

## Seed demand and supply in eastern and northern Uganda – implications for government and non-government interventions

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### Abstract

A study to review smallholders' seed demand and supply, and evaluate potential interventions for enhanced seed supply was carried out in Eastern & Northern Uganda by seed specialists of the Overseas Development Institute (ODI), Nkoola Institutional Development Associates and NARO in 2001. The principal seed sources in the region were farmers' own saved seed or seed from neighbours, and seed purchased from grain markets. Seed purchased from grain markets was simply selected from grain offered for sale – there was virtually no production or sale of materials deliberately produced for seed. Activities geared at promotion of seed were few and not well coordinated among players in the formal seed sector. Despite efforts of NARO, MAAIF and NGOs, awareness of available modern varieties (MVs) was low among farmers in the region. Use of MVs for crops tracked in the study were zero for cowpea & simsim, 4% for pigeonpea, 10% for sorghum, 17% for finger millet, 40% for cassava and sweet potatoes and 52% for groundnuts. The nature of farmers' steady demand is dynamic and it can be divided into three main categories: 1. Increased farmer demand for a new variety (as opposed to the desire of development workers and others to promote new varieties); 2. Problems in on-farm management of seed/ planting materials; and Seed shortages for particular crops or varieties.

The study highlighted the need for decisions making on seed interventions to be based on a clear understanding of the nature of farmers' seed demand. The relative merits of different interventions to address these different aspects of seed demand, and policy issues relating to the role of public research (and Uganda's new national agricultural research system) are discussed.

**Key words:** Farmers, markets, modern varieties, policy issues

### Introduction

Many agriculturalists consider seed to be their most precious resource, and most agricultural research organisations devote considerable resources to the development of improved varieties, most of which are disseminated as seed. Until recently, the state has played a major role in the development, production and dissemination of seed in developing countries. As agriculture becomes increasingly liberalized and commercialised, the role of the public seed sector is being re-examined, and new balances between state support and the private sector are being developed (Tripp, 2001).

A study was carried out in 2001 by seed specialists of the Overseas Development Institute (ODI), a local consultancy firm Nkoola Institutional Development Associates (NIDA), and the Uganda National Agricultural Research Organisation (NARO). The study set out to provide recommendations and guidelines for the development of enhanced seed supply in Eastern and Northern Uganda. Guidelines were informed by a review of current government and non-government interventions, and a field study of farmers' current practices and constraints in obtaining, storing and multiplying seed of improved

(modern) varieties (Longley *et al.*, 2001). This paper summarises the main findings for a wider audience, and up-dates the conclusions, policy issues and recommendations in the context of the recent changes in Uganda's national agricultural research system.

### Materials & methods

The study involved a literature review, key informant interviews, a formal questionnaire, and focus group discussions. The formal quantitative survey was conducted with a sample of 80 farmers from eight villages in Kumi and Lira districts. A total of 10 households evenly distributed between the well-off and least well-off categories were selected in each of the 8 sample communities. Data was solicited from respondents with the help of a structured questionnaire designed to collect quantitative information on the varieties and quantities of seed planted in the 2000 and 2001 seasons, actual sources of the seed planted, seed management and seed availability. Sex-disaggregated focus group discussions were conducted in four villages in Kumi and Lira districts for the collection of qualitative information. In each village, focus groups discussions were conducted simultaneously for men and women. A checklist

was used to guide discussions to determine: the types of crops and varieties locally cultivated; the relative importance of modern (improved) varieties; farmers' seed sources; and general aspects of seed and varietal management. In general, there was a strong degree of convergence between the findings of the focus group discussions and the quantitative results produced by the formal questionnaire.

## Results

### *Crops and varieties cultivated in case study sites*

The survey did not intend to gather data regarding all crops cultivated in the sample villages, but instead focused on eight crops: sorghum, finger millet, groundnut, simsim, cowpea, pigeonpea, cassava and sweet potato. Table 1 lists the most important crops for cash and food in the sample villages. Sorghum, finger millet, cassava and sweet potato are grown by the majority of farmers in both the Lango and Teso study sites. Groundnuts are commonly grown in the Teso study sites, but only a handful of farmers in the Lango areas visited were found to be cultivating groundnuts. Simsim is grown as a second crop in Lango, but hardly features in Teso. Cowpeas are grown as a second season crop by some farmers (more women than men) in Kafir village (Teso) and Abako (Lango). Some Lango farmers (both male and female) grow pigeonpeas, but none of the Teso farmers did.

### *Awareness of and access to improved varieties*

Awareness of improved varieties was generally low. The research station at Ngetta, Adekokwok (near Lira town) and farmers in the Serere area were generally regarded as sources of improved crop varieties by those farmers who were within reasonable distance to these sites, but farmers wanting to access improved material tended to go direct to farmers known to be growing particular varieties rather than to the authority or staff officially responsible for distribution. In the relatively few cases where improved seed had been obtained from extension agents, the agent was often a relative and thus provided seed on the basis of personal ties rather than in an official capacity. In the few

### *Use of improved varieties*

The farmers tended not to distinguish improved varieties from local varieties recently introduced in their areas, making it sometimes difficult to know whether what farmers described as 'new' or recently introduced varieties were in fact released modern varieties (MVs). MVs are often given local names, which vary from place to place. Farmers' experiences with MVs varied with crop and location; in some cases farmers had tried and rejected MVs, while in several cases MVs had been enthusiastically adopted. In these cases, farmers had found that the superior qualities of the MVs outweighed the adjustments in crop or post-harvest management they had to make to compensate for less desirable traits. However, in most cases farmers did not

know the source of the MVs or give any evidence of familiarity with the work of NARO.

Varietal preferences varied, particularly between Lango and Teso and between men and women. New varieties that are considered to display favourable characteristics spread remarkably quickly within a community, provided that there is sufficient seed or planting material available. Whilst farmers are generally keen to try out new materials, varieties that display disadvantages are quickly abandoned. Based on the varieties planted by sample farmers in the first rains of 2001 or first or second rains of 2000, Table 2 summarises the numbers of responses and the proportion of variety use involving MVs. There is little evidence of MV use, with certain notable exceptions: the use of groundnut MVs is quite high in both Lango and Teso, whilst cassava and sweet potato MVs are widely grown in Teso and millet MVs have made modest inroads in Lango. In the majority of these instances farmers are not aware of the origins of the new varieties that they are growing.

The survey also investigated the relationship between wealth status and MV use. There does not appear to be a strong correlation, although in Lango there is a consistent tendency for wealthier farmers to be more likely to grow MVs of sorghum, finger millet and groundnut (Table 3).

### *On-farm seed management*

On-farm seed management was observed to be mostly the responsibility of women. Farmers in Teso tended to devote more attention to seed management than farmers in Lango, where seed is rarely separated from grain until just before planting. Some crops (e.g. cowpea or sorghum) are particularly susceptible to storage pests, but there were few reported instances where farmers lost their entire seed supply because of storage problems. The uncertainties caused by civil unrest in the recent past were more important in shaping farmers' storage practices and strategies than specific seed management problems. Similarly, farmers' lack of seed at planting time was more likely to be caused by a poor harvest than by inadequacies in seed storage. Farmers were generally able to manage planting material maintenance for cassava and sweet potato, although climatic and security problems occasionally caused losses of planting material. As with the case of seed, shortage of planting material was most often associated with an inadequate harvest.

### *Off-farm seed sources*

There was considerable acquisition of seed and planting material off-farm. For many crops, grain markets were the primary source of seed, and even when farmers acquired seed from their neighbours they tended to pay cash or obtain it by barter. Markets for cassava cuttings were poorly developed, and although some farmers specialised in producing sweet potato vines for sale in local markets, the majority of the planting material for these two crops was obtained from other farmers. When farmers acquire off-

**Table 1 Main food and cash crops in case study sites**

Location	Food crops	Cash crops
Lira – Adekokwok	Finger millet Beans Sorghum Cassava	Soya Cotton Maize Sunflower
Lira – Abako	Finger millet Beans Sorghum Cassava	Soya Cotton Maize Sunflower
Kumi – Ngora	Cassava Sorghum Sweet potatoes Groundnuts	Cassava Sweet potatoes Groundnuts Greengrams
Kumi – Kampir	Cassava Sweet potatoes Groundnuts	Cassava Sweet potatoes Groundnuts

Source: Focus group discussions, July 2001

**Table 2. Adoption of MVs in Lango and Teso.**

Crop	Lango		Teso	
	(N) <sup>1</sup>	% MVs	(N)	% MVs
Sorghum	(60)	15%	(56)	5%
Finger millet	(53)	28%	(37)	0
Groundnut	(23)	48%	(59)	54%
Simsim	(25)	0	(1)	0
Cowpea	(2)	0	(14)	0
Pigeonpea	(46)	4%	-	-
Cassava	(67)	1%	(79)	71%
Sweet potato	(85)	18%	(88)	57%

<sup>1</sup>N is the total instances of variety use recorded in the survey.

**Table 3. Relation between MV use and wealth status (sorghum, finger millet and groundnut, Lango)**

Wealth status	Local varieties	MVs	% MVs
Low	51	9	15%
High	50	26	34%

$X^2 = 5.44$ , d.f.=1,  $p < .05$

farm seed, or when they search for seed of a new variety, other farmers and grain markets were the principal sources (Table 4).

The extent to which farmers relied on local markets for off-farm seed varied with crops: Cassava cuttings tend to be easy to maintain on farm, so there is little demand for off-farm planting material, and they are too bulky to be easily marketable. Potato vines, on the other hand, were obtained from the market in most places, with farmers living near swamps tending to specialise in varieties of sweet potatoes since the vines can more easily be maintained over

the dry season. Cassava cuttings tended not to be disseminated through local traders, and potato vines – when available in local markets – tended not to be transported over great distances due to their perishability. Consequently there seems to be little potential for cassava and sweet potato planting material to be rapidly disseminated through market networks.

Seed or planting material was commonly obtained from other farmers in return for cash, as a gift, or as part of an exchange involving repayment in kind, barter, or the provision of labour. Cash transactions and gifts predominate, and it is likely that gifts are more common among close relatives. Cash transactions for seed are more prevalent for commercially important crops. Planting material of cassava or sweet potato is often obtained from other farmers as a gift. The survey showed a slight tendency for wealthier farmers to be able to use other farmers (rather than markets) as sources of seed and planting material. There was very little evidence of any patronage, or even familiarity, with formal seed markets for the crops included in this study (listed as ‘Other’ in the table above). It is noteworthy that only one instance (out of 272 examples) of seed acquisition in the farmer questionnaire involved the purchase of seed from a shop.

## Recommendations

### *The nature of seed demand and implications for interventions*

For seed interventions to succeed, an understanding of the nature of farmers’ seed demand is essential. Farmers seek seed for various reasons, and ‘seed’ may refer to a particular variety or the physical input. Agricultural researchers and extensionists often use the term ‘seed shortage’ to describe various conditions, including: the lack of any appropriate modern variety (MV), a shortage of particular MVs, a lack of awareness of MVs, a general shortage of any type of seed for a particular crop, or farmers’ lack of resources to acquire seed. In order to make informed decision about research directed towards seed shortage, a precise description of the nature of seed demand is required. Many seed production schemes have not been successful because they fail to understand the nature of seed demand (Tripp, 2001). Seed shortages, and farmer demand for seed can be divided into three main categories:

1. Increased farmer demand for a new variety (as opposed to the desire of development workers and others to promote new varieties);
2. Problems in on-farm management of seed/ planting materials; and
3. Seed shortages for particular crops or varieties.

The possible solutions/interventions to seed provision problems depend on the nature of demand described above. Advantages and disadvantages of the possible solutions are described below, classified by type of demand. The list is

**Table 4 Original source of seed and planting material, Lango and Teso (% of cases)**

Crop	(N)	Farmers	Market	Other*
Sorghum	(99)	42%	57%	1%
Finger millet	(76)	50%	36%	14%
Groundnut	(72)	19%	72%	8%
Simsim	(23)	22%	78%	0
Cowpea	(15)	13%	87%	0
Pigeonpea	(36)	50%	44%	6%
Cassava	(120)	89%	3%	8%
Sweet potato	(130)	84%	16%	0

\* 'Other' includes extension, NGOs, and formal seed supply.

not exhaustive, but includes the major interventions that are usually discussed in relation to seed provision.

#### ***Demand for a new variety***

There is a difference between development workers' desire to promote a new variety and a response to a genuine demand from farmers who wish to use the variety. There are many instances where farmers are aware of a new variety but are not motivated to plant it. In other cases, farmers may not know about a new variety. Seed of a new variety should be provided only after the variety has been demonstrated and planted widely enough that farmers know about its principal advantages (and disadvantages) and are able to identify it or distinguish it from other varieties.

At the pre-release stage, seed regulation prevents the commercial multiplication of seed, and it is therefore the responsibility of public research institutes (NARO in this case) to ensure that enough planting material is available for on-farm trials. Public research institutes (e.g. NARO's zonal research institutes) should play a key role in multiplying seed of promising pre-release cultivars for use in widespread on-farm trials. Pre-release material can be promoted through on-farm trials so that farmers can observe varietal characteristics and make their own assessments. On-farm trials of pre-release material should be undertaken by public research plant breeders, working in collaboration with farmers, farmer groups, government and non-government extension. Technology Development Sites in sub-counties under Uganda's National Agricultural Advisory Services (NAADS) also provides an excellent opportunity for exposing farmers to the pre-release materials, where farmers can test and approve of such materials.

Once a new variety has been released, seed of the variety can be multiplied commercially, making it possible for a wider range of actors to become involved in its promotion, including government research institutes, government and non-government extension and private companies. In Uganda this would include the newly constituted zonal research institutes, and NAADS service providers and farmer fora, as well as NGOs and private companies. Released varieties can be promoted through demonstrations and publicity campaigns, and by making small seed packs available for purchase by interested farmers, as described below:

#### ***Demonstrations***

Make sure that there are widespread, comprehensible demonstrations of a variety, under farmers' conditions. This would be a prerequisite to later seed production and provision. Demonstrations can also be a focal point for the initial distribution of small quantities of seed. It is best to try to achieve cost recovery, or at least to charge something for introductory quantities of seed. Special arrangements can be made for poorer farmers who are unable to buy seed. Such arrangements could include use of a voucher scheme to help poor farmers access seed.

#### ***Revolving seed stocks***

Many projects distribute small amounts of seed of new varieties to farmers with plans to collect part of the harvest for subsequent distribution. In other cases farmers are asked to pass on part of their harvest to others, either as gifts or for cash. Such endeavours are often accompanied by training in seed production techniques. In general, the distribution of seed of demanded varieties is often a good way to ensure diffusion. However, plans for revolving seed stocks (or seed banks) are usually difficult to administer and suffer from poor seed quality, and should be very carefully considered, along with all other options, before being accepted for implementation. Admonishing farmers to provide seed to their neighbours ignores the normal practices of farmer-to-farmer seed movement. If training in seed production is proposed, there must be strong evidence that farmers are unable to multiply and maintain seed of a particular variety (e.g., because of specific problems in seed selection).

#### ***Small seed packs***

The sale of small introductory packs of seed can be an effective method of creating demand for new varieties. This is best handled through stockists or other commercial outlets. Government research institutes might be able to contribute to this, although the seed for such packs would be subject only to basic quality control (e.g., purity and germination), not certification.

#### ***Source seed***

Most importantly, government research institutes should do everything necessary to provide breeder seed to seed

companies; this may require some 'demonstrations' aimed at the seed companies, in order to stimulate demand.

#### ***Local seed enterprises***

Demand for new varieties is rarely sufficient (on its own) to maintain a commercial seed enterprise, even a small-scale one. This type of intervention is not recommended.

#### ***On-farm management of seed or planting material***

There are instances when farmers are unable to maintain seed stocks from year to year. Reasons for this include a problem with local seed storage methods; problems in maintaining varietal purity in the field (e.g., because of outcrossing or inadequate seed selection); and difficulties in maintaining vegetative planting material (stalks or vines) in the dry season.

In some areas, farmers found it difficult to maintain the planting material of tubers over the dry season. Although some crops (e.g. sorghum or cowpea) are particularly susceptible to storage pests, farmers rarely lost their entire seed supply due to storage problems. A lack of seed at planting time is more likely to be caused by a poor harvest than by inadequacies in seed storage. Several interventions are listed here, but evidence of the magnitude of losses and the causes is essential before potential solutions are explored:

#### ***Adaptive testing and demonstration of improved storage techniques***

Such techniques need to be costed carefully to ensure that they represent reasonable recommendations. Evidence of the magnitude of losses and the causes is needed before conducting research into improved technologies/practices.

#### ***Strengthen commercial seed sector***

If there are serious farm-level seed management problems, a good option is simply to ensure that the commercial seed sector (or the grain market) is a reliable source of seed. Indeed, this is one of the reasons that commercial seed enterprises emerge.

#### ***Techniques for helping farmers maintain vegetative planting material over the dry season***

Such techniques are unlikely to lead to commercial 'seed' ventures because of the sporadic demand and low monetary value of such planting materials. Again, a precise description of the nature of the problem is required.

#### ***Shortage of seed for a particular crop***

There are various reasons why farmers may not be able to plant as much of a crop as they wish, due to seed shortage. The precise reasons for the shortage need to be determined. They may include:

a) poverty and low productivity, so that households have inadequate production and are unable to save seed or generate income to buy seed;

b) local grain markets (from which farmers often get grain as seed) are not reliable seed sources for the particular crop; and/or

c) the formal seed sector does not supply the seed.

Whilst farmer-to-farmer diffusion of seed occurs effectively at village level without external support, there is need to ensure that seed of improved varieties demanded by farmers is available at local markets and through formal sector channels, possibly in the form of small seed packs that also contain information (preferably in local language) about the variety and its management requirements. Support to strengthen local grain markets and the commercial seed sector is recommended. For the latter, the key role for government research institutes is to maintain and produce adequate breeder seed to meet demand. For commodities which do not easily lend themselves to the private sector, government and non-government research and extension organisations have important roles in ensuring that there is adequate quality seed that farmers/CBOs/NGOs can purchase to renew their seed stocks for these crops.

#### ***Strengthen the commercial seed sector***

Companies need to be informed of the availability and advantages of new varieties. AS noted above, there may often be need for specific schemes to promote new seed to private companies.

#### ***Possibilities for local seed enterprise***

Local seed enterprises are very risky ventures. Experience has shown that community-level seed enterprises almost always fail to achieve financial viability. The reasons include lack of marketing capacity and experience, lack of adequate quality control, lack of access to processing or storage facilities, and lack of access to source seed. A more likely avenue for improving farmers' incomes is to help them to market their grain, rather than turning them into seed entrepreneurs. For crops like cassava, attention might be given to dual purpose gardens that could be used for commercial tuber production as well as planting material supply.

#### ***Developing local farmers as contract growers for a seed company***

Contract seed growing may be a means of increasing income for some farmers, but these are generally better-resourced farmers who have the skills and experience to bear the risks involved. In addition, contract seed growing is usually only viable in concentrated areas that are easily accessed by the company supervisors and where crop production conditions are above average.

#### ***Strengthening local grain markets***

These are often the source of grain that is used as seed. Innovations in grain marketing (e.g., storage or transport) that increase the movement of grain in local markets will help increase the supply of such 'seed' and stimulate

demand for the crop, which in turn stimulates more formal seed provision.

#### ***Improvements in crop management***

Increase crop yield (and hence seed supply).

#### ***Targeted voucher scheme***

For the poorest households that are chronically short of seed, some type of targeted voucher scheme might be considered.

#### ***The role of public research in the seed sector***

Past experience in Africa and elsewhere indicates that any type of public seed production is a risky venture. Before supporting such an enterprise it must be asked whether the public sector is the most appropriate body to undertake large-scale seed production and if it can afford to take the risks involved. Issues that need to be addressed include (Gwarazimba and Fiebig, 1999):

- i) Are suitable processing and storage facilities in place for the various crops of interest at zonal institutes?
- ii) What marketing skills and contacts do zonal institutes possess?
- iii) Is the scale of production sufficient to justify the operation?

The development, production and maintenance of breeder seed is clearly a key role of public research. However, involvement in production of foundation/ basic seed for anything other than support of promotion activities is very questionable. Given the level of facilities and inputs required for sustainable production of basic seed together with the inherent risks of such production, it is recommended that basic seed production is undertaken by private seed companies that are in a position to invest in the necessary processing and storage facilities and promote the necessary marketing skills. For the sustainable long-term development of the [emerging] commercial seed sector, public research should collaborate, and not compete with private sector seed companies. Such collaboration requires the supply of breeder seed to the commercial sector. Agreements and procedures are needed between public research institutes and the private sector so that the costs of breeder production are adequately covered.

There may be justification for public (zonal) research institutes to undertake limited in foundation/basic seed production of low-value crops that are not otherwise available through private commercial channels, if there is a demand for such seed, perhaps from NGO/CBO seed multiplication projects or farmer groups to renew their seed. In general however, it is much better that public research institutes concentrate on outreach activities and establish their reputation as a place where farmers can come for information and perhaps to purchase small quantities of seed of pre-release or recently released material for testing/farmer experimentation.

#### ***Guidelines for selection of seed projects in a competitive funding scheme***

Worldwide, agricultural research and dissemination services are embracing competitive funding arrangements, and Uganda is no exception. This section of the paper offers some guidelines for screening projects focusing on issues of seed demand and supply, based on the results and analyses presented above.

In order to make informed decisions about actions directed towards seed access, proposals should include a precise description of the nature of the seed problem. Evidence of the stated problem should be clearly presented.

Priority should be given to proposals which are seeking to promote new varieties (create demand). Promotion of new varieties is a necessary condition for developing genuine demand and government and non-government interventions should dispense their efforts in this line. Promotion can be achieved through participatory planting breeding, on farm trials/demonstrations, sale of small seed packs at ARDCs, demonstration sites, agricultural shows, grain markets etc.

If a proposal declares that there is genuine farmer demand for a particular variety, evidence must be provided before supporting such a proposal to provide seed of the "new" variety. Evidence is required that:

- i) the variety has been demonstrated and planted widely enough so that farmers know about it and are able to identify it or distinguish it from other varieties ;
- ii) farmers understand its principal advantages (and disadvantages);
- iii) farmers are actively seeking seed of the variety

Proposals suggesting on farm seed management interventions should have a clear and concise description of the nature of the problem to be addressed and present evidence spelling out magnitude of the problem

Proposals suggesting addressing seed shortage should spell out precise reasons for seed shortage. The suggested interventions should logically address the reasons.

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**References**

Gwarazimba, V. & W. Fiebig, 1999. FAO/WB Review Mission of the Uganda Seeds sub-Sector. Final report.

Longley C, Kayobyo G, Tripp R & Nangoti N (2001). Guidelines for Seed Production and the Dissemination of Improved Varieties. Soroti: NARO.

Tripp R. (2001). Seed Provision and Agricultural Development. The Institutions of Rural Change. London: Overseas Development Institute.