Rice Productivity Enhancement: A Case Study on NU-TEC MD Intervention

Contents

Abbreviations and Acronyms

DFID	UK Department for International Development
GAP	Good Agronomical Practices
GBP	Great British Pound
GoU	Government of Uganda
kg	Kilogram
M4P	Making Markets Work for the Poor Approach
NU	Northern Uganda
NU-TEC MD	Northern Uganda: Transforming the Economy through Climate Smart Agriculture: Market Development
NARO	National Agricultural Research Organisation
PWD	Persons with Disabilities
QDS	Quality Declared Seed
RMCU	Rice Millers Council of Uganda
SDC	Swiss Agency for Development and Cooperation
SHF	Smallholder Farmer

1. Introduction

1.1. Background

Rice farming prospects in Uganda are considered as favorable, with most rice grown by either lowland (on wetlands or irrigated land) or upland (usually on hillsides and without flooding) farming systems. In respect of the first farming system – lowland rice farming; most Ugandan lowland rice is grown in the east of country because it has ample flat land and sufficient water resources. Such rice is produced mostly by large-scale[1] commercial farmers, and some smallholder farmers (SHF). This is the most common farming system in Uganda and contributes significantly to food security and the economy but has been criticized due to its long-term environmental impact on the country's wetlands.

The second farming system – upland rice farming – is popular amongst large-scale commercial farmers in Northern Uganda (NU) because the region has a suitable agro-ecosystem, consisting of fertile and sloped land, moderate rainfall and good drainage systems, and is considered climate-smart because it does not rely on a vast water supply. However, few SHFs within NU use an upland rice farming system because they lack access to suitable rice seed varieties. Furthermore, many of the upland rice varieties currently being produced are late maturing, have poor taste and aroma qualities, and are more difficult to cook when compared to varieties grown using lowland techniques. This affects the competitiveness of rice grown in NU.

In reality, there are better upland rice seed varieties available in Uganda. In 2013, the Government of Uganda (GoU), through its research arm, the National Agricultural Research Organization (NARO), introduced a Namche family of foundation rice seed varieties, which are high-yielding, climate-resilient, and suitable for upland production. However, the poorer performing varieties of Nerica 4 and Supa are the two major varieties being farmed in both lowland and upland areas[2], which demonstrates that farmers are either unaware of, or do not have access to, improved varieties.

NU has great potential to be a leading producer of upland rice in East Africa because of its ideal agro-ecological environment, but production of upland rice is not reaching its market potential. This is the scenario that attracted NU-TEC MD to this market space, to establish the real cause of low productivity and create a business model to address it.

This case study presents NU-TEC MD's experiences and learnings in enhancing rice productivity in NU and, specifically, in promoting the NamChe-5 variety amongst SHFs. It also captures how the intervention benefited the farmers and private agribusinesses and suggest way forward for scale and replication.

1.2. About NU-TEC MD

NU-TEC MD is a GBP 19M component of a seven-year programme funded by the UK Department for International Development (DFID). The objective of the programme is to increase the incomes and climate resilience of poor men and women in NU by a) stimulating sustainable, pro-poor growth in selected agricultural markets and b) improving the position of poor men and women within these market systems by making them more inclusive for poor people. NU-TEC MD achieves this by providing expertise and consulting services to innovative Ugandan agribusinesses and by shifting agricultural market dynamics in a way that improves the economic, social and environmental performance of businesses and markets. The aim is to transform the markets to be inclusive and responsive to climate change while remaining commercially viable. NU-TEC-MD focuses

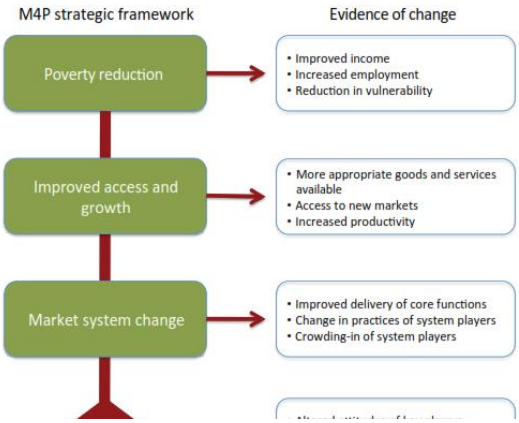


Figure 1M4P strategic framework levels and evidence of change. Source: DFID

[1] Large-scale is defined as a farm producing more than 100 acres of rice in one season
[2] James Joughin rice PEA report

on three sub-regions of Northern Uganda: Acholi, Lango and West Nile.

NU-TEC MD adopts the Making Markets Work for the Poor (M4P) approach, which seeks to change the way that markets work so that poor people are included in the benefits of growth and economic development. The approach does not involve working directly with farmers, but rather, by working with private sector entities (direct beneficiaries) through providing technical assistance and catalytic grants to influence or implement business models that cause key market actors to be more inclusive and address challenges posed by climate change. The business models should be such that they increase the poor's access to markets, and thereby increasing the share of benefits that such improved access providers. By adopting this approach, the project trials interventions that are designed to make markets more inclusive. The M4P framework as proposed by DFID can be seen in figure 1.

2. Enhancing rice productivity in Northern Uganda

2.1. Identifying the Market

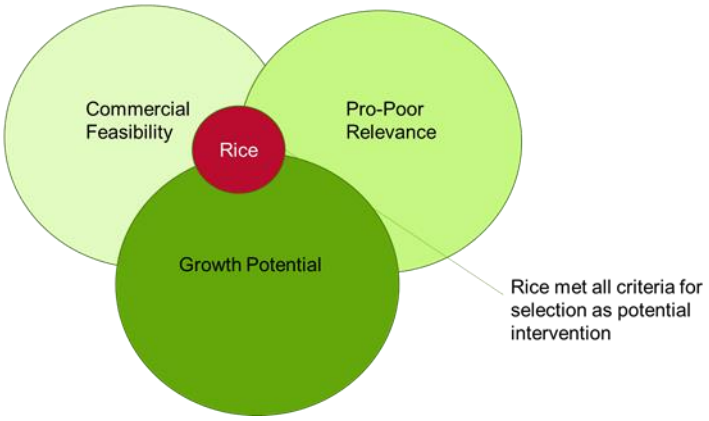
NU-TEC MD's journey into the rice space started in April 2017 when, during a strategic review meeting, two challenges were presented before the team. The first challenge was to identify new value chains and markets that NU-TEC MD could intervene in that had the potential to improve domestic competitiveness. The second challenge was to explore markets where private sector-led investments could enhance productivity at farmer level and where farmers could make the best margins at lowest risks. Due to NU's thin markets, the nature of these challenges meant that there was a need to understand why existing commodity chains were underperforming, and why the private sector not taken the initiative to get involved.

Crop	Value/ acre (UGX)
Rice (lowland)	1,370,956
Rice (upland)	925,458
Groundnuts	618,486
Sesame seeds	521,169
Soybeans	510,480
Maize	425,895
Sunflower seed	402,498

Figure 2 The market value (per acre) of NU's leading cereal crops

Existing studies indicate that nearly one out of every four Ugandan households consume rice and that this trend is likely to grow. Because demand is outstripping supply, rice has been imported from countries such as Pakistan, Tanzania and Kenya and has historically received Government of Uganda (GoU) subsidies which reduce importation costs and affect the competitiveness of domestic rice. This disincentivizes SHFs to grow rice and impacts productivity at farm level, despite the fact that, as a commodity, rice has the potential to contribute significantly to household incomes. It is of high value - upland varieties can generate up to 925,468 UGX per acre – and with good seeds farmers can increase their overall income per acre by between 38% – 61%. Such returns are significantly higher than competing cereal crops that are farmed throughout NU, as shown in figure 2.

A further analysis explored the fit of the rice commodity to the key criteria laid down by NU-TEC MD for its interventions. The team assessed the rice commodity to ascertain that it met all the criteria for intervention design. The criteria include; 1) Pro-poor relevance, 2) growth potential, and 3) Feasibility. Rice met all these criteria making it easy to pick on rice as the right market to focus on.



Despite increases in imported rice, data shows that its price has risen steadily during the last five years, indicating that there is a growing market in Uganda. However, increasing demand and higher prices have not triggered enough production within Uganda's rice industry, and there is an annual shortfall of between 78,360MT and 150,000MT[3]. An in-depth rice study commissioned by NU-TEC MD found the rice market to be dominated by large-scale commercial farms which normally exclude SHFs and sell directly to millers. By utilising greater resources and more advanced farming techniques, these large-scale farms typically secure higher yields per hectare than SHFs, as shown in Figure 3. In addition, the study found that NU has several established rice millers that are operating below capacity because of low supply from surrounding rice farms, especially those belonging to smallholders. Additional research uncovered that many farmers preferred growing the *Supa* and *Nerica* rice seed varieties due to their pleasant aroma and desirable cooking properties, making them popular amongst consumers.

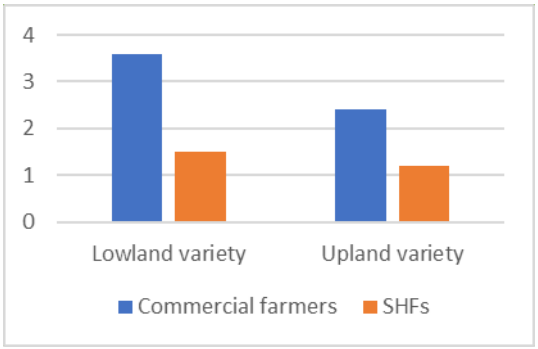


Figure 3MT of Rice produced per HA by Uganda's farmers

2.2. Getting to the Root of the Problem

[redacted]

[redacted]

[redacted]

[3] *The Rice Industry: Policy Brief.* James Joughin.

[redacted]

To understand the true cause of poor market performance, a programme must be ready to invest in conducting multiple enquiries and conversations with a variety of market actors. The real cause of poor market performance is sometimes hidden within consumer preference or product quality that might not be readily captured in a structured market systems analysis.

NARO confirmed that they sold foundation seeds of Namche 5 in large volumes but just to those who proactively made purchase requests. Such requests only come from large-scale farmers who pay in cash for the seeds. The large-scale farmers use the foundation seeds to multiply seeds for own use, meaning the seeds are unavailable to SHFs effectively excluding them from growing this improved, climate-smart variety. NU-TEC MD approached some of the large-scale farmers to develop a route to market for Namche 5 rice seeds, but there was not a great deal of interest.

The programme team then decided to design a seed multiplication business model that would encourage farmer adoption of the Namche 5 variety and increase the production and marketable volumes of the variety among SHFs. The model showed that a seed producer can make profits by producing the seed variety and selling the seeds to neighboring smallholders. With the model finalized, it was pitched to various local seed businesses (LSBs), medium-scale farmers and seed cooperatives, based on the premise that the QDS produced under the model would be best marketed to SHFs located within or adjacent to the communities in which they were produced. Given the fact that rice production is also done by many women farmers, a specific focus was to get women-owned seed cooperatives to invest in producing the Namche 5 variety.

3. Strategy for Intervention

3.1. Pilot Phase (season one)

In order to mitigate the risks associated with engaging in the new business model, NU-TEC MD offered the partners some support to help them in the seed multiplication venture. This was informed by the fact that most of these businesses had not produced seeds before and they had limited knowledge of where to get the guidance required to produce good seeds. The following is some of the support provided to partners;

- Linkages to the producer of foundation seeds for the seed variety (in this case linkages with NARO);
[redacted]
- A performance/milestone-based incentive for production and marketing, including a financial incentive for actors: reimbursements of 30% on production costs (for QDS only) and 20% on costs of selling to SHFs. Such financial incentives were to be gradually reduced and removed altogether by the end of the second year of model implementation.

Eight businesses signed up during the pilot phase and committed to invest their own resources into the model. During the seed growing period, in order to encourage adoption, partner commercial farms became “farmer schools” for the local community by explaining the benefits of these improved seeds to SHFs. Meanwhile, TA helped partners to ensure that their seeds were produced in accordance with QDS guidelines.

After four months partners began to harvest, clean, and sell their seeds to local SHFs. During the season, 814 MT of QDS was produced and sold to both small and medium-scale farmers in NU, based on a total start-up investment of GBP 288,928. One partner – a commercial farm – dropped out of the process as they were unable to secure adequate financing, which contributed to total production volumes being slightly less than projected volume of 900MT. Despite this, it was clear that the intervention had achieved a level of disruption in the market place by attracting both businesses and SHFs. There was evidence that seeds producers were selling a product that SHFs were willing to pay for because of its enhanced productivity, and the information regarding its benefits quickly spread within local communities. Demand for these seeds increased, triggering movements within the market system, with seed distribution companies starting to look for the variety from the producers. SHFs were able to access QDS which offered improved yields, at an average price of UGX 3,000; 33% lower than the conventional price of UGX 4,500 and, the seed producers recognizing the market potential of these seeds, started to increase acreages so that demand could be met. This created a new local supply chain for rice seed, disrupting the monopoly that existed before the start of the pilot.

There pilot phase produced interesting findings around gender as well. Approximately 35% of buyers of the rice were women farmers and almost 60% of them reported increased income after the first year. And whereas women produced lower volumes on average than men, they were able to earn higher prices per kilo which is an indication of higher quality and better bargaining power.

3.2. Scaling the model (season two)

It was clear that the business model was profitable and offered SHFs improved access to QDS. This influenced the project's decision to explore strategies for moving from pilot to scale. In season two, NU-TEC MD decided to replicate the model with additional partners including two local cooperatives that had the capacity to invest in seed production. NU-TEC MD offered an incentive system that rewarded new partners for both the production and marketing of seeds, whilst providing existing partners with an incentive based purely on the marketing of produced seeds. This would allow for continued risk sharing with producers, while testing whether the model can be sustainable. During season two, NU-TEC MD attracted an additional 5 private sector organizations that were ready to invest in rice seed production. [redacted]

The number of seed growers have continued to increase. NU-TEC MD has also reduced the level of performance payments such that only new partners get any form of incentive payments. NU-TEC MD has however continued to pay for TA services from NARO and the Ministry for all the partners to ensure that the integrity of the seed production process is maintained.

4. Expanding the business model: seeds and grain offtake

QDS seed production had acted as a push factor and, in order to transform the market and avoid a price crash, a pull factor was needed to promote investment in grain production and offtake.

> *"It was life changing meeting NU-TEC MD because my business would not have been on this path… or it would have taken quite a number of years to reach where it is now".*
> ***Managing Director, Commercial Farm***

In early 2018, large rice companies and millers did not consider NU's rice grain market as a viable investment because the volumes of grain being produced were small, of variable quality, and faced stiff competition from local mills. These factors rendered SHFs dependent on selling to small mills or mobile buyers that had limited interest in building commercial relationships and offered no incentive for them to produce in greater volumes. Due to the model, production of NamChe 5 QDS had increased, availing seeds to SHFs, and leading to an increase in volume of grain

In thin markets, it is advisable to work with a mixture of actors from the beginning of the pilot stage of the intervention. This reduces the impact of pilot failure and enables the programme to learn about how different businesses choose to pilot the model.

produced in NU. NU-TEC MD approached large millers with a strategy to attract them to invest in buying rice grains from the North due to the increased volumes of rice grains. As part of this strategy, NU-TEC MD invited buyers, millers and seed producers to a rice match-making event, creating a platform for business deals to be initiated and relationships to be built. In addition, to stimulate awareness of this new variety, NU-TEC MD organized rice festivals in urban areas and within cooperative groups, that involved the milling, cooking and tasting of NamChe 5 rice.

Shortening the seed supply chain to SHFs is an excellent way of improving seed systems governance because seed producers and distributors are less likely to sell a questionable product if the farmer can easily trace its source. This builds trust throughout the supply chain and increases the likelihood of repeat business.

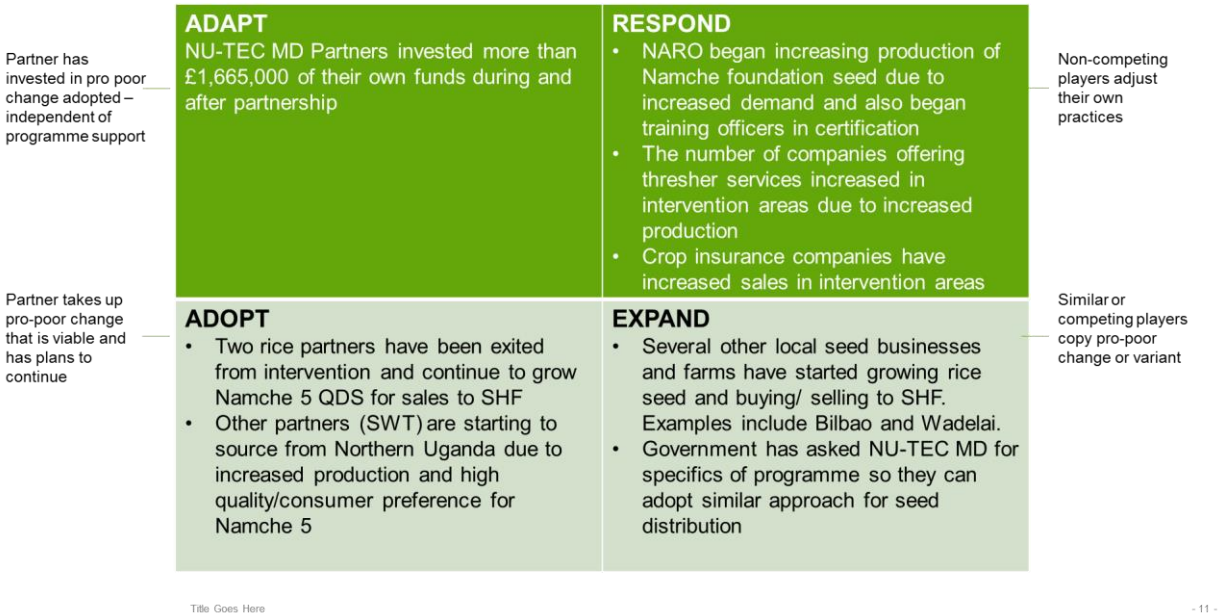
5. Evidence of systemic change

5.1. Investment and re-investment by farmers and new firms;

Since the pilot phase, NARO and other foundation seed suppliers have expanded foundation seed production for Namche 5 creating an emerging commercial collaboration between foundation seed producers and seed multipliers. This has grown without much direct support from NU-TEC MD. NU-TEC MD's 15 partners have continued to grow rice seeds, and have also expanded their acreage under rice grain production with only TA support from NU-TEC MD. Furthermore, local farmers, especially those who have had access to Namche 5 seeds have continued to produce on increased acres rice because of the increased availability of seeds.

Furthermore, new businesses have entered the market to invest in rice production independently. One such company, a major rice importer, chose to focus exclusively on the NamChe 5 variety because of its newfound popularity, having initially planned to grow the NamChe 1,3 and 4 varieties. There is also increased interest in the business model from the GoU and development agencies. For example, an international agency has consulted NARO on how to use the same model to promote and increase adoption of other rice varieties. A government programme has approached NU-TEC MD partners to multiply some of the seeds the programme requires for distribution to farmers, a move that looks exciting but may not be sustainable in the long run.

Using the AAER Framework to Assess NU-TEC MD's Rice Intervention



5.2. A significant reduction in the price of rice seed:

In late 2017, the price of rice seed (*Supa, Nerica*) was beyond the reach of many SHFs, causing them to grow other crops or recycle existing rice seeds. One major achievement of this intervention is that the price of QDS has reduced significantly, from UGX 4,500 in late 2017 to UGX 2,500 (per kg) as at end August 2019, causing demand for new seeds to grow substantially within two years. Given that quality rice seeds can be recycled for at least two seasons, their price is expected to reduce further. Conversely, NU-TEC MD is supporting seed producers to establish a seed growing cycle to ensure that farmers have regular access to fresh seeds, reducing their propensity to recycle and ultimately leading to better yields.

5.3. New relationships are emerging in the rice market:

Without any involvement from NU-TEC MD, several seed producers have been approached by other market players to establish commercial relationships in the growing of rice seeds. Mainstream seed companies are now sourcing locally grown seeds, treating them, and selling to farmers in other regions of Uganda. Business to business relationships are emerging in which large milling and packaging firms are establishing direct business relationships with medium farms for grain purchases.

5.4. Market for rice seed has been restructured

Prior to this intervention, many SHFs bought rice seeds from seed suppliers and distributors that were of variable quality. In cases where good quality seeds were available, they had to be purchased in large quantities, so were only available to buyers with capital. Due to this intervention, SHFs can now access QDS via the many LSBs that have been developed through this intervention. By diversifying the number of channels through which a farmer can purchase seeds, they are more empowered and better placed to decide about which seed to buy and from whom. Diversifying seed supply channels helps increase farmer choice as well as increases resilience of the market system.

5.5. Linkage with Government Agencies

In order to ensure that the intervention is sustainable and resilient, NU-TEC MD has established a strong link between LSBs and the seed inspection and certification departments of the Ministry of Agriculture and Animal Resources. By providing structured TA and capacity building services, NU-TEC MD has created an LSB

The seed market is sensitive and engagement with appropriate government departments will enhance the credibility of the intervention. By engaging key government departments for foundation seed production, inspection and certification, the confidence of farmers in QDS has improved, attracting attention throughout the market system and increasing the level of engagement amongst most rice stakeholders.

capacity building programme, which involves linking NARO to various LSBs that are implementing the model and providing them with technical support. NU-TEC MD has also secured seed inspectors at the local government level to undertake regular inspections of rice seed farms, to ensure that seed production processes meet the minimum required standards. While it is early days to ascertain how sustainable this will be, early indications are that the seed producers have shown willingness to pay the seed inspectors to make visits to their farms. These seed inspectors liaise with government to assure them of seed quality and issue certificates for seeds grown. Such collaboration within the seeds system in Uganda will improve seed system governance.

5.6. Crowding in of other service providers

Many extension services have arisen as a result of this intervention. Examples of this include financial products for use in rice farming; new fertiliser products suited to rice farming; tractor services to assist with land

preparation and weed management, and; rice threshers to help farmers with post-harvest handling. Such services were either not available or difficult to access previously because of low rice productivity but now add substantial value to the market system.

5.7. Delivering income impact at farmer level

It is estimated that SHFs of rice have achieved the highest increase in income since the start of the programme when compared to NU-TEC MD's other interventions, as shown by figure 4. More farmers have registered higher income generation from NamChe-5 rice than any other crop and the market continues to warm up to this variety. This is resulting in increased income to farmers and is causing a shift in the balance of crops that SHFs are producing. Impact has been noted at the household food security level, where the amount of rice held by households as food has increased by 44% during the two years of the intervention.

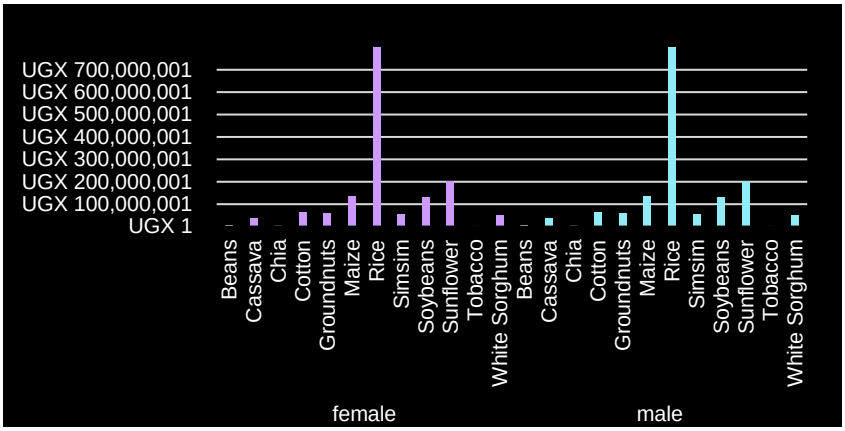


Figure 4: Total SHF income received by crop and gender as a result of NU-TEC MD interventions

6. Conclusions, lessons learned and way forward

The intervention of NU-TEC MD programme has enabled local seed producers to produce an improved and more climate-smart rice variety that earlier was only available to the large farmers. Due to this intervention, the SHFs are able to use these rice varieties affordable to them (at UGX 1,500/ kg versus UGX 4,500/ kg earlier) resulting in improved income as well as improved food security situation.

The key lessons learned from the intervention can be summarized as follows:

1) Increasing productivity in the rice sector has direct impact on the income and overall well-being of the SHF households as this sector is integral from a food security perspective. With improved seed varieties, (NU-TEC data shows that) rice is a dominant crop for increasing incomes of the poor especially women farmers.

2) SHFs respond appropriately to new technologies if they get a first-hand experience about its positive attributes. In case of seeds, adoption of the new varieties was faster as it was produced by the local seed suppliers, within close proximity of the SHFs. This allowed farmers to raise concerns and get support as needed on the use of the new technology.

3) Rice is a resource intensive crop. The more diversified the service (related to seeds, irrigation, mechanisation, etc.) are, the better choices are available for the SHFs who can then avail the suitable service according to their capacity. Programmes, involved in the rice sector, need to facilitate business models with provisions for diversified products/ services to suit the needs of SHFs.

4) In order to improve the seed governance system, shortening the seed supply chain is an important aspect. This was proven from the intervention that disrupted the long supply chain of the rice seed by developing local seed producers.

5) Engagement with the government is important in the rice sector to bring about sustainable changes that can lead to the sector's competitiveness. Also implementing activities in collaboration with sector associations such as the Rice Millers Association of Uganda (which was not active initially) proved beneficial as they started to realise the problems of the sector and act upon them.

6) NU-TEC MD faced challenges in analyzing the sector due to lack of reliable data particularly on the demand and supply situation. A stronger government and/or association involvement in the rice sector is also required to ensure updated data on the sector are available that can be used for proper market analysis and hence steer actions for growth.

NU-TEC MD has fostered the innovation in seed technology for the SHFs but a more concerted effort is required to scale up the new technology. The following points present way forward to scale up the impact of this intervention.

1) **Access to technology:** From planting, to harvesting and processing, production of rice is a labour intensive activity, meaning that SHFs are likely to farm a limited acreage and find it difficult to expand without access to weeding and mechanized threshing equipment. If the programme is to achieve massive production growth over time, more medium-scale and commercial farms with the resources and capacity to manage large-scale production must be engaged. For the production volumes of SHFs to increase beyond the current volumes, besides the use of QDS, farmers must adopt technologies that can enhance extensive or intensive rice production. NU-TEC MD must collaborate with actors to identify production systems that will enhance productivity for both SHFs and medium scale farmers for them to remain competitive in the marketplace.

2) **Ensuring sustainability:** The seed producers, promoted by the intervention, have thus far continued to produce QDS rice seeds. This has been partly driven by the fact that the price of rice generally is increasing, and farmers are keen to grow varieties that are in demand. There are emerging elements of sustainability, for instance, farmers are paying full price for the seeds. The seed growers are reporting profits from sale of seeds. However, the seed sector is very volatile and a drop in consumer price of rice can lead to a drop in demand for seeds. It is difficult to conclude at this stage whether seed producers will continue to pay for services of agronomists and seed inspectors beyond the life of the intervention. Another key threat to the sustainability is if demand for rice seed continues to grow, the seed growers may decide to go the easy way and ignore good practice in producing seeds. These are key aspects that NU-TEC MD will need to monitor and design follow-up interventions if needed.

3) **Aim to develop a competitive rice brand for NU:** Moving forward, NU-TEC MD may have a broader ambition to develop a competitive brand of rice that is produced in NU. By developing relationships with established actors, the target can be to create a brand of rice that is produced in NU and preferred by customers throughout Uganda. This will require intervention at the production, processing and marketing stages of the value chain. It is evident that consumer preference is key in the rice market. Furthermore, as new upland rice varieties continue to be developed, NU-TEC MD and its partners can continue to assess those that meet both processing and consumption qualities. This will form the basis of a brand than can be marketed nationally. Going forward it would be great to help the key stakeholders develop a mechanism that enables them to monitor trends in the rice markets and implement strategies that enables them to remain competitive.
4) **Promoting gender and PwD inclusive buisness models:** The intervention has supported women-led rice cooperatives and women-led local seed businesses to adopt the new seed technology. The programme also continues to work with rice market actors with disabilities to ensure that aggregators with disabilities are provided with a set of services to grow their businesses, access finance and other support services through Village Agents. Whilst these activities are undertaken, NU-TEC MD realized that these have not let to significant impact on returns for women and PwDs. Hence, more efforts should be directed at identifying and implementing strategies for inclusion and for equitable returns.

5) **Influencung policy changes:** The programme will need to strengthen the rice producer and rice-millers associations to influence changes in the policy that can benefit the SHFs and the rice sector in general. Based on a proper policy analysis within the rice sector, the programme will have to commit to a higher level of stakeholder engagement (at informal and formal levels) for policy advocacy. Such engagements are usually complex and time-consuming but if unlocked, have the potential of creating impact at scale.