

ISSD Uganda



BRIEF 15 | 2015



Making foundation seed available

Searching for viable options

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"We have realised that seed entrepreneurship is an expensive but profitable venture for committed and well-trained farmers. But to really benefit from it, you have to invest yourself and not expect any free hand-outs. You need to invest in foundation seed, because investing creates more ownership. We opted to purchase our own foundation seed from the National Semi-Arid Resources Research Institute. This time, we could justify the source of our seed and hence sell it as seed to obtain a better profit. We learned that the more you invest in a seed business, the more you get out, provided you follow all the production and marketing principles." **Patrick Chairman of Tic Ryemo Can, a Local Seed Business (LSB) group in Anaka sub county, Nwoya district, Uganda**

Limited production and delivery of early generation seed (breeder and foundation) is a major constraint for smallholder farmers in Uganda. Access to high quality seed remains a challenge despite the investments put into seed sector development programmes. Seed companies, Local Seed Businesses (LSB), and community seed multiplication programmes all need foundation seed. However, seed companies face various challenges while trying to access foundation seed, which include quality issues around foundation seed and shortage of foundation seed for certain varieties. The National Agricultural Research Organisation

(NARO) and its constituent research institutes depend on funds released by government and development partners annually, and most of the time these funds are not adequate to budget for seed production. There is also a lack of coordinated planning and information sharing between breeders and seed companies. Seed companies and LSBs often do not make good projections to enable proper planning by breeders. This creates a shortfall in the production of breeder seed, subsequently affecting the production of foundation seed. On the other hand, physical distance to breeding institutions, the cost of seed and

seed requirements are the main challenges for LSBs and community seed producers. With a range of partners, initiatives to enhance availability of foundation seed for seed producers have been undertaken. Examples highlighted in this brief are Zonal Agricultural Research and Development Institutes (ZARD-Is) which are producing foundation seed as a business, LSBs producing foundation seed under the guidance of breeders, and pre-booking foundation seed one season in advance.

The foundation seed delivery system in Uganda

In his opening remarks at a national seed sector stakeholders' meeting in 2014 **Mr Komayombi Bulegeya (commissioner for crop protection)** said "... in Uganda there is little or no foundation seed available for most food security crops such as sorghum, millet, beans, cowpea, sesame and groundnut, so seed companies often sell standard seed rather than certified seed of these crops".

Foundation seed is one of the key inputs in producing quality seed. To understand its importance, the role of foundation seed in the value chain must be determined. Figure 1 illustrates the generic seed value chain.

The first step in breeding is to cross existing varieties with good characteristics from other varieties in order to combine traits from multiple varieties into a new one. For example one bean variety may be drought resistant, while the other may give high yields and has a short maturing period. Step 2, once the variety performs well and remains uniform, is to produce breeder (or pre-basic) seed. This breeder seed normally comes from a few plants with the right characteristics and thus the volume is low. In order to create enough volume that can serve as inputs for certified seed or quality declared seed (QDS), this breeder seed needs to be bulked during several seasons. The number of bulking rounds depends on the multiplication rate of the crop. For example, maize has a multiplication rate of 100. Thus after multiplying 1 kg of breeder seed for one season, 100 kg of foundation seed is produced. By multiplying it one more season, 10,000 kg of foundation seed is produced. This 10 MT can then produce 1,000 MT of certified seed. Yet, for legumes, the multiplication rate is only 15. So 1 kg of breeder seed gives 15 kg of foundation. To reach 10 MT, this seed needs to be multiplied for 3-4 seasons. To reach 1,000 MT of quality declared/certified seed, 67 MT foundation seed is needed.

Figure 1: Generic seed value chain



Once sufficient quantities of foundation seed are produced, seed companies use this to produce certified seed and LSBs use this to produce QDS. In addition several development projects work with community groups to multiply seed and also purchase foundation seed. Community seed multiplication is informal and this seed is not certified by the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF).

more established seed companies in Uganda (e.g., NASECO, FICA Seeds, East African Seeds Ltd. and Victoria Seeds) obtain breeder seed of some crops, such as maize and beans, from researchers and multiply it into foundation seed and then sell it to other seed companies. In addition, some (multinational) seed companies breed their own varieties which they register with the national variety register.

The National Agricultural Research Institutes (NARIs) and ZARDIs under NARO, are the major source of early generation seed for new and released varieties. However, some of the

Table 1 provides an overview of the actors in the seed value chain and whether these actors are private sector (Pr), public (P), or public-private (PP) sector actors.

Table 1: Overview of actors responsible for specific activities within each seed value chain

Value chain point	Description	Type of actors
Variety research and development	Research and development of germplasm with desirable farmer and market traits	Breeders in NARIs (P) and International Agricultural Research centres (IARCs) (P)
Variety selection and breeding	Variety evaluation using participatory approaches and release	NARIs (P) and IARCs (P)
Breeder seed production and maintenance	Production of several generations of breeder seed from nucleus seed and variety maintenance	NARIs (P), IARCs (P) and some multinational seed companies and national seed companies that have exclusive rights to particular crops (especially maize hybrids) and varieties (Pr)
Foundation seed production	Production of foundation seed from breeder seed	Direct production - NARIs (P) Direct production - NARIs with contract farmers (PP) Seed companies (Pr), farmer cooperatives and local seed businesses (PP)
Certified and quality declared seed production	Production of quality seed from foundation seed	Seed companies (Pr), farmer cooperatives and local seed businesses (Pr), and individual farmers and groups (Pr)
Marketing and distribution	Distribution through agro-dealer networks, farmer groups and local markets	Sales in open markets, agro-input dealers, seed/grain traders, seed exchange through local seed systems (seed fairs, social networks etc.)
Seed quality control and certification	Variety registration, official inspection and certification	National Seed Certification Services (NSCS) of MAAIF (P)
Seed trade	Facilitate regional and domestic seed trade	Uganda Seed Trade Association (USTA) composed of registered local seed companies (Pr)
Seed uses/uptake	Adoption of improved varieties	Farmers (small, medium and large) (Pr) Direct farmer to farmer diffusion (Pr) Government distribution programmes (e.g. Operation Wealth Creation) (P)

Legend: P=Private, PP= Public-Private, Pr=Private; Source: Mastebroek and Ntare, 2016

Addressing the challenges jointly

During annual national seed sector stakeholder meetings and meetings with breeders, issues hampering growth of the seed sector are analysed. Table 2 provides an overview of the key challenges for foundation seed production that have been raised during these meetings. As shown in Table 2, bottlenecks influencing availability of foundation seed are occurring along the entire seed value chain.

ISSD is piloting innovations with a range of partners in the seed sector, which will be discussed in this brief. In addition, breeders are also involved in seed promotional activities including farmer participatory trials/demonstrations to identify farmer- and market-preferred varieties of major food security crops. These participatory activities have led to valu-

able interaction with farmers to increase their knowledge and demand for quality seeds.

Together with ZARDIs and NARIs, ISSD is facilitating on-farm variety selection trials/demonstrations to increase farmers' awareness of the attributes of improved varieties and yield increasing agronomic practices. On-farm participatory variety selection enhances variety adoption and thus demand for foundation seed. LSB members have shown enthusiasm in getting involved in NARO-organised on-farm participatory variety trials in the ISSD regions of intervention. Other awareness raising activities include field days, inter LSB visits, farmer-friendly brochures and seed fairs. This has greatly increased confidence of farmers in improved varieties and encouraged them to demand quality seed.

Table 2: Summary of key Early Generation Seed (EGS) bottlenecks, causes and explanations

No	Bottleneck	Cause/explanation
1	Limited capacity in research and development	<ul style="list-style-type: none"> • Insufficient budgetary allocation for research is a major constraint • No specific funds are allocated to EGS production and supply • Focus is on very few crops, and there is limited
2	Low capacity to generate own breeder or foundation seed by local seed companies	<ul style="list-style-type: none"> • Seed companies rely on NARO to generate foundation seed. The latter however, has limited capacity to raise enough foundation seed to meet the demand • Seed companies have limited capital and access to affordable credit for their operations and investment in infrastructure for seed processing as well recruiting qualified breeders
3	Low adoption rates of improved seed by farmers	<ul style="list-style-type: none"> • Inadequate research-extension-farmer linkages to facilitate demand-driven research and increase use of improved seed • Gap between user needs and the characteristics of the developed varieties
4	Unpredictable seed demand/market	<ul style="list-style-type: none"> • Caused by several factors: the diversity of producers' sources of seed, including low or non-market channels; the use of seed produced on the farm; subsidies programmes; inefficient agricultural statistics system; low practice of marketing studies in seed companies etc.
5	Poor seed quality	<ul style="list-style-type: none"> • Limited capacity (personnel and logistics) of NSCS to inspect and monitor seed produced by many scattered out-growers and seed dealers • Lack of operating standards/guidelines enforcement of seed regulations • Many smallholder farmers have been disappointed by the quality of the seed on the market traded under labels of registered companies. Unscrupulous dealers sell fake/adulterated seed leading to mistrust of marketed seed and reliance on own saved seed

Source: Adopted from Mastenbroek and Ntare, 2016

ISSD, together with stakeholders, has piloted three ways to increase reliable availability of foundation seed. In the first pilot, LSBs were encouraged to pre-book their foundation seed needs one season in advance, to enable breeders to produce sufficient quantities of foundation seed. In the second pilot, two LSBs produced foundation seed for groundnut under the close supervision of the groundnut breeder to improve cost-efficiency of foundation seed production and to bring foundation seed closer to the local seed businesses to reduce transport costs. Lastly, one ZARDI is producing foundation seed as a business to address cashflow constraints at the institute and increase availability of foundation seed for LSBs in West Nile zone. Each of these pilots is briefly discussed below.

Pilot 1: Pre-booking of foundation seed

In 2014, ISSD guaranteed pre-booking of foundation seed from breeding institutes to ensure that the LSBs have seed in time for the cropping season. Quantities booked and bought in 2014 are presented in Table 3.

Table 3. Quantities (kg) of foundation seed booked and bought by LSBs in 2014

Crop	Amount booked	Amount bought	Balance
Sesame	705	732	+27
Rice	4,830	4,380	-450
Potato	54 (bags)	24 (bags)	-30
Pigeon pea	35	0	-35
Pasture	100	10	-90
Groundnut	100	672	+572
Beans	7,575	6,716	-859
Millet	100	0	-100

Table 3 shows that not all the quantity booked was bought. Pigeon pea and millet seeds booked were not bought. More sesame and groundnut seed were bought than booked,

and the rest had unsold stocks. In addition to unsold stocks, there were also challenges of mismatch of seasons across the country. For instance bean seed could not be delivered on time to two LSBs in northern Uganda. Leftover stocks or seed not paid for is a disincentive to breeders. The use of public transport to deliver the seed from the research institutes to LSB locations resulted in some seed getting lost on the way. Although breeders appreciated early booking, the booking should also go with advance payment which did not occur. This meant that breeders did not have any guarantee that the LSBs were going to pay for the booked foundation seed. At the same time, LSBs found it hard to predict which crops and varieties to plant one season in advance. Many farmers wait until just before planting to assess the climatic conditions and adjust their foundation seed needs accordingly. Therefore, the pilot was not as successful as was anticipated.

Pilot 2: Enhancing foundation seed production through LSBs

This project began in September 2014 with the objective of addressing the challenge of insufficient quality foundation seed to support the growing groundnut seed business by LSB groups in the northern Uganda. The project explored the technical and economic feasibility of getting two LSBs supported by ISSD Uganda to produce foundation seed in their communities under the supervision of two ZARDIs (NaSARRI and Ngetta).

Following trainings in groundnut seed production, Tic Ryemo Can and Aye Medo Ngeca LSB in Nwoya and Dokolo districts, respectively, managed to produce 115 MT of Serenut 5R and Serenut 6T foundation seed over the seasons of 2015A and 2015B. NaSARRI and Ngetta ZARDI supported the two groups in training, quality assurance of seed and



Mr. Kalule explaining the process of Groundnut breeding

assessments of the economic feasibility of foundation seed production within the communities. The fields planted were inspected and passed for seed multiplication. The harvest also qualified as good foundation seed since it had a germination percentage of over 79% for both varieties.

The feasibility analysis indicated that under the right production conditions, LSBs earn margins as high as seven million Uganda shillings (UGX 7 million) per hectare from the sale of the foundation seed; this can increase by at least UGX 300,000 when LSBs produce one more generation of foundation seed before selling it. The maximum gross margin from foundation seed produced at NaSARRI was only five million Uganda shillings (UGX 5M) per hectare. Additionally, the break-even yield per hectare for the first generation of foundation seed is slightly lower (416 kg) for foundation seed produced by the LSBs as compared to 424 kg for that produced at NaSARRI. The difference in break-even yield by LSBs and NaSARRI is especially pronounced when foundation seed is produced from the first generation foundation seed (340 kg/ha for NaSARRI and 305 kg/ha for the LSBs).

From this innovative project, we can conclude that since LSBs sell foundation seed at lower

prices than research institutes and LSBs are operating in areas where other LSBs have a demand for foundation seed, an engagement of LSBs as research seed multipliers would result in increased access to foundation seed in the zones where LSBs are active.

Pilot 3: Enhancing foundation seed production through ZARDIs

Due to the challenges of limited funding to produce foundation seed at NARO institutes, ISSD is supporting a pilot project on the production of foundation seed as a business at the Abi ZARDI in West Nile. This approach has been endorsed by NARO management and crop breeders. It will provide foundation seed of selected crops on a regular basis to LSBs and other seed producers. ISSD provided training to NARO scientists at Ngetta and Abi ZARDIs in business plan preparation to guide operation of the pilot. However, Ngetta, did not submit a revised proposal to enable preparation of a MoU. The commercial value of the project has both social and economic benefits to the region besides generating local revenue for the centre. Lessons learned will guide how the approach is rolled out to other ZARDIs. The ZARDIs, being public institutions, are not permitted to keep non-taxable revenue (NTR) accruing from seed sales, thus limiting further investments into the project. However, government commitment and support are indispensable to get around this issue.

The project was initiated in August 2015 with the goal of getting Abi ZARDI to bridge the foundation seed gap through increased supply of quality products in the amount desired by seed producers in West Nile. This project is piloting production of sesame and potato foundation seed as a business following provision of initial investment capital. The business plan indicates that with the investment capital of UGX 72 million Abi ZARDI

should be able to continue to produce and sell foundation seed profitably every year. So this amount is a one-off investment to boost foundation seed availability in the zone. After the pilot period, which ends in August 2016, Abi ZARDI is expected to continue producing and marketing the foundation seed in West Nile region on a sustainable basis and recovering its production costs.

In the 2015B season, 1.6 hectares of potato (Kachpot 1, Victoria and Rwangume) was planted at Zeu District Farm Institute (Zeu DFI) and 0.4 hectares of sesame breeder seed from NaSARRI was planted at Abi ZARDI. The crops experienced severe drought stress due to the early onset of the dry season; this called for manual irrigation of the fields. The crops are due for harvesting in 2016.

From the first 4 months of the innovative project it became apparent that the ZARDI needs more entrepreneurial and business support to operate under business principles, and the issue of NTR needs to be addressed.

Changes in status quo

The above initiatives, and other sector initiatives, have resulted in significant changes. NARO has recognised the need to decentralise foundation seed production from NARIs to ZARDIs. This will ease the distance covered by the LSBs to access seed from these sources. NARIs and ZARDIs have also expanded their on-farm adaptive research activities through LSBs and received training from ISSD in integrated crop management practices. In addition NARO is considering other initiatives to increase the availability of foundation seed. One example is setting up a private entity, NARO Holdings, to produce and market, amongst others, foundation seed. In this way, seed production is not dependent on timely transfers from the Ministry of Finance.

A recent review of the Development Investment Plan (DSIP) for Uganda (2010-2015) recommended that *"involvement of community based seed producers in planting material and seed production of Quality Declared Seeds (QDS) expedites multiplication, ownership and access to improved seeds and planting materials. This approach helps to bridge the gap in improved seed and planting material supply in the short- to medium-term"*. MAAIF is fully involved in these quality assurance innovations, thus building the confidence of farmers in using quality seeds and planting materials.

There is increased ownership of the innovations by partners which indicates that successful interventions will continue after ISSD support ceases. For example, LSBs in West Nile have established a seed box, which targeted saving for foundation seed. Other sources of resource mobilisation are Village Saving and Loan Associations (VSLA) used to pre-finance foundation seed and the seed gap between harvesting and planting, which can be between 4-9 month (in which farmers are tempted to sell seed as grain).

And finally...

...successful LSBs will increase the demand for foundation seed. Many market-oriented farmers (groups or individuals) are now producing seed as a business. This is creating and increasing demand for foundation seed. Some LSBs have the potential to expand as specialised foundation seed enterprises, but would need further training in market development.

A successful approach to improve availability of foundation seed will require the transfer of knowledge and availability of improved germplasm on a regular basis. This includes supporting the capacities of the LSBs, building partnerships with a range of stakeholders, increasing the involvement and interaction of

government services, and improving marketing strategies. It is also essential to hold seasonal meetings between seed producers and breeders to better plan for foundation seed production. A realistic seed roadmap for each preferred variety is essential. One way to improve coordination between breeders is zonal LSB associations that coordinate the demand for foundation seed within their zones. In this way, breeders only need to deal with one institute per zone instead of 100 LSBs. Preparatory meetings amongst LSBs in West Nile to form their association were held in 2015.

It is essential for NARO to decentralised foundation seed production from NARIs to ZARDIs and provide a one-time grant as a revolving fund to ensure a steady supply in the respective agro-ecological zones.

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Colophon

Published by:

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