The introduction and commercial production of Iron Rich Beans (IRB) in Karamoja aims to address a critical food security gap and help meet the needs of its population.

FEED THE FUTURE UGANDA INCLUSIVE AGRICULTURAL MARKETS (FtF IAM) ACTIVITY

IRON RICH BEANS INTERVENTION

LEARNING BRIEF
September 2022

INTRODUCTION

This learning brief is the first in a series of Feed the Future Uganda Inclusive Agricultural Markets (FtF IAM) Activity learning products. The brief shares lessons learned while implementing the ag-inputs market intervention in the Karamoja sub-region- Northern Uganda. It also highlights the challenges smallholder farmers face due to stressors and shocks, and how these challenges impact their resilience. The information in this brief is drawn from FtF IAM's experience gathered during two implementation cycles: Season A and Season B of which 2021 promoting the production of quality Iron Rich Beans (IRB)[1] seeds in the Karamoja sub-region. FtF IAM implemented this intervention, in collaboration with the National Agricultural Research Organization (NARO).

Target Audiences

- IAM and NARO will use these findings to inform their approaches to working with current and future private sector partners and their intervention strategy in target market systems.
- Development partners and humanitarian actors in Uganda that want to understand how to engage with the private sector and support their investments in the poorest regions of Uganda.
- Private sector partners, especially FtF IAM's present and prospective agri-input and agribusiness service partners considering market entry in the Karamoja sub-region.

Lessons Learned and Adaptation Strategies

By testing and introducing commercial production of new seed varieties in the underserved agriculture market of Karamoja, Uganda, the Activity learned the following:

1. Transforming farmer groups into effective businesses is resource intensive, iterative, and requires an integrated approach: Despite prior work with other development partners to build their capacity, farmer groups that were recommended to FtF IAM lacked basic organizational and technical skills to manage the scale of the initial pilot and supervise their farmer members to implement the seed production model. The transformation of such groups into businesses entities will require patient investment especially in Karamoja. An intervention that builds capacity to multiply seed as a business and de-risks the initial investment must be integrated with technical assistance to help with marketing, financing, insurance, and providing linkages to other market actors like input suppliers.

Facilitator Esther Mbayo, sharing the IRB farming best practices with members of her farmer group in the Rwamwanja refugee settlement in Kamwenge District, Western Uganda.

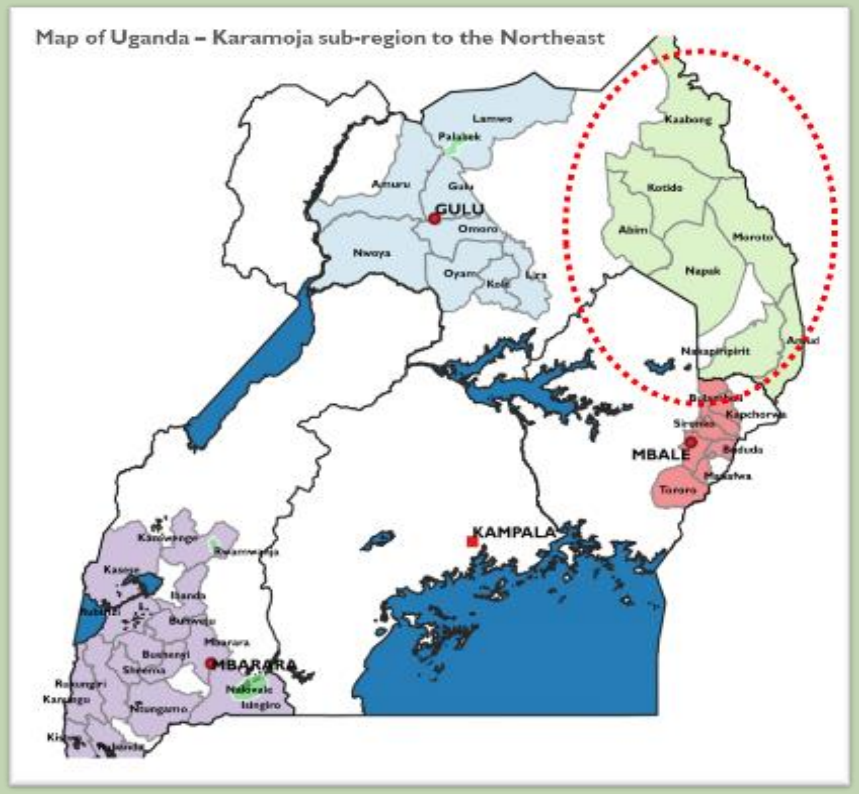
[1] Iron Rich Beans are beans that have had their iron micronutrient content increased

More Lessons Learned and Adaptation Strategies

1. Facilitating market-oriented intervention requires multiple implementation cycles: Incentivizing agribusinesses to do business in Karamoja requires more than one season of implementation. Many partners were apprehensive about doing business in Karamoja and understood the inherent risks. Challenges of insecurity, high transaction costs, and erratic weather discourage market entry based on a one-season experience.
2. Information on conditions and parameters impacting agriculture productivity is paramount to a successful agricultural intervention: In Season A, farmers underestimated the cost and labor requirements for seed multiplication, and the Activity had insufficient information on seed varieties and weather patterns. This hindered farmers from reaching their target yield during both implementation cycles. Early market entry interventions do not always have enough information prior to implementation and thus require higher levels of risk mitigation and limited scale piloting.
3. Facilitating key relationships between market actors takes time: To avoid failure, development programmes must take time to foster strong key relationships. Building rapport with other market actors requires time and still relies heavily on the Activity's coordination and outreach. NARO's increasingly active role enabled the farmer partners to leverage its expertise in sourcing foundation seeds and providing technical assistance in quality seed multiplication. Stronger direct farmer linkages to NARO, NARO Holdings, and other market actors without FF IAM facilitation will support greater long-term sustainability.

KARAMOJA CONTEXT

According to the Uganda Demographic and Health Survey 2016[2], anemia, a direct result of iron deficiency, was higher than the national average for all sexes and age groups in the Karamoja sub-region. One solution is to eat iron rich foods such as IRB, the majority of which are produced in regions far from Karamoja. Aiming to improve iron in the diets of local communities, the Activity sought to partner with organized farmer groups to produce certifiable quality seed that can be available within the sub-region. Situated in the Northeastern section of Uganda, Karamoja is a region with high levels of food insecurity and malnutrition. The region faces recurrent climate-related stocks, such as prolonged mid-season dry spells and drought, and erratic rainfall that causes floods and water logging in some areas. Farmers in the sub-regi4on have limited access to quality inputs and agribusiness support services due to poor infrastructure, insecurity, and weak commercial relationships with agribusinesses outside the region. This contributes to high price fluctuations in inputs and output markets. Alongside the IRB seed multiplication activity, FtF IAM is partnering with six agribusiness companies that sell quality inputs through village agent models to enter the Karamoja market in 2021-2022. IAM is also encouraging market actors to invest in wholesale commodity aggregation and quality food trade models that strengthen business relationships and improve farmers' access to inputs and markets.



[2] Uganda Bureau of Statistics (UBOS) and ICF. 2018. Uganda Demographic and Health Survey 2016. Kampala, Uganda and Rockville, Maryland, USA: UBOS and ICF.

Market Context

The commercial production of quality IRB can address a critical food security gap and help meet the nutritional needs of the population in Karamoja. During the drought seasons, the region is a net food importer with a lack of locally available and affordable food, including beans. This is due to the lack of locally available, high-quality, affordable IRB seeds, among other reasons. This leads farmers to use retained or low-quality seeds procured from local markets, which can adversely affect production yields and increase reliance on humanitarian partners to import quality seeds from other regions.

Key Market Constraints

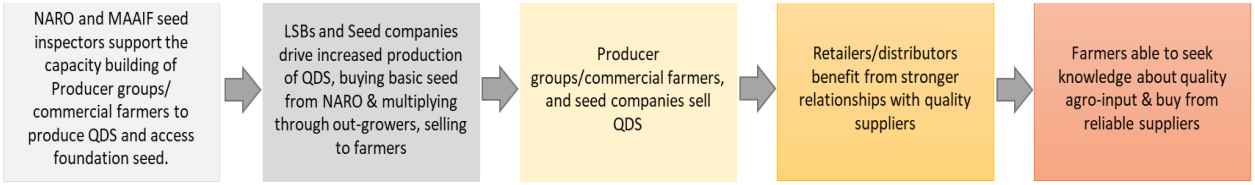
While the production of Quality Declared Seeds (QDS)[3] in regions of seed scarcity such as Karamoja can increase farmers' access to low-cost, high-quality seeds, an underlying challenge with QDS production has been access to foundation seeds, working capital, and markets. One key reason is seed companies do not integrate local seed production into the formal seed supply system – where they could advance inputs on credit – because they do not see an incentive to invest. Seed multipliers therefore often do not have a secure market for the seeds they produce or support in sourcing foundation seeds.

Facilitation for Transformative Change

To improve the production of IRB seed (and in turn grain), the Activity partnered with producer groups, commercial farmers, and NARO to build the capacity of QDS producers in quality seed production. FtF IAM facilitated Local Seed Businesses (LSBs) to produce and sell QDS under performance-based risk-sharing grants. This was aimed at increasing profitability for LSBs from the sale of quality seeds and improve incomes for farmers and complementing the work of other development partners building the capacity of farmers to grow IRB for consumption.

Anticipated Market Systems Change

FtF IAM sought to enable previously trained, relatively high-capacity farmers and farmer groups to participate in the commercial IRB seed production in the Karamoja sub-region for sale to local farmers and farmer groups. It was assumed these partnerships would build overall local seed multiplication capacity, increase awareness among farmers about the value proposition of QDS, and spread knowledge about good agricultural practices. In turn, IRB producers in the region would demand the QDS and increase production of IRB for local consumption. And seed multipliers[4] would strengthen relationships with foundation seed suppliers (private and NARO), develop relationships with markets (seed traders and local farmer groups producing IRB), and continue to invest in IRB seed multiplication with less donor support (including from the Activity).



FTF IAM PARTNERSHIP APPROACH

FtF IAM aimed to reduce risks and enable private producer groups and commercial farmers in the Karamoja region to co-invest in the production of QDS IRB seeds for the first time. Using performance-based awards, the Activity offered to cost-share 45 percent of estimated production, while seed producers contributed 55 percent in inputs, land, and labor. FtF IAM provided support to 16 seed multipliers, including commercial farmers and producer groups from the Kaabong, Kotido, Abim, Napak, and Nakapiripirit districts. NARO provided technical assistance to the partnering seed multipliers with each expected to produce an area between 10 and 78 acres – a projected yield of 300-500 kg/acre (NARO estimation) in the first cycle, Season A.

FtF IAM also introduced its IRB partners to other market actors such as Okeba Uganda Limited[5] (Okeba) – an agribusiness firm that buys produce, offers storage, and provides marketing – to supply quality foundation seed and fertilizer-bean inoculant. The Activity facilitated such linkages to build seed multipliers' capacity to develop direct market relationships and learn how to procure these inputs. It was envisaged such linkages would ensure the seed multipliers ability to independently secure necessary inputs and other future support without FtF IAM help. To date, IAM's intervention has run through two cycles: **Season A** and **Season B** 2021[6]. The following sections showcase the targets, outcomes, and lessons learned, and adaptation strategies the program undertook during its implementation phase. They also highlight the adaptive management and continuous learning applied by the program to adapt its implementation strategies based on field findings.

[3] In Uganda, QDS is a recognized seed class produced by trained, registered, farmer-led enterprises that are supervised by authorized District Agricultural Officers (DAOs). QDS offers an alternative to certified seed that is usually more expensive. QDS is intended to be marketed within the geographical region where the QDS is produced. To be sold as QDS, a DAO completes field inspections, and the seeds are tested by the National Seed Certification Service (NSCS) under the Ministry of Agriculture Animal Industry and Fisheries (MAAIF).

[4] Seed multipliers grow a particular seed variety in a large scale for sale to farmers.

[5] Okeba supplied NARO Bean 2, a variety fortified with iron and promoted by NARO in Karamoja.

6. For Southern Karamoja and Abim season 1 is between March and July but always interrupted by drought and then season 2 is between August and November. However, seasons in Karamoja are not as distinct as in other parts of Uganda. Kaabong, has one rainy season that starts in June.

SEASON A: TARGETS AND OUTPUTS (MARCH – JULY 2021)

Target 1

FtF IAM sought to facilitate a partnership between NARO, the Ministry of Agriculture and Animal Industry (MAAIF), and other service providers to build the capacity of at least 10 farmer groups or commercial farmers to produce QDS IRB.

Outputs

- Due to high farmer interest, FtF IAM facilitated partnerships with16 farmer groups, including both commercial farmers (an average production area between 15 and 30 acres) and smallholder farmers (an average production area between one and three acres).
- The partnership with NARO took longer to facilitate than anticipated, and the Activity engaged NARO less than was planned in the design and farmer capacity building phase.
- The Activity facilitated successful partnerships with the private sector and NARO. Okeba, a premium buyer and trader of grains, sourced 17.88 metric tons (Mt) of foundation IRB seed from NARO and authorized LSBs (9.33 Mt was planted in Season A, and the remaining 8.55 Mt planted in Season B). NARO conducted preseason training for farmers on Good Agronomic Practices (GAP) such as site selection, land opening, seed selection, timely line planting and spacing, pest and disease management, fertilizer application, and post-harvest handling practices. NARO also provided technical assistance during the production and post-harvest handling stages, established demonstration plots, and provided monitoring support of the farmers' plots during production.
- Due to COVID-19 travel restrictions and delays in communication, FtF IAM was unable to onboard MAAIF, which is mandated to inspect and certify seed production.

Target 2

FtF IAM supported the following partners to introduce and sustain an additional seed production business line to what they were already producing:

- 238 commercial and smallholder farmers
- 621 acres of total production area
- 500kg/acre estimated yield
- 220 Mt of QDS IRB production

Outputs: Partners invested approximately UGX 513,000,000 (216,176 USD). Due to massive crop failure due to prolonged drought and floods during Season A, realized outputs deviated significantly from the target:

- 169 commercial and smallholder farmers
- 342 acres of total production area
- 37kg/acre yield
- 12.6 Mt of QDS production

Target 3: FtF IAM aimed to identify a consultant to support seed producers with QDS production and sale facilitation and coordination to improve linkages among seed buyers and other market actors, such as farmer groups, institutional buyers, and donors in Karamoja, to incentivize and de-risk the multiplication of seed in later seasons.

Outputs: FtF IAM was unable to identify a suitable consultant or partner with sufficient incentive and capacity, but continued its facilitation and coordination functions for the next season, and continued to seek out relevant market actor(s) able to take up the facilitation and coordination role.

Lessons Learned

1. Farmers' capacity to produce IRB seeds was lower than expected. Not sufficiently realizing the extent of required labor and crop management for producing seed compared to IRB production for consumption[7], farmers found the process much more labor-intensive than anticipated. This resulted in cost implications and difficulties sourcing additional labor. Given transition from pastoralist livelihoods to crop production is relatively recent, Karamoja farmers (compared to farmers in regions with longer histories of crop production) were less experienced and habituated to the labor required to meet NARO's recommended practices.
2. FtF IAM had insufficient information on IRB varieties that would perform best. Despite recent IRB production by development partners in Karamoja to fulfill nutritional requirements, NARO has not yet completed research on which varieties perform the best in Karamoja zones and climates. As a result, NARO Bean 2 did not perform well in some districts, such as Namalu sub-county in Nakapiripirit, which negatively impacted yields.
3. A semi-arid zone, Karamoja is a predominantly pastoralist area with emergent crop production. High risk crop failure due to heavy rainfall and prolonged drought within the same season, little information exists on weather patterns, planting times, and suitable crops for specific regions.

SEASON B: TARGETS AND OUTPUTS (AUGUST – NOVEMBER 2021)

Adaptation Strategy: Season A to Season B

1. Farmers wanted to plant a second season using seed not planted during Season A. The Activity therefore extended the partnership to Season B, with the expectation that favorable weather conditions would also contribute to learning about weather patterns.
2. Recognizing farmer exposure risks due to adverse weather conditions, the Activity introduced a yield-index based protection service offered by insurance broker Pula[8], and Sanlam, an insurance company.
3. The relationship between key partner NARO and FtF IAM evolved and strengthened over time. Both reflected on how to improve in Season B and planned earlier NARO's team travel to the field. Collaborative efforts resulted in joint planning and monitoring activities to ensure common understanding regarding implementation of activities and roles.
4. No additional funding was awarded to the 16 partners, but IAM modified the performance-based agreement milestones and payment schedules for those who reinvested in Season B.

Outputs: Partners invested approximately UGX 718,000,000. During season B, the partnership between the farmer groups and NARO, and Okeba continued while one with MAAIF did not materialize. NARO continued to provide technical assistance during production and post-harvest handling, while Okeba sourced 4.77 Mt of foundation seed. The realized output was:

- 196 commercial and smallholder farmers, including 103 new farmers from 6 farmer groups
- 479 acres of total production area
- 115kg/acre yield
- 54.92 Mt of QDS production

Note: Experiencing challenges with IRB, and having a ready, larger market in Uganda and in neighboring Kenya, Okeba diversified to soybean and is planning to start soybean animal feed production to meet vegetable oil millers and animal feed producer demands. Not only is soybean production cost much lower, it generates a better investment return than IRB.

QDS yields were better in the second season (115kg/acre) than the first season (37kg/acre) due to improved weather conditions. However, farmers in some areas still faced drought and flood challenges. As a result, the overall yield average of 115kg/acre was much lower than the estimated target of 375kg/acre target (*which was reduced from 500kg*).

[7] Planting requirements for seed are more rigorous requiring stringent agricultural practices to ensure the qualities of good seed are maintained unlike production for consumption.
[8] PULA is an agricultural and technology company

Target 3: FtF IAM aimed to provide crop insurance coverage to 14 IRB seed producers (462 acres across five districts) to protect against risks deriving from weather changes, pests, and disease outbreaks.

Outputs: FtF IAM supported 196 farmers obtain insurance (479 acres worth UGX 1,219,551,804, approx. 350,000 USD). The total pay-out at the end of the season was UGX 259,430,352 (approx. 75,000 USD) and resulted in more farmers interested in continued investing in IRB QDS production. FtF IAM gave an incentive of UGX 250 per Kg of seed/grain sold to IRB farmers to prompt seed producers to develop their own sales plans. However, due to an underdeveloped relationship with MAAIF, the farmers did not receive its tamper-proof green QDS certification label. As a result, most farmers sold their IRB as grains locally to consumers and other farmers, and the World Food Program (WFP). A few sold seeds to IRB seed market farmers. To pay out, FtF IAM confirmed sales by verifying sample transactions.

Facilitater Esther Mbayo of a farmer group in the Rwamwanja refugee settlement demonstrates how to tend to the IRB.

Lessons Learned

1. In thin markets like Karamoja, private sector pre-investment research in demand market assessment for QDS in crucial. More attention should be given to demand signals, especially in donor distorted markets. FtF IAM learning indicates targeting the aid market affected marketing of QDS IRB directly to farmers and did not work.
2. Limited capacity and information resulted in farmers unable to access the local market. According to MAAIF, QDS is required to be marketed where it is grown.
3. Farmers and key stakeholders must drive the next investments in IRB or other QDS production, with FtF IAM playing a facilitative role between market actors. Farmers had limited ability to seek out necessary support services from key stakeholders, such as MAAIF and the DAO for seed inspection and certification, and NARO for provision of foundation seed. As a result, the DAO did not complete the required seed field inspection, and the National Seed Certification Service (NSCS) of MAAIF did not conduct the required seed testing. As a result, the produce could only be sold as grain. Farmers and farmer groups still rely heavily on – and wait for – donor partners such as FtF IAM to approach them and coordinate.

More Lessons Learned

4. Farmers require sufficient finances to manage the QDS production process. The initial investment for farmers was high due to higher-than-anticipated planting, weeding, and pest and disease management costs. The production volume scale was too high and should have been a more limited, resource-intensive, first trial into seed multiplication. As farmers' capacity to manage seed production is built, they will also need to access financing. As they do in other regions, seed traders and end markets can play a strong role in facilitating longer-term financing. In 2022, Okeba and Yield Harvest are testing this with a small number of out-growers.
5. Commercially viable insurance is critical for farmers to mitigate risks against adverse weather conditions. Given Karamoja's severe and erratic weather, FtF IAM's risk mitigation strategies and approach must go beyond cost-share. Insurance companies' offerings must be brought in early on while they concurrently learn about risk profiles and market needs in the region's hard-to-reach areas and fragile ecosystems. Such partnerships must also include a component to sensitize farmers on insurance use. However, insurance company identification of commercially viable business models will make it an attractive business investment opportunity.

Overall, FtF IAM underestimated the significant risk exposure of farmers opting into the partnerships and started at a scale that farmers could not sustainably manage from a financial or technical perspective. Some risks, such as knowledge about the appropriate seed variety to use, weather conditions, cost implications, etc., are inherent to early market entry and new technologies. In hindsight, piloting with smaller land areas for each farmer would have lessened their risk exposure and allowed more intensive work with greater capacity building for the farmers.

In addition, during Season A the Activity relied too heavily on the performance incentives and did not offer enough technical support through its partnership with NARO or the planned local consultant. Direct technical assistance, in coordination with FtF IAM's co-financing, could have improved the real-time understanding of capacity constraints and performance gaps.

[Note: Please see Table 3 in the Annex for a comparative analysis between Season A and Season B performances and explanations for the differences.]

CONCLUSION AND WAY FORWARD

Adaptation Strategy: IRB Intervention in 2022

- Based on its first-year experience, FtF IAM adapted its approach in 2022. The Activity will reallocate its resources from performance-based awards to capacity building of the groups through technical assistance in enterprise development so they can operate as commercially viable entities – Local Seed Businesses (LSB).
- FtF IAM's experience in Karamoja, as well as with other agribusiness partners across Uganda, motivated it to develop a partnership with the Agro Consortium – a coalition of 11 insurance companies licensed to underwrite agriculture insurance in Uganda that access approx. 80 percent agriculture insurance premium subsidies.
- FtF IAM will facilitate technical assistance to farmers to strengthen links with MAAIF and/or DAO's office for inspection and certification, while building the farmers' networking capacity with required stakeholders to ensure farmers' seed is QDS certified as required by law.

Systems Change:

- The Activity's anticipated sequence of change envisioned: 1) it would incentivize seed companies to invest in multiplication and marketing of QDS; and 2) NARO and MAAIF seed inspectors would support building the capacity of Member Based Organizations to produce QDS and access foundation seed. Local seed businesses (LSBs) and companies would then drive increased production of QDS by buying seed from NARO, multiplying via out-growers, and eventually selling to seed farmers.
- FtF IAM succeeded in incentivizing farmers to grow IRB QDS, who experienced the commercial production of QDS, and have come to appreciate the associated challenges and better understand QDS production requirements and associated production costs. This allows them to better determine the appropriate acreage to dedicate to QDS farming.

- However, transforming farmer groups into LSBs requires registered farmer groups have levels of capacity sufficient for production, as well as to engage stakeholders. The intricate requirements of LSB establishment takes time and cannot occur over one or two seasons.

- The expectation was NARO and MAAIF seed inspectors would build farmer associations' capacities to produce QDS and access foundation seed. The Activity successfully engaged with NARO with the partnership evolving and improving over the two seasons. For farmers, establishing and maintaining relationships with key stakeholders such as NARO will take time and development of their networking skills.

- The context in Karamoja is very different from the rest of Uganda. To improve production in the Karamoja sub region, contextual factors that affect production need to be considered. Intervention in the mechanization and financial market systems by implementing partners and donors is needed and will ensure farmers have adequate access to appropriate business development services that can result in increased production and productivity.

General Recommendations:

- NARO is encouraging farmers to register either as QDS or grain producers to allow it to offer specific training tailored to either. DAO registration assistance clearly specifying the crops to be produced can be provided to groups intending to produce QDS.

- NARO will support farmers to produce appropriate seed varieties. To this end, NARO is encouraging farmers to plant NABE 17 (not an IRB variety) in Namalu subcounty in Nakapiripirit, and NARO Bean 2, 3 and 6 in Kaabong, Kotido, Abim, Napak districts and parts of Nakapiripirit where NARO Bean 2 didn't yield as well as expected.

- NARO has advised farmers to cultivate in small, more manageable land sizes (1-3 acres) as they continue to learn how to produce QDS IRB

ANNEX A

TABLE 1: COMPARATIVE ANALYSIS OF DIFFERENCES AND REASONS WHY BETWEEN SEASONS A AND B

	Season A	Season B	Percentage of Change	Explanation
Number of farmers planted	169	196	16 percent	The increased number includes farmers who were not able to plant in Season A due to prolonged drought. Furthermore, the provision of insurance during Season B mitigated and reduced some of the risk, incentivizing additional farmers to invest. Seventy-six small holder farmers lost interest and dropped out after Season A due to the poor harvest caused by the weather.
Number of new farmers	169	103		
Number of farmers planting both seasons	-	93		
Total acreage	342	479	40 percent	
Production (kg)	12,603	54,916	336 percent	The improved production and yield during Season B as compared to Season A is due to favorable climatic conditions and increased knowledge and improved practice by farmers.
Realized yield per acre (kg/acre)	37	115	211 percent	
Average acreage per farmer (acre)	2.02	2.44	21 percent	The farmers who planted for the second time planted less acreage during Season B due to lessons learned from Season A. However, the farmers who didn't plant in season A and carried over their seed maintained their original planned acreage.
Foundation seed purchased (kg)	17,880	4,770		Less seed was purchased during season B, because farmers carried over seed from season A that was not planted due to the bad weather in season A.
Foundation seed carried over to Season B	0	8,550		This is the amount of seed that was carried over from season A as explained above.
Foundation seed planted (kg)	9,330	13,320	43 percent	The increase was due to additional acreage planted by the farmers who didn't plant in Season A.
Farmers investment (UGX)	513,000,000	718,000,000	40 percent	First time farmers planting: 103. This increase is a result of the increased number of farmers who planted more acres.