equality of Means				
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
tmepg	Equal variances not assumed	-.088	34.468	.930	-27.77778	314.04830
tmepg2	Equal variances not assumed	.710	39.593	.482	157.40741	221.70793
tmepg3	Equal variances not assumed	.512	40.481	.611	103.66516	202.27992

tmepg = total mean egg counts at day 0 (before treatment)
tmepg2 = total mean egg counts at day 15
tmepg3 = total mean egg counts at day 21

Appendix 2: T-Test results of comparison of mean epg counts between goats that received Mucuna trichomes and those that received Albendazole

Group Statistics

	Treatment	N	Mean	Std. Deviation	Std. Error Mean
tmepg	Herbs	18	738.8889	1064.75012	250.96401
	Albendazole	21	785.7143	1037.44191	226.38838
tmepg2	Herbs	18	605.5556	472.13186	111.28255
	Albendazole	21	.0000	.00000	.00000
tmepg3	Herbs	17	619.4118	482.73272	117.07988
	Albendazole	19	.0000	.00000	.00000

tmepg = total mean egg counts at day 0 (before treatment)
tmepg2 = total mean egg counts at day 15
tmepg3 = total mean egg counts at day 21
Herbs = Mucuna treatment

Independent Samples Test

		t-test for Equality of Means				
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
tmepg	Equal variances not assumed	-.253	41.902	.801	-74.60317	294.77975
tmepg2	Equal variances not assumed	3.979	26.000	.000	762.96296	191.75662
tmepg3	Equal variances not assumed	4.384	25.000	.000	723.07692	164.95292

tmepg = total mean egg counts at day 0 (before treatment)
tmepg2 = total mean egg counts at day 15
tmepg3 = total mean egg counts at day 21

Appendix 3: T-Test results of comparison of mean epg counts between goats that were untreated (positive controls) and those that received Albendazole

Group Statistics

	Treatment	N	Mean	Std. Deviation	Std. Error Mean
tmepg	Control	27	711.1111	981.00550	188.79460
	Albendazole	21	785.7143	1037.44191	226.38838
tmepg2	Control	27	762.9630	996.39664	191.75662
	Albendazole	21	.0000	.00000	.00000
tmepg3	Control	26	723.0769	841.09818	164.95292
	Albendazole	19	.0000	.00000	.00000

tmepg = total mean egg counts at day 0 (before treatment)
tmepg2 = total mean egg counts at day 15
tmepg3 = total mean egg counts at day 21

Independent Samples Test

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
tmepg	Equal variances not assumed	-.253	41.902	.801	-74.60317	294.77975	-669.534	520.32766
tmepg2	Equal variances not assumed	3.979	26.000	.000	762.96296	191.75662	368.80158	1157.124
tmepg3	Equal variances not assumed	4.384	25.000	.000	723.07692	164.95292	383.35001	1062.804

tmepg = total mean egg counts at day 0 (before treatment)
tmepg2 = total mean egg counts at day 15
tmepg3 = total mean egg counts at day 21

Appendix 4: T-Test results of comparison of mean weights of goats that received Mucuna and the untreated ones

Group Statistics

	treatmt	N	Mean	Std. Deviation	Std. Error Mean
Weight gain between day0 to day 14	Mucuna	40	.4350	1.21793	.19257
	Control	29	.2724	.84638	.15717
Weight gain between day 14 to day 28	Mucuna	39	.7692	1.13674	.18202
	Control	29	.8207	1.34705	.25014
Weight gain between day 28 to day 42	Mucuna	39	-.2308	1.68260	.26943
	Control	29	-.5103	1.60164	.29742
Weight gain between day 42 to day 56	Mucuna	39	.5051	.80556	.12899
	Control	28	.5571	1.06612	.20148

Independent Samples Test

	t-test for Equality of Means				
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Weight gain between day 0 and day 14	.618	67	.539	.16259	.26300
	.654	66.910	.515	.16259	.24857
Weight gain between day 14 and day 28	-.171	66	.865	-.05146	.30169
	-.166	54.288	.869	-.05146	.30936
Weight gain between day 28 and day 42	.692	66	.492	.27958	.40427
	.697	62.031	.489	.27958	.40131
Weight gain between day 42 and day 56	-.228	65	.821	-.05201	.22857
	-.217	47.947	.829	-.05201	.23923

Appendix 5: T-Test results of comparison of mean weights gains of goats that received Mucuna trichomes and those that received Albendazole

Group Statistics

	treatmt	N	Mean	Std. Deviation	Std. Error Mean
pd1	Mucuna	40	.4350	1.21793	.19257
	Albenzadole	37	1.0865	1.48664	.24440
pd2	Mucuna	39	.7692	1.13674	.18202
	Albenzadole	37	.3027	1.04203	.17131
pd3	Mucuna	39	-.2308	1.68260	.26943
	Albenzadole	37	.3946	1.55759	.25607
pd4	Mucuna	39	.5051	.80556	.12899
	Albenzadole	36	.5111	1.38642	.23107

pd1 = weight gains between day 0 and 14 days
pd2 = weight gains between day 14 and day 28,
pd3 = weight gains between day 28 and day 42
pd4 = weight gain between day 42 and day 56

Independent Samples Test

	t-test for Equality of Means		
	t	df	Sig. (2-tailed)
pd1	-2.094	69.757	.040
pd2	1.866	73.917	.066
pd3	-1.682	73.958	.097
pd4	-.023	55.269	.982

pd1 = weight gains between day 0 and 14 days
pd2 = weight gains between day 14 and day 28,
pd3 = weight gains between day 28 and day 42
pd4 = weight gain between day 42 and day 56

Appendix 6: Sample of the form used by goat owners for recording daily observations of study goats

Name of Goat Owner:							
Goat Id. Number:		**Age:**	**Goat Colour:**		**Treatment Group (M or A or C):**		
Date	**Weight (Kg)**	**Weight gain (grams)**	**Faecal sample collected (Yes or No)**	**Observation**	**Advice given by Vet**	**Signature of goat owner**	**Signature of Vet**

Appendix 7: Weights of Goats in days 0, 14 28, 42, and 56

S/No.	**Name of Goat owner**	**Name of Farmer Group**	**Estimated Age (months) of Goat (Months)**	**Goat Identification Number**	**Weight (kg) of Goat**					**Treatment group**
					Day 0	**Day 14**	**Day 28**	**Day 42**	**Day 56**	
1	James Arionzi	Monzokokoba	8	219	12.4	10.5	12.5	11.7	12.6	Control
			30	70	14.7	14.7	16.0	16.0	16.2	Albendazole
			18	173	9	16.7	18.5	18.0	18.7	Albendazole
			36	107	17.6	18.0	21.0	19.8	20.0	Control
			36	101	22.9	23.6	25.7	23.6	23.7	Mucuna
			36	6	15.4	16.0	17.5	17.0	17.6	Mucuna
2	Ondoru Santina	Monzokokoba	36	75	22.0	22.5	23.7	23.0	25.0	Control
			6	179	8.6	9.6	10.6	10.5	10.2	Albemdazole

S/No.	Name of Goat owner	Name of Farmer Group	Estimated Age (months) of Goat (Months)	Goat Identification Number	Weight (kg) of Goat					Treatment group
					Day 0	Day 14	Day 28	Day 42	Day 56	
			6	216	7.7	8.1	10.5	8.0	sold	Control
			36	86	25.0	25.6	27.0	24.8	27.0	Mucuna
				66	17.9	18.1	20.0	19.0	21.3	Control
3	Timona Acadribo	Monzokokoba	24	84	13.5	14.0	15.0	13.3	14.1	Control
			36	100	18.7	20.0	21.5	20.7	20.2	Albendazole
			36	99	22.6	23.6	24.6	19.4	21.0	Mucuna
			18	51	15.4	15.7	16	14.5	15.2	Control
			24	94	13.1	14.5	sold	-	-	Mucuna
			36	71	20.0	22.2	24.0	21.5	19.9	Albendazole
4	Alimadri Fanuel	Monzokokoba		77	17.9	17.5	20.0	19.6	20.5	Mucuna
				62	17.9	20.0	19.2	18.5	20.5	Control
5	Solomon Titre	Monzokokoba	36	81	19.7	19	19.5	18.4	19.0	Albendazole
			8	24	9.2	9.1	10	8.5	9.0	Mucuna
			24	92	16.3	15.2	15.7	12.5	13.5	Albendazole
			36	36	21.1	23.1	24.0	23.1	24.5	Mucuna
			10	57	12.1	12.2	14.2	12.2	12.6	Control
			30	54	18	18.1	18.8	16.0	17.0	Mucuna
			9	215	9.0	10.0	12.0	9.5	9.7	Control
			10	177	9.0	10.5	11.4	11.1	11.4	Albendazole
			36	102	18.9	20.5	20.5	18.7	17.5	Albendazole
6	Dramuke Stephen	Monzokokoba	36	90	20.4	20.0	21.7	21.0	20.4	Control
			36	97	25.0	25.5	28.9	26.5	27.2	Mucuna
			18	183	12.1	12.7	14.0	12.5	Died	Albendazole
			8	176	11.5	12.6	13.5	13.5	14.8	Albendazole

S/No.	Name of Goat owner	Name of Farmer Group	Estimated Age (months) of Goat (Months)	Goat Identification Number	Weight (kg) of Goat					Treatment group
					Day 0	Day 14	Day 28	Day 42	Day 56	
7	Abidrabo Charles	Monzokokoba	36	52	15.0	16.5	17.8	18.0	19.7	Aldendazole
			24	167	15.6	15.0	16.0	14.6	15.5	Mucuna
			24	72	15.0	16.0	17.0	16.1	16.2	Albendazole
			24	79	18.6	19.2	20.0	19.5	19.8	Mucuna
			9	53	12.6	13.0	14.0	13.0	13.2	Control
8	Adriko Fred	Monzokokoba	36	110	22.2	21.8	23.2	22.3	23.5	Mucuna
			24	207	19.6	20	20.7	18.5	20.7	Control
9	John Ogama	Monzokokoba	18	55	14.6	14.0	15.8	14.0	13.6	Control
			18	26	15.3	16.0	17.0	14.5	13.6	Mucuna
			16	165	12.1	14.4	14.5	14.4	13.7	Albendazole
			9	37	8.3	10.0	10.0	9.3	9.0	Mucuna
			36	195	22.6	23.5	26.5	25.5	26.6	Mucuna
			36	205	19.6	20.0	21.4	20.7	20.4	Control
			12	103	10.3	11.5	12.5	11.6	11.3	Albendazole
10	Rutu Avuru	Monzokokoba	18	58	20.0	20.5	21.5	21.0	22.2	Control
			12	73	13.4	14	15	14.9	15.0	Mucuna
11	Peter Odoo	Monzokokoba	18	21	14.9	15.5	16.5	16.5	16.2	Mucuna
			18	180	13.0	13.5	14.7	14.6	15.7	Albendazole
			18	35	14.2	14.5	16.0	15.2	15.7	Mucuna
			18	217	10.0	10.6	11.8	11.4	11.7	
12	Samuel Omuyo	Monzokokoba	36	69	20.1	20.5	21.0	19.6	17.5	Control
			36	68	23.9	24.5	24.7	24.5	23.5	Albendazole

S/No.	Name of Goat owner	Name of Farmer Group	Estimated Age (months) of Goat (Months)	Goat Identification Number	Weight (kg) of Goat					Treatment group
					Day 0	Day 14	Day 28	Day 42	Day 56	
13	Oreteru Plasidia	Monzokokoba	24	38	13.6	14.5	16.0	14.9	14.9	Mucuna
			36	88	17.3	19.3	18.9	18.0	19.0	Albendazole
			30	105	16.0	16.7	16.9	15.7	16.5	Control
14	Cox Obatre	Aliangaka	20	27	18.1	18	17.5	18.0	19.0	Mucuna
15	Esau Abiria	Aliangaka	14	240	20.3	18.5	19.9	20.5	21.5	Control
			9	20	16.8	16	17.1	17.5	18.1	Mucuna
			30	191	19.7	19.5	19.9	21	20.2	Albendazole
16	Emmanuel Mvadeyo	Aliangaka	12	19	10.9	10	10.9	12	11.5	Mucuna
17	Kennedy Ocokoa	Aliangaka	18	10	17	17.4	17.1	20	19.7	Mucuna
			10	220	14	13.5	14.1	15.5	16.3	Control
18	Amaniyo Jenet	Aliangaka	20	192	27.1	26.5	27.5	29.5	29.7	Albendazole
			14	250	24.9	23.6	22.6	24.5	24.9	Control
19	Epiphanio Acidri	Aliangaka	36	40	26.4	26.6	26.2	26.5	28.3	Mucuna
			24	193	18.9	18.6	19.9	20	20.9	Albendazole
			6	239	11.2	11.8	12.7	13	13.9	Control
20	Luiji Amandu	Aliangaka	26	30	25.2	25	26.2	26	27.4	Mucuna
21	Joyce Ariko	Aliangaka	9	151	14.0	14.0	14.4	17.0	17.5	Albendazole
			24	9	17.6	17.0	19.3	20.5	19.5	Mucuna
			8	210	11.5	12.0	12.1	14.0	14.1	Control

S/No.	Name of Goat owner	Name of Farmer Group	Estimated Age (months) of Goat (Months)	Goat Identification Number	Weight (kg) of Goat					Treatment group
					Day 0	Day 14	Day 28	Day 42	Day 56	
			6	194	9.4	10.2	10.4	12.5	12.5	Albendazole
			12	161	14.1	14.5	14.0	17.0	18.0	Aldendazole
			6	18	9.9	10.6	10.5	14.0	13.0	Mucuna
22	Ezayi Michael	Aliangaka	15	152	17.6	19.5	16.4	17.0	19.0	Albendazole
			14	209	14.1	15.1	13.9	15.0	15.7	Control
			36	153	19	19	19.6	21.0	22.5	Albendazole
23	Dravu Anthony	Aliangaka	24	17	25.0	26.5	26.7	27.0	29.0	Mucuna
24	Odroru Luija	Aliangaka	24	154	24.5	24.2	24.6	27.0	29.0	Albendazole
25	Lawrence Odama	Aliangaka	9	39	14.4	16.0	15.0	16.5	16.7	Mucuna
			18	206	19.4	20.4	19.6	21.0	22.0	Control
26	Veronica Candiru	Aliangaka	18	8	14.1	14.5	14	14.5	15.5	Mucuna
			25	162	13.7	15.3	14.3	14.3	15.4	Albendazole
			23	29	17.9	18.4	19.3	17.5	17.3	Mucuna
27			14	171	15.1	15.4	15.1	15.0	17.8	Albendazole
28	Mary Ajio	Aliangaka	24	204	18.9	19.5	18.6	21.2	22.3	Control
			24	155	15.1	17.9	16.9	18.0	19.8	Albendazole
			24	38	14.2	14.5	13.6	14.6	15.7	Mucuna
			24	203	20.1	21.4	20.7	21.3	22.5	Control
			24	28	17.1	19.2	19.6	19.0	19.3	Mucuna
29	Osoru Mary	Aliangaka	11	158	13.4	15.6	14.9	16.4	18.8	Albendazole
30	Paulina Amvucia	Aliangaka	12	15	13.1	13.1	13.4	14.2	15.1	Mucuna
			24	202	18.1	18.9	17.5	19.9	20.5	Control

S/No.	Name of Goat owner	Name of Farmer Group	Estimated Age (months) of Goat (Months)	Goat Identification Number	Weight (kg) of Goat					Treatment group
					Day 0	Day 14	Day 28	Day 42	Day 56	
			6	163	7.0	8.6	8.4	8.6	10.5	Albemdazole
31	Petiku Simon	Aliangaka	12	201	14.8	14.5	14.5	15	15.4	Control
			14	156	15	16.1	16.1	16.2	15.6	Albendazole
			12	16	10.1	10.6	10.9	11.4	10.9	Mucuna
32	Ondua Jacob	Aliangaka	3	7	9.3	10.2	10.9	11.5	11.2	Mucuna
			18	157	23.6	23.9	24.6	26.5	22.2	Albendazole
33	Obandu Richard	Aliangaka	12	13	25.4	20.2	19.4	20.5	20.7	Mucuna
			12	172	10	10.5	10	11.5	11.6	Albedazole
34	Avua George	Aliangaka	24	166	20.9	23.5	24.3	27.2	29.0	Albendazole
			24	25	17.9	19.9	21.8	23.5	24.0	Mucuna
			36	218	29.8	29.9	34	30	27.7	Control
35	Olodriku Dorothy	Aliangaka	24	159	20.6	22.5	20.2	23.9	26.5	Albemdazole
36	Tereziva Asuru	Aliangaka	12	14	21.5	23.9	21.6	24.3	25.2	Mucuna
37	Aguta Gabriel	Aliangaka	6	160	8	8.4	8.4	9.6	10.0	Albendazole