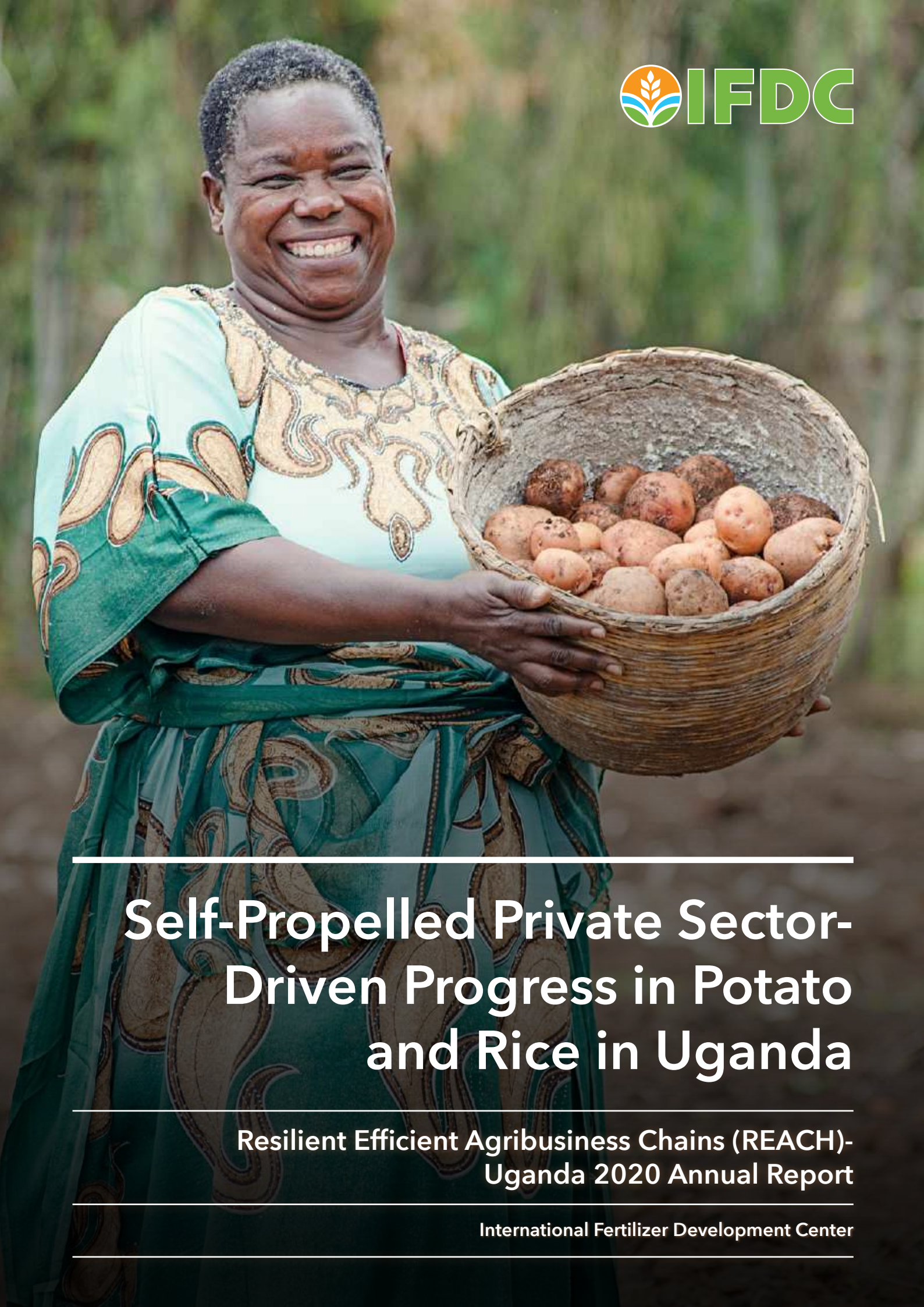

Self-Propelled Private Sector-Driven Progress in Potato and Rice in Uganda

Resilient Efficient Agribusiness Chains (REACH)-Uganda 2020 Annual Report

International Fertilizer Development Center

IFDC

Self-Propelled Private Sector-Driven Progress in Potato and Rice in Uganda

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Abbreviations and Acronyms

CET	Common External Tariff
CSA	Climate-Smart Agriculture
DCA	Detailed Collaboration Agreement
DGL	Diner's Group Limited
DLS	Diffused Light Store
EKN	Embassy of the Kingdom of the Netherlands
FaaB	Farming as a Business
GAP	Good Agricultural Practice
GIF	Gender Integration Framework
GPL	Global Promotions Limited
IFDC	International Fertilizer Development Center
ISB	Integrated Seed Business
KaZARDI	Kachwekano Zonal Agricultural Research and Development Institute
KGCFC	Kapchesombe Green Change Farmers Cooperative
KL	Kibimba Limited
MAAIF	Ministry of Agriculture, Animal Industries, and Fisheries
MIFA	Mengya Integrated Farmers Association
MSC	Microfinance Support Centre
MSMEs	Micro, small, and medium enterprises
MT	Metric tons
NARO	National Agricultural Research Organization
NBC	New Bukumbi Coffee Ltd.
PFIL	Psalms Food Industries Ltd.
QDS	Quality Declared Seed
REACH	Resilient Efficient Agribusiness Chains
RGC	St. Richards Group of Companies
SSP	Spray Service Provider
SWT	SWT Tanners Ltd.
VSLA	Village Savings and Loan Association
WEAI	Women Empowerment in Agriculture Index

01

Achievements in 2020

1.1

The Private Sector in the Driver's Seat during COVID-19

In 2019, REACH-Uganda, funded by the Embassy of the Kingdom of the Netherlands (EKN), completed its direct training delivery on Farming as a Business (FaaB) and Climate-Smart Agriculture (CSA) as well as its direct support to village savings and loan association (VSLA) formation for 36,000 farmers. At the same time, it reworked its entire private sector partnership portfolio and expanded this to 17 detailed collaboration agreements (DCAs). This was expanded further in 2020. By the end of the first quarter of 2020, REACH-Uganda managed an active portfolio of 26 partnerships. Each DCA contains an action plan for investment and innovation, which will lead to a positive impact on rice and potato farmers. While some agreements had already started to progress during the second half of 2019, the bulk of the investments were planned for 2020 – exactly when COVID-19 began to hurt the economy. Whereas 2019 was a year of planning, 2020 was to be a year of investments, albeit in uncertain circumstances.

COVID-19 caused economic disruption worldwide and continues to do so. But while lockdowns came and went and economic uncertainty rose and fell, economies generally kept running, even in Uganda.

To gain a better understanding of the economic impact of COVID-19 on the private sector, in May 2020 REACH-Uganda conducted an early assessment of 89 business partners in Uganda, when the first lockdown was in place. Some of the key findings included:

82% of business had not been able to fulfill orders, and over half could not fulfill more than 30% of their orders since March 2020.

Over 92% reported a shortfall in their supply chain, with almost two-thirds having significant shortfalls of **over 30%.**

At the same time, businesses were able to demonstrate resilience. For instance:

Some micro, small, and medium enterprises (MSMEs) were able to absorb the shock and adapt through product diversification or restructured loans.

Some MSMEs were able to find innovative solutions, such as digital payment systems and online ordering.

Despite the pandemic, REACH-Uganda private sector partners were expected to take the lead in implementing the DCAs, with the project being an informed and engaged but, nonetheless, a relatively hands-off facilitator. Progress under these circumstances would be a testament to the partners' drive to build up their business.

In response to COVID-19, Diner's Group Limited (DGL) autonomously adopted a digital payment system for sourcing rice from farmers as well as managing payments to suppliers. Psalms Food Industries Ltd. (PFIL), when faced with product distribution challenges, opted to increase the size of its truck fleet, thereby reducing dependence on public transport (which was not running) for delivering to areas outside of Kampala.

Despite the pandemic, there was progress across the board:

In 2020, REACH partners invested EUR 1,493,224 in capital equipment, staff, and activities, as agreed upon in the DCAs. REACH partners remained active across the board: 23 of the 26 project partners made investments in 2020.

Furthermore, 21 of the 26 partners were able to complete the majority of their plans for 2020. This included key interventions, such as establishment of screenhouses and diffused light stores (DLSs), importation and commissioning of rice seed cleaners, and conducting promotional activities for multi-stage mills to strengthen their supply chains.

By 2020, REACH partners had collectively increased their sales turnover by EUR 2,430,370, derived from the investments in the DCAs. In addition, 290 full-time jobs, worth approximately EUR 154,304 to the local economy, had been created in factory operation management and on-farm production through these business partnerships.

Some of the DCAs signed or updated in 2019 have started to bear fruit and show impact. In 2020, 13 partners were able to reach a cumulative 2,575 farmers, who each benefited from an average EUR 330 in additional income (EUR 1,033,940 in total). Thus, approximately half of the partners are now benefiting farmers through access to clean seed potato, sales of rice or potato at premium prices, and access to better facilities, such as drying yards.

While most REACH partners are on track to deliver results, interventions in the rice sector did not mature as expected. In addition to the economic downturn, which affected all businesses, the business enabling environment – especially the relaxation of taxes on the importation of brown rice – has not encouraged continued investment in by industry actors. As a result, anticipated outcomes through key partnerships with SWT Tanners Ltd. (SWT) and Kibimba Limited (KL), such as farmer access to certified lowland rice seed and farmer outgrower arrangements, were not realized as planned although both partners remain cautiously optimistic that this will happen in the future depending upon further business enabling environment reform. Additional information on this can be found in the rice section of Chapter 2.

This Annual Report will describe the key achievements made in 2020 and the progress in implementing market-led growth strategies for rice and potato. The updated aggregated value of the REACH portfolio will also be presented. A detailed discussion of each partnership will be presented in the End-of-Project Report, which will be completed by June 2021.

1.2

Key Achievements in 2020

Market Development

In 2020, REACH signed agreements with nine new partners, increasing its business portfolio from 17 to 26 partnerships. Under Output 1.1 of the 2020 workplan, 12 partners were screened, nine were selected, and nine DCAs were signed. These included:

Four new integrated seed businesses (ISBs) – Bitamba, Maziba, Chemonges, and Welishe – to boost the production of early generation seed potato.

Three commercial seed multipliers and one ware producer – Clarke Farm Ltd., Kakie International Ltd., FICA Seeds, and New Bukumbi Coffee Ltd. – to support the certified multiplication of Dutch potato varieties for the Ugandan market.

One certified rice seed producer – Pearl Seeds Ltd. – to boost access to lowland rice seed in Uganda.

Table 1: Overview of partnerships signed in 2020.

Technical area	Geographical area(s)	Partners
Early generation seed potato – additional integrated seed businesses	East and Southwest Uganda	Bitamba, Maziba, Chemonges, and Welishe
Commercial production of Dutch seed potato	Rwenzori (Kyenjojo and Kabarole districts)	Clarke Farm, Kakie International, FICA Seeds, and New Bukumbi Coffee (NBC)
Commercial production of lowland rice seed	Eastern Uganda (hubs of Bugiri, Butaleja, and Iganga)	Pearl Seeds Ltd.

The portfolio of 26 active partnerships means the project has reached the targeted number under Output 1.2 of the 2020 workplan.

The partnerships signed in 2020 will further address the supply constraints in the seed potato system – the main bottleneck to ensuring real takeoff of the potato sector in Uganda. The partnerships with four commercial farms in Rwenzori Sub-Region feature investments in infrastructure, such as cold storage technology, purchase of elite planting materials, and licensing. This will enable Dutch seed potato to be appropriately stored, certified, and supplied to the Ugandan seed system for the first time, reaching 984 farmers. The partnerships signed with the four ISBs will enable an additional 962 farmers to access clean local seed potato once the partnerships reach maturity.

In 2020, two ISBs produced 75 metric tons (MT)[1] of early generation seed, which was sold to 98 individual multipliers and local seed business who will produce 524 MT of quality declared seed (QDS) to benefit approximately 653 ware farmers in 2021. Seed potato multiplication is a process that takes 18-24 months. The volume of QDS produced will increase gradually year by year. The eight ISBs now established represent the start of a longer-term investment to build up the seed potato market. The fact that farmers have placed orders for QDS shows the market demand for clean seed.

Also in 2020, 154 MT of Dutch potato varieties (Markies and Taurus) were commercially sold in the Ugandan market. REACH partners were able to find clients with only limited support from the project, which demonstrates the market demand for these premium processing varieties. On the technical side, REACH support may be warranted for slightly longer to establish a continuous good quality potato supply. For seed, 49 farmers linked to New Bukumbi Coffee Ltd. (NBC) purchased Dutch seed, with progress in licensing and certification of four commercial farms; this is in position to take off in 2021.

More details of partnership results in the potato sector to date can be found in Chapter 2.

In 2020, a cumulative 2,120 rice farmers from 113 farmer groups enjoyed better milling services and clean lowland rice seed. This was achieved by three of the five multi-stage mill partners (St. Richards Group of Companies [RGC], DGL and Lwoba Holdings), which demonstrates their commitment to further organization and expansion of their supply chains and improving post-harvest handling facilities, albeit on a smaller scale than anticipated due to the aforementioned challenges in the rice sector. Through partnerships with KL and Pearl Seeds Ltd., a smaller number of farmers enjoyed 40% higher yields due to access to better seed.

Also in 2020, 200 farmers accessed loans for agriculture production from the Microfinance Support Centre (MSC), 79 farmers had access to irrigation facilities to enable off-season potato production (partnerships with Mengya Integrated Farmers Association [MIFA] and Kapchesombe Green Change Farmers' Cooperative [KGCFC]), and 29 farmers supplied to premium potato markets (PFIL and Byampa).

[1] The 75 MT of basic seed was multiplied from 22 MT of pre-basic seed produce by the same two ISBs. A third ISB produced 4 MT of pre-basic seed which will be multiplied in 2021.

Pre-Market Development and Infrastructure Development

All 67 kilometers (km) of rural feeder roads were completed by the first quarter of 2020 as per Output 1.8 of the 2020 workplan. The 26 km road in Kween District was handed over to the District Local Government. All roads have been well maintained by local authorities and communities and have been able to provide continued access to markets and social amenities for 156,848 community members. Impact studies conducted about the roads revealed that food security for 20,000 households has improved from 31% to 46% during the 'hungry months.' Also, there has been a 62% reduction in time taken to access socioeconomic amenities, such as health centers and extension services, which have been vital for small-holder farmers during the four months of heavy lockdown in 2020 imposed by the Government of Uganda in response to COVID-19.

The proposed additional 10 km of road that was planned in 2020 was not built due to the additional resources that were invested in establishment of infrastructure for the commercial production of Dutch seed potato. This was discussed and agreed with the EKN in November 2019 to de-prioritize the roads in favour of the establishment of the commercial seed producers.

Communications and Stakeholder Engagement

In 2020, potato and rice strategies were updated and can be found at https://ifdc.org/wp-content/uploads/2021/02/Potato-Sector-Strategy-Web.pdf and Rice-Sector-Strategy-Web.pdf (ifdc.org), respectively. These show the current market status of each sector, the challenges, and how REACH is responding to these challenges through its partnerships.

Several partnership updates were developed under the REACH for Results series and can be located at Resilient Efficient Agribusiness Chains in Uganda (REACH-Uganda) - IFDC.

In 2020, REACH conducted two assessments to inform key stakeholders on (1) the economic impact of COVID-19 on private sector businesses and (2) the specific impact on the agro-input sector in Uganda. The results of the first of these assessments were disseminated through an online webinar, which attracted 240 attendees from within and outside Uganda. Details can be found at Webinar Recap: COVID-19's Impact on Uganda's Private Agriculture Sector - IFDC.

1.3

How to Read this Annual Report

Chapter 2

Illustrates the market strategies for potato and rice that REACH-Uganda adopted in 2019 and implemented in 2020 and the Theory of Change (including high-level results). It contains a detailed discussion on progress in 2020 for the market development business portfolio, infrastructure work and pre-market capacity development activities.

Chapter 3

Discusses resilience, cross-cutting themes and lessons learned.

02

Business Portfolio Performance in 2020

2.1

Progress Implementing the Market-Based Strategy for Potato

Recap: Market-Based Strategy for Potato in Brief

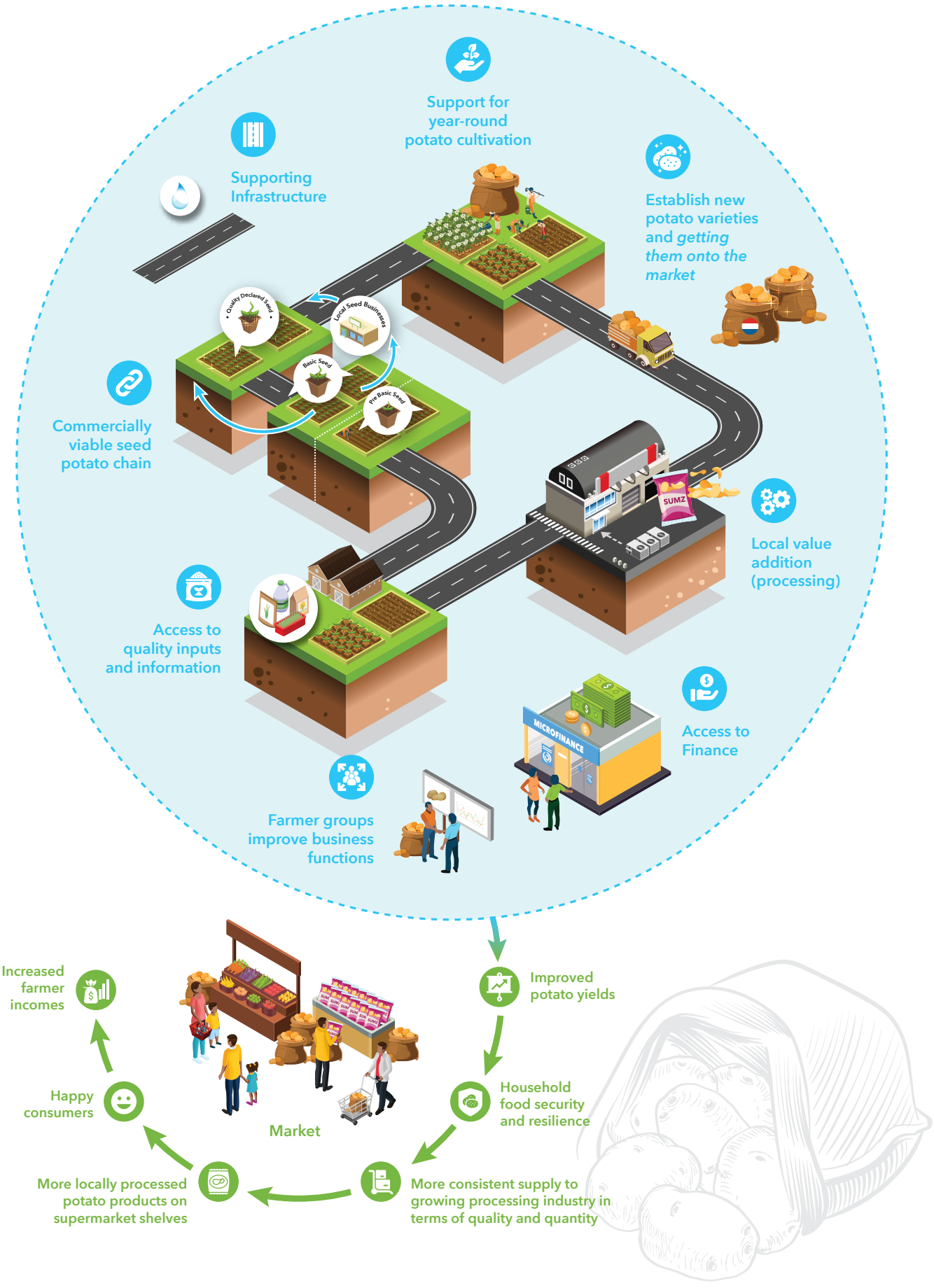
Potato is a fast-growing, high-value cash crop and very nutritious[2] and thus relevant for poverty reduction and food security in Uganda. However, its potential is far from being realized, and its production (its resilience) is at risk due to poor cultivation practices and changing weather patterns. The near absence of an organized seed potato supply chain suppresses yields and increases the prevalence of disease in the crop. Also, the near total absence of potato varieties suitable for processing hampers the development of a local potato processing industry. Poor seed, relatively high costs for agrochemicals, low yields, and low returns result in less savings and another low investment cycle the following season. Better seeds, balanced application of inputs, controlled access to water, and more affordable financial options will help break this cycle. Figure 1 illustrates the REACH-Uganda potato strategy.

In 2020, REACH-Uganda worked on all of these key issues but, as in 2019, the focus continued to be on establishment of a commercial seed industry and introduction of commercial (Dutch) potato varieties to Uganda.

[2] See https://www.eufic.org/en/healthy-living/article/the-goodness-in-potatoes

Figure 1

REACH-Uganda Potato Strategy



Key Strategic Outputs and Outcomes in Potato in 2020

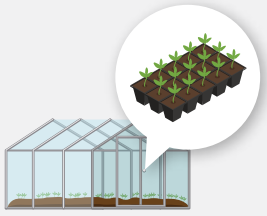
1 A first-of-its-kind fully commercial seed potato (multiplication) supply chain was expanded and became active and is now *supplying clean seed to the Ugandan market.*

In 2020, progress was made in building out the fully commercial seed potato supply chain, as per Output 1.7 of the 2020 workplan. Four additional ISBs (two in Elgon and two in Kigezi) were identified. They have so far invested EUR 11,399 into the establishment of four low-cost, high capacity screenhouses for mini-tuber production, each complemented by a diffused light store for proper seed storage.

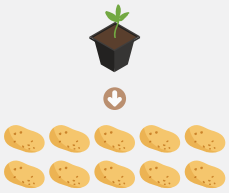
This makes a total of eight ISBs now producing mini-tubers in 10 screenhouse units from plantlets sourced from the private sector (Agromax) or research institutions. The ISBs have placed advanced orders for tissue culture plantlets, and several have become repeat customers. As such the demand for a more structured tissue culture plantlet supply chain is emerging.

The seed potato multiplication chain starts from an in-vitro plantlet laboratory (which uses germplasm to produce plantlets) and continues with ISBs (which can multiply plantlets in screenhouses into mini-tubers, then into pre-basic seed and basic seed) and local seed businesses (which can multiply pre-basic seed into QDS suitable for retailing to farmers). Parts of this supply chain were active before, albeit in a fragmented manner. Farmers traditionally bought plantlets from the National Agricultural Research Organization (NARO), but since their mandate is research and not multiplication, supply was insufficient and erratic. Government and development actors occasionally sourced plantlets from privately owned and managed in-vitro laboratories and established screenhouses for farmer groups, but this did not result in sustained economic activity.

Diagram 1 Process Flow of Typical seed potato production chain from plantlets to basic seed. Average screenhouse size of 144M^2.

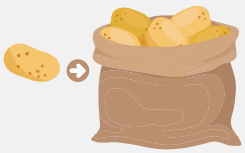


Plantlets planted in **screenhouse**, with mortality rate of 10%, 1,440 plantlets will survive. Plantlets take 4 months in screen house to mature and produce minitubers and 3 additional months for sprouting.



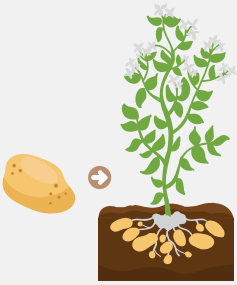
With a ratio of 1 plantlet:10 minitubers, 1,440 plantlets will produce 14,400 minitubers.

Minitubers take 4 months to mature when planted in **open field** to produce **pre-basic seed** and 3 additional months for sprouting.



With a ratio of 1miniuber: 0.25 kgs of pre-basic seed; 14,400 minitubers will produce 3,600 kgs of pre-basic seed.

Pre-basic seed takes 4 months to mature when planted in **open field** to produce **basic seed** and 3 additional months for sprouting.



With a ratio of 1 kg of pre-basic seed: 2.4 kgs of basic seed; 3,600 kgs of pre-basic seed will produce 8,640 kgs of basic seed.

Basic seed takes 4 months to mature when planted in **open field** to produce **quality declared seed** and 3 additional months for sprouting.

As a result of the investments made under these partnerships, clean seed potato is now beginning to reach the Ugandan market. Given the long-term nature of early generation seed potato production, which takes 18-24 months from plantlet to basic seed that can then be sold to QDS multipliers, the new screenhouses are still at the early stages of the production chain. However, partnerships established in 2019 are starting to yield some success, and 75 MT of basic seed has been sold. This will be multiplied into 524 MT of QDS by integrated seed multipliers and then sold to 653 ware potato farmers. The seed is 20% higher yielding compared to local seed, and the cost is comparable to the prevailing market price which is predominantly low-quality seed. **Screenhouse owners have reported orders of seed being made well in advance of agricultural seasons, indicating that farmers are beginning to see the advantages of using clean seed, which suggests signs of sustainable demand going forward.**

In 2020, within the wider network of ISBs and local seed businesses supported by REACH and the Integrated Seed Sector Development (ISSD) Plus project, a total of 1,235 MT of seed (75 MT basic and 1,160 MT QDS) was produced and sold on the Ugandan market. REACH has played the role of linking the local seed businesses that produce QDS to the ISBs. This seed production figure represents 8%[3] of the annual national seed potato demand in Uganda.[4]

Some ISBs faced financial constraints, which slowed down the pace of investment in business expansion. Others are making plans to increase their capacity (adding more screenhouse units), which will ensure more clean seed entering the market over the next few years.

ISBs have also been able to adapt their business models in response to some of the challenges faced in 2020. When they experienced a disruption or a shortage in supply of tissue culture plantlets, ISBs were able to revert to producing apical cuttings from the limited plantlets supplied. This is an innovative rapid multiplication technique in which several cuttings are taken from plantlets then planted in the screenhouse individually to produce mini-tubers. Training on production of apical cuttings was conducted by the International Potato Center (CIP) and has been backstopped by IFDC for all ISBs.

[3] 1,239 x 1.5 (based on a farmer using clean seed every three seasons)/23,900, which is the total national demand per annum = 8%.

[4] However, this does not give the complete picture of total seed produced in Uganda. There are other entities producing and selling seed that are not captured in this network or have data available.

Table 2: Status of Integrated Seed Businesses and Local Seed Businesses at the end of 2020.

Partner, type, location	Investment in 2020 (EUR)	Activities completed	Seed produced and sold
Charles K. Byarugaba Clean and Quality Seed Production Enterprise, Kabale District, Kigezi Sub-Region	7,485	• Screenhouse with a capacity of 3,900 plantlets installed and DLS with 52 MT storage capacity completed. • Farm pond constructed and a 3.2-acre pressure-compensating drip irrigation infrastructure installed. • Purchased 4,100 plantlets from the NARO, KaZARDI, which were propagated into 11,373 apical cuttings.	13.8 MT of pre-basic and 58.75 MT of basic seed was produced and sold to the National Agricultural Advisory Services/OWC and some sold to LSBs.
Muyambi, Kabale District, Kigezi Sub-Region	6,563	• Screenhouse with a capacity of 3,400 plantlets installed and DLS with 38 MT storage capacity completed. • Sourced 1,500 plantlets from KaZARDI, which were multiplied into 3,810 apical cuttings.	Yield data from first batch of plantlets expected in late April 2021.
Bitamba, Kabale District, Kigezi Sub-Region	3,427	• Screenhouse with capacity of 3,400 plantlets was installed. • Placed an order for 1,000 plantlets from KaZARDI.	Yet to produce any mini-tubers.
Maziba, Kabale District, Kigezi Sub-Region	3,183	• Screenhouse with capacity of 3,400 plantlets installed, and a DLS with 40 MT storage capacity completed. • Purchased 1,035 plantlets, which were propagated into 16,389 apical cuttings.	A total of 72,546 mini-tubers produced from the apical cuttings, which yielded 4.4 MT of pre-basic seed.
Kigezi Farmers Resource Centre Limited, Rubanda District, Kigezi Sub-Region	10,778	• Screenhouse with capacity of 1,600 plantlets installed, and a DLS with 72 MT storage capacity constructed. • Purchased 2,292 plantlets from KaZARDI, which were propagated into 4,286 apical cuttings.	A total of 40,230 mini-tubers were produced. Additionally, 8.2 MT of pre-basic seed was produced and multiplied into 16 MT of basic seed.
Chemonges, Kapchorwa District, Elgon Region	3,205	• A screenhouse with capacity of 1,700 plantlets installed. • Placed an order for 2,000 plantlets with Agromax.	Yet to produce any mini-tubers.
Mengya Integrated Farmers' Association (MIFA), Kween District, Elgon Region	-	• DLS with a 60-MT storage capacity completed. • Purchased 8 MT of basic seed to produce QDS. • The established irrigation system enabled 47 farmers access to a constant water supply.	Produced 62 MT of QDS, 32 MT of which was sold to 40 farmers.

Partner, type, location	Investment in 2020 (EUR)	Activities completed	Seed produced and sold
Welishe Stephen, Mbale District, Elgon Region	1,584	• A screenhouse with a capacity of 3,400 plantlets was constructed and installed. • Purchased 700 plantlets for production of basic seed.	3,000 mini-tubers have been produced in the screenhouse so far, and this is expected to produce 7 MT of pre-basic seed once planted.
Kapchesombe Green Change Farmers' Cooperative (KGCFC), Local Seed business, Kapchorwa District Elgon Region.	7,060	• DLS with 60 MT storage capacity completed. • Sourced 2.96 MT of basic seed for multiplication into QDS.	20 MT of QDS was produced and sold to 14 farmers.

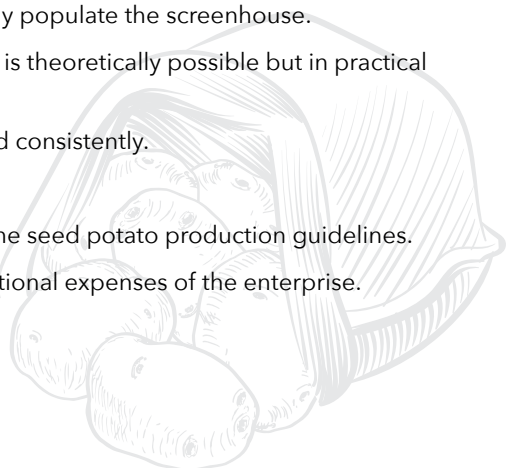
Analytical Assessment of the Differing Economic Scenarios for Integrated Seed Businesses

1 ISB Overview and economic scenarios

The seed potato production cycle in an Integrated Seed Business starts by a farmer purchasing potato invitro plantlets from a tissue culture lab. These invitro plantlets are planted in a screenhouse to produce mini-tubers (foundation seed), mini-tubers are planted in an open field to produce pre-basic seed, pre-basic seed is replanted to produce basic seed. The process as described takes approximately 18 months to produce basic seed. To start a seed potato enterprise, a farmer needs to invest in screenhouse and an appropriate diffused light store for storage and conditioning of seed potatoes before it is marketed.

Assumptions

1. The scenarios provided are based on the plantlet order placed by the farmer being met at 100% by the supplier.
2. If a farmer encountered a situation where only 25% of the plantlet order is met, in this scenario the plantlets can be multiplied into apical cuttings to provide sufficient planting materials to fully populate the screenhouse.
3. A screenhouse produces only two cycles in a year; however, the third cycle is theoretically possible but in practical terms not viable.
4. Conservative multiplication rate of 8 mini-tubers per plantlet has been used consistently.
5. The farmer only sells at basic seed level.
6. There must be sufficient land available for rotational multiplication as per the seed potato production guidelines.
7. The farmer must have sufficient financial liquidity to handle the daily operational expenses of the enterprise.
8. The cashflows are projected for 5 years.



9. The screenhouse has a lifespan of five years, depreciated on straight line method with no residual value.
10. The diffused light store has a life span of 20 years, depreciated on straight line method with no residual value.
11. Low cost diffused light store has a life span of 10 years depreciated on straight line method with no residual value.
12. Farm gate price was considered in the economic analysis.
13. Economies of scale can be achieved with a higher capacity screenhouse of 450M^2.

1
2
3

Investments

The farmer needs to invest in infrastructure that supports the production of mini-tubers. A screenhouse (or green house) is one of the most appropriate technology approaches that can be used in production of mini-tubers. The screenhouse allows plantlets to be grown to produce mini-tubers in a pest and disease-free controlled environment.

A farmer needs to invest approximately UGX.26,338,970/= for 120M^2 Screenhouse (SH) or approximately UGX.41,135,800/= for 450M^2 as an initial outlay.

A farmer needs to invest approximately UGX 51,834,930/= for a 134M^2 Diffused Light Store (DLS) or approximately UGX.71,293,942 for 208M^2 Diffused Light Store (DLS), with a storage capacity of approximately 480 bags and 750 bags of 80 kgs, respectively.

Three investment costings are provided below. Two are based on real costs with ISB partners – KFRC and Muyambi, and the third is an alternative scenario (farmer x) that could be a lower cost option in future.

KFRC

KFRC invested in a screenhouse of 120M^2 and DLS of 208M^2, the total investment (initial outlay) is approximately 97,632,912/=. (Annex4).

With proper rotational protocol of 3 years for seed potato, KFRC needs a minimum of approximately 23 acres to produce pre-basic seed and basic seed.

Muyambi

Muyambi invested in a screenhouse of 450M^2 and DLS of 134M^2, the total investment (initial outlay) is approximately UGX 92,970,730/=. (Annex 6).

With a proper rotational protocol of 3 years for seed potato, Muyambi needs a minimum of around 34 acres to produce pre-basic seed and basic seed.

Farmer X

If Farmer X invested in a screenhouse of 120M^2 and low cost DLS of 134M^2, the total investment (initial outlay) would be approximately UGX 60,705,000/=. (Annex 8).

With proper rotational protocol of 3 years for seed potato, Farmer X needs a minimum of around 23 acres to produce pre-basic seed and basic seed.

Cashflow Analysis

KFRC

Mini-tubers

Screenhouse size 8M×15M, capacity 1,536 plantlets, yield per plantlet 8 mini-tubers, total number of mini-tubers produced 12,288. Unit production cost per mini-tuber UGX 240/=. (Annex 4).

Pre-basic seed

12,288 mini-tubers plant approximately 0.57 acres, each mini-tuber yields 0.27 kgs of pre-basic seed, total yield 3,317.76 kgs (41.47 bags of 80kgs), post-harvest loss 3% 99.53kgs (1.24 bags of 80kgs), unit production cost per kg UGX 1,462/=. (Annex 4).

Basic seed

3,200 kgs plant approximately 3.4 acres, each kg of pre-basic seed yield 6.6kgs of basic seed, total yield 21,120kgs (264 bags of 80kgs), post-harvest loss 3% 633.6 kgs (7.92 bags of 80kgs), unit production cost per kg UGX 577/=, sellable yield 20,486kgs (256 bags of 80 kgs) and price per kg UGX 1,875/ or (UGX150,000/= per bag of 80 kgs). (Annex 4).

Muyambi

Mini-tubers

Screenhouse size 15M×30M, capacity 3,072 plantlets, yield per plantlet 8 mini-tubers, total number of mini-tubers produced 24,576. Unit production cost per mini-tuber UGX 230/=. (Annex 6)

Pre-basic seed

24,576 mini-tubers plant approximately 1.2 acres, each mini-tuber yield 0.27 kgs of pre-basic seed, total yield 6,635.52 kgs (82.94 bags of 80 kgs), post-harvest loss 3% 199.06 kgs (2.48 bags of 80 kgs), unit production cost per kg UGX 1,418/=. (Annex 6)

Basic seed

6,400 kgs plant approximately 6.87 acres, each kg of pre-basic seed yields 6.6 kgs of basic seed, total yield 42,240 kgs (528 bags of 80 kgs), post-harvest loss 3% 1,267.2 kgs (15.84 bags of 80 kgs), unit production cost per kg UGX 535/=, sellable yield 40,960 kgs (512 bags of 80 kgs) and price per kg UGX1,875/=. (Annex 6).

Farmer X

Mini-tubers

Screenhouse size 8M×15M, capacity 1,536 plantlets, yield per plantlet 8 mini-tubers, total number of mini-tubers produced 12,288. Unit production cost per mini-tuber UGX 240/=. (Annex 8)

Pre-basic seed

12,288 mini-tubers plant approximately 0.57 acres, each mini-tuber yields 0.27 kgs of pre-basic seed, total yield 3,317.76 kgs (41.47 bags of 80 kgs), post-harvest loss 3% 99.53 kgs (1.24 bags of 80 kgs), unit production cost per kg UGX 1,462/=. (Annex 8)

Basic seed

3,200 kgs plant approximately 3.4 acres, each kg of pre-basic seed yield 6.6 kgs of basic seed, total yield 21,120 kgs (264 bags of 80 kgs), post-harvest loss 3% 633.6 kgs (7.92 bags of 80 kgs), unit production cost per kg UGX 577/=, sellable yield 20,486 kgs (256 bags of 80 kgs) and price per kg UGX 1,875/ or (UGX150,000/= per bag of 80 kgs). (Annex 8).

Table 3: Summary of cumulative net cashflows per year with subsidy. (Annexes 4,6,8).

Farmer	Annual cumulative cashflows from sale of basic seed/year in UGX					
	1	2	3	4	5	NPV
KFRC	(13,602,048)	(18,025,054)	15,951,940	49,928,934	83,905,928	12,355,843
Muyambi	(23,332,006)	(24,453,663)	51,224,680	126,903,023	202,581,366	117,078,679
Farmer X	(15,060,250)	(20,941,458)	11,577,334	44,096,126	76,614,918	22,509,128

Table 3 shows cumulative annual cashflow when annual production costs and fixed costs of depreciation have been covered.

Table 4: Summary of cumulative net cashflows per year with loan. (Annexes 5,7,9).

Farmer	Annual cumulative cashflows from sale of basic seed/year in UGX					
	1	2	3	4	5	NPV
KFRC	(19,568,241)	(50,614,480)	(29,870,099)	(6,744,693)	19,056,030	(91,343,839)
Muyambi	(31,512,757)	(60,485,785)	92,376	62,937,861	128,330,913	(8,201,293)
Farmer X	(19,384,750)	(42,434,340)	(18,758,074)	6,398,636	35,967,083	(31,455,447)

Table 4 shows annual cumulative cashflow when annual production costs and fixed costs like depreciation and loan interest have been covered.

Based on the above overview, we can analyze the two scenarios; (a farmer who receives a loan form a commercial bank or a subsidy from development project) to investing in screenhouse and diffused light store.

KFRC

KFRC received a 53% subsidy from the REACH - Uganda project and financed the balance from their own monies. KFRC will start making a profit in year 3 and Net Present Value (NPV) is positive after 5 years, so the project is viable. (Table 3 above, Annex 4)

If KFRC received a loan of UGX 97,632,912/= (100% of the infrastructure investment) from financial institution at interest rate of 12% reducing balance, KFRC would start making a profit in year 5, the investment has negative Net Present Value after 5 years, so the project is not viable with a loan. It is advisable that projects/investments with negative NPV be avoided, therefore it might be difficult to convince a financial institution to grant KFRC a loan to invest in the enterprise with negative NPV. (Table 4 above, Annex 5)

Muyambi

Muyambi received a subsidy of 70% from the REACH – Uganda project, and financed the balance from his own monies. He will start making profit in year 3, and the investment has a positive NPV after 5 years so project is viable. (Table 3 above, Annex 6)

If Muyambi received a loan of UGX 92,970,730 (100% of the infrastructure investment) from a financial institution at interest rate of 12% reducing balance, Muyambi would start making a profit in year 3 and the investment has a negative NPV after 5 years, so project is not viable with a loan. It is advisable that projects/investments with negative NPV be avoided, therefore it might be difficult to convince a financial institution to grant Muyambi a loan to invest in the enterprise with negative NPV. (Table 4 above, Annex 7)

Farmer X

If Farmer X received a subsidy of 50% from a development project and financed the balance from their own monies. Farmer X will start making profit in year 3, and the investment has a positive NPV after 5 years so project is viable. (Table 3 above, Annex 8)

If Farmer X received a loan of UGX. 60,705,000 (100% of the infrastructure investment) from a financial institution at interest rate of 12% reducing balance, Farmer X would start making a profit in year 4 and the investment has a negative NPV after 5 years, so project is not viable with a loan. It is advisable that projects/investments with negative NPV be avoided, therefore it might be difficult to convince a financial institution to grant Farmer X a loan to invest in the enterprise with negative NPV. (Table 4 above, Annex 9)

Producing 3 seasons/year

If a farmer wants to produce seed potato for three seasons per annum, it is theoretically possible but in practical terms not viable. (Annex 10,11). The reasons for this are that the production of mini-tubers in a screenhouse overlaps the traditional 2 rainy seasons per year, therefore the seed farmer (and his clients) need an irrigation system.

A farmer would require a substantial amount of land to multiply all the 3 classes of seed potato. For example, if a farmer has a screenhouse with a capacity of 3,072 plantlets, yielding 24,576 mini-tubers per planting and follows the seed potato production protocol of 3-year rotation period, the farmer will need approximately 50.82 acres of land available for multiplication.

Conclusion and Recommendations

KFRC and Muyambi will have challenges accessing a loan from financial institutions to invest in agricultural projects with the associated risk and negative cash flows. Subsidy de-risks the investment and acts as an incentive for KFRC and Muyambi to mobilize additional resources and invest in the project. KFRC, Muyambi and Farmer X can use their cumulative annual cash flows in years 3-5 with subsidy scenario potentially invest in land for multiplication of seed potato add a second screenhouse in future.

An Integrated Seed Business investing in its own screenhouse and DLS from start-up is not feasible with a loan from financial institution under current lending costs. Furthermore, an integrated Seed Business startup would not be eligible for a loan from a financial institution. If the financial institution accepts to grant a loan, it will require significant collateral elsewhere to cushion the risk associated with projects. At present there is no ISB that has applied for a loan for to invest in a second screenhouse, instead they are focusing on meeting the operational costs for the current screenhouse so it can reach a point where they are selling basic seed at profit.

Based on the above, REACH-Uganda recommends a more scalable model screenhouse of 120M^2, and low cost diffused light store of 134M^2 (Annex 8) with 50% subsidy when a farmer focuses on two seasons per year.

2 Selection process of ISB partners

The initial selection process for all partners in REACH involved a screening tool based on Relevance, Impact, Engagement, Do no Harm (RIED screen).

Table 5: Selection criteria for ISBs.

RIED component	Specific criteria to ISBs (typical scenario)
Relevance: Pro-poor, private sector-driven, for profit, innovative, addressing a constraint in agriculture sector	Production of clean and quality seed potato at an affordable price (pro-poor). Already an MSME producing seed for >5 years (private sector-driven). Innovative method of mini-tubers production and screenhouse is new technology) <5% of market for seed can be met (addressing constraint).
Impact: scale (significant number of farmers), depth (change at root cause level)	Each screenhouse has the capacity to reach 500 farmers per season with QDS after two years of multiplication (scale). ISBs can provide seed for market which is currently supplied by NARO but is beyond their mandate (root change).
Engagement: had mutual objectives, was willing to invest own resources	Objective is to supply smallholder farmers with quality seed (mutual objective). Willing to put in between 30-50% of own resources (willingness to invest).
Do no harm: avoid adverse unintended consequences	Screenhouse establishment has no foreseeable adverse consequences.

It was recognized that seed is a localized business and ISBs need to produce seed for their immediate market. While additional ISBs were required to provide for the market in Kigezi sub-region, a second geographical area of Elgon sub-region (where potato growers were ordering seed from Kigezi) was included, which has a less established track record of seed potato production. Some of the newer ISBs identified as partners in the above process were able to contribute less than their more established counterparts such as CKB, KFRC and MIFA.

Cost share

Criteria used

The type of screenhouse promoted under the project has been a semi-permanent structure with a permanent DLS. ISBs were expected to contribute 30-50% of the cost of the screenhouse and DLS. Some of the established ISBs do not have these funds available immediately (they may take a number of agricultural seasons to generate) so the cost share by the ISB partners is often piecemeal. Each ISB partner had a different level of resources available, however, they were expected to contribute the following to be considered for partnership:

For a screenhouse: the foundation, platforms, planting boxes and plantlet purchase.

For a DLS: site foundation; building materials; bricks, hardcore, aggregate, sand, transport, water, timber, wooden poles, metallic door, various tools; labour (50% of contractor's fees).

These are provided in the breakdown of screenhouse and DLS costs Annex 12 'Actual DLS and SH cost Muyambi'.

The following table shows total cost share contribution made by REACH and partners in screenhouses and DLS's from 2018. Variations between partners are related to different sizes of DLS's, cost variations in prices of materials over the intervention period, and location of farms (some more remote and less accessible than others). It should be noted that some partner contributions are being captured as they complete their stores.

Table 6: Contributions of REACH and ISB partners to establishment of screenhouses and DLS's.

Partner name	IFDC-REACH (UGX)	Partner (UGX)	Partner contribution
CKB	76,805,878	31,100,000	29%
KFRC	52,304,530	44,391,000	46%
MIFA	82,920,498	55,650,000	40%
MUYAMBI	65,585,240	32,726,550	33%
MAZIBA	67,149,030	13,223,000	16%
BITAMBA	67,149,030	14,156,000	17%
WELISHE	55,209,531	13,873,000	20%
CHEMONGES	77,940,290	34,125,000	30%
Total	**545,064,027**	**239,244,550**	**31%**

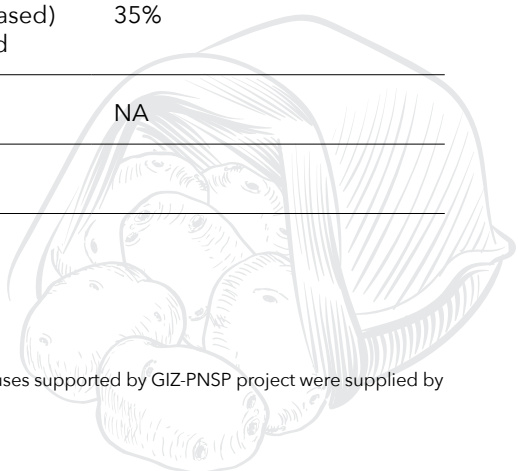
3 Tissue culture plantlet supply[5]

Tissue culture plantlet supply is an essential part of the seed potato system. The table below shows total annual demand and supply from 2019 to mid-2021. The majority of tissue culture plantlet production is still carried out by the public sector through NARO-Kazardi.

From 2019, REACH-Uganda's ISBs partners were linked with Agromax who were unable to fulfil orders in 2020. As such the percentage met is on actual supplied of only 700. Demand figures are based on a total of 12 screenhouse units in 2020 and 2021.

Table 7: Tissue culture plantlet supply and demand 2019-2021.

Year	Demand	Supply KAZARDI	Supply private	Total demand met (actual supply)
2019	9,216	5,600		61%
2020	27,648	8,927	8,900 (purchased) 700 delivered	35%
2021	27,648	9,600		NA
	64,512	24,127	8,900	



[5] This includes only the demand from REACH supported screenhouses, and additional two screenhouses supported by GIZ-PNSP project were supplied by Agromax in early 2021.

Despite linkages made between the main private sector partner Agromax and the ISBs and the placing of orders for tissue culture in advance, Agromax had several challenges in meeting this demand. Some of the challenges were managerial (poor administrative structures) and technical (inadequate laboratory staff). At the same time Agromax cited that ISBs must provide down payments for the plantlets upfront, which the majority of ISBs were able to fulfill, however, Agromax have still failed to deliver.

Seed potato tissue culture supply represents a niche but growing market for established tissue culture laboratories such as Agromax and AGT whose main market is NAADs/OWC for banana suckers. However, other smaller entities such as Senai Biosciences have recognized that this is a potential growth area and are now producing tissue culture plantlets on a smaller scale. Going forward, there may be more scope for smaller, localized entities to serve their immediate geographical areas rather than large, centrally located laboratories.

2 A fully commercial seed potato (multiplication) supply chain for commercial Dutch potato varieties was expanded and became active so that *Dutch potato varieties are now imported, multiplied, and sold into the Ugandan market.*

In 2020, under Output 1.6 of the 2020 workplan, the following progress was made in building out a fully commercial seed potato supply chain for Dutch potato varieties.

Dutch potato is now being commercially produced and is finding its market in Uganda. In addition to the partnership with Highgrow Agro (Namakwaland Farm), four more partnerships with commercial seed multipliers developed in 2019 were signed and became active in 2020. All four of these partners are based in Rwenzori Sub-Region and have large farms with the capacity to sustain the increasing demand for potato processing varieties that is emerging.

In 2020, REACH-Uganda and these four commercial seed growers – plus Highgrow Agro – co-invested EUR 517,877 (REACH EUR 422,098, partners EUR 95,779) in infrastructure (cold storage rooms, power supply), seed, and inputs enabling them to produce and properly store Dutch potato varieties. The partners imported 159 MT of Markies, Panamera, and Taurus varieties to produce 575 MT of ware potato. A strategy of one season of a ware production system (instead of seed production initially) was required for the partners to learn aspects of production, such as mechanization and correct crop protection measures, that they had not done before. As a result, yields attained by the commercial farms varied significantly. At the higher end, Highgrow Agro and Clarke Farm achieved yields of 20-25 MT/ha, which demonstrates the high-yielding potential that can be achieved under optimal conditions.

All partners that have produced Dutch potato at scale have been able to secure a market for their produce, mostly without REACH support. In 2020, Highgrow Agro signed a supply agreement with PFIL and sold 74 MT of Taurus; 154 MT of Markies was sold on the open market. NBC was able to enter into an agreement with PFIL to sell 10 MT per week. Clarke Farm, which produced Panamera, required some sustained marketing efforts given the difference in appearance of the variety to the local market; however, the company was able to reach an agreement with Kampala Fried Chicken. Most of these agreements will be realized in early 2021, and partners acknowledge that, although important quality issues have been ironed out, they are unable supply the quantity and consistency required. Thus, the demand for a consistent supply of Taurus and Markies varieties has been created but cannot be satisfied by the current production level. There is room for much more growth.

The next step will be to commercially grow and sell Dutch seed potato to small- and medium-scale seed producers. In 2020, REACH facilitated three partners (Clarke Farm, Kakie International, and Highgrow Agro/Namakwaland)[6] in undertaking the process of registration and certification as commercial seed producers in Uganda with the Ministry of Agriculture, Animal Industries, and Fisheries (MAAIF). By the end of 2020, some inspection work had been completed by MAAIF, and the process is expected to be completed in early 2021. In addition to this, Highgrow Agro/ Namakwaland signed a further breeder agreement with Agrico,[7] and preparations were made with Clarke Farm to set up a breeder agreement with HZPC. As such, the legal mechanisms as well as the infrastructure and know-how are now in place to produce and sell the industry-demanded Dutch seed varieties to small and medium-scale seed producers.

Table 8 provides an overview of the status of all commercial seed producers.

Table 8: Status of commercial seed producers at the end of 2020.

Partner, type, location	Investments in 2020 (EUR)	Activities completed	Seed imported produced and sold/distributed
Namakwaland, Masaka District, Central Region	32,725	Imported seed potato from the Netherlands, connected the farm to the national electricity grid, and constructed steel structure for housing of the cold room.	• Imported 84 MT Markies and Taurus, which yielded of 248 MT. • Signed a year-round agreement with PFIL to supply 10 MT of Taurus per week. • Total sales: 153.8 MT of Markies in local markets and 74.6 MT of Taurus to PFIL.
Clarke Farm, Kyenjojo District, Rwenzori Sub-Region	1,717	Constructed concrete foundation for cold room.	• Imported 25 MT of Panamera seed, which yielded 159 MT. • Engaged in discussions with Kampala Fried Chicken to supply 500 kg per week of the Panamera variety.
Kakie International, Kabarole District, Rwenzori Sub-Region	7,284	Partially constructed a concrete foundation for cold room.	• Imported 12.5 MT of Panamera, which yielded 8.4 MT. • Sold 4.8 MT of ware potato in the open market.

[6] For the other two companies in the Rwenzori Sub-Region, FICA Seeds is already a registered seed company and NBC will focus on ware production only at the moment.

[7] In addition to the agreement they had with HZPC which was signed in 2019.

Partner, type, location	Investments in 2020 (EUR)	Activities completed	Seed imported produced and sold/distributed
New Bukumbi Coffee Ltd., Kabarole District, Rwenzori Sub-Region	19,555	• Constructed an ambient store with capacity of 200 MT and equipped with storage crates. • Trained and provided crop insurance for 32 progressive farmers in agronomy and post-harvest handling. • Purchased crop insurance.	• Imported 37.5 MT (25 MT Taurus and 12.5 MT Panamera). The 49 farmers yielded 160 MT and sold 106 MT of Taurus and 38 MT of Panamera to NBC. • NBC supplied 82.9 MT of Taurus variety to PFIL and 9 MT sold to other local markets.
FICA Seeds, Kyenjojo District, Rwenzori Sub-Region	34,498	Partially constructed concrete foundations for the cold room.	No seed yet imported.

Economic analysis of commercial farms and Dutch seed

Background and rationale

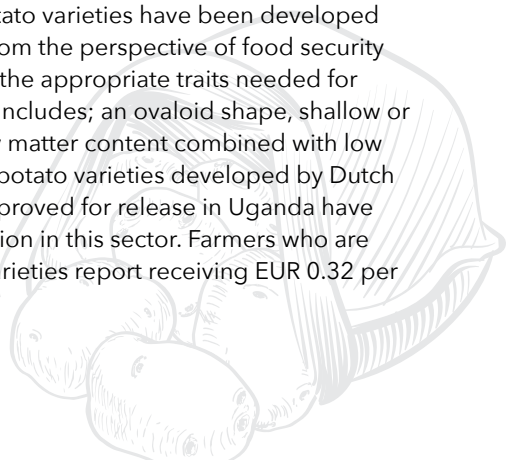
Within the potato sector there are two dominant sectors: seed and ware potato. The seed market is the most specialized of these sectors as it places high technological and financial demands on producers for both local or non-local varieties.

Within the ware potato market there are several sub-sectors, which include 'table,' and 'processing,' potatoes. Table potatoes can be generally classified as those which are frequently consumed in homes and do not have any specialized characteristics, which differentiate them in the market. Given their unspecialized nature it should be acknowledged that table potatoes are the largest market segment presently in Uganda (and the region). Presently farmers receive approximately EUR 0.20 per kilogram for table potatoes. Accessing this market segment does not require the farmers to have a specialized marketing chain or connections. They are, however, generally uncontracted and have little assurances on price.

In recent years Uganda has started to move towards a middle-income status and has been accompanied by a growth in the size of the middle class and increased spending power by urban and peri-urban consumers. These factors have seen an increase in demand for potatoes with processing qualities for the manufacture of crisps and French fries.

At present, based upon research conducted by the REACH - Uganda project as part of the potato strategy development process, the total demand, current and projected, for potatoes for processing, (excluding the informal sector) is approximately 22,000 metric tons annually. This represents approximately 10% of an estimated national demand of 219,370 metric tons (based on data from the ASSP 2020/21-2024/25). Please see Annex 9 for more on potato demand.

Crisp manufacturing is restricted to a commercial basis, but French fries are made at home and commercial food outlets. Local potato varieties have been developed predominantly from the perspective of food security and do not have the appropriate traits needed for processing. This includes; an ovaloid shape, shallow or no eyes, high dry matter content combined with low sugar. Presently, potato varieties developed by Dutch breeders and approved for release in Uganda have a dominant position in this sector. Farmers who are growing these varieties report receiving EUR 0.32 per kilogram.



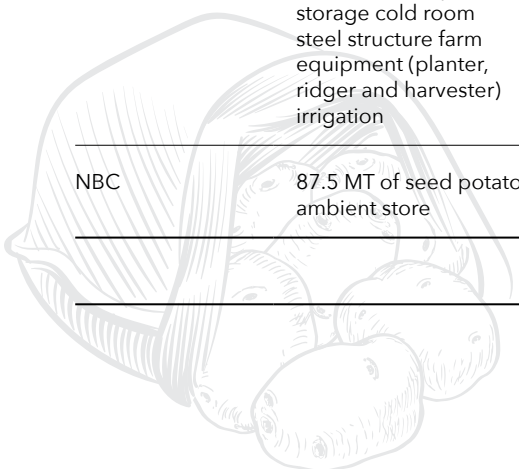
Currently, a number of commercial restaurant chains (Café Java and Java House) are importing Dutch varieties from Kenya to meet their processing needs. Other firms, such as Sumz and Chicken Express, have sourced smaller volumes of Dutch varieties from Ugandan growers and supeoplemented this with local potato varieties. Investments by Holland Fair Foods, Veris Investments and the KPPIL factory are targeting the use of Dutch varieties as their first priority and are highly reluctant to use local varieties. Based on current and projected demand, is anticipated that Dutch varieties could have a market share of approximately 74% or 16,000 MT (please see Annex 9) of the processing sector.

2 Cost share contributions

The table below shows financial information to date of REACH investments and partner investments in the Dutch potato sector in Uganda. REACH has covered the cost of the following for the four seed partners 1-4 below: cold storage units (2), farm equipment for mechanization (except Namakwaland), steel structures (protective roofing for stores) and initial seed importation, and irrigation (apart from Namakwaland). The farms have covered: concrete floors to support cold storage units, pallets for the stores, and irrigation (Namakwaland). A full breakdown of these costs is provided in Annex 15. The table below shows that REACH has covered 57% of the costs and partners 43%.

Table 9: Total financial contribution by REACH and commercial seed producers from 2017 to date.

Partner	Activities	IFDC-REACH Uganda Actual (EURs)	Partner Actual (EURs)	TOTAL Actual (EURs)	% contribution IFDC	% contribution partner
CLARKE FARM	50 MT of seed potato farm equipment (planter, ridger and harvester) storage cold room irrigation	202,202	77,335	279,537	72.2%	27.8%
KAKIE FARM	25 MT of seed potato farm equipment (planter, ridger and harvester) irrigation storage cold room	102,742	54,551	157,293	65.3%	34.7%
NAMAKWALAND	109 MT of seed potato connecting to the national electricity grid storage cold room	217,721	400,179	617,900	35.2%	64.8%
FICA	25 MT of seed potato storage cold room steel structure farm equipment (planter, ridger and harvester) irrigation	174,232	80,155	254,387	68.5%	31.5%
NBC	87.5 MT of seed potato ambient store	111,969	19,555	131,524	85.1%	14.9%
		808,866	**631,775**	**1,440,641**		




UAX 46

The first part of the strategy was to build the capacity and experience of these commercial farmers in the production of Dutch varieties which requires skills such as mechanization. The second step was to start getting these seed varieties into the hands of smallholder farmers. With registrations completed and breeder agreements in place, this will be now possible.

Subsidies provided by the project and investment by the four farms themselves have been fairly high to get this seed system established. This reflects the complexity of the production dynamics and capital-intensive nature of the initial start-up process. Without this catalytic support, investment would not be crowding into the processing sector.

3 Profitability

In the table below, the profitably of Dutch seed at different price levels and yields is provided. If a farm produces 8 MT/acre and sells at 2,500 minimum they make a profit of 2,789,979 or 645 euros per acre. This is based on the assumption that 100% subsidy was provided, however, as per table 9, an average of 43% contribution was made by partners. The full breakdown of this is provided in Annex 13.

Table 10: Profitability of Dutch seed at different yields and sale price.

Yield	NP LEVEL 1 (sell at 3,000 UGX per kg)	NP LEVEL 2 (sell at 2,500 UGX per kg)	NP LEVEL 3 (sell at 2,000 per kg)	NP LEVEL 4 (sell at 1,500 per kg)
8 MT/acre	6,789,979	2,789,979	(1,210,021)	(5,210,021)
6 MT/acre	789,979	(2,210,021)	(5,210,021)	(8,210,021)
4 MT/acre	(5,210,021)	(7,210,021)	(9,210,021)	(11,210,021)

4 Investment in the processing sector

The availability of processing varieties has been key for the entrance of firms and direct foreign investment from the Netherlands into the Ugandan potato processing sector. These include two potato crisp manufacturers and one French fry producer. Discussions held by IFDC with these firms have confirmed that potential availability of raw material was critical in their decision-making process.

Dialogue with Veris Investments in respect to their investment decision process also raised a series of other technical and non-technical considerations. This included the potential market size, both met and unmet. Related to this was an analysis of their competitive advantage regarding whether they could achieve a market share. Veris also considered the availability of land for purchase to establish an industrial site, tax regulations, political stability, construction costs (and ability to identify a contractor(s) capable of delivering the required quality). An assessment of the supply chain for related raw materials such as vegetable oil, seasoning ingredients and packaging materials was also conducted. In addition, Veris also considered the availability and costs of suitably qualified staff to manage the operation.

More broadly for the sector, there are other considerations which need to be made by investors in relation to their market entry into Uganda. At present there is no appropriate grading, labelling, and packaging of ware potato. A lack of adequate storage facilities leads to fluctuating prices, which sees very low prices immediately in the post-harvest period, followed by significantly higher prices in the off season. Market linkages are weak and dominated by a lack of trust between actors within the value chain. Resulting from this are informal marketing chains with high transaction costs that dominate the sector. The Ugandan

agricultural extension system lacks funding and qualified professionals. Consequently, the technical capacity of Ugandan potato farmers is low, which is mirrored by their low overall productivity.

All new markets entrants intend to have a diversified supply chain, which will incorporate smallholder farmers with formal contracting arrangements. Availability of contracting agreements make these growers more 'bankable,' with potential to access credit.

5 The role of the Dutch private sector

The main involvement of Dutch businesses has been on the development of breeder agreements which lay the foundation for multiplication and sale of seed potatoes. It is expected that Dutch businesses will now invest more in these partnerships – especially through technical support to the less experienced farms, however, these relationships need to be deepened.

The establishment of the four farms with support from the REACH Uganda project has taken place in a highly compressed timeframe of approximately 1½ years (although had been discussed with the EKN Kampala for a number of years previously). This reflects the EKN Uganda's joint desire with the REACH project to see much greater stimulus, both technical and financial, given to the sector. More detail of the farms activities is provided in the Annex 16. Discussions held between IFDC, the local commercial seed growers and Netherlands-based actors indicate that, concurrent with the anticipated reduction in COVID-19 related disruptions, they will provide significantly greater input with the growers based in Uganda.

Involvement of Netherlands seed exporters has been at times limited. In 2020 as the sector in Uganda was gathering momentum, the COVID pandemic heavily impacted their ability to play the leading role that they should have. While the Netherlands is global seed exporter, the sector is still very much dominated by personal relationships and connections. During 2020 planned face-to-face meetings to cultivate stronger relationships between the Dutch seed exporters and the Ugandan growers wasn't possible. However, licensing by Agrico and HZPC of growers in 2021 is a major step by these firms, who place reputation before all else. Both firms have made offers of promotional materials available to the growers. From this point forward an increase in their levels of investment support to the local growers should take place.

Discussions with HZPC (one of two presently active seed exporters to Uganda) in relation to a notable absence of support from them to local multipliers reinforced the challenge that COVID has raised. During our talks HZPC stated that, direct technical assistance to growers through in country visits by their technical and sales managers, which forms their main form of support, have been curtailed since the start of 2020. Further, HZPC stated that Uganda is part of their growing focus on the East African market but needed greater opportunity for direct interaction with local multipliers to build up their confidence to provide greater support. They also wanted to see that licensing agreements would be honored by the growers in terms of royalty payments. HZPC also has a policy of not investing in land or infrastructure outside of the EU (although the policy varies from company to company). This precludes them from entering directly into the Ugandan or East African seed sector.

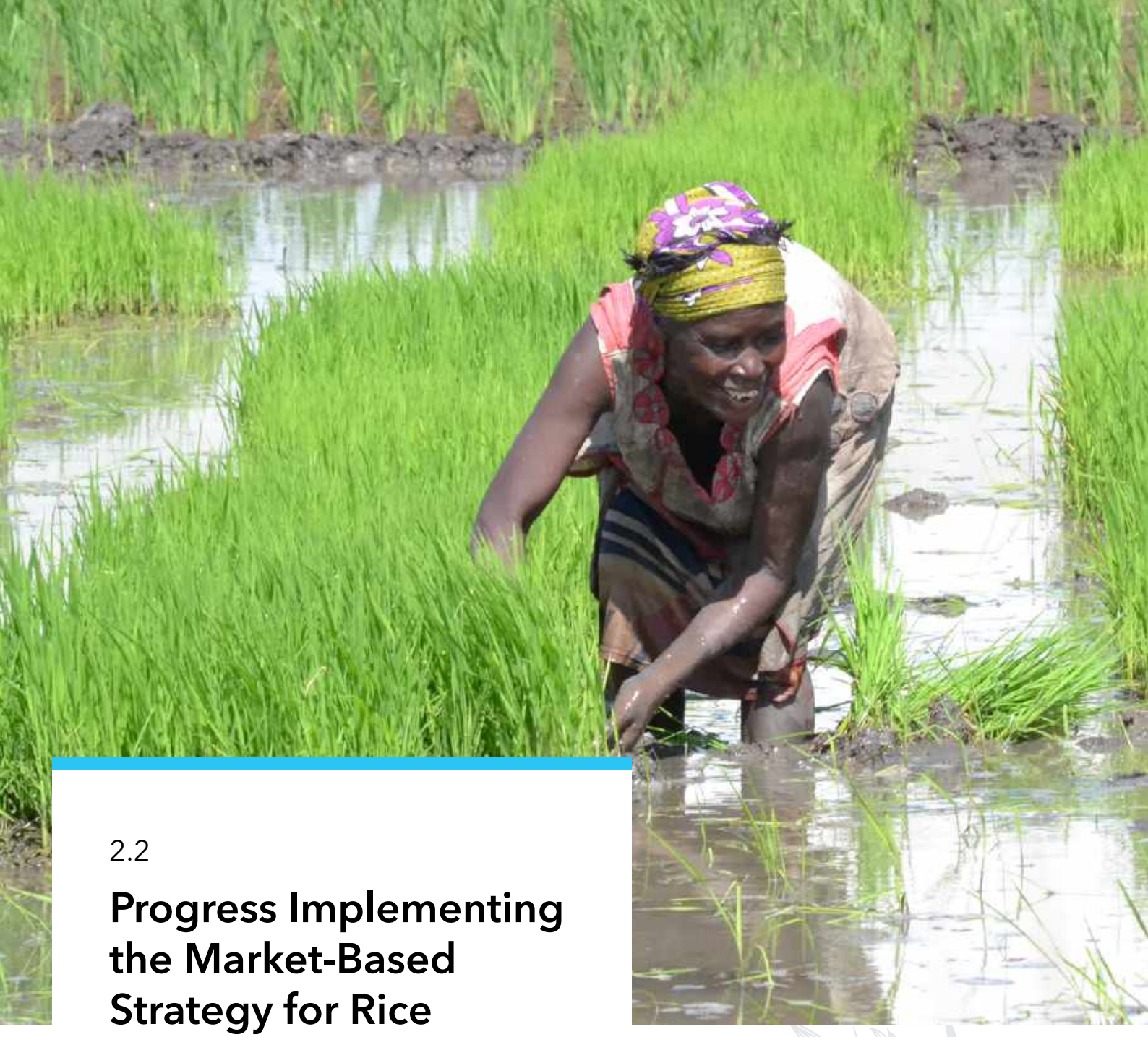
Trade, including potato, has been recognized within the EKN's Multi-Annual Country Strategy as a potential driver of growth not just between the Netherlands and Uganda, but also with the wider East African geographic region. For this to take off, the basic foundations need to be in place, which for potato starts with seed. When Dutch developed potatoes are being grown and multiplied in a country it opens-up channels for trade in seed, production and storage technology as well as investments in the processing sector. Already investment in the processing sector is taking off, which will continue to act as a driver to the others. During the final phase of the REACH-Uganda project, it was recognized that a bold strategy was needed to kick start all of this. In coming years, support to the potato sector should be more cautious while the activities to date are allowed to mature and start to deliver on their promise.

3 The 26-kilometer road in Kween was completed to link potato production to markets.

Cheminy-Atar Road

Bringing Services Closer During COVID-19

A 26 km road was completed in Kween District and handed over to the District Local Government in May 2020. The completion of the road was challenging, given that the last stages of the work coincided with the lockdown due to COVID-19. The project was given special permission to continue road construction by the Resident District Commissioner due to its importance in providing access to social amenities and markets for a population of 30,515. An impact assessment conducted in September 2020 revealed a reported 50% reduction in transport costs could be attributed to the improvements in the road. In addition, produce buyers were now able to reach farming communities (previously, produce was taken 20 km to Kapchorwa, which was expensive and time consuming) and were able to offer 40% more per kilogram of potato compared to the previous year. These impacts are being sustained under the road maintenance plans developed by the District Local Government.



2.2

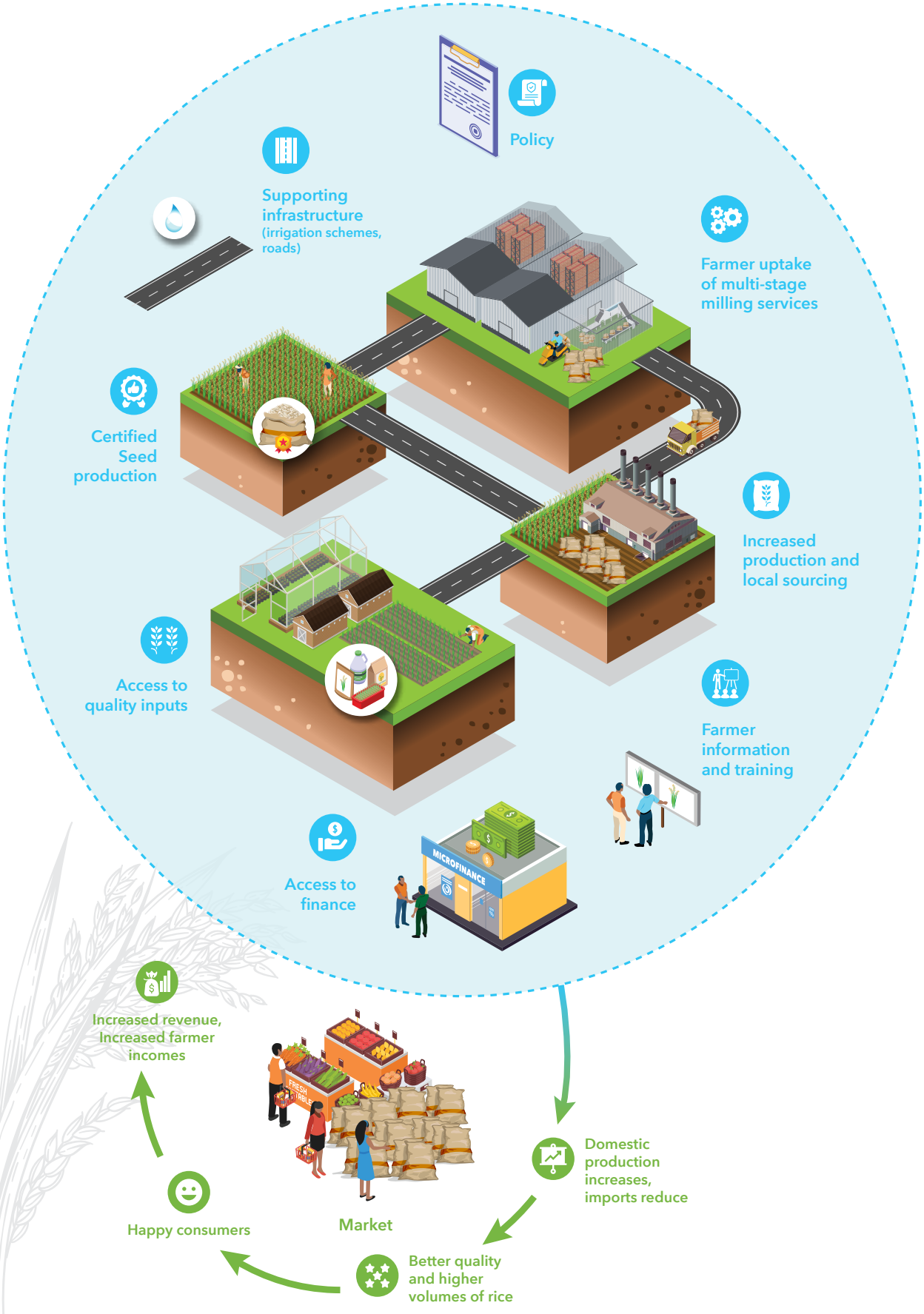
Progress Implementing the Market-Based Strategy for Rice

Recap: Market-Based Strategy for Rice in Brief

Rice is another important and fast-growing cash crop in Uganda that has not met its full potential. The constraints are comparable to those for potato. The near complete absence of a commercial seed industry hampers productivity. Cultivation practices are far from optimal due to gaps in awareness/knowledge and limited resources. Further value is lost during the harvesting and milling process: overdying and the use of single stage mills results in an inefficient milling process with a high percentage of broken kernels (which equates to a financial loss for the farmer). With more investment in quality inputs (including seed) and modest improvements in skills, rice can give farmers much better returns. Access to finance can be used to kickstart a more intensive cultivation process. Water management will become more important to handle changing rainfall patterns and flash rains (flooding lowlands). Figure 2 illustrates the REACH-Uganda rice strategy.

Figure 2

REACH-Uganda Rice Strategy



In 2020, REACH-Uganda worked on all of these key issues, but the focus was on the establishment of a commercial seed industry to increase yields and improve milling and market linkages, thus creating a higher valu e product. This should provide the incentive and ability to invest more in intensified cultivation.

During 2020, partners were active in both these areas, although their efforts were hampered by the slowdown that occurred in the domestic rice industry as a result of the changes in the political environment

Disruptions in the Business Enabling Environment for Rice

From 2017-2019 the Government of Uganda had supported the strategy of self-sufficiency in the rice sector through domestic production. This encouraged investment in nucleus farms by several processors and more organized supply chains from smallholder farmers. Domestic production of rice during this period was approximately 190,000 MT of rice per annum. In 2020, the policy of taxation on importation of rice from outside the country was reversed, which led many rice processors to shift away from a domestic production model and revert back to an importation model. As a result, Uganda was flooded with at least 50,000 MT of rice from neighboring Tanzania. This entered the market at a lower price and therefore undercut domestic prices – a disincentive for growers to cultivate rice and for processors to pay them premium or higher prices.

Key Strategic Outputs and Outcomes in Rice in 2020

1 In 2020, DGL, SWT, KL, RGC, and Lwoba Holdings were able to continue to operate multi-stage mills in a challenging environment.

The five partners invested a total of EUR 1,305,115 in areas such as expanding irrigated rice production (SWT), infrastructure including drying yards (Lwoba Holdings), promotion of multi-stage mills, and product marketing. They have also been able to adjust their business approaches during the COVID-19 lockdown by moving toward more digitalization of their supply chains. This shows that these partners are committed and resilient despite the challenging year they have encountered.

Three of the rice processers were able to improve and expand their supply chains, albeit at a reduced level compared to what was planned. In total, DGL, RGC, and Lwoba Holdings sourced 2,865 MT of paddy from 1,509 farmers at the prevailing market price or slightly better. This is a good improvement from 2019, when only DGL was able to source directly from farmers. As a result of the efficiencies created by a more consistent supply of higher quality rice directly from farmers, these businesses have been able to generate an additional turnover of EUR 1,264,782. These are impressive gains despite the twin challenges of an economic downturn and the destabilizing business operating environment. At the same time, SWT and KL have not gone ahead with any organized sourcing from farmer groups due to the economic challenges experienced.

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2 A first-of-its-kind large-scale commercial lowland rice seed production business in Uganda was expanded and became active and is now selling fresh seed in the Ugandan market.

In 2019, as part its first effort to open up the seed market, KL produced 130 MT of seed, enough to supply 13,000 farmers. In 2020, KL was able to clean this seed crop and promote their clean seed through radio talk shows in Eastern Uganda. KL was able to sell 6.9 MT to farmers and seed companies, benefiting 551 farmers – the first commercial lowland rice clean seed produced and sold in Uganda. The clean rice seed sold at UGX 5,000/kg and had an average yield of 1.6 MT/acre, which is approximately 40% higher than the average yields of the same farmers previously. Farmers who bought seed also indicated that they would purchase clean seed again and reported that the seed is more resistant to rice yellow mottle virus which can cause stunting or poor panicle growth thus a reduction in yields.

Access to improved seed for farmers has been vital to ensure that they can produce a crop with uniform physical characteristics, which can achieve a higher price at the time of sale. Seed however is not the sole determinant of productivity in rice. Other agronomic practices such as weeding, field water management and fertilizer application also impact on yields. The figure of 1.6 MT/acre still compares favorably with the projects baseline was 0.6 MT/acre and UBOS statistics.

In recent years the Government of Uganda has periodically suspended and re-introduced import duties on rice from outside the EAC as discussed in the text box above. This has led to price volatility (and generally lower prices) and led farmers to perceive rice as a riskier crop. Correspondingly, farmers have responded by reducing their risk exposure by investing less in other agronomic aspects (such as line planting and weeding). This in turn has the impact of stifling some productivity gains.

The efforts of KL show that there is a market for clean lowland rice seed in Uganda. The scaling up of this effort to reach a larger number of farmers has been inhibited by KL's inability to register as a certified seed producer with MAAIF. Due to the delays in this process during which time several meetings were held with little progress, REACH engaged a consultant to get KL "fit for purpose" as a seed producer. This required some coaching on the processes to follow, correcting documentation, and allowing MAAIF to inspect KL's farm and seed production facility. Without this registration to enable the addition of a certification label to its product, KL is reluctant to invest in any additional promotion or marketing efforts for the seed.

To further strengthen the rice seed market, REACH also entered into partnership with Pearl Seeds Ltd., a registered seed company in Uganda with expertise in managing commercial seed production. The company has already identified, trained, and provided foundation seed to 60 outgrowers and procured 9 MT of seed crop from them. Pearl Seeds Ltd. has procured a seed cleaner and will now begin cleaning the seed to produce and package certified seed.

Table 11 provides an overview of the status of all multi-stage mills and seed producers.

Table 11: Status of multi-stage mills and seed producers at the end of 2020.

Partner, type, location	Investment in 2020 (EUR)	Activities completed	Rice produced and sold
RGC, rice processor, Tororo District	5,188	• Sourced and milled 481 MT of paddy. • 370 farmers milled with a multi-stage mill.	392 MT of milled rice sold for a cumulative turnover of EUR 185,329.
Kibimba Limited, rice processor and seed producer, Bugiri District	479	1.3 MT of foundation seed procured, which produced 190 MT of seed crop. Procured a 2-MT seed cleaner.	83.7 MT of seed planted on own land, 6.9 MT sold to farmers and seed companies, benefiting 551 farmers. Additional sales from seed of EUR 6,211.
Diner's Group Limited, rice processor, Mbale District	370	370 Volume of paddy sourced increased from 679 MT in 2019 to 779 MT in 2020; this was supported by access to a truck. Hired two extension workers to boost awareness of milling services.	Sourced 779 MT and milled and sold 422 MT. Cumulative turnover of EUR 517,114
Lwoba Holdings, cooperative rice scheme Butaleja District	4,707	1,064 MT of paddy was sourced from 891 farmers; 360 of these farmers were from Manafa River Basin. Construction of a 2,023M^2 drying yard completed.	1,604 MT of paddy sourced, 1,042 MT rice milled and sold. Additional turnover of EUR 562,339.
SWT Tanners Ltd., implementing rice value chain, Bulambuli District	1,294,372	Procured 1.2 MT of Wita 9 seed from KL for own farm production. Produced 337.4 MT of paddy from the SWT nucleus farm in 2020.	Yielded 337.4 MT from own farm, sourced 1,264 MT from outside, and milled and sold 902 MT. Created 222 full-time equivalent jobs earning an average income of EUR 98,202. Additional turnover of EUR 582,229.
Pearl Seeds Ltd., seed company implementing rice seed production, Wakiso District	18,299	Procured 2 MT per hour seed processing unit. Procured 900 kg of Wita 9, 200 kg of ARU, and 150 kg of MET 12 foundation seed and produced 9 MT of seed crop.	Seed will be cleaned and sold starting in 2021.

3 Construction of irrigation works began for providing controlled, year-round access to water for 346 acres of land in support of paddy production.

In 2019, SWT developed a plan to cultivate paddy on 6,722 acres of land, accessed through a 5 km road constructed in partnership with REACH. In 2020, SWT continued to open up land, with an additional 346 acres developed, and was able to progress with construction of infrastructure, such as farm buildings for housing equipment and workers. In 2020, SWT began rice production on the farm; a total of 300 acres of rice was cultivated, which has yielded 337 MT so far.[8] In addition, the farm development has created 222 full-time equivalent jobs , resulting in an additional EUR 98,202 from employment and casual labor on the farm. Due to the economic climate and changes in the business operating environment, SWT has reduced their efforts in direct sourcing from farmers or farmer groups but expects to pick this up again should the political and economic environment become favorable.

2.3

Portfolio Theory of Change and High-Level Results

The progress implementing the market-based strategies for potato and rice informs the following project Theory of Change, including high-level results.

In potato, 9,617 farmers will increase returns from potato cultivation, as they experience yield increases of 70% and receive better prices from direct sales into premium market segments. This will create an increase in income of EUR 7,715,117.

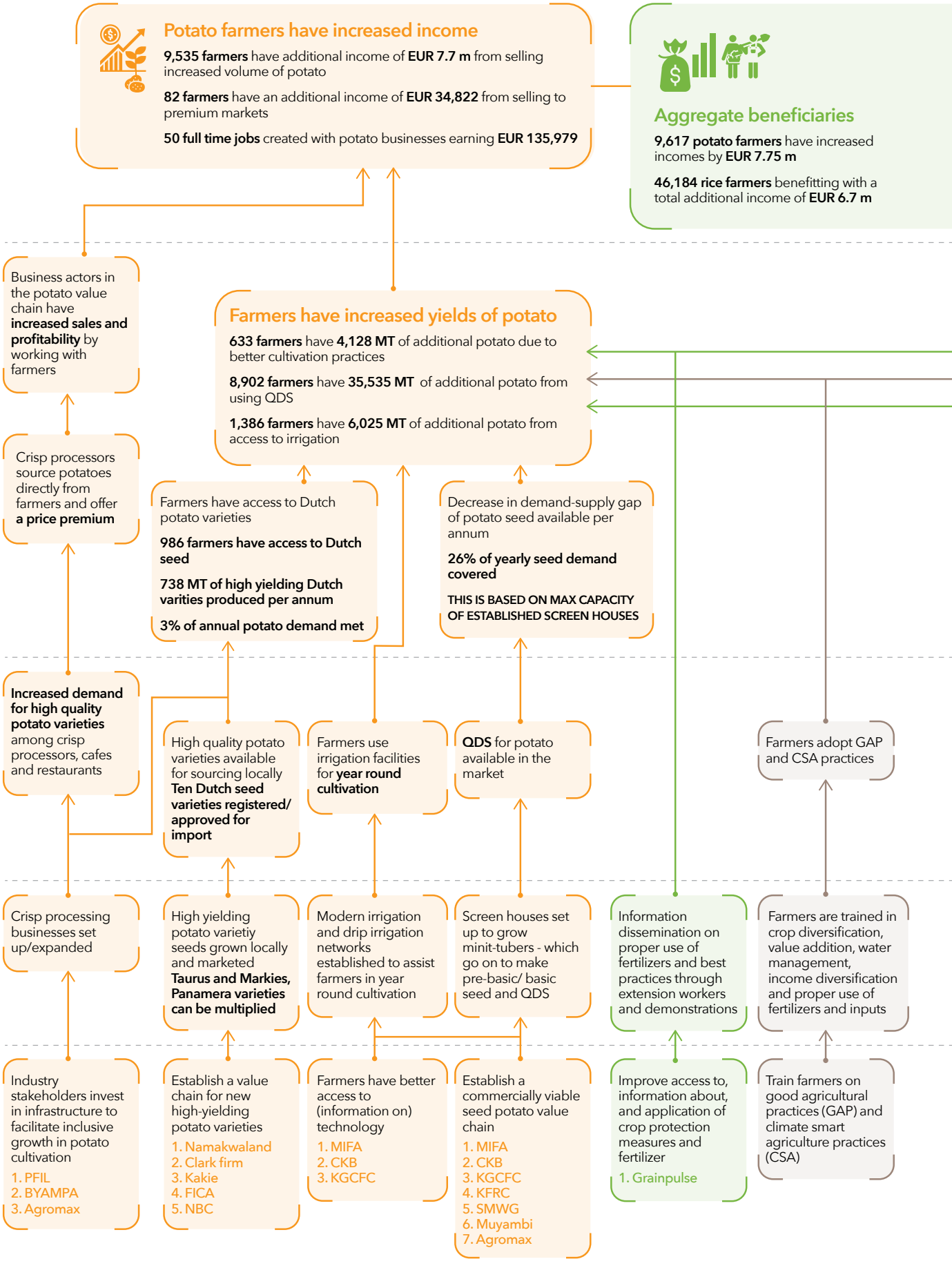
In rice, 46,184 farmers will increase returns from rice farming by cultivating newly irrigated lands and using certified seed, boosting yields by 50%, and by accessing better milling technology. This will create an increase in income of EUR 6,778,178.

An additional 1,800 farmers will access finance through formal channels, with interest rates as low as 13% per annum. This will save these farmers an additional EUR 865,542.

A total of 832 full-time jobs will be created in both the potato and rice value chains in managing on-farm production and operations and providing extension services for businesses. This will create an increase in income of EUR 928,665 through jobs.

[8] About 15% of these 300 acres was not considered under harvest, as rice was washed away. Almost 50% of the land is still to be harvested.

Figure 3 REACH Theory of Change and High-Level Results



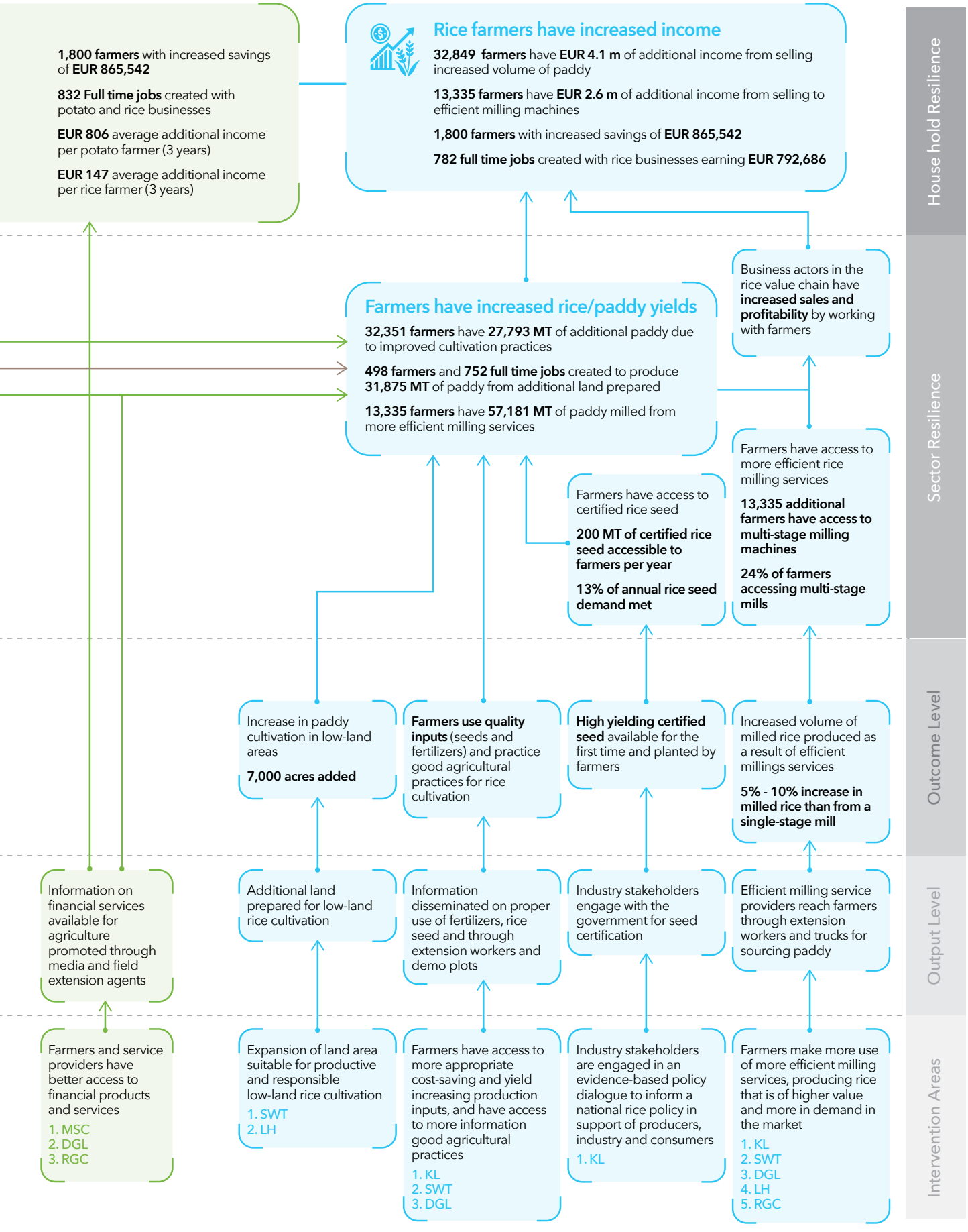

1,800 farmers with increased savings of EUR 865,542
832 Full time jobs created with potato and rice businesses
EUR 806 average additional income per potato farmer (3 years)
EUR 147 average additional income per rice farmer (3 years)
Rice farmers have increased income
32,849 farmers have EUR 4.1 m of additional income from selling increased volume of paddy
13,335 farmers have EUR 2.6 m of additional income from selling to efficient milling machines
1,800 farmers with increased savings of EUR 865,542
782 full time jobs created with rice businesses earning EUR 792,686
Business actors in the rice value chain have increased sales and profitability by working with farmers
Farmers have increased rice/paddy yields
32,351 farmers have 27,793 MT of additional paddy due to improved cultivation practices
498 farmers and 752 full time jobs created to produce 31,875 MT of paddy from additional land prepared
13,335 farmers have 57,181 MT of paddy milled from more efficient milling services
Farmers have access to more efficient rice milling services
13,335 additional farmers have access to multi-stage milling machines
24% of farmers accessing multi-stage mills
Farmers have access to certified rice seed
200 MT of certified rice seed accessible to farmers per year
13% of annual rice seed demand met
Increase in paddy cultivation in low-land areas
7,000 acres added
Farmers use quality inputs (seeds and fertilizers) and practice good agricultural practices for rice cultivation
High yielding certified seed available for the first time and planted by farmers
Increased volume of milled rice produced as a result of efficient millings services
5% - 10% increase in milled rice than from a single-stage mill
Information on financial services available for agriculture promoted through media and field extension agents
Additional land prepared for low-land rice cultivation
Information disseminated on proper use of fertilizers, rice seed and through extension workers and demo plots
Industry stakeholders engage with the government for seed certification
Efficient milling service providers reach farmers through extension workers and trucks for sourcing paddy
Farmers and service providers have better access to financial products and services
1. MSC
2. DGL
3. RGC
Expansion of land area suitable for productive and responsible low-land rice cultivation
1. SWT
2. LH
Farmers have access to more appropriate cost-saving and yield increasing production inputs, and have access to more information good agricultural practices
1. KL
2. SWT
3. DGL
Industry stakeholders are engaged in an evidence-based policy dialogue to inform a national rice policy in support of producers, industry and consumers
1. KL
Farmers make more use of more efficient milling services, producing rice that is of higher value and more in demand in the market
1. KL
2. SWT
3. DGL
4. LH
5. RGC
House hold Resilience
Sector Resilience
Outcome Level
Output Level
Intervention Areas

Table 12: REACH aggregate results by 2020.

REACH-UGANDA Results 2020	
Impact – Household Resilience	
Income	√ In 2020, additional income of EUR 1,033,940 was generated by 2,575 farmers. √ Total additional income for farmers from partnerships signed is projected to be EUR 16,287,502.
Jobs	√ In 2020, an additional 244 full-time jobs were created, for a total of 290 full-time jobs created cumulatively: 41 in factory operation management and 249 in on-farm production. √ Total full-time jobs from partnerships signed is expected to be 847.
Food security	√ In 2020, 59% of farming households were food secure, which was an improvement from the 2019 figure of 47%.
Impact – Improved Sector Resilience in 2020	
Lead firm and service provider performance	√ In 2020, lead firm and service providers collectively increased their sales turnover by EUR 2,430,370 derived from the investments in the detailed collaboration agreements. √ In 2020, lead firms and service providers improved their efficiency. Additional innovative business practices were introduced, including cost-effective and practical screenhouses for farmers and business digitalization for marketing and service delivery. √ In 2020, lead firms and service providers improved their product quality. Additional innovative business practices were introduced: commercial production of new Dutch potato varieties, commercial seed potato production in Eastern Uganda, and establishment of cold chain storage units and ambient stores for Dutch seed potato.
Farm productivity	√ In 2020, the rice productivity increase of 45% over 2019 was due to improved access to quality improved inputs, and application of key CSA and GAP approaches by farmers including line planting, better water management (construction of bunds) and pest and disease management. √ In 2020, the potato productivity increase of 29% over 2019 was due to better weather conditions (less rain than 2019 meant reduced occurrence of late blght) and application of key CSA and GAP approaches by farmers, fertilizer application, weed management, and adoption of field preparation.
Farmers adopt resilience strategies	**Of the 36,000 farmers trained during 2017-2019:** √ In 2020, all farmers practiced one out of 10 approaches of CSA, 62% practiced four out of 10, and 38% practiced five out of 10 approaches. Potato farmers that practiced five out of 10 approaches achieved 36% higher yields than their counterparts who practiced only one. √ In 2020, 99% of farmers practiced some element of income diversification; 44% of these farmers were engaged in off-farm small-scale business, reducing their reliance on agriculture as an income source. √ In 2020, 66% of farming households practiced joint decision-making for the family farm.

REACH-UGANDA Results 2020

Outcomes – Systemic Change Pathways

Improved access to markets	√ In 2020, 1,509 rice farmers from 113 farmer groups enjoyed better access to markets as a result of collective sales, storage, value addition, and/or linkages with lead firms (multi-stage mills). √ In 2020, 156,848 people enjoyed better road connections to markets and other social amenities, with a 50% reduction in transport costs.
Improved access to inputs and equipment	√ Partnerships signed in 2020 with Clarke Farm, NBC, FICA Seeds, and Kakie in Rwenzori Sub-Region will enable 986 potato farmers to have access to better quality Dutch seed potato varieties by 2024. √ Partnerships signed in 2020 with Welishe, Bitamba, Chemonges, and Maziba will enable 962 farmers to access to better quality inputs (quality declared potato seed). √ A partnership with Pearl Seeds will enable an additional 15,317 rice farmers to have access to better inputs by 2022.
Improved access to finance	√ In 2020, MSC sensitized 62 groups with 10 loans disbursed, creating access to 200 farmers amounting to EUR 46,288. √ In 2020, 39% of all farmers had access to finance through formal financial institutions, whereas 84% of farmers had access to finance through VSLAs.
Improved access to water for irrigation.	√ In 2020, 58 farmers were able to access a consistent water supply using the irrigation systems established in partnership with MIFA and KGCFC. Approximately 50% of the crops grown using irrigation were potato, while the rest were vegetables, such as cabbages and onions. √ SWT produced 337 MT of paddy from 300 acres of irrigated land. Additionally, employment opportunities were created for 222 individuals who worked as casual laborers and permanent staff on the nucleus farm.

Outputs	2020	Cumulative
6. Sector engagement (license, policy dialogue, research)	• In 2020, the project facilitated the process of licensing two Dutch seed potato producers by HZPC and one by Agrico. • In 2020, the project initiated and facilitated the process of licensing three Dutch seed potato producers in Uganda by MAAIF.	One license was secured between HZPC and Namakwaland.
5. Private sector investment leveraged	EUR 1,493,224	EUR 5,243,686
4. Private sector innovations adopted	4	16
3. Metric tons of clean seed potato produced	1,235	4,066
2. Seed multipliers linked to Dutch businesses	4	5
1. Dutch potato varieties introduced	16 varieties were evaluated and 8 have been put forward to the Varietal Release Committee, which will meet in the second quarter of 2021.	Three varieties under production in Uganda – Markies, Taurus, and Panamera.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03

Resilience, Cross-Cutting Themes, Lessons Learned

Chapter 3 presents an examination of farmer resilience, cross-cutting themes and lessons learned in 2020.

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3.1

Farmer Resilience

Good Agronomic Practices

In potato, farmers improved in their agricultural practices from 73% practicing at least 4 Good Agronomic Practices (GAPs) in their farming in 2019 to 96% in 2020. Some of the GAP approaches that had high adoption by famers in 2020 included fertilizer application, weed management, adoption of the field preparation and water management structures.

In rice, farmers improved in their adoption from 81% practicing at least 4 GAPS in their farming to 88% in 2020. The main GAPs adopted by the rice farmers were line planting, bund construction and pest and disease management. Use of fertilizer improved from 24% to 63%. It was observed that the farmers who practice at least 4 practices had higher yields than those that practiced one of the practices. Farmers cited access to reliable agri-services (information, skills and knowledge) such as the input stockists and the availability of extension agents from business actors to provide information as some of the key reasons for the improvements in 2020.

Resilience Practices

In both rice and potato growing areas households experienced shocks or setbacks such as price fluctuations due to the economic impact of COVID-19 and changes in the business operating environment in rice. Better understanding of the resilience strategies by farmers helped households to cope with economic and climatic shocks. The climatic shocks included heavy rains experienced in both rice and potato growing areas in 2020. Farmers reported that this led to flooding of rice and higher occurrence of pest and disease in potato growing areas.

In 2020, farmers adopted and used the four resilience strategies promoted in the project, which included access to finance, income diversification, gender dynamics, and Climate Smart Agriculture. There was an improved adoption of resilience measures from 89% of farmers reporting practicing 3 out 4 measures in 2019 to 94% in 2020.

This encouraged 99% of the farmers to have at least one other source of income besides rice and potato production. Farmers adopted risk mitigation strategies such as crop diversification, livestock and off-farm income generating activities which helped them sustain livelihoods during the hard times of economic and climatic shocks. These risk mitigation strategies encouraged 24% of farmers to establish new or additional sources of income such as small-scale businesses that are less dependent on rainfall or other climate variables. This included engaging in retail trading/shops in produce or other household items. Although there was a reduction from the 2019 figure of 38% engaging in small scale business, this may have been due to the difficulties faced in accessing finance to start a new venture during these difficult economic conditions created by the COVID-19 pandemic.

Through VSLAs, 84% of the farmers were able to access finance and 39% of farmers had access to finance through formal financial institutions hence contributing to household resilience. Finance from commercial loans was used to purchase agro-inputs such as fertilizers and crop protection products, which farmers attributed to the yield improvements they enjoyed in 2020. This in turn increased incomes for farmers and provided them with funds for mitigating shocks and or setbacks. Where farmers were unable to access loans from financial services providers, savings and loans from VSLAs was used for every day needs such as food and health as a coping strategy.

In gender, the couple-centered approach promoted at the household level has led to equitable access to resources (information, skills, and knowledge) that enhanced adoption of agriculture practices in farming. Joint decision-making emphasizes joint planning and budgeting as well as equitable sharing of household incomes and other resources. Joint decision-making enabled male buy-in and influenced men's perceptions of women's participation in sales and marketing for household agricultural products. As a result of this, sales and the proceeds from the sales were used to fund other income generating activities such as the purchase of livestock for a household which in turn increased the income base for the household. Women were aware of the prevailing market price for their produce through their interactions with farmers and VSLA groups, which served as avenues for information exchange with extension services, local traders and middlemen. This encouraged them to set a better price and establish the quantity they would be able to sell to the market.

In 2020, there was however a reduction from 66% of women participating in decision-making at household level compared to 87% in 2019. Women reported that the economic situation in 2020 and financial constraints have limited their empowerment in decision-making. However, as a result of promoting positive gender dynamics, many women have attained access to resources like land, participation in a business selling produce as well as putting them on a stronger footing in terms of decision-making for household livelihood planning.

3.2

Cross-Cutting Themes

Access to Finance

Under Output 1.4 of the 2020 workplan, the project is partnering with financial institutions to offer suitable financial products that can support investment in agriculture. This builds on training on financial literacy and VSLA strengthening that was provided during 2017-2019, which is yielding results – 84% of farmers are able to access finance through VSLAs for their immediate household needs. Farmers prefer accessing loans from VSLAs as opposed to formal financial institutions due to the convenience in terms of the time it takes to acquire the loans, and the limited security required despite the high interest rate. At the same time, most of these loans are small and only cover immediate needs rather than providing sufficient capital to invest in productive agriculture.

To take this to the next level, REACH-Uganda is partnering with MSC to provide affordable credit to VSLA groups, who present a less risky investment proposition due to their understanding and practice of some of the basics of financial literacy. Under the partnership in 2020, MSC sensitized 62 groups, with 10 loans disbursed, creating access to finance for 200 farmers amounting to EUR 46,288, or EUR 231 per farmer. Most of the credit has been used for productive agriculture, although farmers note that in some cases the loans are received too late to purchase inputs for the agricultural season. Despite this, the vast majority of the groups have been able to repay the loans within the agreed term. MSC's outreach has been more limited.

Access to finance for productive agriculture through MSC

Some groups and individual farmers report that from the loans received they have been able to purchase land and improve their productivity. For example, Geshaho Farmer Group in Butaleja District, received a loan of UGX 30,000,0000 and bought 20 acres of land for rice cultivation. This investment was based on what they learned about investing money under the financial literacy training. They cultivated rice and achieved a yield of 1 MT per acre. They attribute this to the skills they learned under the GAPs promoted by the project. The have applied for a bigger loan of UGX 60,000,000 which is being processed .More information on this story can be found at **Boosting Rice Yields through Access to Finance - IFDC**.

Overall, 39% of farmers are able to access loans from financial institutions, an improvement from the baseline of 27% and the 2019 figure of 37%. The financial literacy and VSLA training provided to 23,816 farmers and the introduction of financial institutions to groups during 2017-2019 have made groups a less risky investment and potentially more attractive to financial institutions, such as DFCU, Centenary Bank, and Post Bank. At the same time, the project has not been able to broker any additional formal partnerships with financial institutions. REACH explored a further partnership with DFCU. A partnership agreement was drafted but was not signed due to the high expectations of REACH and limited commitments they were prepared to make to the partnerships.

Although training of an additional 13,000 farmers on financial literacy was planned under Output 2.1, this was not possible due to the restrictions imposed by the lockdown, which did not allow face-to-face contact with farmers. During this period, the movement of agricultural goods and continuation of agricultural production was allowed, however, trainings were considered non-essential and public gatherings were prohibited under the guidelines provided by the GoU. These trainings are typically large groups of 25-30 persons.

Other alternatives to the training that were explored were using mobile messaging which is useful for providing key messages as reinforcement to already trained farmers on the same subject. However, as this was a new topic that required a basic understanding of the key principles of financial literacy, VSLA and business planning it was determined that the messaging would not be effective on its own. Radio was also considered but again could only provide key messaging services rather than the comprehensive knowledge transfer required.

Future Prospects on Access to Finance

Presently, farmers are predominantly addressing their financing needs via VSLAs. The REACH project has observed that this source of credit dominates for a number of reasons, including: proximity of services to farmers, ease of accessing credit and hesitancy by farmers to engage with the formal financial sector. In addition, there are structural issues with the banking sector presently, which makes accessing credit difficult for rural farmers. REACH's experience with banks in Uganda shows that they are only willing to operate in an approximate 40 km radius of their branches (which are almost exclusively urban-based). Further, loans officers within the banking system place a low priority on agricultural lending, as they have general sales targets rather than one broken down by sector. Much of these learnings were generated from REACH-Uganda's partnerships with DFCU and Postbank.

A report released in September 2020 by Dalberg Consulting[9] showed that, in Uganda, agricultural lending forms 12% of banks' total loan portfolios. Further, the report highlights that agricultural lending is considered less lucrative than other sectors offering on average 4-5% lower returns.

Agricultural finance for small scale farmers remains a challenge from the perspective of both lenders and borrowers. Cost of borrowing for farmers and returns on investment for lenders is unattractive due to high transaction costs. Opportunities may exist to make the lending and borrowing market more attractive for both parties by integrating more technology into the system. Further gains could be achieved by targeting of lending to individual farmers, guaranteed on a group basis.

Uganda has begun the roll-out of Agent Banking Services, which allows enterprises and shops to act as agents on behalf of financial institutions to receive deposits and make disbursements (much like mobile money services). Through this approach, basic banking services can now be accessed by rural residents and farmers. This reduces the disincentive created by expensive long-distance travel, which was formally associated with loan repayments. Digitization of the loan application process within banks could offer savings in time and general efficiency in the loan application process. Greater adoption of digital processes by banks serving rura lcustomers would streamline this process.

Group guaranteed, (but individually received) 'Save for loan' products have been piloted previously by DFCU bank. This is when group savings are used to guarantee individual farmer loans. Important lessons learned from this could be adopted by other lenders to build upon, improve and expand this approach. Whilst the DFCU pilot highlighted a number of problems with the system, none of these should prevent a more refined system from succeeding. Greater digitization of the process and embracing of the agent banking network could make this type of loan product relevant for banks and borrowers.

Under the CATALIST program, IFDC also sought to introduce non-traditional forms of finance. This included the introduction of venture capital and angel investors lending organized by BidNetwork. Lessons learned from this included local entrepreneurs are reluctant to give up equity to secure loans. In addition, angel type investors are much more attracted to social enterprises, which they consider have immediate impact at scale.

A hybrid financing model and revised business plan approach is required for screenhouses/ISBs to be potentially capable of attracting finance. The hybrid finance model would require the lending institution to provide an approximate 24-month grace period before repayments would begin (presently the maximum on offer is 12 months). This grace period could be guaranteed through a structured fund created specifically for this purpose. A financial product design specialist would be required to provide technical guidance on design specifics and the legal requirements of such a facility.

For ISBs to achieve turnover earlier, their business model could be expanded to include the sale of other planting materials. These products could include rooted seedlings for horticulture crops, tissue culture banana plantlets (and possibly other tissue culture plantlets, including coffee) and act as sales agents for Local Seed Businesses (LSBs). Experience has shown that due to the complex legal requirements and lengthy registration process for agri-input dealers ISBs are not a suitable for this form of trading.

[9] https://aceliafrica.org/bridging-the-financing-gap-unlocking-the-impact-potential-of-agricultural-smes-in-africa/

Access to Fertilizer, Agrochemicals, and Spray Service Providers

Spray service providers (SSPs) offer both crop protection services and last-mile agro-input distribution networks to farmers. Under Output 1.5 of the 2020 workplan, the project worked closely with several SSP associations (Bugiri, Kabale, and Kanungu) that had been formed in 2019 but had challenges in areas such as marketing their services. In 2020, COVID-19 affected the ability of SSPs to provide the service, and the number of SSPs actively engaged in business decreased to 53.[10]

Bugiri Spray Service Provider Association was supported in awareness creation and market activation activities for spray service provision through demonstration gardens, field day events, and radio talk shows. The field day activities enabled farmers to receive extension knowledge and support from the youth SSPs, and this has facilitated a relationship between the SSPs and farmers. In Bugiri, the association has sprayed over 6,000 acres for 879 rice farmers (397 women), and demand for their services is increasing into neighboring districts.

Some impacts of Bugiri SSP Association

- Farmer's report increased crop yields by 50% as a result of best agronomic practices and genuine inputs as advised by SSPs.
- Farmers have expanded acreage under production as the SSPs provide labor for land opening through spraying herbicides and providing advisory services.
- The SSPs association has established an agro-input shop and, through this, farmers acknowledge having access to genuine and cheaper inputs. They have also got an input loan worth UGX 2,000,000 from Akorion Company Limited. They are planning to increase to UGX 4,000,000 by the end of the 2021A season.
- Farmers pay for these crop protection services at an affordable rate (UGX21,000-35,000 per acre), therefore the SSPs, who are all youth aged 20-35 years old, have developed an additional source of income in addition to their own farming practices.

To improve access to crop-specific fertilizers, REACH has been in partnership with Grain Pulse Ltd (GPL). In 2020, 72 demonstration plots (42 potato and 30 rice) were established to show the effectiveness of crop-specific fertilizers. In addition, some promotion was conducted by GPL through 20 radio talk shows in Southwest and Eastern Uganda. For potato, farmers reported that through the use of the crop-specific fertilizers, the crop is more resistant to pest and disease and has more vegetative cover. At the same time, farmers are still not convinced the product is worth the additional price charged (which is UGX 15,000 to 30,000 higher than generic fertilizer). As such, further demonstrations, more organized stockist networks, marketing, and a price reduction may need to be considered by GPL if this fertilizer is to start penetrating the market.

[10] Mbale 9, Kween 5, Kapchorwa 17, Bugiri 10, Butaleja 12.

Gender

The gender and youth approach has been a process of regular gender analysis that informs the project of persistent gaps and opportunities that both constrain and advance women's economic empowerment through the adoption of appropriate tools, such as the Gender Integration Framework (GIF) and Women Empowerment in Agriculture Index (WEAI). These tools have expanded the approach of the project on gender from four to seven domains – from access, agency, time, poverty and representation to also include changes in social and human capital. Additionally, youth inclusion has been tackled through current project youth-centered initiatives, such as SSPs in boosting their spraying businesses as discussed above.

The business partnership approach has contributed to some inclusive strategies that were adopted and implemented to enhance the economic opportunities of women and youth. Furthermore, these findings were then disseminated during gender reflection sessions with the entire project team to build gender and youth awareness.

Table 13: Gender specific interventions by partnership.

Partner, type, location	Gender specific interventions/ activities completed	Impact
Mengya Integrated Farmers Association (MIFA), Kween District Kapchesombe Green Change Farmers Cooperative (KGCFC), Kapchorwa District Sukut Multi-Purpose Women's Group, Kween District	Training on potato value addition, or potato crisp processing, was conducted for 50 farmers (33 women) by Byampa Enterprises. The purpose was to create an additional income-generating pathway for women farmers. The inclusion of male farmers was a way to embrace male engagement in supporting women in the crisp processing business.	To date, MIFA has processed eight bags of potatoes (100 kg) into crisps and identified three supermarkets and one hotel in Kapchorwa as market outlets for potato crisps. The estimated current profit is UGX 2,000,000. This has become an additional source of income for women and female youth in KGCFC.
RGC, rice processing business, Tororo District	The firm has realized the importance of working with women in the marketplace as multistage machine operators, casual laborers in the drying yard, and village agents.	Of 17 full-time employees, 12 are women, and all casual laborers at the drying yard are female.

3.3

Lessons Learned

Uganda needs seed potato autonomy

Uganda cannot rely on neighboring countries or trading partners, it must produce seed potato on its own. Substantial investment in the Kenyan seed sector has taken place in recent years; however, availability of seed remains unreliable for cross-border trade. The Government of Kenya has prioritized domestic availability of seed ahead of the regional seed trade. This has been evidenced by the difficulties experienced by large-scale Uganda growers, such as Highgrow Agro/Namakwaland, when attempting to import seed from Kenya. Tobias Basson, the farm's owner and managing director, reported that it took over six months to secure permission from the Kenyan authorities to export approximately 10 MT of seed potato.

Multiple investment decisions have been or are being made based around the ability of the processing sector being readily able to access potato in a reliable and consistent manner. Experiences such as that of Highgrow Agro reinforce the message that Uganda needs to achieve seed autonomy, especially for the local multiplication of Dutch-developed varieties. Interruptions in the seed potato supply chain now have serious consequences beyond food security, impacting at an industrial level. The key to achieving autonomy lies in being able to innovate within the sector, bringing in new partnerships aligned with new technology. Uganda can and has benefited from seed technology developed outside its borders but must be ultimately responsible for the growth of the end product.

Crowding in the potato sector gaining pace

Frequently, patience over a long period of time is needed to see positive change at a system level. Change is often represented by shifts in perception of the opportunities offered by a sector. The Ugandan potato sector, which is starting to experience rapid change, is one of those. Work by the REACH-Uganda project has incentivized local seed production, de-risked investment, and introduced the food processing sector to specialized varieties fit for processing.

This change in perception has led to crowding into the sector, which has seen announcements of investment by Holland Fair Foods, Delphy, and Veris Investments without any financial support from the project. This, in combination with expansion by Highgrow Agro/Namakwaland, Kigezi Farmer Resource Center, and others, demonstrates that, if a patient approach is taken, a sector can blossom to its full potential. For these investors, knowing that there is a seed system in place capable of supplying their out-grower network, with preferred materials increased their confidence to invest.

Stakeholders need to be unified

The duty on rice imported into Uganda remains controversial. Some claim that it stifles innovation; others point out that it simply levels the playing field for domestic farmers in the face of heavily subsidized production in Pakistan, Thailand, and Vietnam. In 2020, we again saw the Government of Uganda suspending the Common External Tariff (CET) on rice imports. As a result, domestic rice prices crashed, leaving farmers and many small millers with rice that, when sold, did not cover their cost of production.

Rice is a target crop for the REACH-Uganda project. Disincentives to investment created by the suspension of the CET heavily impacted the project's targets in the rice sector. Investment by farmers and firms has been cut drastically as revenues and profits fall. Continued suspension of the CET is likely to cause further contractions in the rice sector.

The project's experience in the rice sector has demonstrated that, for an effective business enabling environment to exist, there must be unity in vision among stakeholders and platforms. Unfortunately, the Ugandan rice sector is presently dominated by two separate factions, those for the CET (Uganda Rice Growers Association) and those against it (Uganda Rice Millers Association). Those against the CET currently hold the upper hand, which is to the significant detriment of domestic producers. Going forward, IFDC recognizes the need to ensure that there is unity of vision and purpose within stakeholder platforms; otherwise, there is a significant risk that gains made will be rapidly lost.

Resilience/Climate Smart Agriculture

Households who adopt higher numbers of GAP/CSA practices are able to achieve higher yields. Potato farmers that practiced five out of 10 approaches achieved 36% higher yields, which contributes towards building resilience, than their counterparts who practiced only one. Moreover, the more critical practices for potato and rice that influence yield are now clearer. Future training will focus only on the most effective and critical practices rather than the wider menu that was adopted in the GAP/CSA training between 2017-2019.

The private sector is highly adaptive

Earlier in this report we highlighted strategies adopted by our private sector partners to overcome the challenges faced as a result of the COVID-19 pandemic. To survive, firms need to be able to function. Looking at the survival strategies employed by our partners, both high and low-tech solutions are relevant. Some firms, such as Diner's Group Ltd, opted to invest in software to streamline payments to, and sourcing from, rice farmers. Other partners, such as PFIL, focused on more rudimentary but equally vital solutions such as expanding their in-house trucking capacity.

The ISB model has challenges and opportunities but requires some subsidized support

ISBs have demonstrated that there are opportunities, which can offer greater farmer access to quality planting materials. The 13 units supported by the REACH project started to come into production in 2020. ISBs come with challenges, their business model is capital intensive in the early stages. Given that it takes 24 months before they start to generate revenue, they are not an attractive business for a financial lender. Therefore, ISBs require alternative financing models and external subsidies to get their businesses established.

ISBs are dependent on the generation of tissue culture plantlets for their starter material. At present, this is being primarily sourced from the KaZARDI lab in Kabale. This presents a logistical challenge for the transport of seedlings from there to Eastern Uganda (880 kms), where a number of the ISBs are located. In addition to the logistical challenges, KaZARDI, alongside private labs, have been unreliable in the delivery of tissue culture plantlets. In recent years, KaZARDI closed its lab unannounced for renovations for an extended period. Agromax a private tissue culture facility located on the outskirts of Kampala and was identified as a potential additional supplier of materials. Sadly, Agromax has also been unreliable in the generation of seed material and has failed to fulfill multiple orders placed by farmers. Further investigation of this situation has revealed that they had prioritized the supply of seedlings to a large institutional buyer, at the expense of small private clients.

Hope is offered to ISBs through the utilization of Rooted Apical Cuttings (RACs). These are cuttings, taken from tissue culture plantlets and then rooted in screenhouses. A tissue culture plantlet can produce approximately four RAC's before it needs to be planted out for the production of mini-tubers. RACs produce approximately 20% fewer mini-tubers per plantlet, but offer farmers the advantage of meeting the majority of their plantlet needs through self-generation of cuttings. By taking this approach, pressure could be reduced on labs who would only need to produce approximately 25% of the total material required by ISBs.


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Annex 1: 2020 Annual Report Statistics

	Performance							Narrative on Performance
	Indicator	**Baseline**	**Target**	**2017**	**2018**	**2019**	**2020**	**Cumulative**	
Goal To strengthen the efficiency and inclusiveness of the agricultural market system while contributing to improved household resilience and productivity in selected value chains in Uganda	Employment created in the chain (total additional FTE)	0	125	0	2	44	244	**290**	SWT: 222 FTE, PFIL: 15 FTE, LH: 2 FTE, CKB: 26 FTE, KFRC: 2 FTE, DGL :8 FTE, RGC 4 FTE, MSC 3 FTE, Muyambi: 2 FTE, Maziba: 6 FTE. 77% of the FTEs were created by SWT as a result of the establishment of a nucleus farm where 9 permanent staff plus 266 casual laborers were hired.
	% of farmers classified as food secure	55%	65%	47%	52%	47%	59%	**59%**	58% of rice farmers and 59% of potato farmers.
	% increase in net income of farmers attributable to potato (per acre of potato)	1,689,058	2,026,870 (20%)	3,256,152 (92%)	3,498,479 (7%)	2,666,845 (-24%)	2,667,653 (0.03%)	**19%**	Net income for potato farmers slightly increased for 2020, this is mostly due to utilization of clean seed by the farmers. The use of clean seed led to improved yields for farmers, there was a 2% increase in net income per kg for farmers who used clean seed compared to their counterparts who did not. In addition, farmers attributed the increase in net income per acre to the increase in prices of potatoes by 13%. Since some farmers could not plant potatoes in 2020 due to financial constraints, those who did, hiked their prices because of increased demand.

	Performance							Narrative on Performance
	Indicator	**Baseline**	**Target**	**2017**	**2018**	**2019**	**2020**	**Cumulative**	
Goal To strengthen the efficiency and inclusiveness of the agricultural market system while contributing to improved household resilience and productivity in selected value chains in Uganda	% increase in net income of farmers attributable to rice (per acre of rice)	800,926	961,111	1,707,299 (113%)	1,832,519 (7%)	2,486,079 (36%)	1,001,192 (-60%)	**24%**	Net income for rice farmers drastically reduced for 2020, this was due to much lower prices for milled rice as a result of COVID-19. This led to lack of market for rice as most economic activities were affected and schools, which are the strongest source of market for rice farmers, were closed. This situation was worsened by the importation of Tanzanian rice which was way cheaper compared to the usual market prices, farmers had already invested lot of finance in rice production and most of them ended up making losses for 2020. However, in comparison to the baseline, net income per acre has increased by 25%.
At the business level Higher turnover and improved efficiencies	Average % increase in turnover of MSMEs	0	10%		27%	65%	20%	**37%**	PFIL turnover increased by 18% from UGX 1,791,088,000 in 2019 to UGX 2,107,872,000 in 2020 which is attributed to the increase in the number of retail points. RGC turnover was increased by 36% from UGX 290,800 in 2019 when using a single stage mill to UGX 3,112,500,000 in 2020. DGL's turnover increased by 6% from UGX 1,118,384,486 in 2019 to UGX 1,182,975,326 in 2020. The low percentage increment was due to the high competition in the rice market which caused a fall in prices.
	Revenue per acre (Potato) UGX/acre	2,417,849	3,143,203	1,844,393	5,265,769	3,051,434	4,250,494	**4,250,494**	There was a 39% increase in revenue per acre attributed to yield increment per acre by 29% compared to 2019. This in addition to steady prices for potato for 2020 led to increased revenue for potato farmers.
	Revenue per acre (Rice) UGX/acre	1,281,018	1,665,323	1,254,188	2,056,496	3,122,359	2,754,282	**2,754,282**	12% reduction in revenue per acre of rice mostly attributed to price drops in 2020 as a result of dumping imported rice.

	Performance							Narrative on Performance
	Indicator	**Baseline**	**Target**	**2017**	**2018**	**2019**	**2020**	**Cumulative**	
At the farm level Increased income	% agricultural production sold (HH level) - Milled rice	73%	95%	89%	89%	90%	92%	**92%**	Much as prices for rice were much lower in 2020, farmers still sold almost all their milled rice to try and cover up production losses.
	% agricultural production sold (HH level) - Potato	63%	80%	63%	62%	66%	68%	**68%**	On average potato farmers sold 68% of the produce.
	% agricultural production sold to miller/value added (Rice)	66%	76%			79%	90%	**90%**	On average, farmers who supply to multi-stage mills, sell 90% of their produce to millers.
Outcome 1.1 Farmers achieve increased profitability and efficiency through access to improved market functions	% of produce sold by FG & FBGs to Agribusiness/ MSMEs (Rice)	0	50%			0%	79%		Since almost all FGs are not aggregating produce, farmers sell their rice individually. Farmers are now selling 90% of their produce to millers.
	% of produce sold by FG & FBGs to Agribusiness/ MSMEs (Potato)	0	25%			32%	32%	**32%**	32% of the produce by FGs to Agribusiness/MSME.
	% FGs supplying a MSME	0	25	N/A	N/A	49 %	58%	**58%**	Potato; 35% (PFIL) Rice (DGL 87%, LH 73% and RGC 37%) of FGs supplying.
	% farmers selling via FG/FBG (by gender) - Rice	10%	40%	0%	0%	0%	11%	**11%**	Only a few farmers reported to be supplying their rice by aggregating together with their fellow group members. Most as these farmers are paid individually as they believe costs of transportation and storage are reduced when they sell via their Farmer G roups. Of the 11% who sold via FG, 50% were female and 50% male.
	% farmers selling via FG/FBG (by gender) - Potato	0%	35%	0%	0%	5%	0%	**5%**	In 2020, potato farmers sold their produce individually. This was mainly attributed to the closure of markets during the COVID-19 pandemic.

	Performance							Narrative on Performance
	Indicator	**Baseline**	**Target**	**2017**	**2018**	**2019**	**2020**	**Cumulative**	
Outcome 1.1 Farmers achieve increased profitability and efficiency through access to improved market functions	Rice production cost per unit (KG)	656	558	881	760	823	411	**411**	Expenses were incurred on hiring land, land preparation, labor for planting, purchase of inputs, weeding, bird scaring, harvesting, and milling.
	Potato production cost per unit (KG)	343	292	450	376	392	433	**433**	Expenses were incurred on labor for planting, land preparation, purchase of inputs.
	% farmers using at least 2 identified support services (disaggregated by gender and age category)	0	30%	8%	14%	39%	27%	**27%**	Support services accessed included extension services, financial services, spray services, and agro-input services. 72% of all rice farmers had used at least one of the mentioned support services while 56% of the potato farmers had used at least one of the support services :39%, Rice 15% Potato.
Outcome 1.2 Agribusinesses and service providers are able to achieve higher sales and expand clientele by offering better input services and transactions.	% increase in volumes purchased from FGs/FBGs	0	20%	N/A	N/A	14.5%	10%	**42%**	Potato: 4% increase in volumes sourced from FGs. Rice: 15% increase in the volume of paddy sourced from farmer groups.
	% increase in volumes sold	0	15%			25%	14%	**53%**	PFIL volumes sold increased by 18% from 112 MT in 2019 to 132 MT in 2020. There was slight increase in volumes sold in 2020, due to the lock down as there was limited movements which led to a reduction of sales by 50% between April and September. The volume of rice sold by DGL increased from 546 MT in 2019 to 595 MT in 2020, indicating a 9% increase. The slight increase in sales was caused by the very high competition in the rice markets following the high importation of Tanzanian rice which was sold at a very cheap price. Additionally, the COVID-19 lockdown greatly affected sales since sourcing was limited and markets were almost closed.
Output 1.1 Agribusinesses, service providers screened and selected.	# lead firm/MSMEs screened	0	50	13	22	23	11	**69**	A cumulative total of 69 MSMEs have been identified and screened for potential engagement by IFDC (Clarke, Rwengaju, Batuma, New Bukumbi coffee, FICA, Kakie, Pearl Seed and screenhouse owners (Maziba, Bitamba and two ISBs).

	Performance							Narrative on Performance
	Indicator	**Baseline**	**Target**	**2017**	**2018**	**2019**	**2020**	**Cumulative**	
Output 1.1 Agribusinesses, service providers screened and selected.	# lead firms/MSMEs selected	0	25	5	14	11	9	**26**	Cumulatively, REACH-Uganda has selected and implemented 26 partnerships i.e. 6 in rice, 18 in potato value chains and 2 cutting across. Potato partnerships include 5 involved in producing seed and ware potato with Dutch varieties (Clarks, FICA, Namakwaland, New Bukumbi Coffee and Kakie).
Output 1.2 Develop, formalize and implement partnership agreements with business plans	# action plans implemented with FBGs	0	50	1	1	24	5	**31**	DGL (4), Kibimba (2), RGC (3), PFIL (2), MIFA (2), KGCFC (5), SUKUT (4), GPL (1) and MSC (2) LH (2), NBC (2). These are the actions implemented to directly benefit farmers within each DCA, including sourcing, trainings, drying, access to finance, access to inputs etc.
	# business plans implemented with MSMEs	0	25	5	12	17	26	**26**	26 signed partnerships are actively implementing plans in line with the Detailed Collaboration Agreements signed.
Output 1.3 Public facilitation leverages private investment and introduction of innovative businesses practices.	Amount (Euros) invested by private sector through partnerships	0	EUR 1.0m	EUR 0.33m	EUR 1.12m	EUR 4.05m	EUR 1.38m	**EUR 6.88**	

	Performance							Narrative on Performance
	Indicator	**Baseline**	**Target**	**2017**	**2018**	**2019**	**2020**	**Cumulative**	
Output 1.3 Public facilitation leverages private investment and introduction of innovative businesses practices.	# innovative business practices introduced	0	50			12	3	**15**	These have been introduced within Interventions including: ◦ Commercial production of new Dutch varieties. ◦ Cost effective and practical screenhouses for farmers. ◦ Farm ponds to collect and reserve water for seed potato multiplication. ◦ Development of rice scheme with SWT to produce locally grown rice. ◦ Automated crisps processing equipment and machinery, new flavors of crisps to the Ugandan market. ◦ Lowland Rice seed production. ◦ 2 gravity flow drip irrigation systems. ◦ Sourcing plan for in-vitro plantlets with Agromax. ◦ Introduction of multi-stage to replace single stage mills. ◦ Use of moisture meters before milling at RGC. ◦ Establishment of cold rooms. ◦ Establishment of the ambient stores. ◦ Introducing seed potato production in Eastern Uganda. ◦ Business digitalization for marketing and service delivery.
Output 1.4 FBGs, FG and Farmers are able to access financial products for productive investments.	% FGs accessing loans	17.43%	30%	9%	7%	13%	33%	**33%**	62 farmer groups were sensitized about the MSC loan plans surpassing the original target of 60 farmer groups. Furthermore, 10 groups received loans from MSC with the average amount of UGX 20,000,000 per farmer group, representing 200 farmers with a total of UGX 206,000,000 accessed loans from MSC.
	% farmers accessing loans	16%	30%	39%	37%	37%	26%	**26%**	19% and 33% of rice and potato farmers respectively accessed loans from financial institutions in the year 2020.
Output 1.5 Work placements created at FBGs and MSMEs	# work placements created	0	100	0	31	42	0	**73**	Activity completed in 2019.

	Performance							Narrative on Performance
	Indicator	**Baseline**	**Target**	**2017**	**2018**	**2019**	**2020**	**Cumulative**	
Output 1.6 Youth entrepreneurs supported to be Spray Service Providers (SSPs).	# youth spray service providers trained	0	100	27	83	137		**137**	Activity completed in 2019.
	# youth sprays service providers operating a functioning business	0	50	0	28	113			In an effort to increase visibility of SSP work, promotional activities have been conducted for selected SSPs from those trained in 2019. These promotional activities include establishment of demos, radio talk shows and farmer field days. Eight SSPs in the South-West and 11 SSPs in the East have been engaged. From this, 60% of the beneficiaries are women and youth through indirect knowledge transfer to other fellow SSPs and learning from the farmer field days. This business awareness activity increased demand for spray services attracting 56 new farmer customers. On average, over 2,000 acres are sprayed by SSPs in a season.
Output 1.7 Dutch developed potato varieties registered and/ or promoted through National Varietal Performance Trials and commercial linkages.	# of new Dutch potato varieties registered	0	15	0	7	16 under trials			8 varieties were evaluated and have been put forward to the Varietal Release Committee (VRC) which will meet in quarter two of 2021.
	# businesses introducing and or using Dutch potato varieties in the Ugandan market	0	2	1	5	5	11	**11**	5 businesses including Namakwaland, Clarke farm, Kakie, FICA and New Bukumbi Coffee are producing Dutch potato varieties for the Ugandan market. Previously, 5 Dutch Seed companies participated in supplying seed potato for evaluation under NVPTs in 2018. These include HZPC, AGRICO, Den Hartigh B.V, Europlant and Meijer B.V.
	# seed multipliers linked to Dutch businesses	0	10	0	0	1	2	**3**	Namakwaland farm, Clarke farm and FICA have been linked to Dutch seed potato breeders to multiply Dutch seed.

	Performance							Narrative on Performance
	Indicator	**Baseline**	**Target**	**2017**	**2018**	**2019**	**2020**	**Cumulative**	
Output 1.8 Additional local businesses and screenhouse owner (associations) are supported to make bacteria and virus free seed potato planting material on the Ugandan market.	MT of clean seed potato produced and supplied per year	0	1000	163	668	1,999.7	1,263.6	**4,094.3**	A total of 239,005 mini-tubers were produced in 2020 from 4 screenhouses (CKB, KFRC, Maziba, Justus, Jonas and Welishe). In 2020 Season A, a total of 539.7 MT of clean seed was produced (14.02MT of pre-basic,33.03 MT of basic and 492.7 MT of QDS) 2020 Season B, 723.9 MT of clean seed produced (12.44 MT of pre-basic, 44.85 basic and 666.6 MT of QDS)
	# new screenhouses established and operational (related to additional funds)	0	6	-	-	5	4	**9**	8 partnerships with screenhouse installation were signed, 5 of these are in the South-West and 3 in the East; including CKB, KFRC, MIFA, MUYAMBI, Maziba, Bitamba, Welishe and Chemonges.
Output 1.9 Up to EUR 1.0 million earmarked for joint investment in public infrastructure through match funding with District Local Government.	Amount invested in public infrastructure (roads, irrigation, storage)	0	EUR 1.5 m	EUR 0.34m	EUR 0.34m	EUR 1.28m	0	**EUR 1.28m**	
	# km of roads constructed and rehabilitated between farmers and markets	0	25	0	44.13 opened	23.3		**67.43**	Completed.
	# farmers within road catchments.	0	19,000	-	76,988	149,083	156,848	**156,848**	
At the farmer level Improved productivity and resilience	% of farmers are practicing 3 (of 4) resilience measures	0	50%	23%	71%	89%	94%	**89%**	96% and 92% of the potato and rice farmers respectively practiced 3 (of 4) resilience measures.
	% farmers increase their yields to 2 MT/ acre for rice and 5.5 MT/acre for potato (disaggregated by gender and age category)	10%	50%	16%	39%	20%	26%	**26%**	25% for rice 26% for potatoes

	Performance							Narrative on Performance
	Indicator	**Baseline**	**Target**	**2017**	**2018**	**2019**	**2020**	**Cumulative**	
Outcome 2.1 As a result of training farmers increase their yields (potato and rice) to at least 65% optimal level	Average yields for rice (MT, disaggregated by gender)	0.6	2.0	0.6	0.97	0.99	1.44	**1.44**	Season A; 1.52 MT/acre. Season B; 1.36 MT/acre. F: 1.2 MT/acre. M: 1.5 MT/acre.
	Average yields for potato (MT, disaggregated by gender)	3.07	5.0	3.9	4.75	3.08	3.98	**3.98**	Season A; 4.33 MT/acre. Season B; 3.53 MT/acre. F: 3.71 MT/acre. M: 4.11 MT/acre. While for farmers using QDS average is 4.40 MT. Season A; 5.26 MT/acre. Season B; 4.58 MT/acre. F: 4.64 MT/acre. M: 3.57 MT/acre.
Outcome 2.2 Farmers adopt and use resilience strategies	% farmers have diversified their income (disaggregated by gender and age category)	50%	70%	99%	99%	99%	99%	**99%**	Almost all farmers trained had other sources of incomes besides rice and potato production. These include other crop production, livestock and owning small businesses.
	% of farmers have access to finance (disaggregated by gender and age category)	27%	50%	28%	29%	33%	39%	**39%**	39% of all farmers have access to finance through formal financial institutions whereas 84% of farmers have access to finance through VSLAs.
	% of female farmers with input into decision making at household level	45%	60%	67t%	60%	87%	66%	**66%**	64% and 67% of female rice and potato farmers reported to have input in most or all decisions at HH level. While women farmers were reporting their contribution to household affairs, they are however still facing financial constraints that limit their empowerment in decision-making, this was especially so in 2020 where most economic activities were affected.

	Performance							Narrative on Performance
	Indicator	**Baseline**	**Target**	**2017**	**2018**	**2019**	**2020**	**Cumulative**	
Outcome 2.2 Farmers adopt and use resilience strategies	% of farmers use climate smart approaches in agriculture (disaggregated by gender and age category)	0%	70%	99%	99%	99%	100%	**100%**	All rice and potato farmers had used at least one CSA approach. Out of these 62% had used 4 out of the 10 approaches while only 38% had used up to 5 of the 10 approaches.
	% farmers using at least 4 good agricultural practices in rice and potato production	0%	70%	84%	79%	77%	92%	**92%**	Farmers have improved their farming practices with 88% and 96% of all trained potato and rice farmers practicing at least 4 GAPs in their farming. Better yet, 25% of these farmers go ahead and practice all the recommended GAPs in potato and rice production.
	# VSLAs established and trained	0	1500	705	904	449		**1,353**	84% of all farmers belong to a VSLA at a farmer group level.

Annex 2: Summary of Business Partnerships

Partner	Value chain	Intervention area	Main activities	Key achievements as at December 2020
Psalms Food Industries Limited (PFIL)	Potato	Local potato value addition through processing crisps	◦ Engage consultant to review process flow and plant layout ◦ Expansion of factory space 179M^2 to 392M^2 ◦ Purchase and installation of processing machinery and equipment (fryer, packaging, peeler, slicer) ◦ Developing a brand and new packing materials ◦ Launching a new brand on market and brand promotion ◦ Developing new product flavours ◦ Developing a strategic plan and business plan ◦ Training staff in sales and marketing, operation of machines and equipment ◦ Developing a sourcing plan from farmers.	◦ In 2020, PFIL sourced a total of 527 MT; 357.8 MT of local varieties from farmers and traders and 169.2 MT of Dutch varieties from Namakwaland and New Bukumbi Coffee. ◦ The production has increased to 100 kg/hour, 132 MT crisps were produced in 2020 which is an increment of 18% from that of 2019. ◦ Eight additional FTEs created and trained in 2020 with an additional income of EUR 8,628. Five sales staff were recruited to support with the promotion and sale of PFIL products. This brings the cumulative number of FTEs created to 15 by end of December 2020. ◦ PFIL crisps sale turnover increased by 18% with additional revenue of EUR 243,703 by December 2020. This is attributed to the increased number of the retail point. ◦ 485 retail points were established by December 2020.
Kibimba Limited (KL)	Rice	Certified seed production for small farmers and paddy sourcing from farmers	◦ Acquire license and foundation seed to produce certified seed. ◦ Seed multiplication, processing, packaging, and branding. ◦ Recruit four field extension workers ◦ Procure motorcycles ◦ Setting up demonstration plots and marketing of seed. ◦ Develop a sensitization and sourcing plan for paddy.	◦ 20 demonstration plots were in several places in Bugiri and Tororo districts where WITA 9 seed was planted and harvested towards obtaining higher production and productivity. The demonstrations harvested with maximum 700 kgs and minimum 560 kgs. Four brown field days where 150 farmers participated as an avenue of creating awareness of the WITA 9 variety. ◦ 1.3 MT of foundation seed was procured to produce seed crop. ◦ Seed processing unit of 2 MT per hour capacity, complete with cleaner, grader and packaging unit has been procured and installed. ◦ KL harvested 194.4 MT of seed crop of which 83.7 MT were used on their own land. 6.9 MT were sold to farmers and seed companies. 5.5 MT were sold and benefitting 551 farmers. ◦ Additional sales from certified seed worth EUR 2,966.

Partner	Value chain	Intervention area	Main activities	Key achievements as at December 2020
Diner's Group Limited (DGL)	Rice	Farmers make more use of more efficient milling services, producing rice that is of higher value and more in demand in the market	◦ Assessing DGL's working capital requirement ◦ Develop sourcing plan for paddy ◦ Recruitment of field agents and purchase of two motorcycles ◦ Purchase of 12 MT truck to transport paddy from farmer communities ◦ Purchase and distribution of 215 tarpaulins to farmer groups ◦ Develop and design new log and packaging material ◦ Engage financial service provider ◦ Sensitization and seasonal review meetings with farmers and DGL ◦ Expansion of Kampala outlet.	◦ Increased sourcing of paddy from 52 farmer groups by 15% from 679 MT to 779 MT. This has been mainly enhanced by the truck which is used to source paddy from farmers at a lower cost. Additionally, farmer sensitization and mobilization by the 2 extension workers boosted awareness of DGL's milling services. ◦ DGL's turnover increased by 6% from EUR 251,300 in 2019 to EUR 265,813 in 2020. The low percentage increment was due to the high competition in the rice markets which caused a decline in demand plus a fall in prices. ◦ 8 additional FTEs were created earning an additional income of EUR 5,733.
Mengya Integrated Farmers' Association (MIFA)	Potato	Establishing commercially viable seed potato business	◦ Irrigation demonstration. ◦ Develop a sourcing for clean in-vitro plantlets ◦ Establish a screenhouses ◦ Train members and workers in screenhouse operation and management ◦ Establish diffused light sores ◦ Branding of MIFA seed potato.	◦ Established a diffused light store with a capacity to store 60 MT of clean seed. ◦ 15 MIFA farmers were trained on clean seed production while 4 were trained on screenhouse management. ◦ With technical guidance from REACH, MIFA purchased 8 MT of basic seed which was used to produce 62 MT of Quality Declared Seed (QDS). 32 MT was sold to 40 other farmers while the 30 MT were retained by the 25 MIFA farmers for production of ware potatoes. ◦ The established irrigation system enabled 47 farmers to access constant water supply in 2020 Season B on 106 acres. 50% of the crops grown using irrigation were potatoes while the rest were vegetables such as cabbages and onions.
SWT Tanners Ltd.	Rice	Increase sourcing of local paddy for milling by facilitating investment in scheme development and relevant agricultural services	◦ Land identification, testing and acquisition. ◦ Carry out general and topographic surveys to develop the land ◦ Opening of the land ◦ Develop a master plan and a business plan ◦ Develop access roads ◦ Develop water infrastructure ◦ Sourcing paddy from farmers ◦ Provide transport services to farmers while sourcing paddy ◦ Develop an SWT Ugandan brand ◦ Procure equipment and machinery to facilitate farm operations.	◦ Purchased 1.2 MT of WITTA 9 rice seed from KL for production of rice. ◦ Using the nucleus farm, SWT produced 337.4 MT of paddy in 2020 from 300 acres. ◦ Additional turnover for SWT from selling milled rice is EUR 582,229. ◦ Established farm structures such as; farm buildings, water infrastructure among others. ◦ Created 222 FTEs who earned an average income of EUR 98,203. These resulted from the establishment of a nucleus farm where nine permanent staff plus 266 casual laborers were hired.

Partner	Value chain	Intervention area	Main activities	Key achievements as at December 2020
St. Richards Group of Companies (RGC)	Rice	Farmers make use of efficient milling services and produce higher valued rice	◦ Expansion of the drying yard ◦ Purchase of moisture meters ◦ Training of village agents in post-harvest handling ◦ Renovation of the building to install the new multi-stage milling machine ◦ Purchase the multi-stage milling machine.	◦ 481 MT of paddy was sourced and milled at RGC using the multi-stage mill by December 2020. ◦ 370 farmers milled using the multi-stage mill out of the 1,069 farmers milling from RGC as of December 2020. The multi-stage mill started operations from August 2020. ◦ 4 (2 males and 2 females) staff employed at RGC and involved in the operation of the multi-stage mill with additional income of EUR 971 per year. ◦ Additional turnover for RGC of EUR 185,329 from selling better quality milled rice.
Charles K. Byarugaba (CKB)	Potato	Establishing commercially viable seed potato business	◦ Develop sourcing plan for plantlets ◦ Construction of a screenhouse ◦ Construction of farm ponds & installation of 3.2 acre pressure compensating drip irrigation ◦ Construction of diffused light store.	◦ With Technical guidance from REACH, CKB produced a total of 13.8MT of pre-basic seed, 53% of this was from the new additional screenhouse (7.32 MT), and 58.75 MT of basic seed in 2020. The basic seed was sold to NAADS (OWC). From the 58.75 MT of basic seed, integrated seed multipliers are expected to produce 411.3 MT of QDS which will benefit 514 farmers for ware potato production. ◦ 26 FTEs created with additional income of EUR 11,713. ◦ CKB earned a turnover of EUR 37,369 from sale of pre-basic and basic seed in 2020. ◦ With a production potential of 405.1 MT basic seed from two SHs, over 3,500 farmers can benefit from 2835 MT of QDS produced. This will depend on constant and reliable supply of plantlets for all seasons.
Kigezi Farmer's Resource Center (KFRC)	Potato		◦ Develop sourcing plan for plantlets ◦ Construction of a screenhouse ◦ Construction of diffused light store ◦ Develop a marketing plan for seed ◦ Conduct radio talk shows.	◦ In 2020, with technical support from REACH, KFRC produced a total of 40,230 mini-tubers. 39% of these were produced from the new screenhouse. Additionally, 8.2 MT of pre-basic seed were produced and multiplied into 16 MT of basic seed. ◦ Earned a turnover of EUR 7,141 from sales of basic seed. ◦ From the 16 MT of basic seed, Integrated seed multipliers are expected to produce 113.3 MT of QDS that will be sold to 139 farmers for ware potato production. ◦ 2 FTEs were created earning an additional income of EUR 1,079. ◦ With the reliable supply of plantlets, over 387 farmers will benefit from clean seed production given KFRC's potential of 44.3 MT of basic per year.
Kapchosombe Green Change Farmers' Cooperative (KGCFC)	Potato	Establishing commercially viable seed potato business (from basic seed to QDS)	◦ Improvement and expansion of irrigation system ◦ Establishment of water user committee ◦ Sourcing clean basic seed for planting ◦ Training in QDS seed production ◦ Establish a diffused light store ◦ Support marketing for QDS produced.	◦ Established a diffused light store with a capacity to store 60 MT of clean seed. ◦ Procured 2.96 MT of seed and planted 2 MT of the seed on the collective land of 3 acres. This yielded 20 MT. ◦ 14 farmers benefitted from the use of the QDS produced at KGCFC. ◦ 11 farmers benefitting from using the irrigation system on seven acres. 50% of the crops grown using irrigation were potatoes while the rest were vegetables such as cabbages and onions. ◦ Additional income for farmers using QDS is EUR 6,117. ◦ Additional turnover for KGCFC from the sale of QDS is EUR 2,966

Partner	Value chain	Intervention area	Main activities	Key achievements as at December 2020
Grain Pulse Limited (GPL)	Cross cutting	Farmers have access to crop specific fertilizers and information on how to use them	◦ Selection & assessment of stockists ◦ Training of selected stockists and lead farmers /agents/CATS ◦ Establishment of demonstration plots ◦ Increased market activation through pocket guides/booklets, leaflets, and banners ◦ Increased market activation of the crop specific fertilizer blends through radio talk shows.	◦ 42 potato and 30 rice demonstration plots were established with crop specific fertilizers. ◦ Increased awareness of crop specific fertilizers among farmers by conducting 20 radio talk shows in the Southwest and Eastern Uganda. ◦ Because of COVID-19, demonstrations could not be held as planned, therefore farmers are still somewhat unconvinced of the benefits of the GPL blends. Once the situation normalizes and GPL undertakes aggressive marketing, farmers will start demanding and using the crop-specific fertilizers.
Microfinance support center (MSC)	Cross-cutting	Farmers and service providers have better access to financial products and services.	◦ Recruitment of 4 agriculture loan officers ◦ Procure 4 motorcycles and 4 desktop computers for the credit assistants ◦ Conduct sensitization meetings to popularize MSC products to farmers ◦ Review the current MSC financial products. ◦ Identify and select potential farmer groups eligible for lending ◦ Training of community extension workers in GAPs.	◦ Recruited 3 credit assistants to support with the sensitization of farmers on the MSC loan products. These earn an additional income of EUR 5,986. ◦ 62 farmer groups were sensitized on the MSC products in both regions (30 farmer groups in the South-West and 32 in the East). ◦ 10 groups received loans as of December 2020 with the average amount of EUR 4,494 per farmer group, representing 200 farmers with a total of EUR 46,288. ◦ Additional turnover for MSC from the disbursement of loans EUR 30,649 ◦ Additional income for farmers EUR 22,470.
Lwoba Holdings (LH)	Rice	Farmers make use of efficient milling services and produce higher valued rice	◦ Recruitment of field agents ◦ Construction of a one-acre concrete drying yard ◦ Training on post-harvest handling of paddy ◦ Linkage to MSC for loans to LH and farmers of Manafa River Basin Cooperative ◦ LH to operate as a distributor of inputs like fertilizers, pesticides, and certified rice seed from Grain Pulse and Kibimba Ltd. ◦ Training staff on agro-inputs handling.	◦ 1,042 MT of rice has been milled at LWOBA by December 2020. ◦ 1,604 MT of paddy was sourced 891 farmers of which 360 Farmers were from the Manafwa Basin. ◦ LH purchased 400 kgs from KL at EUR 1.12 which was purchased by 27 farmers. ◦ Establishment of 30 demonstrations plots with inputs (20 demonstrations with Pearl seeds foundation seed and 10 demonstrations with rice-specific fertilizers from Grain Pulse). ◦ 98 farmers participated in the farmer field days as an avenue of creating awareness of the inputs. ◦ 2 FTEs were created earning an additional income of EUR 2,966. ◦ LH's turnover was EUR 562,339 as at December 2020.

Partner	Value chain	Intervention area	Main activities	Key achievements as at December 2020
Agromax	Potato	Supporting the development of seed potato market	◦ Identification of farmers and farmer groups with capacity and skills to operate screenhouses ◦ Purchase and installation of screenhouses based on specifications ◦ Develop a sourcing plan for plantlets ◦ Execution of technical assistance ◦ Seed potato quality assurance, certification, and promotion.	◦ Constructed 8 new screenhouses and repaired 5 existing screenhouses for 10 ISBs. These screenhouses are currently being utilised for production of clean seed (mini-tubers). ◦ Installed 8 irrigation systems within the new screenhouses. These have enabled constant water supply leading to all year-round production of clean seed.
Sukutu Multipurpose Women Group (SMWG)	Potato	Establishing commercially viable seed potato business (from basic seed to QDS)	◦ Training in seed production ◦ Sourcing of clean basic seed for planting ◦ Exposure learning visit to MIFA ◦ Establish a diffused light store ◦ Support marketing of seed potato.	◦ Planted 1.6 MT of basic seed sourced from CKB for production of QDS. ◦ Capacity building and training of 20 (12 females and 8 males) SMWG farmers on clean seed production, learning visit to MIFA for the 3 farmer members. ◦ Produced 1.1 MT of clean seed with technical guidance from REACH.
Byampa Enterprise	Potato	Women benefit from access to information, skills and opportunities	◦ Develop new packs for crisps ◦ Purchase of digital weighing scale and sealing machine ◦ Upgrading of production room, installation of electricity, installation of water tank ◦ Develop a marketing plan ◦ Procurement of semi-automated processing equipment ◦ Training in operation of machinery and equipment ◦ Develop annual sourcing plan for raw materials ◦ Construction of storage unit.	◦ Acquired processing equipment for processing crisps which have enabled the enterprise to process 22 kg of crisps from each 100 kg of potatoes. Byampa has not been able to process crisps as expected due to setbacks like the collapse of the production structure caused by hailstorms. ◦ Branded and developed new attractive packs for crisps which have increased her visibility in the market. In 2020, Byampa was able to sell 1.54 MT of crisps earning her a turnover of EURO 4,314. ◦ Trained a total of 50 farmers on crisps processing in the Eastern region.

Partner	Value chain	Intervention area	Main activities	Key achievements as at December 2020
Highgrow Agri (Namakwaland farm)	Potato	Establish a value chain for new (Dutch) potato varieties	◦ Secure market for Dutch potato varieties. ◦ Purchase and transportation of seed potato (basic) to Namakwaland Farm ◦ Produce seed potato of Dutch potato varieties in Uganda ◦ Popularize Dutch potato varieties among farmers ◦ Connect Namakwaland Farm to the National Grid of Electricity ◦ Construct and install a cold chain storage unit.	◦ Imported 84 MT of Markies and Taurus seed potatoes for production of ware potatoes. ◦ Produced 247.87 MT of ware potato (83.08 MT of Taurus and 165.8 MT of Markies). ◦ Trained 30 NBC farmers on pest and disease management, irrigation, and post-harvest management. With these skills, the farmers were able to produce ware potatoes of Taurus and Panamera Dutch varieties. ◦ Purchased and installed a cold chain storage unit with a capacity to store approximately 200 MT of seed potato. ◦ Additional turnover from sales of 228.37 MT ware potato of EUR 65,361.
Muyambi William	Potato	Establishing commercially viable seed potato value chain from plantlets to basic seed to producing QDS at affordable prices	◦ Purchase and installation of a screenhouse. ◦ Linkage of Muyambi to Agromax to source plantlets. ◦ Construction of a diffused light store ◦ Promoting clean quality seed potato.	◦ Installed a screenhouse with a capacity of 3,400 plantlets and constructed a DLS which has the capacity to store 38 MT of seed potato. ◦ Purchased 1,500 plantlets which were multiplied into 3,810 apical cuttings planted in the new screenhouse. ◦ 2 FTEs were created earning an additional income of EUR 906.
Welishe	Potato	Establishing commercially viable seed potato business from plantlets to basic seed.	◦ Develop sourcing plan for plantlets ◦ Construction of a screenhouse ◦ Construction of DLS ◦ Promoting clean quality seed.	◦ A screenhouse with a capacity of 3,400 plantlets was installed. ◦ Purchased 700 plantlets from Agromax for production of basic seed that were propagated into 1000 apical cuttings. ◦ Welishe yielded 3,000 mini-tubers in the screenhouse. These plantlets are expected to produce over 7 MT of pre-basic seed once planted. ◦ Training of 2 staff on the screenhouse management.
Chemonges	Potato	Establishing commercially viable seed potato business from plantlets to basic seed	◦ Develop sourcing plan for plantlets ◦ Construction of a screenhouse ◦ Construction of DLS ◦ Promoting clean quality seed.	◦ A screenhouse with capacity for 1700 plantlets was installed. ◦ Training of 2 staff on screenhouse management. ◦ Placed an order for 2,000 plantlets with Agromax.

Partner	Value chain	Intervention area	Main activities	Key achievements as at December 2020
Bitamba	Potato	Establishing commercially viable seed potato business from plantlets to basic seed	◦ Develop sourcing plan for plantlets ◦ Construction of a screenhouse ◦ Construction of DLS ◦ Promoting clean quality seed.	◦ A screenhouse with a capacity of 3,400 plantlets was installed. ◦ Bitamba placed an order of 1,000 plantlets from NARO KAZARDI. ◦ Training of Bitamba in screenhouse management from CKB.
New Bukumbi Coffee (NBC)	Potato	Establish a value chain for new (Dutch) potato varieties	◦ Secure market for Dutch potato varieties. ◦ Produce ware potato of Dutch potato varieties in Uganda ◦ Popularize Dutch potato varieties among the farmers ◦ Improved storage and marketing of ware potato (construction of the ambient store).	◦ Imported 25 MT of Taurus seed varieties and 12.5 MT of Panamera for production of ware potatoes. This seed was distributed to a total of 49 farmers for planting on at least 1 acre. ◦ 30 NBC farmers were trained at Namakwaland on pest and disease management, irrigation and post-harvest management. With these skills, these farmers were able to produce ware potatoes of Taurus and Panamera Dutch varieties. ◦ The farmers had an average yield of 3.3 MT/acre per farmer. The farmers yielded 160 MT and a total 144 MT was purchased by NBC (106 MT of Taurus and 38 MT of Panamera Variety). 82.9 MT of Taurus variety supplied to PFIL at EUR 24,216 and 9 MT sold to the surrounding farmers. ◦ Low farmer yields are attributed to too much rain, poor management of fields as well as lack of crop protection inputs. Going froward, NBC is resorting to more training of individual farmers in proper GAPs as well as better management of crop protection inputs. ◦ Turnover from the sale of ware potatoes to potential customers was EUR 25,470. ◦ NBC farmers earned an additional income of EUR 24,272 from sale of potatoes to NBC.
Clarke farm	Potato	Establish a value chain for new (Dutch) potato varieties	◦ Secure market for Dutch potato varieties. ◦ Installation of the appropriate irrigation system ◦ Produce seed potato of Dutch potato varieties in Uganda ◦ Popularize Dutch potato varieties among the farmers ◦ Construct and install a cold chain storage unit.	◦ Purchased potato seeder, ridger and harvester that have enabled mechanised and efficient production of Dutch potatoes varieties. ◦ Installation of the cold storage unit with capacity of 180 to 200 MT of seed potato. ◦ Received 25 MT of Panamera seed for production of ware potato. ◦ Yielded 159 MT of ware potatoes with average yield of 5.5 MT /acre across all fields and a highest yield of 8.1 MT/acre from the best performing field. This is mainly attributed to GAPs and proper use of crop protection inputs. ◦ 23 FTEs created at Clarke with additional income of EUR. 2,427. ◦ Additional revenue of EUR 27,263 for Clarke from selling ware potatoes.

Partner	Value chain	Intervention area	Main activities	Key achievements as at December 2020
Pearl Seeds	Rice	Farmers have access to more appropriate cost-saving and yield-increasing production inputs (seed) and have access to more information on how to use these and other Good Agricultural Practices (GAPs)	◦ Foundation seed procured, and seed crop produced ◦ Required infrastructure for seed processing developed ◦ WITA-9 and the newly released seed varieties tested on farms ◦ Popularization of the certified seed.	◦ Identified and trained 60 out-growers on seed crop production in the districts of Iganga, Bugiri, Butalejja and Tororo. The trainings focused on water management and its implication on pest prevalence, plant spacing and its implication on overall seed yield, and other general agronomic practices such as cost-effective weed management options to minimize weed prevalence. ◦ Procured 900 kgs of WITA-9, 200 kgs of ARU and 150 kgs of MET 12 foundation to produce seed crop, 9.13 MT of seed crop (WITA-9-2.8 MT, MET 12-3.75 and ARU-2.58 MT) was harvested from the demonstration plots hosted by out-growers farmers. ◦ Procured a seed processing unit of 2 MT.
FICA	Potato	Establish a value chain for new (Dutch) potato varieties	◦ Secure market for Dutch potato varieties. ◦ Installation of the appropriate irrigation system ◦ Produce seed potato of Dutch potato varieties in Uganda ◦ Popularize Dutch potato varieties among the farmers. ◦ Construct and install a cold chain storage unit.	◦ Procured a potato seeder, ridger and harvester to enable mechanised and efficient production of Dutch potatoes varieties. ◦ Secured a certificate or registration from MAAIF to operate as a seed producer.
Maziba Progressive Farmers Resource Centre Ltd (MPFRC)	Potato	Establishing commercially viable seed potato business from plantlets to Basic seed	◦ Purchase and installation of a screenhouse. ◦ Sourcing of approximately 3,200 plantlets ◦ Construction of a DLS ◦ Promoting clean quality seed potato.	◦ A screenhouse with a capacity of 3,400 plantlets plus a DLS with a capacity to store 40MT of seed were constructed. ◦ Maziba purchased 1,035 plantlets which he propagated into 16,389 apical cuttings. From the cuttings, a total of 72,546 mini-tubers were produced which yielded 4.4 MT of pre-basic seed. ◦ With technical support from REACH, Maziba earned a turnover of EUR. 2,902 from sales of mini-tubers and pre-basic seed. ◦ 6 FTEs were created earning an additional income of EUR. 1,941.

Partner	Value chain	Intervention area	Main activities	Key achievements as at December 2020
KAKIE Farm	Potato	Establish a value chain for new (Dutch) potato varieties	◦ Import certified seed for ware potato production ◦ Installation of the appropriate irrigation infrastructure ◦ Import of farm equipment and machinery ◦ Import elite seed for seed potato production ◦ Popularize Dutch potato varieties among the farmers ◦ Construct and install a cold chain storage unit.	◦ Imported 12.5 MT of Panamera variety which yielded 8.4 MT of ware potato. The low yield was primarily due to the terrible weather conditions characterized by floods which affected most of the crops while in the garden, in addition to lack of crop protection inputs. ◦ Purchased potato seeder, ridger and harvester that have enabled mechanized and efficient production of Dutch potatoes varieties. ◦ Constructed a concrete foundation and installed a steel structure awaiting installation of the cold room for proper storage of seed potato. ◦ Additional turnover from sales of 4.8 MT of ware potato was EUR. 1078.56.

Annex 3: EKN Indicators

Outcome	Indicator	Achievement	Comment
Peoples' nutrition improved	# people with improved food intake	23,081	23,081 farmers out of the total number 39,121 diversified their food intake.
	# people with improved access to healthy diverse food	N/A	
Economic performance and resilience of farmer systems increased	# farmers with increased productivity	9,463	9,463 farmers increased productivity through trainings on GAP, CSA, (26% of the trained farmers).
	# farmers with increased income (net)	12,375	12,375 farmers achieved increased net income from higher yields through CSA and GAP (22% of potato and 46% of rice farmers, 34% overall average).
	# farmers with improved access to services	10,563	Through trainings on GAP, CSA and financial literacy, farmers were able to access support services such as: extension services, financial services, spray services, and agro-input services.
	# farmers more resilient to shocks	36,774	Adopted 3 or 4 resilience measures which included: CSA, access to formal finance, income diversification and joint decision making in the household.
	# hectares of farmland that become more resilient	3,047	38% of the trained farmers practiced 5 out of 9 CSA practices. Average acreage is 0.5 acres equals 0.22 hectares.
Quality of private sector development of FNS increased	# jobs created in agro food sector	244	The 244 FTEs were primarily created for on-farm production and factory operation management
	# value chains/sectors that perform better		
	# businesses co-investing in FNS activities	23	Of the 26 partners, 23 business co-invest in FNS activities.

Annex 4: Economic Analysis of Screenhouse (Subsidy-KFRC)

Costing of screenhouse mini-tuber production (capacity of screenhouse is approximately 1,536 plantlets)

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Soil excavation and collection (5 tipperfuls sterilising units by 2 man days)	man days	2	1	2	5,000	10,000	KFRC does not sell mini-tubers or pre-basic seed, only sells basic seed.
Transport (5 tipperfuls @15,000 used for 2 season) i.e 2.5 tipperfuls per season	tipperfuls	2.5	1	2.5	15,000	37,500	
Labour loading soil	tipperfuls	2.5	1	2.5	5,000	12,500	
Sand purchase; 1 big tipperful at 70,000, loading 5,000 and transport 50,000 used for 2 seasons (i.e 125,000)	tipperfuls	0.5	1	0.5	125,000	62,500	
Gunny bags for soil sterlization (18 bags @ 1,200)	pcs	18	1	18	1,200	21,600	
Labour soil sieving and bagging and loading into sterlization unit 2 people @ 2 days	man days	2	2	4	5,000	20,000	
Soil/sand sterilization (3 rounds @ 2 people loading and cooking UGX 5,000)	man days	4	3	12	5,000	60,000	
Off-loading (3 rounds @ 2 people half day @ 5,000)	man days	1	3	3	5,000	15,000	
Firewood purchase	lot	1	1	1	34,000	34,000	
Labour for transporting firewood	contract	1	1	1	10,000	10,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for removal of used soil and Cleaning of boxes (6 people @ 5,000)	man days	6	1	6	5,000	30,000	
Labour for Mixing of sand/soil & filling in boxes : 4 people for 1 day	man days	4	1	4	5,000	20,000	
Plantlet collection from KAZARDI (1 day transport 50,000)	trips	1	1	1	50,000	50,000	
Plantlet purchase	numbers	1536	1	1536	1,500	2,304,000	Total cost of invitro plantlet @ 1,500/=.
Fertilizer N.P.K 17:17; 4.8 kgs @ 2,500	kgs	4.8	1	4.8	2,500	12,000	
Planting (6 people in 1 day @ 5,000)	man days	6	1	6	5,000	30,000	
Watering (1 person for 1 hour, twice a day i.e 2 hrs per day 2/8 =0.25 man days for approximately 40 days)	man days	0.25	40	10	5,000	50,000	
Weeding (1st weeding/soil loosening 1 people for 1 day @ 5000)	man days	1	1	1	5,000	5,000	
Soil/Sand filling boxes (2 people for 3 times)	man days	2	3	6	5,000	30,000	
Stucking/supporting wires/ropes; 3 layers @ 2 people for a day	man days	2	3	6	5,000	30,000	
String (rolls) 4 rolls recycled for four seasons i.e 1 roll per seasson	rolls	1	1	1	7,000	7,000	
Nails (kgs)	kgs	1	1	1	4,000	4,000	
Leaf prunning (2 times @ 1 people for a day @ 5,000)	man days	1	2	2	5,000	10,000	
Fungicides				0		-	
i) Fungicides (Systemic; Ridomil 0.25 kgs @ 70,000; 2 sprays)	kg	0.25	1	0.25	70,000	17,500	
ii) Fungicides (Contact ; Mancozeb 0.5 kgs @ 13,000, 2 sprays)	kgs	0.5	1	0.5	13,000	6,500	
Labour fungicide, insectide and foliar fert spraying (4 sprays @ 0.5 hr i.e 0.5/8 =0.0625 mandays @ 5,000)	man days	0.0625	4	0.25	5,000	1,250	
Insecticide (agrothoate) 125 ml i.e 0.125 litres @ 18,000 per litre	litres	0.125	1	0.125	18,000	2,250	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for dehaulming and disposal of haulms (1 people for half day)	man days	0.5	1	0.5	5,000	2,500	
Harvesting and counting (6 people for a day)	man days	6	1	6	5,000	30,000	
Harvesting poly bags (24 @ Shs. 200)	pcs	24	1	24	200	4,800	
Sorting after curing and storing and insecticide/malathion dust appln (1 people @ 0.25 days)	man days	0.25	1	0.25	5,000	1,250	
Marathion dust (250 gm)	kg	0.25	1	0.25	8,000	2,000	
Sanitation: Jick (2 bottles @ 750 ml @ 5,000) - Lts	bottles	2	1	2	5,000	10,000	
Total expenditure						**2,943,150**	
Total mini-tubers produced (8 mini-tubers/plantlet)	numbers					**12,288**	
Cost per mini-tuber (12,288 tubers) (Shs)						**240**	Unit production cost of tuber UGX 240/=.
Cost of mini-tubers per acre						**5,077,700**	If a farmer were to buy seed at this level, they would need 21,200 to plant an acre if spacing was 30cm*75cm which will mean they spend UGX 5,077,700/= on buying seed. Seed at this stage is too expensive and not feasible.
Pre-basic seed production							
Land hire 0.57 acre	acres	0.57	1	0.57	400,000	228,000	12,288 mini-tubers plant 57% of acre.
Bush clearing (1 litre herbicide @ Shs. 20,000)	litres	1	1	1	20,000	20,000	
Labour for water and Herbicide appln (1 people @ Shs. 5,000)	man days	1	1	1	5,000	5,000	
Labour for water for herbicide appln	man days	1	1	1	5,000	5,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Primary/secondary cultn combined (approximately 0.57 acres)	contract	1	1	1	50,000	50,000	
Secondary cultivation (0.57 acres)	contract	1	1	1	110,000	110,000	
Seed cost (mini-tubers)	batch	1	1	1	2,943,150	2,943,150	
Fertilizer (9 bags N.P.K 17:17: 1 bag @ Shs.105,000)	bags	9	1	9	105,000	945,000	
Transport fertilizer	bags	9	1	9	5,000	45,000	
Planting (11 people for one day @ Shs. 5000)	man days	11	1	11	5,000	55,000	
Weeding/hilling (1st and 2nd weeding)	man days	9	2	18	5,000	90,000	
Contact fungicides (4 kgs mancozeb at Shs.12,000)	kg	4	1	4	12,000	48,000	
Systemic Fungicides (Ridomil 1.0 kgs at Shs.70,000)	kg	1	1	1	70,000	70,000	
Insecticide (0.7 litre agrothoate)	litres	0.7	1	0.7	15,000	10,500	
Labour for Spraying (5 sprays @ 2 people @ Shs. 5,000)	man days	1	5	5	5,000	25,000	
Labour for Water for fungicide appln (1 person @ 5,000 for 5 sprays)	man days	1	1	1	5,000	5,000	
Dehaulming (4 people @ Shs.5,000)	man days	4	1	4	5,000	20,000	
Harvesting/digging out tubers (16 people for 1 day @ 5,000)	man days	16	1	16	5,000	80,000	
Gunny bags (21 gunny bags @ 1,200)	pcs	21	1	21	1,200	25,200	
Transportation of seed from field to stores (33 bags of 100 kgs)	bags	33	1	33	2,000	66,000	
Insecticide (Malathion dust) for storage pests (360 g bottle)	kg	0.36	1	0.36	10,000	3,600	
Total expenditure						**4,849,450**	
Production cost per acre						**8,507,807**	If KFRC plants an acre, total production cost would be UGX 8,507,807/=.

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Total Production 3,317.76 kgs = 41.47 bags of 80 kgs							
Yield (bags/acre): 3,317.76 kgs/0.57 acres							If an acre was planted, production would be 5,901.7 kgs = 73.77 bags @ 80kgs.
Post harvest loss 99.53 kgs (1.24 bags of 80 kgs)							
Seed sold (40.23 bags @ 80 kg @ Shs.150,00 after 3 months) 41.47-1.24 = 40.23 bags	bags	40	1	40	150,000	**6,000,000**	
Net income						**1,150,550**	If an KFRC sells pre-basic seed @ 150,000 per bag, make loss of UGX 1,150,550/=.
Cost per 80 kg bag						**116,939**	
Cost per kg of PBS (cost per 80 kg bag/80 kg)						**1,462**	
Revenue/income							
40.23 bags @80 kgs sold @ Shs. 150,000 per bag		40	1	40	150,000	**6,000,000**	
Gross income						**6,000,000**	
Gross income per acre						**10,526,316**	
Net income						**1,150,550**	
Net income per acre						**2,018,509**	
Net income per month (12 months from mini-tuber production to sell of PBS i.e 2 seasons)						**168,209**	
Net income per 80 kg bag						**28,764**	
Net income per kg of PBS						**360**	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Basic seed production							
Land hire 3.4 acres	acres	3.4	1	3.4	291,667	991,667	
Bush clearing (7 litres herbicide @ Shs. 20,000	litres	7	1	7	20,000	140,000	
Labour herbicide appln (7 people @ Shs. 8000)	man days	7	1	7	8,000	56,000	
Water for herbicide appln	jerrycans	51	1	51	1,000	51,000	
Primary/secondary cultn combined (approximately 3.4 acres)	contract	3.4	1	2.4	250,000	600,000	
Secondary cultivation (3.4 acres)	contract	3.4	1	3.4	250,000	850,000	
Seed cost						4,849,450	Total production cost of pre-basic seed.
Transport (seed 100,000 plus loading and offloading Shs. 20,000)	contract	1.42	1	1.42	120,000	170,400	
Fertilizer (9.9 bags N.P.K 17:17: @ Shs.105,000)	bags	9.9	1	9.9	105,000	1,039,500	
Transport fertilizer	bags	9.9	1	9.9	5,000	49,500	
Planting (28 people for 3 time @ Shs. 7,000)	man days	28	3.25	91	7,000	637,000	
Weeding (1st and 2nd weeding)	acres	3.4	1	3.4	125,000	425,000	
Contact fungicides (5.9 kgs mancozeb at Shs. 12,000)	kg	5.9	1	5.9	12,000	70,800	
Systemic fungicides (Ridomil 7.79 kgs at Shs. 70,000)	kg	7.79	1	7.79	70,000	545,300	
Labour for Spraying (3 sprays @ 5.66 people @ Shs. 7,000)	man days	5.66	3	16.98	7,000	118,860	
Water for fungicide appln (202.5 jerrycans @ 1,000)	jerrycans	202.5	1	202.5	1,000	202,500	
Dehaulming (8.5 people @ Shs. 7,000)	man days	8.5	1	8.5	7,000	59,500	
Harvesting and transport to store (18 people for 7 days @ 7,000)	man days	18.4	7	128.8	7,000	901,600	
Gunny bags (283 gunny bags @ 1,000)	pcs	283.3	1	283.3	1,000	283,300	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Sisal string	rolls	2.83	1	2.83	6,000	16,980	
Loading and off-loading	contract	1.42	1	1.42	20,000	28,400	
Pouring and spreading seed in store (10 people @5000)	man days	9.9	1	9.9	5,000	49,500	
Post harvest handling (sorting 10 people @ 5,000)	man days	9.9	1	9.9	5,000	49,500	
Total expenditure on 3.4 acres						**12,185,757**	
Total production cost per acre						**3,584,046**	
Total yield (harvest): 264 bags @80 kgs=21,120 kgs							If 1kg of pre-basic produces 6.6 kgs of basic seed.
Revenue							
Seed sold 256 bags @ 80 kg Shs.150,000 after 3 months (postharvest loss 7.92 bags) i.e 3%	80 kg-bags	256	1	256	150,000	**38,400,000**	If KFRC sales all tubers as seed.
Gross revenue/income						**38,400,000**	
Gross revenue/income per acre						**11,294,118**	
Net income for 3.4 acres						**26,214,243**	
Net income per acre						**7,710,072**	
Cost per 80 kg bag						**46,158**	
Cost per kg of basic seed (cost per 80 kg bag/80 kg)						**577**	
Net income						**26,214,243**	
Net Income per acre						**7,710,072**	
Net income per acre per month						**428,337**	
Net income per bag						**102,399**	
Net income per kg of basic seed						**1,280**	
							It takes approximately 18 months to produce basic seed from plantlets considering dormancy stages.

Cost-Income Summary

			Years				
			year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual income	**Basic Seed**		**-**	**38,400,000**	**76,800,000**	**76,800,000**	**76,800,000**
Seasonal production costs	Mini-tubers	Season 1	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)
		Season 2	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)
	Pre-basic seed	Season 1		(4,849,450)	(4,849,450)	(4,849,450)	(4,849,450)
		Season 2	(4,849,450)	(4,849,450)	(4,849,450)	(4,849,450)	(4,849,450)
	Basic seed	Season 1	-	(12,185,754)	(12,185,754)	(12,185,754)	(12,185,754)
		Season 2		(12,185,754)	(12,185,754)	(12,185,754)	(12,185,754)
Total annual production costs			**(10,735,750)**	**(39,956,708)**	**(39,956,708)**	**(39,956,708)**	**(39,956,708)**
	Net profit/loss		(10,735,750)	(1,556,708)	36,843,292	36,843,292	36,843,292

Cash Flow Projections

	Years				
	year 1	**year 2**	**year 3**	**year 4**	**year 5**
Cash inflows	(10,735,750)	(1,556,708)	36,843,292	36,843,292	36,843,292
Annual depreciation (SH)	(733,200)	(733,200)	(733,200)	(733,200)	(733,200)
Annual depreciation (DLS)	(2,133,098)	(2,133,098)	(2,133,098)	(2,133,098)	(2,133,098)
Net cash flows	(13,602,048)	(4,423,006)	33,976,994	33,976,994	33,976,994
Cumulative cash flows	(13,602,048)	(18,025,054)	15,951,940	49,928,934	83,905,928

Net Present Value

Project (screenhouse)

Discount Rate: 8%

Period	Cash Flow	PV
0	(46,327,962)	
1	(13,602,048)	(12,594,489)
2	(4,423,006)	(3,792,015)
3	33,976,994	26,972,033
4	33,976,994	24,974,105
5	33,976,994	23,124,171
NPV	12,355,843	58,683,805
		12,355,843

Annex 5: Economic Analysis of Screenhouse (Loan-KFRC)

Costing of screenhouse mini-tuber production (capacity of screenhouse is approximately 1,536 plantlets)

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Soil excavation and collection (5 tipperfuls sterilising units by 2 man days)	man days	2	1	2	5,000	10,000	KFRC does not sell mini-tubers or pre-basic seed, only sells basic seed.
Transport (5 tipperfuls @15,000 used for 2 season) i.e 2.5 tipperfuls per season	tipperfuls	2.5	1	2.5	15,000	37,500	
Labour loading soil	tipperfuls	2.5	1	2.5	5,000	12,500	
Sand purchase; 1 big tipperful at 70,000, loading 5,000 and transport 50,000 used for 2 seasons (i.e 125,000)	tipperfuls	0.5	1	0.5	125,000	62,500	
Gunny bags for soil sterlization (18 bags @ 1,200)	pcs	18	1	18	1,200	21,600	
Labour soil sieving and bagging and loading into sterlization unit 2 people @ 2 days	man days	2	2	4	5,000	20,000	
Soil/sand sterilization (3 rounds @ 2 people loading and cooking UGX 5,000)	man days	4	3	12	5,000	60,000	
Off-loading (3 rounds @ 2 people half day @ 5,000)	man days	1	3	3	5,000	15,000	
Firewood purchase	lot	1	1	1	34,000	34,000	
Labour for transporting firewood	contract	1	1	1	10,000	10,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for removal of used soil and Cleaning of boxes (6 people @ 5,000)	man days	6	1	6	5,000	30,000	
Labour for Mixing of sand/soil & filling in boxes : 4 people for 1 day	man days	4	1	4	5,000	20,000	
Plantlet collection from KAZARDI (1 day transport 50,000)	trips	1	1	1	50,000	50,000	
Plantlet purchase	numbers	1536	1	1536	1,500	2,304,000	Total cost of invitro plantlet @ 1,500/=.
Fertilizer N.P.K 17:17; 4.8 kgs @ 2,500	kgs	4.8	1	4.8	2,500	12,000	
Planting (6 people in 1 day @ 5,000)	man days	6	1	6	5,000	30,000	
Watering (1 person for 1 hour, twice a day i.e 2 hrs per day 2/8 =0.25 man days for approximately 40 days)	man days	0.25	40	10	5,000	50,000	
Weeding (1st weeding/soil loosening 1 people for 1 day @ 5000)	man days	1	1	1	5,000	5,000	
Soil/Sand filling boxes (2 people for 3 times)	man days	2	3	6	5,000	30,000	
Stucking/supporting wires/ropes; 3 layers @ 2 people for a day	man days	2	3	6	5,000	30,000	
String (rolls) 4 rolls recycled for four seasons i.e 1 roll per seasson	rolls	1	1	1	7,000	7,000	
Nails (kgs)	kgs	1	1	1	4,000	4,000	
Leaf prunning (2 times @ 1 people for a day @ 5,000)	man days	1	2	2	5,000	10,000	
Fungicides				0		-	
i) Fungicides (Systemic; Ridomil 0.25 kgs @ 70,000; 2 sprays)	kg	0.25	1	0.25	70,000	17,500	
ii) Fungicides (Contact ; Mancozeb 0.5 kgs @ 13,000, 2 sprays)	kgs	0.5	1	0.5	13,000	6,500	
Labour fungicide, insectide and foliar fert spraying (4 sprays @ 0.5 hr i.e 0.5/8 =0.0625 mandays @ 5,000)	man days	0.0625	4	0.25	5,000	1,250	
Insecticide (agrothoate) 125 ml i.e 0.125 litres @ 18,000 per litre	litres	0.125	1	0.125	18,000	2,250	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for dehaulming and disposal of haulms (1 people for half day)	man days	0.5	1	0.5	5,000	2,500	
Harvesting and counting (6 people for a day)	man days	6	1	6	5,000	30,000	
Harvesting poly bags (24 @ Shs. 200)	pcs	24	1	24	200	4,800	
Sorting after curing and storing and insecticide/malathion dust appln (1 people @ 0.25 days)	man days	0.25	1	0.25	5,000	1,250	
Marathion dust (250 gm)	kg	0.25	1	0.25	8,000	2,000	
Sanitation: Jick (2 bottles @ 750 ml @ 5,000) - Lts	bottles	2	1	2	5,000	10,000	
Total expenditure						**2,943,150**	
Total mini-tubers produced (8 mini-tubers/plantlet)	numbers					**12,288**	
Cost per mini-tuber (12,288 tubers) (Shs)						**240**	Unit production cost UGX 240/=.
Cost of mini-tubers per acre						**5,077,700**	If a farmer were to buy seed at this level, they would need 21,200 to plant an acre if spacing was 30cm*75cm which would mean they spend UGX 5,077,700/= on buying seed. Seed at this stage is too expensive and not feasible.
Pre-basic seed production							
Land hire 0.57 acre	acres	0.57	1	0.57	400,000	228,000	12,288 mini-tubers plant 57% of acre.
Bush clearing (1 litre herbicide @ Shs. 20,000)	litres	1	1	1	20,000	20,000	
Labour for water and Herbicide appln (1 people @ Shs. 5,000)	man days	1	1	1	5,000	5,000	
Labour for water for herbicide appln	man days	1	1	1	5,000	5,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Primary/secondary cultn combined (approximately 0.57 acres)	contract	1	1	1	50,000	50,000	
Secondary cultivation (0.57 acres)	contract	1	1	1	110,000	110,000	
Seed cost (mini-tubers)	batch	1	1	1	2,943,150	2,943,150	
Fertilizer (9 bags N.P.K 17:17: 1 bag @ Shs.105,000)	bags	9	1	9	105,000	945,000	
Transport fertilizer	bags	9	1	9	5,000	45,000	
Planting (11 people for one day @ Shs. 5000)	man days	11	1	11	5,000	55,000	
Weeding/hilling (1st and 2nd weeding)	man days	9	2	18	5,000	90,000	
Contact fungicides (4 kgs mancozeb at Shs.12,000)	kg	4	1	4	12,000	48,000	
Systemic Fungicides (Ridomil 1.0 kgs at Shs.70,000)	kg	1	1	1	70,000	70,000	
Insecticide (0.7 litre agrothoate)	litres	0.7	1	0.7	15,000	10,500	
Labour for Spraying (5 sprays @ 2 people @ Shs. 5,000)	man days	1	5	5	5,000	25,000	
Labour for Water for fungicide appln (1 person @ 5,000 for 5 sprays)	man days	1	1	1	5,000	5,000	
Dehaulming (4 people @ Shs.5,000)	man days	4	1	4	5,000	20,000	
Harvesting/digging out tubers (16 people for 1 day @ 5,000)	man days	16	1	16	5,000	80,000	
Gunny bags (21 gunny bags @ 1,200)	pcs	21	1	21	1,200	25,200	
Transportation of seed from field to stores (33 bags of 100 kgs)	bags	33	1	33	2,000	66,000	
Insecticide (Malathion dust) for storage pests (360 g bottle)	kg	0.36	1	0.36	10,000	3,600	
Total expenditure						**4,849,450**	
Production cost per acre						**8,507,807**	If KFRC plants an acre, total production cost would be UGX 8,507,807/=.

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Total production 3,364 kgs = 41.47 bags of 80 kgs							
Yield (bags/acre): 3,364 kgs/0.57 acres							If an acre was planted, production would be 5,901.7 kgs = 73.77 bags @ 80 kgs.
Total amount of seed after storage (total Production less PH losses = 41.47 bags - 1.3 bags)							
Seed sold (40 bags @ 80 kg @ Shs. 150,000 after 3 months)	bags	40	1	40	150,000	**6,000,000**	
Net profit						**1,150,550**	If an KFRC sells pre-basic seed @ 150,000 per bag, make loss of UGX 1,150,550/=.
Cost per 80 kg bag						**116,939**	
Cost per kg of PBS (cost per 80 kg bag/80 kg)						**1,462**	
Revenue /Income							
40 bags @ 80 kgs sold @ Shs. 150,000 per bag		40	1	40	150,000	**6,000,000**	
Gross income						**6,000,000**	
GrossiIncome per acre (gross income 0.57 acres)						**10,526,316**	
Net income						**1,150,550**	
Net income per acre						**2,018,509**	
Net incomeper month (12 months from mini-tuber production to sell of PBS i.e 2 seasons)						**168,209**	
Net income per 80 kg bag						**28,764**	
Net income per kg of PBS						**360**	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Basic seed production							
Land hire 3.4 acres	acres	3.4	1	3.4	291,667	991,667	
Bush clearing (7 litres herbicide @ Shs. 20,000	litres	7	1	7	20,000	140,000	
Labour herbicide appln (7 people @ Shs. 8000)	man days	7	1	7	8,000	56,000	
Water for herbicide appln	jerrycans	51	1	51	1,000	51,000	
Primary/secondary cultn combined (approximately 3.4 acres)	contract	3.4	1	2.4	250,000	600,000	
Secondary cultivation (3.4 acres)	contract	3.4	1	3.4	250,000	850,000	
Seed cost	batch	1	1	1	4,849,450	4,849,450	Total production cost of pre-basic seed.
Transport (seed 100,000 plus loading and offloading Shs. 20,000)	contract	1.42	1	1.42	120,000	170,400	
Fertilizer (9.9 bags N.P.K 17:17: @ Shs.105,000)	bags	9.9	1	9.9	105,000	1,039,500	
Transport fertilizer	bags	9.9	1	9.9	5,000	49,500	
Planting (28 people for 3 time @ Shs. 7,000)	man days	28	3.25	91	7,000	637,000	
Weeding (1st and 2nd weeding)	acres	3.4	1	3.4	125,000	425,000	
Contact fungicides (5.9 kgs mancozeb at Shs. 12,000)	kg	5.9	1	5.9	12,000	70,800	
Systemic fungicides (Ridomil 7.79 kgs at Shs. 70,000)	kg	7.79	1	7.79	70,000	545,300	
Labour for Spraying (3 sprays @ 5.66 people @ Shs. 7,000)	man days	5.66	3	16.98	7,000	118,860	
Water for fungicide appln (202.5 jerrycans @ 1,000)	jerrycans	202.5	1	202.5	1,000	202,500	
Dehaulming (8.5 people @ Shs. 7,000)	man days	8.5	1	8.5	7,000	59,500	
Harvesting and transport to store (18 people for 7 days @ 7,000)	man days	18.4	7	128.8	7,000	901,600	
Gunny bags (283 gunny bags @ 1,000)	pcs	283.3	1	283.3	1,000	283,300	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Sisal string	rolls	2.83	1	2.83	6,000	16,980	
Loading and off-loading	contract	1.42	1	1.42	20,000	28,400	
Pouring and spreading seed in store (10 people @5000)	man days	9.9	1	9.9	5,000	49,500	
Post harvest handling (sorting 10 people @ 5,000)	man days	9.9	1	9.9	5,000	49,500	
Total expenditure on 3.4 acres						**12,185,757**	
Total production cost per acre						**3,584,046**	
Total yield (harvest): 264 bags @80 kgs = 21,120 kgs							If 1 kg of pre-basic produces 6.6 kgs of basic seed.
Revenue							
Seed sold 256 bags @ 80 kg Shs. 150,000 after 3 months (Postharvest loss 7.92 bags) i.e 3%	80 kg-bags	256	1	256	150,000	**38,400,000**	If KFRC sells all tubers as seed.
Gross revenue/income						**38,400,000**	
Gross revenue/income per acre						**11,294,118**	
Postharvest loss (7.92 bags) i.e 3%							
Net income for 3.4 acres						**26,214,243**	
Net income per acre						**7,710,072**	
Cost per 80 kg bag						**46,158**	
Cost per kg of basic seed (cost per 80 kg bag/80 kg)						**577**	
Net income						**26,214,243**	
Net income per acre						**7,710,072**	
Net income per acre per month						**428,337**	
Net income per bag						**102,399**	
Net income per kg of basic seed						**1,280**	
							It takes approximately 18 months to produce basic seed from plantlets considering dormancy stages.

Cost-Income Summary

			Years				
			year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual income	**Basic Seed**		**-**	**38,400,000**	**76,800,000**	**76,800,000**	**76,800,000**
Seasonal production costs	Mini-tubers	Season 1	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)
		Season 2	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)
	Pre-basic seed	Season 1		(4,849,450)	(4,849,450)	(4,849,450)	(4,849,450)
		Season 2	(4,849,450)	(4,849,450)	(4,849,450)	(4,849,450)	(4,849,450)
	Basic seed	Season 1	-	(12,185,754)	(12,185,754)	(12,185,754)	(12,185,754)
		Season 2		(12,185,754)	(12,185,754)	(12,185,754)	(12,185,754)
Total annual production costs			**(10,735,750)**	**(39,956,708)**	**(39,956,708)**	**(39,956,708)**	**(39,956,708)**
	Net profit/loss		(10,735,750)	(1,556,708)	36,843,292	36,843,292	36,843,292

Cash Flow Projections

	Years				
	year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual cash in/out flows	(10,735,750)	(1,556,708)	36,843,292	36,843,292	36,843,292
Annual depreciation (SH)	(5,267,794)	(5,267,794)	(5,267,794)	(5,267,794)	(5,267,794)
Annual depreciation (DLS)	(3,564,697)	(3,564,697)	(3,564,697)	(3,564,697)	(3,564,697)
Interest on loan	-	(20,657,040)	(7,266,420)	(4,885,396)	(2,210,077)
Net cash flows	(19,568,241)	(31,046,239)	20,744,381	23,125,405	25,800,724
Cumulative cash flows	(19,568,241)	(50,614,480)	(29,870,099)	(6,744,693)	19,056,030

Net Present Value

Project (screenhouse)

Discount Rate: 8%

Period	Cash Flow	PV
0	(97,632,912)	
1	(19,568,241)	(18,118,742)
2	(31,046,239)	(26,617,146)
3	20,744,381	16,467,559
4	23,125,405	16,997,863
5	25,800,724	17,559,539
NPV	(91,343,839)	6,289,073
		(91,343,839)

Annex 6: Economic Analysis of Screenhouse (Subsidy-Muyambi)

Costing of screenhouse mini-tuber production (capacity of screenhouse is approximately 3,072 plantlets)

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Soil excavation & collection (5 tipperful sterilising units by 4 man days)	man days	4	1	4	5,000	20,000	Muyambi does not sell mini-tubers and pre-basic seed, only sells basic seed.
Transport (4 tipperfuls @ 15,000 used for 2 season) i.e 5 tipperfuls per season	tipperfuls	4	2	8	15,000	120,000	
Labour loading soil	tipperfuls	4	1	4	5,000	20,000	
Sand purchase; 2 big tipperfuls at 70,000, loading 5,000 and transport 50,000 used for 2 seasons i.e 195,000	tipperfuls	1	1	1	97,500	97,500	
Gunny bags for soil sterlization (18 bags @ 1,200)	pcs	18	1	18	1,200	21,600	
Labour soil sieving and bagging and loading into sterlization unit 4 people @ 2 days	man days	4	2	8	5,000	40,000	
Soil/sand sterilization (3 rounds @ 4 people loading and cooking @ UGX 5,000)	man days	4	3	12	5,000	60,000	
Off-loading (3 rounds @ 4people half day @ 5,000)	man days	2	3	6	5,000	30,000	
Firewood purchase	lot	2	1	2	34,000	68,000	
Labour for transporting firewood	contract	2	1	2	10,000	20,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for removal of used soil and cleaning of boxes (8 people @5,000)	man days	8	1	8	5,000	40,000	
Labour for mixing of sand/soil and filling in boxes: 6 people for 1 day	man days	6	1	6	5,000	30,000	
Plantlet collection from KAZARDI (1 day transport 50,000)	trips	1	1	1	50,000	50,000	
Plantlet purchase	numbers	3072	1	3072	1,500	4,608,000	Total cost of plantlets @ 1,500/=.
Fertilizer N.P.K 17:17; 9.6 kgs @ 2,500	kgs	9.6	1	9.6	2,500	24,000	
Planting (10 people in 1 day @ 5,000)	man days	10	1	10	5,000	50,000	
Watering (2 people for 1 hr twice a day i.e 4 hrs per day 4/8 = 0.5 man days for approximately 40 days)	man days	0.25	40	10	5,000	50,000	
Weeding (1st weeding/soil loosening 2 people for 1 day @ 5,000	man days	2	1	2	5,000	10,000	
Soil/sand filling boxes (4 people for 3 times)	man days	4	3	12	5,000	60,000	
Stucking/supporting wires/ropes; 3 layers @ 2 people for a day	man days	2	1	2	5,000	10,000	
String (rolls) 4 rolls recycled for four seasons i.e 2 roll per seasson	rolls	2	1	2	7,000	14,000	
Nails (kgs)	kgs	2	1	2	4,000	8,000	
Leaf prunning (2 times @ 2 people for a day @ 5,000)	man days	2	2	4	5,000	20,000	
Fungicides				0		-	
i) Fungicides (systemic; Ridomil 0.5 kg @70,000; 2 sprays)	kg	0.5	2	1	70,000	70,000	
ii) Fungicides (Contact; Mancozeb 1 kg @13,000, 2 sprays)	kgs	1	2	2	13,000	26,000	
Labour fungicide, insectide and foliar fert spraying (4 sprays @ 1hr i.e 1/8 = 0.125 man day @ 5,000)	man days	0.125	4	0.5	5,000	2,500	
Insecticide (agrothoate) 125 ml i.e 0.25 liters @ 18,000 per litre	litres	0.25	1	0.25	18,000	4,500	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for dehaulming and disposal of haulms (2 people for half day)	man days	1	1	1	5,000	5,000	
Harvesting and counting (8 people for a day)	man days	8	1	8	5,000	40,000	
Harvesting poly bags (48 @ Shs. 200)	pcs	48	1	48	200	9,600	
Sorting after curing and storing & insecticide/malathion dust appln (1 people @ 0.5 days)	man days	0.5	0.5	0.25	5,000	1,250	
Marathion dust (0.5 gm)	kg	0.5	1	0.5	8,000	4,000	
Sanitation: Jick(2 bottles @750 ml @5000) - Lts	bottles	2	1	2	5,000	10,000	
Total expenditure						**5,643,950**	
Total mini-tubers produced (8 mini-tubers@plantlet)	numbers					**24,576**	If the yield is 8 mini-tubers/plantlet.
Cost per mini-tuber (24,576 tubers) (Shs)						**230**	Unit production cost UGX 230/=.
Cost of mini-tubers per acre						**4,868,642**	If a farmer were to buy seed at this level, they would need 21,200 to plant an acre if spacing was 30cm*75cm which will mean they spend UGX 4,868,642/= on buying seed. Seed at this stage is too expensive and not feasible.
Pre-basic seed production							
Land hire 1.2 acre	acres	1.2	1	1.2	400,000	480,000	24,576 mini-tubers plant 1.2 acres.
Bush clearing (2 litres herbicide @ Shs. 20,000)	liters	2	1	2	20,000	40,000	
Labour for water and Herbicide appln (2 people @ Shs. 5,000)	mandays	2	1	2	5,000	10,000	
Labour for water for herbicide appln	mandays	2	1	2	5,000	10,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Primary/secondary cultn combined (approx 1.2 acres)	contract	2	1	2	50,000	100,000	
Secondary cultivation (1.2 acres)	contract	2	1	2	110,000	220,000	
Seed cost (mini-tubers)	batch	1	1	1	5,643,950	5,643,950	Total production cost of pre-basic seed.
Fertilizer (18 bags N.P.K 17:17: 1 bag @ Shs.105,000)	bags	18	1	18	105,000	1,890,000	
Transport fertilizer	bags	18	1	18	4,000	72,000	
Planting (20 people for one day @ Shs. 5,000)	man days	20	1	20	5,000	100,000	
Weeding/hilling (1st and 2nd weeding)	man days	18	2	36	5,000	180,000	
Contact Fungicides (8 kgs mancozeb at Shs.12,000)	kg	8	1	8	12,000	96,000	
Systemic Fungicides (Ridomil 2.0 kgs at Shs. 70,000)	kg	2	1	2	70,000	140,000	
Insecticide (1.5 liter agrothoate)	litres	1.5	1	1.5	15,000	22,500	
Labour for spraying (5 sprays @ 2 people @ Shs. 5,000)	man days	2	5	10	5,000	50,000	
Labour for water for fungicide appln (2 persons @ 5,000 for 5 sprays)	man days	2	1	2	5,000	10,000	
Dehaulming (2 people @ Shs. 5,000)	man days	2	1	2	5,000	10,000	
Harvesting/digging out tubers (20 people for 1 day @ 5,000)	man days	20	1	20	5,000	100,000	
Gunny bags (70 gunny bags @ 1,200)	pcs	70	1	70	1,200	84,000	
Transportation of seed from field to stores (70 bags of 100 kgs)	bags	70	1	70	2,000	140,000	
Insecticide (Malathion dust) for storage pests (750 g bottle)	kg	0.75	1	0.75	10,000	7,500	
Total expenditure						**9,405,950**	
Production cost per acre						**7,838,292**	If Muyambi plants an acre.

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Total production 6,635.52 kgs =82.94 bags of 80 kgs							Assuming @ mini-tuber yield 0.27 kg of pre-basic seed.
Yield (bags/acre): 6,635.5 kgs/1.2 acres							If an acre was planted, production would be 5,529.6 kgs = 69.12 bags @ 80 kgs .
Total amount of seed after storage (total production less PH losses 3% = 82.9 bags -2.487 bags)							
Seed sold (80 bags @ 80 kg @ Shs. 150,000 after 3 months)	bags	80	1	80	150,000	**12,000,000**	
Net income						**2,594,050**	
Cost per 80 kg bag						**113,407**	
Cost per kg of PBS (cost per 80 kg bag/80 kg)						**1,418**	
Revenue /income							
80 bags @ 80 kgs sold @ Shs. 150,000 per bag		80	1	80	150,000	**12,000,000**	Income if Muyambi sells pre-basic seed.
Gross income						**12,000,000**	
Gross income per acre						**10,000,000**	
Net income						**2,594,050**	Net income if Muyambi sells pre-basic seed.
Net income per acre						**2,161,708**	
Net income per month (12 months from mini-tuber production to sell of PBS i.e 2 seasons)						**180,142**	
Net income per 80 kg bag						**32,426**	
Net income per kg of PBS						**405**	
Basic seed production							
Land hire 6.87 acres	acres	6.87	1	6.87	291,667	2,003,750	
Bush clearing (14 litres herbicide @ Shs. 20,000	litres	14	1	14	20,000	280,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour herbicide appln (10 people @ Shs. 8,000)	man days	10	1	10	8,000	80,000	
Water for herbicide appln	jerrycans	98	1	98	1,000	98,000	
Primary/secondary cultn combined (approximately 6.87 acres)	contract	6.87	1	6.87	240,000	1,648,800	
Secondary cultivation (6.87 acres)	contract	6.87	1	6.87	200,000	1,374,000	
Seed cost		1	1	1	9,405,950	9,405,950	
Transport (seed 80,000 plus loading and offloading Shs. 20,000)	contract	2	1	2	100,000	200,000	
Fertilizer (21 bags N.P.K 17:17: @ Shs.105,000)	bags	21	1	21	105,000	2,205,000	
Transport fertilizer	bags	21	1	21	5,000	105,000	
Planting (20 people for 3 time @ Shs. 7,000)	man days	20	3	60	7,000	420,000	
Weeding (1st and 2nd weeding	acres	6.87	1	6.87	105,000	721,350	
Contact Fungicides (10 kgs mancozeb at Shs. 12,000)	kg	10	1	10	12,000	120,000	
Systemic Fungicides (Ridomil 16 kgs at Shs. 70,000)	kg	16	1	16	70,000	1,120,000	
Labour for Spraying (3 sprays @ 8 people @ Shs. 7,000)	man days	8	3	24	7,000	168,000	
Water for fungicide appln (408 jerrycans @ 1,000)	jerrycans	408	1	408	1,000	408,000	
Dehaulming (14 people @ Shs. 7,000)	man days	14	1	14	7,000	98,000	
Harvesting and transport to store (28 people for 7 days @ 7,000)	man days	28	7	196	7,000	1,372,000	
Gunny bags (530 gunny bags @ 1,000)	pcs	530	1	530	1,000	530,000	
Sisal string	rolls	4	1	4	6,000	24,000	
Loading and off-loading	contract	3	1	3	20,000	60,000	
Pouring and spreading seed in store (19 people @5000)	man days	15	1	15	5,000	75,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Post harvest handling (sorting 19 people @ 5,000)	man days	15	1	15	5,000	75,000	
Total expenditure on 6.87 acres						**22,591,850**	
Total Production cost per acre						**3,288,479**	
Total harvest (528 bags @80 kgs) = 42,240 kgs							If 1 kg of pre-basic produces 6.6 kgs of basic seed,
Yield/acre (42,240 kg/6.87 acres = 6,148.47 kgs)							
Revenue				0		-	
Seed sold (512 @ 80 kg, Shs. 150,000 after 3 months)	80 kg-bags	512	1	512	150,000.00	**76,800,000**	If Muyambi sells all tubers as basic seed.
Gross revenue/income						**76,800,000**	
Gross revenue/income per acre						**11,179,039**	
Postharvest loss (15.84 bags) i.e 3%							
Net income for 6.87 acres						**54,208,150**	
Net income per acre						**7,890,560**	
Cost per 80 kg bag						**42,788**	
Cost per kg of Basic seed (Cost per 80 kg bag/80 kg)						**535**	
Net income						**54,208,150**	
Net Income per acre						**7,890,560**	
Net income per acre per month						**375,741**	
Net income per bag						**105,875**	
Net income per kg of basic seed						**1,323**	
							It takes approximately 18 months to produce basic seed from plantlets considering dormancy stages. Muyambi sells basic seed only.

Cost-Income Summary

			Years				
			year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual income	**Basic Seed**		**-**	**76,800,000**	**153,600,000**	**153,600,000**	**153,600,000**
Seasonal production costs	Mini-tubers	Season 1	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)
		Season 2	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)
	Pre-basic seed	Season 1		(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)
		Season 2	(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)
	Basic seed	Season 1	-	(22,591,850)	(22,591,850)	(22,591,850)	(22,591,850)
		Season 2		(22,591,850)	(22,591,850)	(22,591,850)	(22,591,850)
Total annual production costs			**(20,693,850)**	**(75,283,500)**	**(75,283,500)**	**(75,283,500)**	**(75,283,500)**
	Net profit/loss		(20,693,850)	1,516,500	78,316,500	78,316,500	78,316,500

Cash Flow Projections

	Years				
	year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual cash inflows	(20,693,850)	1,516,500	78,316,500	78,316,500	78,316,500
Annual depreciation (SH)	(1,680,000)	(1,680,000)	(1,680,000)	(1,680,000)	(1,680,000)
Annual depreciation (DLS)	(958,157)	(958,157)	(958,157)	(958,157)	(958,157)
Net cash flows	(23,332,007)	(1,121,657)	75,678,343	75,678,343	75,678,343
Annual cummulative cash flows	(23,332,006.50)	(24,453,663)	51,224,680	126,903,023	202,581,366

Net Present Value

Project (SH +DLS)

Discount Rate: 8%

Period	Cash Flow	PV
0	(27,563,130)	
1	(23,332,007)	(21,603,710)
2	(1,121,657)	(961,640)
3	75,678,343	60,075,909
4	75,678,343	55,625,841
5	75,678,343	51,505,409
NPV	117,078,679	144,641,809
		117,078,679

Annex 7: Economic Analysis of Screenhouse (Loan-Muyambi)

Costing of screenhouse mini-tuber production (capacity of screenhouse is approximately 3,072 plantlets)

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Soil excavation and collection (5 tipperful sterilising units by 4 man days)	man days	4	1	4	5,000	20,000	Muyambi does not sell mini-tubers and pre-basic seed, only sells basic seed.
Transport (4 tipperfuls @ 15,000 used for 2 season) i.e 5 tipperfuls per season	tipperfuls	4	2	8	15,000	120,000	
Labour loading soil	tipperfuls	4	1	4	5,000	20,000	
Sand purchase; 2 big tipperfuls at 70,000, loading 5,000 and transport 50,000 used for 2 seasons i.e 195,000	tipperfuls	1	1	1	97,500	97,500	
Gunny bags for soil sterlization (18 bags @ 1,200)	pcs	18	1	18	1,200	21,600	
Labour soil sieving and bagging and loading into sterlization unit 4 people @ 2 days	man days	4	2	8	5,000	40,000	
Soil/sand sterilization (3 rounds @ 4 people loading and cooking @ UGX 5,000)	man days	4	3	12	5,000	60,000	
Off-loading (3 rounds @ 4people half day @ 5,000)	man days	2	3	6	5,000	30,000	
Firewood purchase	lot	2	1	2	34,000	68,000	
Labour for transporting firewood	contract	2	1	2	10,000	20,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for removal of used soil and cleaning of boxes (8 people @5,000)	man days	8	1	8	5,000	40,000	
Labour for mixing of sand/soil and filling in boxes: 6 people for 1 day	man days	6	1	6	5,000	30,000	
Plantlet collection from KAZARDI (1 day transport 50,000)	trips	1	1	1	50,000	50,000	
Plantlet purchase	numbers	3072	1	3072	1,500	4,608,000	Total cost of plantlets @ 1,500/=.
Fertilizer N.P.K 17:17; 9.6 kgs @ 2,500	kgs	9.6	1	9.6	2,500	24,000	
Planting (10 people in 1 day @ 5,000)	man days	10	1	10	5,000	50,000	
Watering (2 people for 1 hr twice a day i.e 4 hrs per day 4/8 = 0.5 man days for approximately 40 days)	man days	0.25	40	10	5,000	50,000	
Weeding (1st weeding/soil loosening 2 people for 1 day @ 5,000	man days	2	1	2	5,000	10,000	
Soil/sand filling boxes (4 people for 3 times)	man days	4	3	12	5,000	60,000	
Stucking/supporting wires/ropes; 3 layers @ 2 people for a day	man days	2	1	2	5,000	10,000	
String (rolls) 4 rolls recycled for four seasons i.e 2 roll per seasson	rolls	2	1	2	7,000	14,000	
Nails (kgs)	kgs	2	1	2	4,000	8,000	
Leaf prunning (2 times @ 2 people for a day @ 5,000)	man days	2	2	4	5,000	20,000	
Fungicides				0		-	
i) Fungicides (systemic; Ridomil 0.5 kg @70,000; 2 sprays)	kg	0.5	2	1	70,000	70,000	
ii) Fungicides (Contact; Mancozeb 1 kg @13,000, 2 sprays)	kgs	1	2	2	13,000	26,000	
Labour fungicide, insectide and foliar fert spraying (4 sprays @ 1hr i.e 1/8 = 0.125 man day @ 5,000)	man days	0.125	4	0.5	5,000	2,500	
Insecticide (agrothoate) 125 ml i.e 0.25 liters @ 18,000 per litre	litres	0.25	1	0.25	18,000	4,500	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for dehaulming and disposal of haulms (2 people for half day)	man days	1	1	1	5,000	5,000	
Harvesting and counting (8 people for a day)	man days	8	1	8	5,000	40,000	
Harvesting poly bags (48 @ Shs. 200)	pcs	48	1	48	200	9,600	
Sorting after curing and storing & insecticide/malathion dust appln (1 people @ 0.5 days)	man days	0.5	0.5	0.25	5,000	1,250	
Marathion dust (0.5 gm)	kg	0.5	1	0.5	8,000	4,000	
Sanitation: Jick(2 bottles @750 ml @5000) - Lts	bottles	2	1	2	5,000	10,000	
Total expenditure						**5,643,950**	
Total mini-tubers produced (8 mini-tubers@plantlet)	numbers					**24,576**	If the yield is 8 mini-tubers/plantlet.
Cost per mini-tuber (24,576 tubers) (Shs)						**230**	Unit production cost UGX 230/=.
Cost of mini-tubers per acre						**4,868,642**	If a farmer were to buy seed at this level, they would need 21,200 to plant an acre if spacing was 30cm*75cm which would mean they spend UGX 4,868,642/= for buying seed. Seed at this stage is too expensive and not feasible.
Pre-basic seed production							
Land hire 1.2 acre	acres	1.2	1	1.2	400,000	480,000	24,576 mini-tubers plant 1.2 acres
Bush clearing (2 litres herbicide @ Shs. 20,000)	liters	2	1	2	20,000	40,000	
Labour for water and Herbicide appln (2 people @ Shs. 5,000)	mandays	2	1	2	5,000	10,000	
Labour for water for herbicide appln	mandays	2	1	2	5,000	10,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Primary/secondary cultn combined (approx 1.2 acres)	contract	2	1	2	50,000	100,000	
Secondary cultivation (1.2 acres)	contract	2	1	2	110,000	220,000	
Seed cost (mini-tubers)	batch	1	1	1	5,643,950	5,643,950	Total production cost of pre-basic seed.
Fertilizer (18 bags N.P.K 17:17: 1 bag @ Shs.105,000)	bags	18	1	18	105,000	1,890,000	
Transport fertilizer	bags	18	1	18	4,000	72,000	
Planting (20 people for one day @ Shs. 5,000)	man days	20	1	20	5,000	100,000	
Weeding/hilling (1st and 2nd weeding)	man days	18	2	36	5,000	180,000	
Contact Fungicides (8 kgs mancozeb at Shs.12,000)	kg	8	1	8	12,000	96,000	
Systemic Fungicides (Ridomil 2.0 kgs at Shs. 70,000)	kg	2	1	2	70,000	140,000	
Insecticide (1.5 liter agrothoate)	litres	1.5	1	1.5	15,000	22,500	
Labour for spraying (5 sprays @ 2 people @ Shs. 5,000)	man days	2	5	10	5,000	50,000	
Labour for water for fungicide appln (2 persons @ 5,000 for 5 sprays)	man days	2	1	2	5,000	10,000	
Dehaulming (2 people @ Shs. 5,000)	man days	2	1	2	5,000	10,000	
Harvesting/digging out tubers (20 people for 1 day @ 5,000)	man days	20	1	20	5,000	100,000	
Gunny bags (70 gunny bags @ 1,200)	pcs	70	1	70	1,200	84,000	
Transportation of seed from field to stores (70 bags of 100 kgs)	bags	70	1	70	2,000	140,000	
Insecticide (Malathion dust) for storage pests (750 g bottle)	kg	0.75	1	0.75	10,000	7,500	
Total expenditure						**9,405,950**	
Production cost per acre						**7,838,292**	If Muyambi plants an acre.

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Total production 6,635.52 kgs =82.94 bags of 80 kgs							Assuming @ mini-tuber yield 0.27 kg of pre-basic seed.
Yield (bags/acre): 6,635.5 kgs/1.2 acres							If an acre was planted, production would be 5,529.6 kgs = 69.12 bags @ 80 kgs.
Total amount of seed after storage (total production less PH losses 3% = 82.9 bags -2.487 bags)							
Seed sold (80 bags @ 80 kg @ Shs. 150,000 after 3 months)	bags	80	1	80	150,000	**12,000,000**	
Net income						**2,594,050**	
Cost per 80 kg bag						**113,407**	
Cost per kg of PBS (cost per 80 kg bag/80 kg)						**1,418**	
Revenue /income							
80 bags @ 80 kgs sold @ Shs. 150,000 per bag		80	1	80	150,000	**12,000,000**	Income if Muyambi sells pre-basic seed.
Gross income						**12,000,000**	
Gross income per acre						**10,000,000**	
Net income						**2,594,050**	Net income if Muyambi sells pre-basic seed.
Net income per acre						**2,161,708**	
Net income per month (12 months from mini-tuber production to sell of PBS i.e 2 seasons)						**180,142**	
Net income per 80 kg bag						**32,426**	
Net income per kg of PBS						**405**	
Basic seed production							
Land hire 6.87 acres	acres	6.87	1	6.87	291,667	2,003,750	
Bush clearing (14 litres herbicide @ Shs. 20,000	litres	14	1	14	20,000	280,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour herbicide appln (10 people @ Shs. 8,000)	man days	10	1	10	8,000	80,000	
Water for herbicide appln	jerrycans	98	1	98	1,000	98,000	
Primary/secondary cultn combined (approximately 6.87 acres)	contract	6.87	1	6.87	240,000	1,648,800	
Secondary cultivation (6.87 acres)	contract	6.87	1	6.87	200,000	1,374,000	
Seed cost		1	1	1	9,405,950	9,405,950	
Transport (seed 80,000 plus loading and offloading Shs. 20,000)	contract	2	1	2	100,000	200,000	
Fertilizer (21 bags N.P.K 17:17: @ Shs.105,000)	bags	21	1	21	105,000	2,205,000	
Transport fertilizer	bags	21	1	21	5,000	105,000	
Planting (20 people for 3 time @ Shs. 7,000)	man days	20	3	60	7,000	420,000	
Weeding (1st and 2nd weeding	acres	6.87	1	6.87	105,000	721,350	
Contact Fungicides (10 kgs mancozeb at Shs. 12,000)	kg	10	1	10	12,000	120,000	
Systemic Fungicides (Ridomil 16 kgs at Shs. 70,000)	kg	16	1	16	70,000	1,120,000	
Labour for Spraying (3 sprays @ 8 people @ Shs. 7,000)	man days	8	3	24	7,000	168,000	
Water for fungicide appln (408 jerrycans @ 1,000)	jerrycans	408	1	408	1,000	408,000	
Dehaulming (14 people @ Shs. 7,000)	man days	14	1	14	7,000	98,000	
Harvesting and transport to store (28 people for 7 days @ 7,000)	man days	28	7	196	7,000	1,372,000	
Gunny bags (530 gunny bags @ 1,000)	pcs	530	1	530	1,000	530,000	
Sisal string	rolls	4	1	4	6,000	24,000	
Loading and off-loading	contract	3	1	3	20,000	60,000	
Pouring and spreading seed in store (19 people @5000)	man days	15	1	15	5,000	75,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Post harvest handling (sorting 19 people@5000)	man days	15	1	15	5,000	75,000	
Total expenditure on 6.87 acres						**22,591,850**	
Total Production cost per acre						**3,288,479**	
Total harvest (528 bags @80 kgs) = 42,240 kgs							If 1 kg of pre-basic produces 6.6 kgs of basic seed.
Yield /acre (42,240 kg/6.87 acres = 6,148.47 kgs)							
Seed sold (512 @ 80 kg, @ Shs.150,000 after 3 months)	80 kg-bags	512	1	512	150,000	**76,800,000**	If Muyambi sells all tubers as basic seed.
Gross revenue/income						**76,800,000**	
Gross revenue/income per acre						**11,179,039**	
Postharvest loss (15.84 bags) i.e 3%							
Net income for 6.87 acres						**54,208,150**	
Net income per acre						**7,890,560**	
Cost per 80 kg bag						**42,788**	
Cost per kg of Basic seed (Cost per 80 kg bag/80 kg)						**535**	
Net income						**54,208,150**	
Net Income per acre						**7,890,560**	
Net income per acre per month						**375,741**	
Net income per bag						**105,875**	
Net income per kg of basic seed						**1,323**	
							It takes approximately 18 months to produce basic seed from plantlets considering dormancy stages. Muyambi sells basic seed only.

Cost-Income Summary

			Years				
			year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual income	**Basic Seed**		**-**	**76,800,000**	**153,600,000**	**153,600,000**	**153,600,000**
Seasonal production costs	Mini-tubers	Season 1	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)
		Season 2	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)
	Pre-basic seed	Season 1		(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)
		Season 2	(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)
	Basic seed	Season 1	-	(22,591,850)	(22,591,850)	(22,591,850)	(22,591,850)
		Season 2		(22,591,850)	(22,591,850)	(22,591,850)	(22,591,850)
Total annual production costs			**(20,693,850)**	**(75,283,500)**	**(75,283,500)**	**(75,283,500)**	**(75,283,500)**
	Net profit/loss		(20,693,850)	1,516,500	78,316,500	78,316,500	78,316,500

Cash Flow Projections

	Years				
	year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual cash in/out flows	(20,693,850)	1,516,500	78,316,500	78,316,500	78,316,500
Annual depreciation (SH)	(8,227,160)	(8,227,160)	(8,227,160)	(8,227,160)	(8,227,160)
Annual depreciation (DLS)	(2,591,747)	(2,591,747)	(2,591,747)	(2,591,747)	(2,591,747)
Interest on loan		(19,670,621)	(6,919,433)	(4,652,108)	(2,104,541)
Net cash flows	(31,512,757)	(28,973,028)	60,578,160	62,845,486	65,393,052
Annual cummulative cash flows	(31,512,757)	(60,485,785)	92,376	62,937,861	128,330,913

Net Present Value

Project (SH +DLS)

Discount Rate: 8%

Period	Cash Flow	PV
0	(92,970,730)	
1	(31,512,757)	(29,178,478)
2	(28,973,028)	(24,839,702)
3	60,578,160	48,088,897
4	62,845,486	46,193,308
5	65,393,052	44,505,412
NPV	(8,201,293)	84,769,437
		(8,201,293)

Annex 8: Economic Analysis of Screenhouse (Subsidy-Farmer X)

Costing of screenhouse mini-tuber production (capacity of screenhouse is approximately 1,536 plantlets)

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Soil excavation and collection (5 tipperfuls sterilising units by 2 man days)	man days	2	1	2	5,000	10,000	Farmer X only sells basic seed.
Transport (5 tipperfuls @15,000 used for 2 season) i.e 2.5 tipperfuls per season	tipperfuls	2.5	1	2.5	15,000	37,500	
Labour loading soil	tipperfuls	2.5	1	2.5	5,000	12,500	
Sand purchase; 1 big tipperful at 70,000, loading 5,000 and transport 50,000 used for 2 seasons (i.e 125,000)	tipperfuls	0.5	1	0.5	125,000	62,500	
Gunny bags for soil sterlization (18 bags @ 1,200)	pcs	18	1	18	1,200	21,600	
Labour soil sieving and bagging and loading into sterlization unit 2 people @ 2 days	man days	2	2	4	5,000	20,000	
Soil/sand sterilization (3 rounds @ 2 people loading and cooking UGX 5,000)	man days	4	3	12	5,000	60,000	
Off-loading (3 rounds @ 2 people half day @ 5,000)	man days	1	3	3	5,000	15,000	
Firewood purchase	lot	1	1	1	34,000	34,000	
Labour for transporting firewood	contract	1	1	1	10,000	10,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for removal of used soil and Cleaning of boxes (6 people @ 5,000)	man days	6	1	6	5,000	30,000	
Labour for Mixing of sand/soil & filling in boxes : 4 people for 1 day	man days	4	1	4	5,000	20,000	
Plantlet collection from KAZARDI (1 day transport 50,000)	trips	1	1	1	50,000	50,000	
Plantlet purchase	numbers	1536	1	1536	1,500	2,304,000	Total cost of invitro plantlet is 1,500/=.
Fertilizer N.P.K 17:17; 4.8 kgs @ 2,500	kgs	4.8	1	4.8	2,500	12,000	
Planting (6 people in 1 day @ 5,000)	man days	6	1	6	5,000	30,000	
Watering (1 person for 1 hour, twice a day i.e 2 hrs per day 2/8 = 0.25 man days for approximately 40 days)	man days	0.25	40	10	5,000	50,000	
Weeding (1st weeding/soil loosening 1 people for 1 day @ 5000)	man days	1	1	1	5,000	5,000	
Soil/Sand filling boxes (2 people for 3 times)	man days	2	3	6	5,000	30,000	
Stucking/supporting wires/ropes; 3 layers @ 2 people for a day	man days	2	3	6	5,000	30,000	
String (rolls) 4 rolls recycled for four seasons i.e 1 roll per seasson	rolls	1	1	1	7,000	7,000	
Nails (kgs)	kgs	1	1	1	4,000	4,000	
Leaf prunning (2 times @ 1 people for a day @ 5,000)	man days	1	2	2	5,000	10,000	
Fungicides				0		-	
i) Fungicides (Systemic; Ridomil 0.25 kgs @ 70,000; 2 sprays)	kg	0.25	1	0.25	70,000	17,500	
ii) Fungicides (Contact ; Mancozeb 0.5 kgs @ 13,000, 2 sprays)	kgs	0.5	1	0.5	13,000	6,500	
Labour fungicide, insectide and foliar fert spraying (4 sprays @ 0.5 hr i.e 0.5/8 = 0.0625 mandays @ 5,000)	man days	0.0625	4	0.25	5,000	1,250	
Insecticide (agrothoate) 125 ml i.e 0.125 litres @ 18,000 per litre	litres	0.125	1	0.125	18,000	2,250	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for dehaulming and disposal of haulms (1 people for half day)	mandays	0.5	1	0.5	5,000	2,500	
Harvesting and counting (6 people for a day)	mandays	6	1	6	5,000	30,000	
Harvesting poly bags (24 @ Shs. 200)	Pcs	24	1	24	200	4,800	
Sorting after curing and storing and insecticide/malathion dust appln (1 people @ 0.25 days)	mandays	0.25	1	0.25	5,000	1,250	
Marathion dust (250 gm)	Kg	0.25	1	0.25	8,000	2,000	
Sanitation: Jick (2 bottles @ 750 ml @ 5,000) - Lts	bottles	2	1	2	5,000	10,000	
Total expenditure						**2,943,150**	
Total mini-tubers produced (8 mini-tubers/plantlet)	numbers					**12,288**	
Cost per mini-tuber (12,288 tubers) (Shs)						**240**	Unit production cost of tuber UGX 240/=.
Cost of mini-tubers per acre						**5,077,700**	If a farmer were to buy seed at this level, they would need 21,200 to plant an acre if spacing was 30cm*75cm which would mean they spend UGX 5,077,700/= on buying seed. Seed at this stage is too expensive and not feasible.
Pre-basic seed production							
Land hire 0.57 acre	acres	0.57	1	0.57	400,000	228,000	12,288 mini-tubers plant 57% of acre.
Bush clearing (1 litre herbicide @ Shs. 20,000)	litres	1	1	1	20,000	20,000	
Labour for water and Herbicide appln (1 people @ Shs. 5,000)	man days	1	1	1	5,000	5,000	
Labour for water for herbicide appln	man days	1	1	1	5,000	5,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Primary/secondary cultn combined (approximately 0.57 acres)	contract	1	1	1	50,000	50,000	
Secondary cultivation (0.57 acres)	contract	1	1	1	110,000	110,000	
Seed cost (mini-tubers)	batch	1	1	1	2,943,159	2,943,159	Total cost of producing mini-tubers.
Fertilizer (9 bags N.P.K 17:17: 1 bag @ Shs.105,000)	bags	9	1	9	105,000	945,000	
Transport fertilizer	bags	9	1	9	5,000	45,000	
Planting (11 people for one day @ Shs. 5000)	man days	11	1	11	5,000	55,000	
Weeding/hilling (1st and 2nd weeding)	man days	9	2	18	5,000	90,000	
Contact fungicides (4 kgs mancozeb at Shs.12,000)	kg	4	1	4	12,000	48,000	
Systemic Fungicides (Ridomil 1.0 kgs at Shs.70,000)	kg	1	1	1	70,000	70,000	
Insecticide (0.7 litre agrothoate)	litres	0.7	1	0.7	15,000	10,500	
Labour for Spraying (5 sprays @ 2 people @ Shs. 5,000)	man days	1	5	5	5,000	25,000	
Labour for Water for fungicide appln (1 person @ 5,000 for 5 sprays)	man days	1	1	1	5,000	5,000	
Dehaulming (4 people @ Shs.5,000)	man days	4	1	4	5,000	20,000	
Harvesting/digging out tubers (16 people for 1 day @ 5,000)	man days	16	1	16	5,000	80,000	
Gunny bags (21 gunny bags @ 1,200)	pcs	21	1	21	1,200	25,200	
Transportation of seed from field to stores (33 bags of 100 kgs)	bags	33	1	33	2,000	66,000	
Insecticide (Malathion dust) for storage pests (360 g bottle)	kg	0.36	1	0.36	10,000	3,600	
Total expenditure						**4,849,459**	
Production cost per acre						**8,507,823**	If the farmer plants an acre, total production cost would be UGX 8,507,823/=.

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Total Production 3,317.76 kgs = 41.47 bags of 80 kgs							
Yield (bags/acre): 3,317.76 kgs/0.57 acres							If an acre was planted, production would be 5,820.63 kgs =72.75 bags @ 80 kgs.
Post harvest loss 99.53 kgs (1.24 bags of 80 kgs)							
Seed sold (40.23 bags @ 80 kg @ Shs.150,00 after 3 months) 41.47-1.24 = 40.23 bags	bags	40	1	40	150,000	**6,000,000**	If postharvest loss is 3% (41.47 bags - 1.24 bags = 40.23 bags.
Net income						**1,150,541**	If the farmer sells prebasic seed @ 150,000 per bag, makes profit of UGX 1,150,541/=.
Cost per 80 kg bag						**116,939**	
Cost per kg of PBS (cost per 80 kg bag/80 kg)						**1,462**	
Revenue/income							
40.23 bags @80 kgs sold @ Shs. 150,000 per bag		40	1	40	150,000	**6,000,000**	
Gross income						**6,000,000**	
Gross income per acre						**10,526,316**	
Net income						**1,150,541**	
Net income per acre						**2,018,493**	
Net income per month (12 months from mini-tuber production to sell of PBS i.e 2 seasons)						**168,208**	
Net income per 80 kg bag						**28,764**	
Net income per kg of PBS						**360**	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Basic seed production							
Land hire 3.4 acres	acres	3.4	1	3.4	291,667	991,667	
Bush clearing (7 litres herbicide @ Shs. 20,000	litres	7	1	7	20,000	140,000	
Labour herbicide appln (7 people @ Shs. 8000)	man days	7	1	7	8,000	56,000	
Water for herbicide appln	jerrycans	51	1	51	1,000	51,000	
Primary/secondary cultn combined (approximately 3.4 acres)	contract	3.4	1	2.4	250,000	600,000	
Secondary cultivation (3.4 acres)	contract	3.4	1	3.4	250,000	850,000	
Seed cost						4,849,459	Total production cost of pre-basic seed.
Transport (seed 100,000 plus loading and offloading Shs. 20,000)	contract	1.42	1	1.42	120,000	170,400	
Fertilizer (9.9 bags N.P.K 17:17: @ Shs.105,000)	bags	9.9	1	9.9	105,000	1,039,500	
Transport fertilizer	bags	9.9	1	9.9	5,000	49,500	
Planting (28 people for 3 time @ Shs. 7,000)	man days	28	3.25	91	7,000	637,000	
Weeding (1st and 2nd weeding)	acres	3.4	1	3.4	125,000	425,000	
Contact fungicides (5.9 kgs mancozeb at Shs. 12,000)	kg	5.9	1	5.9	12,000	70,800	
Systemic fungicides (Ridomil 7.79 kgs at Shs. 70,000)	kg	7.79	1	7.79	70,000	545,300	
Labour for Spraying (3 sprays @ 5.66 people @ Shs. 7,000)	man days	5.66	3	16.98	7,000	118,860	
Water for fungicide appln (202.5 jerrycans @ 1,000)	jerrycans	202.5	1	202.5	1,000	202,500	
Dehaulming (8.5 people @ Shs. 7,000)	man days	8.5	1	8.5	7,000	59,500	
Harvesting and transport to store (18 people for 7 days @ 7,000)	man days	18.4	7	128.8	7,000	901,600	
Gunny bags (283 gunny bags @ 1,000)	pcs	283.3	1	283.3	1,000	283,300	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Sisal string	rolls	2.83	1	2.83	6,000	16,980	
Loading and off-loading	contract	1.42	1	1.42	20,000	28,400	
Pouring and spreading seed in store (10 people @5000)	man days	9.9	1	9.9	5,000	49,500	
Post harvest handling (sorting 10 people @ 5,000)	man days	9.9	1	9.9	5,000	49,500	
Total expenditure on 3.4 acres						**12,185,766**	
Total production cost per acre						**3,584,049**	
Total yield (harvest): 264 bags @80 kgs=21,120 kgs							If 1 kg of pre-basic produces 6.6 kgs of basic seed.
Revenue							
Seed sold 256 bags @ 80 kg Shs.150,000 after 3 months (postharvest loss 7.92 bags) i.e 3%	80 kg-bags	256	1	256	150,000	**38,400,000**	If the farmer sells all tubers as basic seed.
Gross revenue/income						**38,400,000**	
Gross revenue/income per acre						**11,294,118**	
Net income for 3.4 acres						**26,214,234**	
Net income per acre						**7,710,069**	
Cost per 80 kg bag						**46,158**	
Cost per kg of basic seed (cost per 80 kg bag/80 kg)						**577**	
Net income						**26,214,234**	
Net Income per acre						**7,710,069**	
Net income per acre per month						**367,146**	
Net income per bag						**102,399**	
Net income per kg of basic seed						**1,280**	
							It takes approximately 18 months to produce basic seed from plantlets considering dormancy stages.

Cost-Income Summary

			Years				
			year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual income	**Basic Seed**		**-**	**38,400,000**	**76,800,000**	**76,800,000**	**76,800,000**
Seasonal production costs	Mini-tubers	Season 1	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)
		Season 2	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)
	Pre-basic seed	Season 1		(4,849,450)	(4,849,450)	(4,849,450)	(4,849,450)
		Season 2	(4,849,450)	(4,849,450)	(4,849,450)	(4,849,450)	(4,849,450)
	Basic seed	Season 1	-	(12,185,754)	(12,185,754)	(12,185,754)	(12,185,754)
		Season 2		(12,185,754)	(12,185,754)	(12,185,754)	(12,185,754)
Total annual production costs			**(10,735,750)**	**(39,956,708)**	**(39,956,708)**	**(39,956,708)**	**(39,956,708)**
	Net profit/loss		(10,735,750)	(1,556,708)	36,843,292	36,843,292	36,843,292

Cash Flow Projections

	Years				
	year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual cash inflows	(10,735,750)	(1,556,708)	36,843,292	36,843,292	36,843,292
Annual depreciation (SH)	(2,578,500)	(2,578,500)	(2,578,500)	(2,578,500)	(2,578,500)
Annual depreciation (DLS)	(1,746,000)	(1,746,000)	(1,746,000)	(1,746,000)	(1,746,000)
Net cash flows	(15,060,250)	(5,881,208)	32,518,792	32,518,792	32,518,792
Annual cummulative cash flow	(15,060,250)	(20,941,458)	11,577,334	44,096,126	76,614,918

Net Present Value

Project (screenhouse)

Discount Rate: 8%

Period	Cash Flow	PV
0	(30,352,500)	
1	(15,060,250)	(13,944,676)
2	(5,881,208)	(5,042,188)
3	32,518,792	25,814,466
4	32,518,792	23,902,283
5	32,518,792	22,131,743
NPV	22,509,128	52,861,628
		22,509,128

Annex 9: Economic Analysis of Screenhouse (Loan-Farmer X)

Costing of screenhouse mini-tuber production (capacity of screenhouse is approximately 1,536 plantlets)

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Soil excavation and collection (5 tipperfuls sterilising units by 2 man days)	man days	2	1	2	5,000	10,000	Farmer X only sells basic seed.
Transport (5 tipperfuls @15,000 used for 2 season) i.e 2.5 tipperfuls per season	tipperfuls	2.5	1	2.5	15,000	37,500	
Labour loading soil	tipperfuls	2.5	1	2.5	5,000	12,500	
Sand purchase; 1 big tipperful at 70,000, loading 5,000 and transport 50,000 used for 2 seasons (i.e 125,000)	tipperfuls	0.5	1	0.5	125,000	62,500	
Gunny bags for soil sterlization (18 bags @ 1,200)	pcs	18	1	18	1,200	21,600	
Labour soil sieving and bagging and loading into sterlization unit 2 people @ 2 days	man days	2	2	4	5,000	20,000	
Soil/sand sterilization (3 rounds @ 2 people loading and cooking UGX 5,000)	man days	4	3	12	5,000	60,000	
Off-loading (3 rounds @ 2 people half day @ 5,000)	man days	1	3	3	5,000	15,000	
Firewood purchase	lot	1	1	1	34,000	34,000	
Labour for transporting firewood	contract	1	1	1	10,000	10,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for removal of used soil and Cleaning of boxes (6 people @ 5,000)	man days	6	1	6	5,000	30,000	
Labour for Mixing of sand/soil & filling in boxes: 4 people for 1 day	man days	4	1	4	5,000	20,000	
Plantlet collection from KAZARDI (1 day transport 50,000)	trips	1	1	1	50,000	50,000	
Plantlet purchase	numbers	1536	1	1536	1,500	2,304,000	Cost of invitro plantlet is 1,500/=.
Fertilizer N.P.K 17:17; 4.8 kgs @ 2,500	kgs	4.8	1	4.8	2,500	12,000	
Planting (6 people in 1 day @ 5,000)	man days	6	1	6	5,000	30,000	
Watering (1 person for 1 hour, twice a day i.e 2 hrs per day 2/8 =0.25 man days for approximately 40 days)	man days	0.25	40	10	5,000	50,000	
Weeding (1st weeding/soil loosening 1 people for 1 day @ 5000)	man days	1	1	1	5,000	5,000	
Soil/sand filling boxes (2 people for 3 times)	man days	2	3	6	5,000	30,000	
Stucking/supporting wires/ropes; 3 layers @ 2 people for a day	man days	2	3	6	5,000	30,000	
String (rolls) 4 rolls recycled for four seasons i.e 1 roll per seasson	rolls	1	1	1	7,000	7,000	
Nails (kgs)	kgs	1	1	1	4,000	4,000	
Leaf prunning (2 times @ 1 people for a day @ 5,000)	man days	1	2	2	5,000	10,000	
Fungicides				0		-	
i) Fungicides (Systemic; Ridomil 0.25 kgs @ 70,000; 2 sprays)	kg	0.25	1	0.25	70,000	17,500	
ii) Fungicides (Contact ; Mancozeb 0.5 kgs @ 13,000, 2 sprays)	kgs	0.5	1	0.5	13,000	6,500	
Labour fungicide, insectide and foliar fert spraying (4 sprays @ 0.5 hr i.e 0.5/8 =0.0625 mandays @ 5,000)	man days	0.0625	4	0.25	5,000	1,250	
Insecticide (agrothoate) 125 ml i.e 0.125 litres @ 18,000 per litre	litres	0.125	1	0.125	18,000	2,250	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for dehaulming and disposal of haulms (1 people for half day)	man days	0.5	1	0.5	5,000	2,500	
Harvesting and counting (6 people for a day)	man days	6	1	6	5,000	30,000	
Harvesting poly bags (24 @ Shs. 200)	pcs	24	1	24	200	4,800	
Sorting after curing and storing and insecticide/malathion dust appln (1 people @ 0.25 days)	man days	0.25	1	0.25	5,000	1,250	
Marathion dust (250 gm)	kg	0.25	1	0.25	8,000	2,000	
Sanitation: Jick (2 bottles @ 750 ml @ 5,000) - Lts	bottles	2	1	2	5,000	10,000	
Total expenditure						**2,943,150**	
Total mini-tubers produced (8 mini-tubers/plantlet)	numbers					**12,288**	
Cost per mini-tuber (12,288 tubers) (Shs)						**240**	Unit production cost UGX 240/=.
Cost of mini-tubers per acre						**5,077,700**	If a farmer were to buy seed at this level, they would need 21,200 to plant an acre if spacing was 30cm*75cm which would mean they spend UGX 5,077,700/= on buying seed. Seed at this stage is too expensive and not feasible.
Pre-basic seed production							
Land hire 0.57 acre	acres	0.57	1	0.57	400,000	228,000	12,288 mini-tubers plant 57% of acre.
Bush clearing (1 litre herbicide @ Shs. 20,000)	litres	1	1	1	20,000	20,000	
Labour for water and Herbicide appln (1 people @ Shs. 5,000)	man days	1	1	1	5,000	5,000	
Labour for water for herbicide appln	man days	1	1	1	5,000	5,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Primary/secondary cultn combined (approximately 0.57 acres)	contract	1	1	1	50,000	50,000	
Secondary cultivation (0.57 acres)	contract	1	1	1	110,000	110,000	
Seed cost (mini-tubers)	batch	1	1	1	2,943,159	2,943,159	Total cost of producing mini-tubers.
Fertilizer (9 bags N.P.K 17:17: 1 bag @ Shs.105,000)	bags	9	1	9	105,000	945,000	
Transport fertilizer	bags	9	1	9	5,000	45,000	
Planting (11 people for one day @ Shs. 5000)	man days	11	1	11	5,000	55,000	
Weeding/hilling (1st and 2nd weeding)	man days	9	2	18	5,000	90,000	
Contact fungicides (4 kgs mancozeb at Shs.12,000)	kg	4	1	4	12,000	48,000	
Systemic Fungicides (Ridomil 1.0 kgs at Shs.70,000)	kg	1	1	1	70,000	70,000	
Insecticide (0.7 litre agrothoate)	litres	0.7	1	0.7	15,000	10,500	
Labour for Spraying (5 sprays @ 2 people @ Shs. 5,000)	man days	1	5	5	5,000	25,000	
Labour for Water for fungicide appln (1 person @ 5,000 for 5 sprays)	man days	1	1	1	5,000	5,000	
Dehaulming (4 people @ Shs.5,000)	man days	4	1	4	5,000	20,000	
Harvesting/digging out tubers (16 people for 1 day @ 5,000)	man days	16	1	16	5,000	80,000	
Gunny bags (21 gunny bags @ 1,200)	pcs	21	1	21	1,200	25,200	
Transportation of seed from field to stores (33 bags of 100 kgs)	bags	33	1	33	2,000	66,000	
Insecticide (Malathion dust) for storage pests (360 g bottle)	kg	0.36	1	0.36	10,000	3,600	
Total expenditure						**4,849,459**	
Production cost per acre						**8,507,823**	If the farmer plants an acre, total production cost would be UGX 8,507,823/=.

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Total production 3,317.76 kgs = 41.47 bags of 80 kgs							
Yield (bags/acre): 3,317.76 kgs/0.57 acres							If an acre was planted, production would be 5,820.63 kgs = 72.75 bags @ 80 kgs.
Post harvest loss 99.53kgs (1.24 bags of 80 kgs)							
Seed sold (40.23 bags @ 80 kg @ Shs.150,00 after 3 months) 41.47-1.24 = 40.23 bags	bags	40	1	40	150,000	**6,000,000**	If post-harvest loss is 3% (41.47 bags - 1.24 bags = 40.23 bags).
Net income						**1,150,541**	If the farmer sells prebasic seed @150,000 per bag, makes profit of UGX 1,150,541/=.
Cost per 80 kg bag						**116,939**	
Cost per kg of PBS (Cost per 80 kg bag/80 kg)						**1,462**	
Revenue/income							
40.23 bags @80 kgs sold @ Shs. 150,000 per bag		40	1	40	150,000	**6,000,000**	
Gross income						**6,000,000**	
Gross income per acre						**10,526,316**	
Net income						**1,150,541**	
Net income per acre						**2,018,493**	
Net income per month (12 months from mini-tuber production to sell of PBS i.e 2 seasons)						**168,208**	
Net income per 80 kg bag						**28,764**	
Net income per kg of PBS						**360**	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Basic seed production							
Land hire 3.4 acres	acres	3.4	1	3.4	291,667	991,667	
Bush clearing (7 litres herbicide @ Shs. 20,000	litres	7	1	7	20,000	140,000	
Labour herbicide appln (7 people @ Shs. 8000)	man days	7	1	7	8,000	56,000	
Water for herbicide appln	jerrycans	51	1	51	1,000	51,000	
Primary/secondary cultn combined (approximately 3.4 acres)	contract	3.4	1	2.4	250,000	600,000	
Secondary cultivation (3.4 acres)	contract	3.4	1	3.4	250,000	850,000	
Seed cost	batch					4,849,459	Total cost of producing pre-basic seed.
Transport (seed 100,000 plus loading and offloading Shs. 20,000)	contract	1.42	1	1.42	120,000	170,400	
Fertilizer (9.9 bags N.P.K 17:17: @ Shs.105,000)	bags	9.9	1	9.9	105,000	1,039,500	
Transport fertilizer	bags	9.9	1	9.9	5,000	49,500	
Planting (28 people for 3 time @ Shs. 7,000)	man days	28	3.25	91	7,000	637,000	
Weeding (1st and 2nd weeding)	acres	3.4	1	3.4	125,000	425,000	
Contact fungicides (5.9 kgs mancozeb at Shs. 12,000)	kg	5.9	1	5.9	12,000	70,800	
Systemic fungicides (Ridomil 7.79 kgs at Shs. 70,000)	kg	7.79	1	7.79	70,000	545,300	
Labour for Spraying (3 sprays @ 5.66 people @ Shs. 7,000)	man days	5.66	3	16.98	7,000	118,860	
Water for fungicide appln (202.5 jerrycans @ 1,000)	jerrycans	202.5	1	202.5	1,000	202,500	
Dehaulming (8.5 people @ Shs. 7,000)	man days	8.5	1	8.5	7,000	59,500	
Harvesting and transport to store (18 people for 7 days @ 7,000)	man days	18.4	7	128.8	7,000	901,600	
Gunny bags (283 gunny bags @ 1,000)	pcs	283.3	1	283.3	1,000	283,300	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Sisal string	rolls	2.83	1	2.83	6,000	16,980	
Loading and off-loading	contract	1.42	1	1.42	20,000	28,400	
Pouring and spreading seed in store (10 people @5000)	man days	9.9	1	9.9	5,000	49,500	
Post harvest handling (sorting 10 people @ 5,000)	man days	9.9	1	9.9	5,000	49,500	
Total expenditure on 3.4 acres						**12,185,766**	
Total production cost per acre						**3,584,049**	
Total yield (harvest): 264 bags @ 80 kgs = 21,120 kgs							If 1kg of pre-basic produces 6.6 kgs of basic seed.
Revenue							
Seed sold 256 bags @ 80 kg Shs.150,000 after 3 months (postharvest loss 7.92 bags) i.e 3%)	80 kg-bags	256	1	256	150,000	**38,400,000**	If the farmer sells all tubers as basic seed.
Gross revenue/income						**38,400,000**	
Gross revenue/income per acre						**11,294,118**	
Net income for 3.4 acres						**26,214,234.2**	
Net income per acre						**7,710,069**	
Cost per 80 kg bag						**46,158**	
Cost per kg of Basic seed (cost per 80 kg bag/80 kg)						**577**	
Net income						**26,214,234**	
Net Income per acre						**7,710,069**	
Net income per acre per month						**367,146**	
Net income per bag						**102,399**	
Net income per kg of basic seed						**1,280**	
							It takes approximately 18 months to produce basic seed from plantlets considering dormancy stages.

Cost-Income Summary

			Years				
			year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual income	**Basic Seed**		**-**	**38,400,000**	**76,800,000**	**76,800,000**	**76,800,000**
Seasonal production costs	Mini-tubers	Season 1	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)
		Season 2	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)	(2,943,150)
	Pre-basic seed	Season 1		(4,849,450)	(4,849,450)	(4,849,450)	(4,849,450)
		Season 2	(4,849,450)	(4,849,450)	(4,849,450)	(4,849,450)	(4,849,450)
	Basic seed	Season 1	-	(12,185,754)	(12,185,754)	(12,185,754)	(12,185,754)
		Season 2		(12,185,754)	(12,185,754)	(12,185,754)	(12,185,754)
Total annual production costs			**(10,735,750)**	**(39,956,708)**	**(39,956,708)**	**(39,956,708)**	**(39,956,708)**
	Net profit/loss		(10,735,750)	(1,556,708)	36,843,292	36,843,292	36,843,292

Cash Flow Projections

	Years				
	year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual cash inflows	(10,735,750)	(1,556,708)	36,843,292	36,843,292	36,843,292
Annual depreciation (SH)	(5,157,000)	(5,157,000)	(5,157,000)	(5,157,000)	(5,157,000)
Annual depreciation (DLS)	(3,492,000)	(3,492,000)	(3,492,000)	(3,492,000)	(3,492,000)
Loan interest	-	(12,843,882)	(4,518,026)	(3,037,582)	1,374,155
Net cash flows	(19,384,750)	(23,049,590)	23,676,266	25,156,710	29,568,447
Annual cummulative cash flows	(19,384,750)	(42,434,340)	(18,758,074)	6,398,636	35,967,083

Net Present Value

Project (screenhouse)

Discount Rate: 8%

Period	Cash Flow	PV
0	(60,705,000)	
1	(9,070,750)	(8,398,843)
2	(23,049,590)	(19,761,308)
3	23,676,266	18,794,983
4	25,156,710	18,490,933
5	29,568,447	20,123,788
NPV	(31,455,447)	29,249,553
		(31,455,447)

Annex 10: Economic Analysis of Screenhouse (Subsidy-Muyambi, Three Seasons)

Costing of screenhouse mini-tuber production (capacity of screenhouse is approximately 3,072 plantlets)

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Soil excavation & collection (5 tipperful sterilising units by 4 man days)	man days	4	1	4	5,000	20,000	Muyambi does not sell mini-tubers and pre-basic seed, only sells basic seed.
Transport (4 tipperfuls @ 15,000 used for 2 season) i.e 5 tipperfuls per season	tipperfuls	4	2	8	15,000	120,000	
Labour loading soil	tipperfuls	4	1	4	5,000	20,000	
Sand purchase; 2 big tipperfuls at 70,000, loading 5,000 and transport 50,000 used for 2 seasons i.e 195,000	tipperfuls	1	1	1	97,500	97,500	
Gunny bags for soil sterlization (18 bags @ 1,200)	pcs	18	1	18	1,200	21,600	
Labour soil sieving and bagging and loading into sterlization unit 4 people @ 2 days	man days	4	2	8	5,000	40,000	
Soil/sand sterilization (3 rounds @ 4 people loading and cooking @ UGX 5,000)	man days	4	3	12	5,000	60,000	
Off-loading (3 rounds @ 4people half day @ 5,000)	man days	2	3	6	5,000	30,000	
Firewood purchase	lot	2	1	2	34,000	68,000	
Labour for transporting firewood	contract	2	1	2	10,000	20,000	
Labour for removal of used soil and cleaning of boxes (8 people @5,000)	man days	8	1	8	5,000	40,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for mixing of sand/soil and filling in boxes: 6 people for 1 day	man days	6	1	6	5,000	30,000	
Plantlet collection from KAZARDI (1 day transport 50,000)	trips	1	1	1	50,000	50,000	
Plantlet purchase	numbers	3072	1	3072	1,500	4,608,000	Total cost of plantlets @ 1,500/=.
Fertilizer N.P.K 17:17; 9.6 kgs @ 2,500	kgs	9.6	1	9.6	2,500	24,000	
Planting (10 people in 1 day @ 5,000)	man days	10	1	10	5,000	50,000	
Watering (2 people for 1 hr twice a day i.e 4 hrs per day 4/8 = 0.5 man days for approximately 40 days)	man days	0.25	40	10	5,000	50,000	
Weeding (1st weeding/soil loosening 2 people for 1 day @ 5,000	man days	2	1	2	5,000	10,000	
Soil/sand filling boxes (4 people for 3 times)	man days	4	3	12	5,000	60,000	
Stucking/supporting wires/ropes; 3 layers @ 2 people for a day	man days	2	1	2	5,000	10,000	
String (rolls) 4 rolls recycled for four seasons i.e 2 roll per seasson	rolls	2	1	2	7,000	14,000	
Nails (kgs)	kgs	2	1	2	4,000	8,000	
Leaf prunning (2 times @ 2 people for a day @ 5,000)	man days	2	2	4	5,000	20,000	
Fungicides				0		-	
i) Fungicides (systemic; Ridomil 0.5 kg @70,000; 2 sprays)	kg	0.5	2	1	70,000	70,000	
ii) Fungicides (Contact; Mancozeb 1 kg @13,000, 2 sprays)	kgs	1	2	2	13,000	26,000	
Labour fungicide, insectide and foliar fert spraying (4 sprays @ 1hr i.e 1/8 = 0.125 man day @ 5,000)	man days	0.125	4	0.5	5,000	2,500	
Insecticide (agrothoate) 125 ml i.e 0.25 liters @ 18,000 per litre	litres	0.25	1	0.25	18,000	4,500	
Labour for dehaulming and disposal of haulms (2 people for half day)	man days	1	1	1	5,000	5,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Harvesting and counting (8 people for a day)	man days	8	1	8	5,000	40,000	
Harvesting poly bags (48 @ Shs. 200)	pcs	48	1	48	200	9,600	
Sorting after curing and storing & insecticide/malathion dust appln (1 people @ 0.5 days)	man days	0.5	0.5	0.25	5,000	1,250	
Marathion dust (0.5 gm)	kg	0.5	1	0.5	8,000	4,000	
Sanitation: Jick(2 bottles @750 ml @5000) - Lts	bottles	2	1	2	5,000	10,000	
Total expenditure						**5,643,950**	
Total mini-tubers produced (8 mini-tubers@plantlet)	numbers					**24,576**	If the yield is 8 mini-tubers/plantlet.
Cost per mini-tuber (24,576 tubers) (Shs)						**230**	Unit production cost UGX 230/=.
Cost of mini-tubers per acre						**4,868,642**	If a farmer were to buy seed at this level, they would need 21,200 to plant an acre if spacing was 30cm*75cm which would mean they spend UGX 4,868,642/= on buying seed. Seed at this stage is too expensive and not feasible.
Pre-basic seed production							
Land hire 1.2 acre	acres	1.2	1	1.2	400,000	480,000	24,576 mini-tubers plant 1.2 acres.
Bush clearing (2 litres herbicide @ Shs. 20,000)	liters	2	1	2	20,000	40,000	
Labour for water and Herbicide appln (2 people @ Shs. 5,000)	mandays	2	1	2	5,000	10,000	
Labour for water for herbicide appln	mandays	2	1	2	5,000	10,000	
Primary/secondary cultn combined (approx 1.2 acres)	contract	2	1	2	50,000	100,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Secondary cultivation (1.2 acres)	contract	2	1	2	110,000	220,000	
Seed cost (mini-tubers)	batch	1	1	1	5,643,950	5,643,950	Total production cost of pre-basic seed.
Fertilizer (18 bags N.P.K 17:17: 1 bag @ Shs.105,000)	bags	18	1	18	105,000	1,890,000	
Transport fertilizer	bags	18	1	18	4,000	72,000	
Planting (20 people for one day @ Shs. 5,000)	man days	20	1	20	5,000	100,000	
Weeding/hilling (1st and 2nd weeding)	man days	18	2	36	5,000	180,000	
Contact Fungicides (8 kgs mancozeb at Shs.12,000)	kg	8	1	8	12,000	96,000	
Systemic Fungicides (Ridomil 2.0 kgs at Shs. 70,000)	kg	2	1	2	70,000	140,000	
Insecticide (1.5 liter agrothoate)	litres	1.5	1	1.5	15,000	22,500	
Labour for spraying (5 sprays @ 2 people @ Shs. 5,000)	man days	2	5	10	5,000	50,000	
Labour for water for fungicide appln (2 persons @ 5,000 for 5 sprays)	man days	2	1	2	5,000	10,000	
Dehaulming (2 people @ Shs. 5,000)	man days	2	1	2	5,000	10,000	
Harvesting/digging out tubers (20 people for 1 day @ 5,000)	man days	20	1	20	5,000	100,000	
Gunny bags (70 gunny bags @ 1,200)	pcs	70	1	70	1,200	84,000	
Transportation of seed from field to stores (70 bags of 100 kgs)	bags	70	1	70	2,000	140,000	
Insecticide (Malathion dust) for storage pests (750 g bottle)	kg	0.75	1	0.75	10,000	7,500	
Total expenditure						**9,405,950**	
Production cost per acre						**7,838,292**	If Muyambi plants an acre.
Total Production 6,635.52 kgs = 82.94 bags of 80 kgs							Assuming @mini-tuber yield 0.27kg of pre-basic seed.

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Yield (bags/acre): 6,635.5 kgs/1.2 acres							If an acre was planted, production would be 5,529.6 kgs = 69.12 bags @ 80 kgs.
Total amount of seed after storage (total production less PH losses 3% = 82.9 bags - 2.487 bags)							
Seed sold (80 bags @ 80 kg @ Shs. 150,000 after 3 months)	bags	80	1	80	150,000	**12,000,000**	
Net income						**2,594,050**	
Cost per 80 kg bag						**113,407**	
Cost per kg of PBS (cost per 80 kg bag/80 kg)						**1,418**	
Revenue /income							
80 bags @ 80 kgs sold @ Shs. 150,000 per bag		80	1	80	150,000	**12,000,000**	Income if Muyambi sells pre-basic seed.
Gross income						**12,000,000**	
Gross income per acre						**10,000,000**	
Net income						**2,594,050**	Net income if Muyambi sells pre-basic seed.
Net income per acre						**2,161,708**	
Net income per month (12 months from mini-tuber production to sell of PBS i.e 2 seasons)						**180,142**	
Net income per 80 kg bag						**32,426**	
Net income per kg of PBS						**405**	
Basic seed production							
Land hire 6.87 acres	acres	6.87	1	6.87	291,667	2,003,750	
Bush clearing (14 litres herbicide @ Shs. 20,000	litres	14	1	14	20,000	280,000	
Labour herbicide appln (10 people @ Shs. 8,000)	man days	10	1	10	8,000	80,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Water for herbicide appln	jerrycans	98	1	98	1,000	98,000	
Primary/secondary cultn combined (approximately 6.87 acres)	contract	6.87	1	6.87	240,000	1,648,800	
Secondary cultivation (6.87 acres)	contract	6.87	1	6.87	200,000	1,374,000	
Seed cost		1	1	1	9,405,950	9,405,950	
Transport (seed 80,000 plus loading and offloading Shs. 20,000)	contract	2	1	2	100,000	200,000	
Fertilizer (21 bags N.P.K 17:17: @ Shs.105,000)	bags	21	1	21	105,000	2,205,000	
Transport fertilizer	bags	21	1	21	5,000	105,000	
Planting (20 people for 3 time @ Shs. 7,000)	man days	20	3	60	7,000	420,000	
Weeding (1st and 2nd weeding	acres	6.87	1	6.87	105,000	721,350	
Contact Fungicides (10 kgs mancozeb at Shs. 12,000)	kg	10	1	10	12,000	120,000	
Systemic Fungicides (Ridomil 16 kgs at Shs. 70,000)	kg	16	1	16	70,000	1,120,000	
Labour for Spraying (3 sprays @ 8 people @ Shs. 7,000)	man days	8	3	24	7,000	168,000	
Water for fungicide appln (408 jerrycans @ 1,000)	jerrycans	408	1	408	1,000	408,000	
Dehaulming (14 people @ Shs. 7,000)	man days	14	1	14	7,000	98,000	
Harvesting and transport to store (28 people for 7 days @ 7,000)	man days	28	7	196	7,000	1,372,000	
Gunny bags (530 gunny bags @ 1,000)	pcs	530	1	530	1,000	530,000	
Sisal string	rolls	4	1	4	6,000	24,000	
Loading and off-loading	contract	3	1	3	20,000	60,000	
Pouring and spreading seed in store (19 people @5000)	man days	15	1	15	5,000	75,000	
Post harvest handling (sorting 19 people @ 5,000)	man days	15	1	15	5,000	75,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Total expenditure on 6.87 acres						**22,591,850**	
Total Production cost per acre						**3,288,479**	
Total harvest (528 bags @80 kgs) = 42,240 kgs							If 1kg of prebasic produces 6.6 kgs of basic seed.
Yield/acre (42,240 kg/6.87 acres = 6,148.47 kgs)							
Revenue							
Seed sold (512 @ 80 kg, Shs. 150,000 after 3 months)	80 kg-bags	512	1	512	150,000	**76,800,000**	If Muyambi sells all tubers as basic seed.
Gross revenue/income						**76,800,000**	
Gross revenue/income per acre						**11,179,039**	
Postharvest loss (15.84 bags) i.e 3%							
Net income for 6.87 acres						**54,208,150**	
Net income per acre						**7,890,560**	
Cost per 80 kg bag						**42,788**	
Cost per kg of Basic seed (Cost per 80 kg bag/80 kg)						**535**	
Net income						**54,208,150**	
Net Income per acre						**7,890,560**	
Net income per acre per month						**375,741**	
Net income per bag						**105,875**	
Net income per kg of basic seed						**1,323**	
							It takes approximately 18 months to produce basic seed from plantlets considering dormancy stages. Muyambi sells basic seed only.

Cost-Income Summary

			Years				
			year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual income	**Basic Seed**		**-**	**230,400,000**	**230,400,000**	**230,400,000**	**230,400,000**
Seasonal production costs	Mini-tubers	Season 1	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)
		Season 2	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)
		Season 3	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)
	Pre-basic seed	Season 1	(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)
		Season 2	(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)
		Season 3		(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)
	Basic seed	Season 1	-	(22,591,850)	(22,591,850)	(22,591,850)	(22,591,850)
		Season 2		(22,591,850)	(22,591,850)	(22,591,850)	(22,591,850)
		Season 3		(22,591,850)	(22,591,850)	(22,591,850)	(22,591,850)
Total annual production costs			**(35,743,750)**	**(112,925,251)**	**(112,925,251)**	**(112,925,251)**	**(112,925,251)**
	Net profit/Loss		(35,743,750)	117,474,749	117,474,749	117,474,749	117,474,749

Cash Flow Projections

	Years				
	year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual cash flows	(35,743,750)	117,474,749	117,474,749	117,474,749	117,474,749
Annual depreciation (SH)	(1,680,000)	(1,680,000)	(1,680,000)	(1,680,000)	(1,680,000)
Annual depreciation (DLS)	(958,157)	(958,157)	(958,157)	(958,157)	(958,157)
Net cash flows	(38,381,907)	114,836,593	114,836,593	114,836,593	114,836,593

Net Present Value

Project (SH +DLS)

Discount Rate: 8%

Period	Cash Flow	PV
0	(27,563,130)	
1	(38,381,907)	(35,538,802)
2	114,836,593	98,453,869
3	114,836,593	91,160,990
4	114,836,593	84,408,324
5	114,836,593	78,155,855
NPV	289,077,106	316,640,236
		289,077,106

Annex 11: Economic Analysis of Screenhouse (Loan-Muyambi, Three Seasons)

Costing of screenhouse mini-tuber production (capacity of screenhouse is approximately 3,072 plantlets)

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Soil excavation and collection (5 tipperful sterilising units by 4 man days)	man days	4	1	4	5,000	20,000	Muyambi does not sell mini-tubers and pre-basic seed, only sells basic seed.
Transport (4 tipperfuls @ 15,000 used for 2 season) i.e 5 tipperfuls per season	tipperfuls	4	2	8	15,000	120,000	
Labour loading soil	tipperfuls	4	1	4	5,000	20,000	
Sand purchase; 2 big tipperfuls at 70,000, loading 5,000 and transport 50,000 used for 2 seasons i.e 195,000	tipperfuls	1	1	1	97,500	97,500	
Gunny bags for soil sterlization (18 bags @ 1,200)	pcs	18	1	18	1,200	21,600	
Labour soil sieving and bagging and loading into sterlization unit 4 people @ 2 days	man days	4	2	8	5,000	40,000	
Soil/sand sterilization (3 rounds @ 4 people loading and cooking @ UGX 5,000)	man days	4	3	12	5,000	60,000	
Off-loading (3 rounds @ 4people half day @ 5,000)	man days	2	3	6	5,000	30,000	
Firewood purchase	lot	2	1	2	34,000	68,000	
Labour for transporting firewood	contract	2	1	2	10,000	20,000	
Labour for removal of used soil and cleaning of boxes (8 people @ 5,000)	man days	8	1	8	5,000	40,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Labour for mixing of sand/soil and filling in boxes: 6 people for 1 day	man days	6	1	6	5,000	30,000	
Plantlet collection from KAZARDI (1 day transport 50,000)	trips	1	1	1	50,000	50,000	
Plantlet purchase	numbers	3072	1	3072	1,500	4,608,000	Total cost of plantlets @ 1,500/=.
Fertilizer N.P.K 17:17; 9.6 kgs @ 2,500	kgs	9.6	1	9.6	2,500	24,000	
Planting (10 people in 1 day @ 5,000)	man days	10	1	10	5,000	50,000	
Watering (2 people for 1 hr twice a day i.e 4 hrs per day 4/8 = 0.5 man days for approximately 40 days)	man days	0.25	40	10	5,000	50,000	
Weeding (1st weeding/soil loosening 2 people for 1 day @ 5,000	man days	2	1	2	5,000	10,000	
Soil/sand filling boxes (4 people for 3 times)	man days	4	3	12	5,000	60,000	
Stucking/supporting wires/ropes; 3 layers @ 2 people for a day	man days	2	1	2	5,000	10,000	
String (rolls) 4 rolls recycled for four seasons i.e 2 roll per seasson	rolls	2	1	2	7,000	14,000	
Nails (kgs)	kgs	2	1	2	4,000	8,000	
Leaf prunning (2 times @ 2 people for a day @ 5,000)	man days	2	2	4	5,000	20,000	
Fungicides				0		-	
i) Fungicides (systemic; Ridomil 0.5 kg @70,000; 2 sprays)	kg	0.5	2	1	70,000	70,000	
ii) Fungicides (Contact; Mancozeb 1 kg @13,000, 2 sprays)	kgs	1	2	2	13,000	26,000	
Labour fungicide, insectide and foliar fert spraying (4 sprays @ 1hr i.e 1/8 = 0.125 man day @ 5,000)	man days	0.125	4	0.5	5,000	2,500	
Insecticide (agrothoate) 125 ml i.e 0.25 liters @ 18,000 per litre	litres	0.25	1	0.25	18,000	4,500	
Labour for dehaulming and disposal of haulms (2 people for half day)	man days	1	1	1	5,000	5,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Harvesting and counting (8 people for a day)	man days	8	1	8	5,000	40,000	
Harvesting poly bags (48 @ Shs. 200)	pcs	48	1	48	200	9,600	
Sorting after curing and storing & insecticide/malathion dust appln (1 people @ 0.5 days)	man days	0.5	0.5	0.25	5,000	1,250	
Marathion dust (0.5 gm)	kg	0.5	1	0.5	8,000	4,000	
Sanitation: Jick(2 bottles @750 ml @5000) - Lts	bottles	2	1	2	5,000	10,000	
Total expenditure						**5,643,950**	
Total mini-tubers produced (8 mini-tubers@plantlet)	numbers					**24,576**	If the yield is 8 mini-tubers/plantlet.
Cost per mini-tuber (24,576 tubers) (Shs)						**230**	Unit production cost UGX 230/=.
Cost of mini-tubers per acre						**4,868,642**	If a farmer were to buy seed at this level, they would need 21,200 to plant an acre if spacing was 30cm*75cm which would mean they spend UGX 4,868,642/= on buying seed. Seed at this stage is too expensive and not feasible.
Pre-basic seed production							
Land hire 1.2 acre	acres	1.2	1	1.2	400,000	480,000	24,576 mini-tubers plant 1.2 acres.
Bush clearing (2 litres herbicide @ Shs. 20,000)	liters	2	1	2	20,000	40,000	
Labour for water and Herbicide appln (2 people @ Shs. 5,000)	mandays	2	1	2	5,000	10,000	
Labour for water for herbicide appln	mandays	2	1	2	5,000	10,000	
Primary/secondary cultn combined (approx 1.2 acres)	contract	2	1	2	50,000	100,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Secondary cultivation (1.2 acres)	contract	2	1	2	110,000	220,000	
Seed cost (mini-tubers)	batch	1	1	1	5,643,950	5,643,950	Total production cost of pre-basic seed.
Fertilizer (18 bags N.P.K 17:17: 1 bag @ Shs.105,000)	bags	18	1	18	105,000	1,890,000	
Transport fertilizer	bags	18	1	18	4,000	72,000	
Planting (20 people for one day @ Shs. 5,000)	man days	20	1	20	5,000	100,000	
Weeding/hilling (1st and 2nd weeding)	man days	18	2	36	5,000	180,000	
Contact Fungicides (8 kgs mancozeb at Shs.12,000)	kg	8	1	8	12,000	96,000	
Systemic Fungicides (Ridomil 2.0 kgs at Shs. 70,000)	kg	2	1	2	70,000	140,000	
Insecticide (1.5 liter agrothoate)	litres	1.5	1	1.5	15,000	22,500	
Labour for spraying (5 sprays @ 2 people @ Shs. 5,000)	man days	2	5	10	5,000	50,000	
Labour for water for fungicide appln (2 persons @ 5,000 for 5 sprays)	man days	2	1	2	5,000	10,000	
Dehaulming (2 people @ Shs. 5,000)	man days	2	1	2	5,000	10,000	
Harvesting/digging out tubers (20 people for 1 day @ 5,000)	man days	20	1	20	5,000	100,000	
Gunny bags (70 gunny bags @ 1,200)	pcs	70	1	70	1,200	84,000	
Transportation of seed from field to stores (70 bags of 100 kgs)	bags	70	1	70	2,000	140,000	
Insecticide (Malathion dust) for storage pests (750 g bottle)	kg	0.75	1	0.75	10,000	7,500	
Total expenditure						**9,405,950**	
Production cost per acre						**7,838,292**	If Muyambi plants an acre
Total production 6,635.52 kgs =82.94 bags of 80 kgs							Assuming @ mini-tuber yield 0.27 kg of pre-basic seed

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Yield (bags/acre): 6,635.5 kgs/1.2 acres							If an acre was planted, production would be 5,529.6 kgs = 69.12 bags @ 80 kgs.
Total amount of seed after storage (total production less PH losses 3% = 82.9 bags -2.487 bags)							
Seed sold (80 bags @ 80 kg @ Shs. 150,000 after 3 months)	bags	80	1	80	150,000	**12,000,000**	
Net income						**2,594,050**	
Cost per 80 kg bag						**113,407**	
Cost per kg of PBS (cost per 80 kg bag/80 kg)						**1,418**	
Revenue /income							
80 bags @ 80 kgs sold @ Shs. 150,000 per bag		80	1	80	150,000	**12,000,000**	Income if Muyambi sells pre-basic seed.
Gross income						**12,000,000**	
Gross income per acre						**10,000,000**	
Net income						**2,594,050**	Net income if Muyambi sells pre-basic seed.
Net income per acre						**2,161,708**	
Net income per month (12 months from mini-tuber production to sell of PBS i.e 2 seasons)						**180,142**	
Net income per 80 kg bag						**32,426**	
Net income per kg of PBS						**405**	
Basic seed production							
Land hire 6.87 acres	acres	6.87	1	6.87	291,667	2,003,750	
Bush clearing (14 litres herbicide @ Shs. 20,000	litres	14	1	14	20,000	280,000	
Labour herbicide appln (10 people @ Shs. 8,000)	man days	10	1	10	8,000	80,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Water for herbicide appln	jerrycans	98	1	98	1,000	98,000	
Primary/secondary cultn combined (approximately 6.87 acres)	contract	6.87	1	6.87	240,000	1,648,800	
Secondary cultivation (6.87 acres)	contract	6.87	1	6.87	200,000	1,374,000	
Seed cost		1	1	1	9,405,950	9,405,950	
Transport (seed 80,000 plus loading and offloading Shs. 20,000)	contract	2	1	2	100,000	200,000	
Fertilizer (21 bags N.P.K 17:17: @ Shs.105,000)	bags	21	1	21	105,000	2,205,000	
Transport fertilizer	bags	21	1	21	5,000	105,000	
Planting (20 people for 3 time @ Shs. 7,000)	man days	20	3	60	7,000	420,000	
Weeding (1st and 2nd weeding	acres	6.87	1	6.87	105,000	721,350	
Contact Fungicides (10 kgs mancozeb at Shs. 12,000)	kg	10	1	10	12,000	120,000	
Systemic Fungicides (Ridomil 16 kgs at Shs. 70,000)	kg	16	1	16	70,000	1,120,000	
Labour for Spraying (3 sprays @ 8 people @ Shs. 7,000)	man days	8	3	24	7,000	168,000	
Water for fungicide appln (408 jerrycans @ 1,000)	jerrycans	408	1	408	1,000	408,000	
Dehaulming (14 people @ Shs. 7,000)	man days	14	1	14	7,000	98,000	
Harvesting and transport to store (28 people for 7 days @ 7,000)	man days	28	7	196	7,000	1,372,000	
Gunny bags (530 gunny bags @ 1,000)	pcs	530	1	530	1,000	530,000	
Sisal string	rolls	4	1	4	6,000	24,000	
Loading and off-loading	contract	3	1	3	20,000	60,000	
Pouring and spreading seed in store (19 people @5000)	man days	15	1	15	5,000	75,000	
Post harvest handling (sorting 19 people@5000)	man days	15	1	15	5,000	75,000	

Activity/item	Units	Quantity	Frequency	Total	Unit Cost (Shs)	Total amount (Shs)	Comments
Total expenditure on 6.87 acres						**22,591,850**	
Total Production cost per acre						**3,288,479**	
Total harvest (528 bags @80 kgs) = 42,240 kgs							If 1 kg of pre-basic produces 6.6 kgs of basic seed.
Yield /acre (42,240 kg/6.87 acres = 6,148.47 kgs)							
Seed sold (512 @ 80 kg, @ Shs.150,000 after 3 months)	80 kg-bags	512	1	512	150,000	**76,800,000**	If Muyambi sells all tubers as basic seed.
Gross revenue/income						**76,800,000**	
Gross revenue/income per acre						**11,179,039**	
Postharvest loss (15.84 bags) i.e 3%							
Net income for 6.87 acres						**54,208,150**	
Net income per acre						**7,890,560**	
Cost per 80 kg bag						**42,788**	
Cost per kg of Basic seed (Cost per 80 kg bag/80 kg)						**535**	
Net income						**54,208,150**	
Net Income per acre						**7,890,560**	
Net income per acre per month						**375,741**	
Net income per bag						**105,875**	
Net income per kg of basic seed						**1,323**	
							It takes approximately 18 months to produce basic seed from plantlets considering dormancy stages. Muyambi sells basic seed only.

Cost-Income Summary

			Years				
			year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual income	**Basic Seed**		**-**	**230,400,000**	**230,400,000**	**230,400,000**	**230,400,000**
Seasonal production costs	Mini-tubers	Season 1	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)
		Season 2	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)
		Season 3	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)	(5,643,950)
	Pre-basic seed	Season 1	(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)
		Season 2	(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)
		Season 3		(9,405,950)	(9,405,950)	(9,405,950)	(9,405,950)
	Basic seed	Season 1	-	(22,591,850)	(22,591,850)	(22,591,850)	(22,591,850)
		Season 2		(22,591,850)	(22,591,850)	(22,591,850)	(22,591,850)
		Season 3		(22,591,850)	(22,591,850)	(22,591,850)	(22,591,850)
Total annual production costs			**(35,743,750)**	**(112,925,251)**	**(112,925,251)**	**(112,925,251)**	**(112,925,251)**
	Net profit/loss		(35,743,750)	117,474,749	117,474,749	117,474,749	117,474,749

Cash Flow Projections

	Years				
	year 1	**year 2**	**year 3**	**year 4**	**year 5**
Annual cash inflows	(35,743,750)	117,474,749	117,474,749	117,474,749	117,474,749
Annual depreciation (SH)	(8,227,160)	(8,227,160)	(8,227,160)	(8,227,160)	(8,227,160)
Annual depreciation (DLS)	(2,591,747)	(2,591,747)	(2,591,747)	(2,591,747)	(2,591,747)
Interest on loan		(19,670,621)	(6,919,433)	(4,652,108)	(2,104,541)
Net cash flows	(46,562,657)	86,985,221	99,736,410	102,003,735	104,551,302

Net Present Value

Project (SH +DLS)

Discount Rate: 8%

Period	Cash Flow	PV
0	(92,970,730)	
1	(46,562,657)	(43,113,571)
2	86,985,221	74,575,807
3	99,736,410	79,173,978
4	102,003,735	74,975,791
5	104,551,302	71,155,859
NPV	163,797,134	256,767,864
		163,797,134

Annex 12: Actual Cost of Screenhouse and DLS (Muyambi)

Muyambi William's budget for construction of difused light store (10m×13.4m) =134M^2

Code	Line Item	Units	No of Units	Frequency	Unit of Cost (UGX)	Muyambi W.	Reach	Total
1.1	**Site preparation for diffuses store**							
	Site/foundation preparation, marking and digging of trenches and soil spreading	Mandays	80.00	1	10,000.00	800,000.00	-	800,000.00
	Sub-Total					**800,000.00**		**800,000.00**
1.2	**Purchase of building materials**							
	Bricks	Pcs	12,000.00	1	300.00	3,600,000.00	-	3,600,000.00
	Transport of bricks	Trips	12.00	1	100,000.00	1,200,000.00	-	1,200,000.00
	Hardcore	Tippers	12.00	1	80,000.00	960,000.00	-	960,000.00
	Transport of hardcore	Trips	12.00	1	80,000.00	960,000.00	-	960,000.00
	Aggregate	Tippers	10.00	1	180,000.00	1,800,000.00	-	1,800,000.00
	Transport of aggregate	Trips	10.00	1	100,000.00	1,000,000.00	-	1,000,000.00
	Sand	Tippers	17.00	1	90,000.00	1,530,000.00	-	1,530,000.00
	Transport of sand	Trips	17.00	1	50,000.00	850,000.00	-	850,000.00
	Iron bars (12mm)	Pcs	56.00	1	35,000.00		1,960,000.00	1,960,000.00
	Rings	Pcs	30.00	1	10,000.00		300,000.00	300,000.00
	Cement	Bags	130.00	1	28,000.00		3,640,000.00	3,640,000.00
	Dump proof course membrene DPC	Metre	10.00	1	95,000.00		950,000.00	950,000.00
	Water for construction	Jerrycan	600.00	1	500.00	300,000.00		300,000.00
	Timbers 1*9 (facial boards)	Pcs	18.00	1	18,000.00	324,000.00		324,000.00

Code	Line Item	Units	No of Units	Frequency	Unit of Cost (UGX)	Muyambi W.	Reach	Total
	Timbers 3*4	pcs	160.00	1	6,000.00		960,000.00	960,000.00
	Timbers 6*2	pcs	350.00	1	6,000.00		2,100,000.00	2,100,000.00
	Timbers 4*2	pcs	350.00	1	5,000.00		1,750,000.00	1,750,000.00
	Timber (Kirundo) 9*1'' (for shelves and shuttering)	pcs	400.00	1	8,500.00		3,400,000.00	3,400,000.00
	Transport of timbers	trips	2.00	1	150,000.00	300,000.00		300,000.00
	Wooden poles	pcs	50.00	1	5,000.00	250,000.00		250,000.00
	Transportation wooden poles	trips	2.00	1	50,000.00	100,000.00		100,000.00
	Wood preservative	tins	5.00	1	35,000.00		175,000.00	175,000.00
	Insect proof net/mesh (3x 100m rolls)	rolls	1.00	1	985,500.00		985,500.00	985,500.00
	Chainlink (gauge 10)	rolls	4.00	1	600,000.00		2,400,000.00	2,400,000.00
	Roofing iron sheets (30 gauge)	pcs	110.00	1	45,000.00		4,950,000.00	4,950,000.00
	Ridges (30 gauge)	pcs	14.00	1	14,000.00		196,000.00	196,000.00
	Perspex sheets (30 gauge)	pcs	10.00	1	80,000.00		800,000.00	800,000.00
	Gutters PVC	pcs	8.00	1	25,000.00		200,000.00	200,000.00
	Gutter brackets	pcs	15.00	1	3,000.00		45,000.00	45,000.00
	Gutter union oints	pcs	3.00	1	8,000.00		24,000.00	24,000.00
	Gutter outlets	pcs	4.00	1	15,000.00		60,000.00	60,000.00
	PVC down pipe	pcs	4.00	1	25,000.00		100,000.00	100,000.00
	PVC pipe Ccumps	pcs	8.00	1	3,000.00		24,000.00	24,000.00
	End cups	pcs	4.00	1	5,000.00		20,000.00	20,000.00
	PVC pipe bends	pcs	10.00	1	5,000.00		50,000.00	50,000.00
	Solvent cement	tubes	1.00	1	20,000.00		20,000.00	20,000.00
	Silicon sealant	tubes	1.00	1	10,000.00		10,000.00	10,000.00
	Loop pyerns/loop iron	rolls	2.00	1	25,000.00		50,000.00	50,000.00
	Metalic door double swing	pcs	1.00	1	550,000.00	550,000.00		550,000.00

Code	Line Item	Units	No of Units	Frequency	Unit of Cost (UGX)	Muyambi W.	Reach	Total
	Padlock	pcs	2.00	1	80,000.00	160,000.00		160,000.00
	Roovers					-	-	-
	Wheel barrows	pcs	1.00	1	150,000.00	150,000.00		150,000.00
	Spades	pcs	3.00	1	17,000.00	51,000.00		51,000.00
	Soka jembe/pick axe	pcs	2.00	1	15,000.00	30,000.00		30,000.00
	Hoes	pcs	2.00	1	10,000.00	20,000.00		20,000.00
	Sisal string	rolls	2.00	1	7,000.00	14,000.00		14,000.00
	Roofing nails	kgs	25.00	1	6,000.00		150,000.00	150,000.00
	Rubber washers	Packets	5.00	1	10,000.00		50,000.00	50,000.00
	Nails 6 inch	kg bags	50.00	1	5,000.00		250,000.00	250,000.00
	Nails 5 inch	kg bags	50.00	1	5,000.00		250,000.00	250,000.00
	Nails 4 inch	kg bags	50.00	1	5,000.00		250,000.00	250,000.00
	Nails 3 inch	kgs	25.00	1	5,000.00		125,000.00	125,000.00
	Nails 2.5 inch	kgs	15.00	1	5,000.00		75,000.00	75,000.00
	Nails 2 inch	kgs	3.00	1	5,000.00		15,000.00	15,000.00
	Binding wire	kgs	15.00	1	5,000.00		75,000.00	75,000.00
	U nails (for chainlink)	kgs	15.00	1	6,000.00		90,000.00	90,000.00
	Transport (nails, roofing sheets, iron bars, cement etc)	trips	7.00	1	100,000.00	700,000.00		700,000.00
	Labour (contract)		1.00	1	7,000,000.00	3,500,000.00	3,500,000.00	7,000,000.00
Sub-Total						**18,349,000.00**	**29,999,500.00**	**48,348,500.00**
Grand Total						**19,149,000.00**	**29,999,500.00**	**49,148,500.00**

Muyambi William's budget for establishment of screenhouse (15m×30m = 450sqm) capacity 3,072 plantlets

No.	Code	U/m	Quantity	Unit Price	IFDC-REACH	Muyambi
1	Greenhouse - tunnel model 8 x 30 meter, growing area 240 SQM strong galvanized metal structure, height of 2.7m on the gutter and 5m in the center for improved air circulation, side cover with insect proof net 50 mesh, roof with PVC diffuser multi-layer UV 150 microns	unit	1	21,360,000	21,360,000	
2	Drip irrigation with spacing of 20/30 and 50 cm, filter, connectors, HDPE pipe and tank outlets	unit	1	985,000	985,000	
3	Tank 500 Littres		1	150,000	150,000	
4	Tank stand	unit	1	610,000	610,000	
5	Entrance chamber creating double door solution,for better crop protection (recommended)	unit	1	980,000	980,000	
6	PVC rain gather harvest (91 meters)	unit	1	870,000	870,000	
7	Plant buckets	pcs	1	1,260,000	1,260,000	
8	Installation and hand over	pack	1	830,000	830,000	
9	Transportation of materials to site	unit	1	1,000,000	1,000,000	
10	Site preparation	man days	80	10,000.00		800,000
11	Bricks	pcs	2,400	300.00		720,000
12	Transportation of bricks	trip	2	100,000.00		200,000
13	Cement	bags	20	28,000.00		560,000
14	Transportation of cement	trip	1	100,000.00		100,000
15	Aggregates	trip	6	180,000.00		1,080,000
16	Transport of aggregates	trip	6	100,000.00		600,000
17	Water	jerrycan	300	500.00		150,000
18	Sand	trip	7	90,000.00		630,000
19	Transport	trip	7	50,000.00		350,000

No.	Code	U/m	Quantity	Unit Price	IFDC-REACH	Muyambi
20	Labour	contract	1	1,500,000.00		1,500,000
21	Online control volves	pcs	20	8,050.00		161,000
22	Soil sterilisation drum	pcs	1	1,549,000.00		1,549,000
VAT					4,690,000	
Totals					**32,735,000**	**8,400,000**

Annex 13: Dutch Seed Potato Production Costing

Cost of seed production using imported materials

Inputs	Particulars	Unit	Unit cost (UGX)	Total (UGX)
	Land hire	1	500,000	500,000
	Seed potato (kgs)	800		4,657,400
	Fertilizers	300	4,000	1,200,000
	Manures	5	40,000	200,000
	Fungicides	5	75,000	375,000
	Insecticides	5	75,000	375,000
	Irrigation	1	1,000,000	1,000,000
	Land preparation by tractor	1	500,000	500,000
	Planting	20	10,000	200,000
	Weeding	60	10,000	600,000
	Fertilizers application	10	10,000	100,000
	Spraying	30	10,000	300,000
	Harvesting (mechanised)	1	500,000	500,000
	Collection from the field	1	300,000	300,000
	Sorting	1	200,000	200,000
	packing	1	200,000	200,000
	Storing	1	200,000	200,000
Overhead cost	Management	1	500,000	500,000
	Maintenance and repair	1	400,000	400,000
	Office rent	1	200,000	200,000

Inputs	Particulars	Unit	Unit cost (UGX)	Total (UGX)
Overhead cost	Internet	1	20,000	20,000
	Transport	1	50,000	50,000
Total operating cost				**12,577,400**
Fixed cost	Depreciation on equipment	1	1,361,667	1,361,667
	Interest on operating cost	1	1,509,288	1,509,288
	Interest on investment	1	1,761,667	1,761,667
Total fixed cost				**4,632,621**
Total production cost per acre				**17,210,021**
Cost per kg based on 8 MT/acre production				2,151.25
Profitability analysis				
Estimated gross yield per acre (kgs)				8,000
Avg price per kg				2,500
Revenue per acre				**20,000,000**
Marginal return analysis				
Return over operating cost (GP)				7,422,600
Return over total cost (NP)				2,789,979

Price analysis at different production and sales level

Yield level	1. PRICE SOLD Shs/kg	2. PRICE SOLD Shs/kg	3. PRICE SOLD Shs/kg	4. PRICE SOLD Shs/kg	NP level 1	NP level 2	NP level 3	NP level 4
	3000	2500	2000	1500				
8,000	24,000,000	20,000,000	16,000,000	12,000,000	**6,789,979**	**2,789,979**	(1,210,021)	(5,210,021)
6,000	18,000,000	15,000,000	12,000,000	9,000,000	789,979	(2,210,021)	(5,210,021)	(8,210,021)
4,000	12,000,000	10,000,000	8,000,000	6,000,000	(5,210,021)	(7,210,021)	(9,210,021)	(11,210,021)

Assumptions

CAPITAL INVESTMENT				
Land for production	Acre	200	1,500,000	300,000,000
Cold room		1	438,000,000	438,000,000
Office facilities		1	100,000,000	100,000,000
Transport VAN		1	50,000,000	50,000,000
Irrigation		1	219,000,000	219,000,000
Tractor		1	127,750,000	127,750,000
Harrow		1	36,500,000	36,500,000
Other implement		1	50,000,000	50,000,000
TOTAL				**1,321,250,000**
Depreciation on equipment/year				**204,250,000**
Depreciation on equipment/acre/year				**1,361,666.67**
Interest per annum at 20%				264,250,000
Interest per acre per annum at 20%				1,761,667

ELITE SEED POTATO COST			**USD**
FOB cost for 25 MT			16,000
Lisence for 25 MT ($65/MT)			1,625
Transport upto Mombasa			7,250
Transport from Mombasa to Kampala			10,000
Storage cost			5,000
Total cost for 25 MT			**39,875**
Cost per kg			**1.60**
Cost UGX per kg			**5,821.75**
Required seed potato per acre		**KGS**	**800**
Cost per acre for elite seed potato			**4,657,400.00**

Annex 14: Potato Demand and Market Segments

Market segment	Name	Variety(ies) required	Demand current nd project per year (MT)	Notes
			Crisps Sector	
PROCESSORS	SNACK ATTACK	Taurus, Rwangume & Kinigi	960	Based on the product visibility on the mkt, demand is estimated @ 80 MT/month
	SUMZ		1,040	Machine capacity (output) 125 kgs/h, input/h 500 kgs of potato, working 5 days a week, 52 weeks a year
	NEWMANS		480	Based on the product visibility on the mkt, it is estimated @ 40 MT/month
	VERIS INVESTMENT		2,500	Projected demand @ 208 MT/month based upon interviews held with Veris staff
	HOLLAND FAIR FOOD/Winers		400 rising to 1,500	Commencing operations February 2022, demand based upon interviews with HFF management
	TROPICAL HEAT		1,500	Based on the product visibility on the mkt, demand is estimated @ 125 MT/month, currently processing from Kenya, but have purchased a factory site outside Kampala for crisp manufacturing.
	KATIBA TRADERS		104	Machine capacity (output) 12.5 kgs/h, input/h 50 kgs of potato, working 5 days a week, 52 weeks a year. Facility mainly used for business incubation purpose
		Sub-total MT	**7,230**	
			French Fries Sector	
PROCESSORS	KPPL		1,500 rising to 6,000	Sale of precooked frozen french fries from February 2022, demand based upon interviews with Delphy and KPPIL team
	KFC		504	Current demand @ 42 MT/month, for cut fries. Based upon data supplied by Ministry of Finance, Planning and Economic Development.
	CHICKEN EXPRESS		360	Current demand @ 30 MT/month, locally sourced based upon interview with Purchasing Manager
	CAFÉ JAVAS	Markies, Kinigi, Panamera & Rwangume.	1,296	Current demand @ 108 MT/month based on data collected from interview with Procurement Manager in 2020
	JAVA HOUSE		624	Current demand @ 52MT/month interview with Procurement Manager in 2020
	SUPERMARKET (Shoprite & Caerefour)		3,650	Frozen chips, mainly imported

Market segment	Name	Variety(ies) required	Demand current nd project per year (MT)	Notes
PROCESSORS	Informal resturants, road side venders		32,662	We considered a total of 10,887 road side vendors and resturants in the country with each consuming 10 kgs/day for 300 days
	Hotels/Resturant		1,095	15 big hotels in Kampala
	Medium size resturant (Kampala)		3,979	109 eating places in Kampala using on average 11 kgs/per day for a full calendar year
	13 other major population centers		783	15 estimated gazzetted eating places, demand estimated @ 11 kgs/day, 365 days
		Sub-total MT	**47,953**	
			Fresh Potato Sector	
SUPER MARKETS	SHOPRITE	Rwangume, Kinigi, Victoria, Markies, Panamera and other local varieties	180	Estimated current demand @ 15 MT/month
	OTHERS (7 super mkt)		151	Demand for @ hotel estimated at 1,800 kgs/month
LOCAL DISTRIBUTORS	KPPIL		1,500 rising to 6,000	Supplying, cleaned and bagged potatoes for the retail sector from February 2022
OPEN MARKETS	Open market		135,456	Based on analysis of ASSP 2020/21-2024/25 for potato
	Farmers		25,400	Potatoes kept by farmers to be used as seed
		Sub-total MT	**164,187**	
		Total demand MT	**219,370**	
Total current and projected demand NL varieties		**MT**	**16,724**	
% of NL potato for processing sector excluding Informal resturants		**22,521**	**74**	

Annex 15: Cost Share Report from Private Sector for the Period January 2017-December 2020 (Amounts In Euros)

		IFDC			PARTNERS			TOTAL		PERCENTAGE CONTRIBUTION		
Sector	Partners	Sum of Expected Contribution (Euros)	Sum of Actual Contribution (Euros)	% age Contribution Reached	Sum of Expected Contribution (Euros)	Sum of Actual Contribution (Euros)	% age Contribution Reached	Total Sum of Expected Contribution (Euros)	Total Sum of Actual Contribution (Euros)	IFDC	Budget Line	Partner
Private Sector	Bitamba Enterprise (ISB)	15,061	16,278	108%	4,073	3,427	84%	19,134	19,705	83%	Intervention fund (Cardno), 1.7	17%
	Byampa Enterprises Limited (BYAMPA)	3,796	4,579	121%	1,144	3,573	312%	4,940	8,153	56%	Infrastructure, PPP, and Capacity Building Grant Fund	44%
	Chemonges Stephen	16,011	17,757	111%	4,513	3,205	71%	20,524	20,962	85%	Intervention fund (Cardno), 1.7	15%
	Crop Life Uganda Limited	39,683	40,054	101%	26,330	28,017	106%	66,012	68,071	59%	1.5	41%
	CKB Cleen & Quality Seed Potato Production Enterprise	60,519	55,545	92%	29,034	10,292	35%	89,553	65,836	84%	Infrastructure, PPP, and Capacity Building Grant Fund, 1.7	16%
	CLARKE FARM	138,154	117,481	85%	59,822	1,717	3%	197,976	119,198	99%	Infrastructure, PPP, and Capacity Building Grant Fund	1%
	CYSCAS International	50,150	41,176	82%	25,161	51,693	205%	75,312	92,870	44%	1.7	56%
	Diner's Group Limited	54,937	50,375	92%	47,747	30,015	63%	102,684	80,390	63%	Intervention fund (Cardno), Infrastructure, PPP, and Capacity Building Grant Fund, 1.2, 1.3, 1.4	37%
	Farm Input Care Center (FICA) LTD	156,743	16,642	11%	52,784	34,498	65%	209,528	51,140	33%	Infrastructure, PPP, and Capacity Building Grant Fund	67%

		IFDC			PARTNERS			TOTAL		PERCENTAGE CONTRIBUTION		
Sector	Partners	Sum of Expected Contribution (Euros)	Sum of Actual Contribution (Euros)	% age Contribution Reached	Sum of Expected Contribution (Euros)	Sum of Actual Contribution (Euros)	% age Contribution Reached	Total Sum of Expected Contribution (Euros)	Total Sum of Actual Contribution (Euros)	IFDC	Budget Line	Partner
Private Sector	Grain pulse Limited (GPL)	12,457	8,968	72%	15,380	8,628	56%	27,837	17,595	51%	Communications (launch, commodity events), 1.8	49%
	Kakie International Ltd	131,257	79,976	61%	46,485	7,284	16%	177,743	87,260	92%	Intervention fund (Cardno), Infrastructure, PPP, and Capacity Building Grant Fund	8%
	Kapchesombe Green Change Farmers' Cooperative (KGCFC)	37,988	43,463	114%	18,589	11,587	62%	56,577	55,050	79%	Intervention fund (Cardno), Infrastructure, PPP, and Capacity Building Grant Fund, 1.2, 1.7, 1.8, 2.2	21%
	Kibimba Limited	128,001	63,165	49%	273,201	43,406	16%	401,203	106,571	59%	Intervention fund (Cardno), Infrastructure, PPP, and Capacity Building Grant Fund, 1.3	41%
	Kigezi Farmer's Resource Centre Limited (KFRC)	11,807	12,531	106%	9,034	11,031	122%	20,841	23,562	53%	Intervention fund (Cardno), Infrastructure, PPP, and Capacity Building Grant Fund, 1.7	47%
	Lwoba Holdings	7,099	6,295	89%	6,044	4,707	78%	13,143	11,002	57%	Infrastructure, PPP, and Capacity Building Grant Fund, 1.3, 1.8	43%
	Maziba Progressive Farmers Resource Center Ltd (MPFRC)	15,061	16,606	110%	4,073	3,183	78%	19,134	19,789	84%	Intervention fund (Cardno), 1.7	16%
	Mengya Intergrated Farmers Association (MIFA)	85,717	76,359	89%	37,293	7,477	20%	123,010	83,835	91%	Communications (launch, commodity events), 1.7, 1.8	9%
	Muyambi William	8,888	15,551	175%	4,177	6,563	157%	13,065	22,114	70%	1.7	30%

		IFDC			PARTNERS			TOTAL		PERCENTAGE CONTRIBUTION		
Sector	Partners	Sum of Expected Contribution (Euros)	Sum of Actual Contribution (Euros)	% age Contribution Reached	Sum of Expected Contribution (Euros)	Sum of Actual Contribution (Euros)	% age Contribution Reached	Total Sum of Expected Contribution (Euros)	Total Sum of Actual Contribution (Euros)	IFDC	Budget Line	Partner
Private Sector	Namakwaland Farm/High Grow Agri (HGA)	402,336	194,871	48%	331,244	391,793	118%	733,580	586,664	33%	Intervention fund (Cardno), Infrastructure, PPP, and Capacity Building Grant Fund, 1.2	67%
	Netherlands Potato Organization (NAO)	22,146	39,745	179%	24,374	34,619	142%	46,520	74,364	53%	1.6	47%
	New Bukumbi Coffee Processors Limited (NBC)	64,949	61,397	95%	29,304	19,555	67%	94,254	80,951	76%	Infrastructure, PPP, and Capacity Building Grant Fund	24%
	PEARL Seed	75,218	67,678	90%	92,479	18,299	20%	167,697	85,978	79%	Intervention fund (Cardno)	21%
	Psalms Food Industries Limited (PFIL)	156,365	113,853	73%	477,645	507,445	106%	634,010	621,298	18%	Intervention fund (Cardno), 1.4	82%
	Solar Now	6,583	2,705	41%	1,635	1,636	100%	8,218	4,341	62%	1.4	38%
	St. Richards Group of Companies (RGC)	26,839	27,165	101%	54,837	43,101	79%	81,676	70,266	39%	Intervention fund (Cardno), Infrastructure, PPP, and Capacity Building Grant Fund, 2.2	61%
	SWT Tanners Limited (SWT)	502,851	116,940	23%	8,360,832	3,948,784	47%	8,863,683	4,065,723	3%	Infrastructure, PPP, and Capacity Building Grant Fund, 1.4, 2.1	97%
	The MicroFinance Support Centre Limited (MSC)	15,319	6,303	41%	8,105	6,567	81%	23,424	12,870	49%	Intervention fund (Cardno), 1.3, 1.4, 1.8	51%
	Welishe Stephen	12,116	13,091	108%	6,128	1,584	26%	18,244	14,675	89%	Intervention fund (Cardno), 1.7	11%
TOTAL		**2,258,053**	**1,326,547**		**10,051,471**	**5,243,686**		**12,309,524**	**6,570,234**			

Annex 16: Commercial farm detailed progress report

Farm	What has been done so far	Engagement with Dutch breeders	Challenges	Opportunities	Seed plans
Namakwaland/ Birinzi	◦ 109 MT of Dutch seed potato imported from Netherlands;84 MT for production of ware potato to initiate commercialization of Dutch varieties in Uganda and create awareness among end users about the availability of the potatoes on the market. ◦ 25 MT of elite material for production of seed potato to sell to smallholder farmers for mass production. ◦ Licensed as seed potato producer by MAAIF to pave way for commercial seed potato production and marketing> Dutch potato varieties. ◦ Installed storage cold room on the farm to facilitate the storage and marketing of seed potato to farmers. ◦ Farm connected to the national electric grid for sustainable and reliable supply of power to the cold room to ensure that seed potato conditions are maintained. ◦ The farm has established networks with potato out-growers to ensure sustained production and supply of seed potato to farmers.	Signed licensing agreement with HZPC to commercialize production and marketing of Dutch seed potato (Taurus variety) on Ugandan market.	◦ Importing seed materials from Netherlands, Kenya or South Africa is expensive and not sustainable business model. ◦ Working relationship between Namakwaland and MAAIF seed inspectors. ◦ Does not have enough area for longer period production ◦ Diversification to other location with higher altitude.	◦ Dutch seed potato breeders establishing TC lab to do propagation, multiplication, and marketing of seed potato in Uganda. ◦ Dutch seed potato breeders partnering with already established tissue culture lab in Uganda to propagate the seed. ◦ Commercial farm Importation of micro-tubers as opposed to elite materials> these would be expensive but not bulk. ◦ Availability of land, water, and irrigation for sustained production throughout the year. ◦ To diversify the portfolio of varieties, Namakwaland to sign licensing agreement with AGRICO and other Dutch potato breeder. ◦ Develop a private seed inspection and certifications other than MAAIF. ◦ Scalability of production to other areas.	Will produce 247 MT seed in 2021 to be sold to 198 potential farmers. Production to be doubled in 2022.

Farm	What has been done so far	Engagement with Dutch breeders	Challenges	Opportunities	Seed plans
Clarke Farm	◦ 50 MT of Dutch seed potato imported from Netherlands. ◦ 25 MT for production of ware potato to activate market and create awareness among end users about the availability of the potatoes on the market. ◦ 25 MT of elite material for production of seed potato to sell to smallholder farmers for mass production. ◦ Invested in farm equipment (potato planter, ridger and harvester. ◦ Licensed as seed potato producer by MAAIF to pave way for commercial seed potato production and marketing of Dutch potato varieties. ◦ Installed storage cold room on the farm to facilitate the storage and marketing of seed potato to farmers.	◦ Signed licensing agreement with HZPC to commercialize production and marketing of Dutch seed potato (Taurus variety) on Ugandan market. ◦ Signed licensing agreement with AGRICO to commercialize production and marketing of Dutch seed potato (MARKIES variety) on Ugandan market.	New in Irish business, hence need more exposure Need to work with other breeders.	Land for rotational and sustained production of potatoes available Others as above.	Will produce 247 MT seed in 2021 to be sold to 198 potential farmers.
KAKIE Farm	◦ 25 MT of Dutch seed potato imported from Netherlands;12.5 MT for production of ware potato to activate market and create awareness among end users about the availability of the potatoes on the market. 12.5 MT of elite material for production of seed potato to sell to smallholder farmers for mass production. ◦ Invested in farm equipment (potato planter, ridger and harvester. ◦ Processing license as seed potato producer from MAAIF to pave way for commercial seed potato production and marketing> Dutch potato varieties. ◦ Installed storage cold room on the farm to facilitate the storage and marketing of seed potato to farmers.	No licensing agreement established.		◦ Land for multiplication of seed potato is available. ◦ Work with bigger tissue culture lab to access mini-tubers to multiply basic seed.	

Farm	What has been done so far	Engagement with Dutch breeders	Challenges	Opportunities	Seed plans
FICA Farm	◦ 25 MT of elite material Dutch seed potato imported from Netherlands; for multiplication into seed potato to sell to smallholder farmers. ◦ Invested in farm equipment (potato planter, ridger and harvester. ◦ Signed licensing agreement with AGRICO to commercialize production and marketing of Dutch seed potato (Markies variety) on Ugandan market. ◦ Licensed as seed potato producer by MAAIF to pave way for commercial seed potato production and marketing> Dutch potato varieties. ◦ Installed storage cold room on the farm to facilitate the storage and marketing of seed potato to farmers. ◦ Installed 20 acre irrigation system.	Signed licensing agreement with AGRICO to commercialize production and marketing of Dutch seed potato (Markies variety) on Ugandan market.		◦ FICA is already registered seed company, hence need to develop seed potato business plan. ◦ Revive the existing tissue culture lab that can partner with Dutch breeders to propagate and produce plantlets and mini-tubers. ◦ Irrigation available to support sustained seed potato production.	Will produce 247 MT seed in 2021 to be sold to 198 potential farmers.
NBC	◦ 75 MT of Dutch seed potato (Panamera, Markies, Taurus) imported and distributed to 123 smallholder farmers. ◦ Constructed ambient store for storage of ware potato.		◦ Sustainable supply of seed to the farmers to produce ware potato to sustain the market. ◦ Yields registered by farmers are below the potentials yield of those varieties. ◦ NBC breach of contract for not being able to sustainably supply consistently as per the supply agreement.	◦ Very good business model that can be explored and replicated with other farmers in the country. ◦ Demand for Dutch seed potato to produce ware potato is gaining momentum.	

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