MINISTRY OF AGRICULTURE, ANIMAL INDUSTRY AND FISHERIES

CALCULATED PROFITABILITY ANALYSIS AND STRATEGIC INTERVENTIONS PER VALUE CHAIN

FOREWORD

Government took a decision to channel public investments in Agriculture through a commodity approach based on zoning as informed by the zonal/regional leaders' meetings that took place at State House Entebbe and also as informed by the National Agriculture Zoning Strategy. As a result of this, the Agriculture chapters in the National Development Plan II and National Development Plan III have been based on a commodity approach. Commodity approach (Value chain approach) is the full range of activities that is required to bring a product or service from conception, through the different phases of production up to the final consumers, and final disposal after use. In the context of food production, these activities include farm production, trade and support to get food commodities to the end consumer.

In the State of the Nation Address 2020, H.E the President unveiled his publication "***Real vs Vulnerable economy***" where he urged Ugandans to focus on the fundamental human needs which support life, morality and enlightenment and, a firm ground for economics in answering the fundamental human needs. These are: food, clothes, shelter, defense, the human resource development (education and health), infrastructure, medicine and spirituality.

In the same publication, H.E the President urged the public to focus on 14 real economy commodities which have now become 19 as a result of Cabinet guidance and these include bananas, cassava, beans, maize, irish potatoes, sweet potatoes, millet, cattle for beef and leather, cattle for dairy products, fish, coffee, tea, cocoa, textiles (cotton), fruits and vegetables, cashew nuts, hass avocado, macadamia and shea nut tree.

This book provides a stakeholder analysis of the key players in each value chain, a summary of interventions required to take each value chain to attain the medium-term production targets and the profitability analysis *(ekibalo)* for each value chain to guide the public.

I implore all our stakeholders at the centre and in the District Local Governments to pass on the knowledge contained in this book to the farming communities for purposes of attracting them to get involved in commercial farming.

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1.1 MAIZE

1.1.1 Maize is cultivated by 55% of 5.94 million agriculture households for food and income security. It is also an industrial crop for the animal feeds industry and it has high potential for value addition to support the agro-processing industry. Maize production in 2019 amounted to 5 million MT, of which 750,000 MT were exported both formally and informally. Production is estimated to increase to 7.1 million MT over the medium term. The formal exports generated US$ 95.48 million for the country.

1.1.2 The Grain Council of Uganda (TGCU), an association of private grain processors, has over 750,000 MT of total storage capacity distributed country wide to date and still growing. The council has also identified regions with high grain production potential and which still require storage facilities. These include; North Buganda, Bunyoro, Elgon, some parts of Busoga, Teso and Acholi.

1.1.3 Currently, TGCU handles and trades over 50% of the total formally traded grain but utilises only 30% of its installed capacity leaving 70% of installed capacity redundant. Government will work with TGCU to mobilise farmers around processing centers for bulk supply of grain, incentivise farmers supplying TGCU to access fertiliser and boost productivity and set up storage facilities in areas with established production potential.

1.1.4 In terms of profitability, when ready for harvest, one acre of a maize plantation provides about 3500kgs of dry maize grain which would earn a farmer about Ushs.2.1 million. Together with the costs of setting up the plantation, total costs for a season's harvest would amount to about Ushs.1.4 million, giving a profit of Ush.704,600 (see Table 2). Profits from processing would increase to Ush.1.964,000 assuming primary processing yields both maize flour (45% of the harvest) and maize bran (55% of the harvest) (see **table 2**), taking the farmer less time to recover the initial investment, making a case for primary processing.

1.1.5 With some of the above interventions and those detailed below, the sector targets to increase production from 5 million MT to about 7.1 million MT in five years.

Table 1: Required Maize value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Develop modalities with Sukulu fertilizer factory to ensure that the farmers supplying members of TGCU are provided with fertilizer at a concession fee to boost maize productivity.	MAAIF	25.0
	Enhance research in maize through NARO to ensure that each Agro-Ecological Zone has suitable varieties in order to guarantee increased productivity of maize.	NARO	5.0
	Strengthen UGC to take on more farmer organisations in collaboration with Ministry of Trade	MAAIF	6.0

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Aggregation	Train farmers in post-harvest handling in collaboration with UGC at zonal level and through the identified nucleus farmers	MAAIF	12.0
Processing	Construct Processing Centres in areas which are not marked by TGCU but have high production potential through a Memorandum of Understanding with M/s Alvan Blanch.	MAAIF	20.0
	Work with Ministry of Energy to ensure formulation and enforcement of a special tariff for silo facilities in order to guarantee food security and increased farmer income through maize.	MoE	-
	Work with the Grain Council of Uganda (TGCU) management through UDB to assist the private sector set up processing centres in the areas with big production potential but with lack of processing and storage centres through a Public private partnership framework.	Private sector, UDB, MicArofinance Support Center, Pride, ACF	-
Marketing	Strengthen enforcement of certification officers and agriculture police officers at the border posts to minimize illegal/cross border trade in maize.	MAAIF	2.0
	Work with TGCU to mobilize farmers around processing centres to tap into the advantages of assured off-taking.	MAAIF	5.0
Grand Total			**75.0**

Table 2: Profitability Analysis of maize

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
A. TRADITIONAL FARMER								
One acre will require about 11 kgs of seed. A traditional farmer will spend a total of Ush.244,000 per acre on inputs, labour and post-harvest handling.	Production expenses (traditional farmer)	Inputs	Seeds (free)					-
			Sub-total					-
		Labour	Ploughing	Man days	1	1	60,000	60,000
			Planting	Man days	1	1	20,000	20,000
			Weeding	Man days	1	1	80,000	80,000
			Harvesting	Man days	1	1	16,000	16,000
			Sub-total					176,000
	Postharvest handling expenses	Postharvest handling	Bags (for harvest and storage)	Number	8	1	1,000	8,000
			Tarpaulins	Misc	1	1	20,000	20,000
			Shelling	Misc	1	1	20,000	20,000
			Transportation from the garden	Car	1	1	20,000	20,000
			Sub-total					68,000
			Total expenses for one season (traditional farmer)					**244,000**
The traditional farmer yields 900kgs of grain per acre. The farmer earns about Ush.540,000 from the sell of maize grain, earning a profit of about Ush.296,000 per acre	Production only revenue	Maize grain	Revenue	Kgs	900	1	600	540,000
			Profitability per acre per season					**296,000**
B. IMPROVED FARMER (IMPROVED SEED ONLY)								
One acre will require about 11 kgs of seed. An improved farmer who applies improved seeds will spend a total of Ush.792,900 per acre on inputs, labour and post harvest handling.	Production expenses (with improved seed only)	Inputs	Seeds	Kgs	11	1	8,500	93,500
			Herbicides	Litres	1.6	1	14,000	22,400
			Pesticides Amadox	Litres	1	0.8	70,000	56,000
			Sub-total					171,900
		Labour	Herbicide application	Man days	1	1	6,000	6,000

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
			Ploughing	Man days	1	1	90,000	90,000
			Planting	Man days	1	1	60,000	60,000
			Weeding	Man days	1	1	80,000	80,000
			Harvesting	Man days	1	1	90,000	90,000
			Sub-total					326,000
	Postharvest handling expenses	Postharvest handling	Bags (for harvest and storage)	Number	20	1	1,000	20,000
			Malathion dust	Grams	20	1	5,000	100,000
			Tarpaulins	Misc.	1	1	80,000	80,000
			Shelling	Misc.	1	1	75,000	75,000
			Transportation from the garden	Car	1	1	20,000	20,000
			Sub-total					295,000
			Total expenses for one season (improved seeds and fertilisers)					**792,900**
Processing the maize grain into maize flour and maize bran will involve milling costs of up to Ushs.400,000 per acre of harvest.	Primary processing expenses	Primary processing	Milling	Kgs	2000	1	200	400,000
			Sub-total					400,000
			Total production and primary processing costs for one season (improved seeds and fertiliser)					**1,192,900**
The improved farmer yields 2000kgs of grain per acre. If he farmer sells the grain without processing, the farmer earns about Ush.407,000 in profit. If the farmer goes on to undertake primary processing, 55 kgs of 100kg bag is expected to be maize flour. The rest will be bran.This farmer would earn more, with a profit of about Ush.1.127 million per acre	Production only revenue	Maize grain	Revenue	Kgs	2000	1	600	1,200,000
			Profitability per acre per season (Production only farmer)					**407,100**
	Processing revenue	Maize flour (Grade 1)	Revenue	Kgs	1100	1	1,600	1,760,000
		Maize bran	Revenue	Kgs	800	1	700	560,000
			Profitability per acre per season (Production and Primary processing farmer)					**1,127,100**
C. ADVANCED FARMER (IMPROVED SEEDS, FERTILISER AND MECHANISED)								

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
One acre will require about 11 kgs of seed. An advanced farmer who applies improved seeds, fertiliser and mechanisation will spend a total of Ush.1.395 million per acre on inputs, labour and post-harvest handling.	Production expenses (with improved seed. Fertiliser and mechanisation)	Inputs	Seeds	Kgs	11	1	8,500	93,500
			Herbicides	Litres	2	1	14,000	22,400
			Fertiliser DAP	Bags	1	1	135,000	135,000
			Fertiliser Urea	Bags	1	2	135,000	202,500
			Pesticides Amadox	Litres	1	0.8	70,000	56,000
			Sub-total					509,400
		Labour	Herbicide application	Man days	1	1	6,000	6,000
			Ploughing	Man days	1	1	90,000	90,000
			Planting	Man days	1	1	60,000	60,000
			Fertiliser DAP application	Man days	1	1	45,000	45,000
			Weeding	Man days	1	1	60,000	60,000
			Fertiliser Urea application	Man days	1	1	45,000	45,000
			Pesticide application	Man days	1	1	45,000	45,000
			Harvesting	Man days	1	1	150,000	150,000
			Sub-total					501,000
	Postharvest handling expenses	Postharvest handling	Bags (for harvest and storage)	Number	35	1	1,000	35,000
			Malathion dust	Grams	35	1	5,000	175,000
			Tarpaulins	Misc	1	1	80,000	80,000
			Shelling	Misc	1	1	75,000	75,000
			Transportation from the garden	Car	1	1	20,000	20,000
			Sub-total					385,000
			Total expenses for one season (improved seeds and fertilisers)					1,395,400
Processing the maize grain into maize flour and maize bran will involve milling costs of up to Ushs.700,000 per acre of harvest.	Primary processing expenses	Primary processing	Milling	Kgs	3500	1	200	700,000
			Sub-total					700,000
			Total production and primary processing costs for one season (improved seeds and fertiliser)					**2,095,400**

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
The advanced farmer with improved methods yields 3500kgs of grain per acre. If he farmer sells the grain without processing, the farmer earns about Ush.704,600 in profits. If the farmer goes on to undertake primary processing, 55 kgs of 100kg bag is expected to be maize flour. The rest will be bran. This farmer would earn more, with a profit of about Ush.1.964 million per acre	Production only revenue	Maize grain	Revenue	Kgs	3,500	1	600	2,100,000
			Profitability per acre per season (Production only farmer)					**704,600**
	Processing revenue	Maize flour (Grade 1)	Revenue	Kgs	1,925	1	1,600	3,080,000
		Maize bran	Revenue	Kgs	1,400	1	700	980,000
			Profitability per acre per season (Production and Primary processing farmer)					**1,964,600**

MAIZE PRODUCTION PROFITABILITY OVER THE MEDIUM TERM

a) Maize production is targeted to increase to 7.1 million MT in 5 years.

b) Assuming an average yield per acre of 2100 kgs (2.1MT), the country would need to have a total of about 3,300 acres of maize under cultivation.

c) At a total cost of about Ush.509,400 for inputs per acre, the required total acreage would cost inputs worth Ush.1,701 billion.

d) Government proposes to spend a total of **Ushs.25 billion** on inputs in the first year of production.

e) Considering the average of revenues for the different scenarios above, maize production has the potential to generate Ush.3,004 billion if the target production levels are attained.

1.2 COFFEE

1.2.1 Coffee is a priority commodity and plays a leading role in the livelihoods of Ugandans and contributes substantially to the national economy. It has been the leading export earner over the last four decades. The current production of coffee in 2018/19 was at 6.95 million 60-kg bags. In FY 2018/19, Uganda exported 4.2 million 60-kg bags worth US$416 million and targets to earn US$1.3 billion from coffee exports by 2025. The crop is produced by an estimated 1.7 million families. Notably, the current domestic consumption has also increased to 532,800 60kg-bags in 2018/19 with about 20 Ugandan coffee brands on the supermarket shelves.

1.2.2 Currently, there are 578 primary processing facilities operating at 40% of the total installed capacity, 22 washing stations which are operating at 50% of the total installed capacity and 23 roasters whose operating capacity depends on the local demand for the final product. The major processing facilities in Uganda are UGACOF, Kyagalanyi Coffee Ltd, Kawacom Uganda Ltd in Kapchorwa, Louis Dreyfus Commodities Uganda Ltd, Olam International, Export Trading Company (U) Ltd, Ideal Quality Commodities Ltd and The Gold Pearl Coffee. The major coffee washers include Kawacom Uganda Ltd, Kyagalanyi Coffee Ltd and Great Lakes Coffee Ltd; while some of the roasters include National Union of Coffee Agribusiness & Farm Enterprises (NUCAFE), Great Lakes Coffee Ltd and Big Gorilla Coffee. It is therefore clear that we need to produce much more coffee as a country. The coffee roadmap gives a target of 20 million 60-kg bags by 2025. The Ministry shall also intensify support to the private sector to produce soluble coffee products (proposal already available), while domestic consumption of roasted and processed coffee will be promoted to sustain demand and to avoid total dependence on international markets.

1.2.3 In terms of profitability, a coffee plantation takes about three years before it is ready for harvest. The advanced farmer using proper agronomic practices will yield much higher profits than the traditional farmer. For the traditional farmer, processing to unshelled dry cherries provides the optimal profits. This is because the additional cost from more processing outweighs the additional income. There is, however, more profitability in processing to shelled dry cherries for the advanced farmer.

1.2.4 With some of the above interventions and those detailed below, the sector targets to increase production from 6.95 million MT to about 20 million MT in five years. Export earnings are expected to increase from US$416 million to US$1.3 billion.

Table 3: Required Coffee value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Enhance coffee seedling multiplication and distribution	UCDA	40.0
	Government to work with Tororo Sukulu Phosphate Project and other fertilizer firms to ensure availability of fertilizer to coffee farmers with more than 10 acres on concessional terms.	MAAIF, UCDA	30.0
	Mobilize coffee farmers through local leadership and extension system to ensure good maintenance of existing coffee trees – community mobilization.	UCDA, MoLG	14.0
	Provide concession to farmers with more than 10 acres to access renewable energy systems e.g solar pumps for coffee irrigation.	MAAIF	40.0
	Provide more funding for coffee research	NARO, UCDA	10.0
	Re-verify and re-certify coffee nursery operators to ensure quality of coffee seedlings.	UCDA	4.0
	Strengthen management and control of coffee pests and diseases	MAAIF, UCDA	15.0
Processing	Government to work through the Uganda Development Bank and with Uganda Coffee producers and exporter's associations to avail cheap investment capital for coffee processors, roasters, establishment of 2 soluble coffee plants and 4 washing stations.	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
	Supporting acquisition and lease equipment for wet processing stations		-
Grand Total			**153.0**

Table 4: Establishment and operational expenses of a coffee plantation

Description	Stage	Sub-stage	Item	Item types	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
A coffee plantation starts yielding 2 to 3 years after plantation. In this analysis, we assume that the farmer starts to harvest in the 3rd year. The plantation establishment costs therefore reflect the farmers' expenditure in the first 2 years where the farmer does not harvest. We also consider both a traditional farmer and one that uses good agronomic practices i.e. applies fertilisers and pesticides. The traditional farmer will spend about Ush.1.2 million per acre over 2 years while the advanced farmer will spend about Ush.2.5 million per acre over 2 years.	Plantation establishment expenses for 2 years before year of first harvest	Inputs	Seedlings	Number	450	1	900	405,000
			Compost manure	Trucks	3	2*	120,000	720,000
			Fertiliser NPK (25-5-5)	Bags	1	2*	110,000	220,000
			Chemicals and pesticides		1	2*	120,000	240,000
			Sub-total					1,585,000
		Labour	Trailing/bending	Man days	1	4*	50,000	200,000
			Weeding	Man days	1	6*	80,000	480,000
			Pruning	Man days	1	4*	30,000	120,000
			Pesticide application	Man days	1	2*	30,000	60,000
			Applying fertiliser	Man days	1	2*	25,000	50,000
			Sub-total					910,000
		Total initial investment before year of harvest (Traditional methods)						**1,205,000**
		Total initial investment before year of harvest (Proper agronomic practices)						**2,495,000**
This part of the analysis shows the expenses the farmer incurs starting in the year of harvest. A traditional farmer who doesn't go into processing will spend Ush.750,000 per year per acre planted; while an advanced farmer will spend Ush.1.4 million per year per acre.	Annual production expenses starting in year of harvest	Inputs	Compost manure	Trucks	3	1	120,000	360,000
			Fertiliser NPK (25-5-5)	Bags	1	1	110,000	110,000
			Chemicals and pesticides		1	1	120,000	120,000
			Bags	Number	10	1	1,000	10,000
			Sub-total					600,000
		Labour	Trailing/bending	Man days	1	2	50,000	100,000
			Weeding	Man days	1	3	80,000	240,000
			Pruning	Man days	1	2	30,000	60,000
			Pesticide application	Man days	1	1	30,000	30,000
			Applying fertiliser	Man days	1	1	25,000	25,000
			Harvesting	Man days	1	2	100,000	200,000
			Sub-total					655,000
		Postharvest handling	Transporting	Car	1	1	150,000	150,000
			Sub-total					150,000
		Total annual expenses starting in year of harvest (Traditional Methods)						**750,000**
		Total annual expenses starting in year of harvest (Proper Agronomic Practices)						**1,405,000**

Description	Stage	Sub-stage	Item	Item types	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
Processing the fresh cherries into unshelled dry cherries will involve drying, stirring, packing and loading costs of up to Ushs.170,000 per acre of harvest.	Processing expenses	Unshelled dry cherries	Drying & stirring	Misc	1	1	70,000	70,000
			Packing & loading	Misc	1	1	100,000	100,000
			Sub-total					170,000
		Total annual expenses starting in year of harvest (Traditional Methods)						**920,000**
		Total annual expenses starting in year of harvest (Proper Agronomic Practices)						**1,575,000**
Processing into shelled dry cherries will involve drying, stirring, milling, packing and loading costs of up to Ushs.970,000 per acre of harvest.		Shelled dry cherries	Drying & stirring	Misc	1	1	70,000	70,000
			Packing & loading	Misc	1	1	100,000	100,000
			Milling		600	100	800,000	800,000
			Sub-total					970,000
		Total annual expenses starting in year of harvest (Traditional Methods)						**1,720,000**
		Total annual expenses starting in year of harvest (Proper Agronomic Practices)						**2,375,000**

**In a year, these are applied at half the indicated frequency, because consideration is for costs to set up over two years*

Table 5: Revenue and profitability analysis of coffee production and processing

Description	Stage	Sub-stage	Item	Item type	Quantity per tree	No. of trees/ Acre/Year	Unit price	Gross Revenue
The advanced farmer of proper agronomic practices will yield much higher profits than the traditional farmer. For the traditional farmer, processing to unshelled dry cherries provides the optimal profits. This is because the additional cost from more processing outweighs the additional income. There is, however, more profitability in processing to shelled dry cherries for the advanced farmer.	Revenues	Fresh cherries	Revenue (Traditional Methods)	Kgs	4	900	800	2,880,000
			Revenue (Proper Agronomic Practices)	Kgs	20	900	800	14,400,000
			Profitability per acre per year (Traditional methods)					**2,130,000**
			Profitability per acre per year (Proper Agronomic Practices)					**12,995,000**
		Unshelled dry cherries	Revenue (Traditional Methods)	Kgs	2	900	2,000	3,600,000
			Revenue (Proper Agronomic Practices)	Kgs	10	900	2,000	18,000,000
			Profitability per acre per year (Traditional methods)					**2,680,000**
			Profitability per acre per year (Proper Agronomic Practices)					**16,425,000**
		Shelled dry cherries	Revenue (Traditional Methods)	Kgs	1	900	4,500	4,050,000
			Revenue (Proper Agronomic Practices)	Kgs	5	900	4,500	20,250,000
			Profitability per acre per year (Traditional methods)					**2,330,000**
			Profitability per acre per year (Proper Agronomic Practices)					**17,875,000**

COFFEE PRODUCTION PROFITABILITY OVER THE MEDIUM TERM

a) Coffee production is targeted to increase from 6.95 million bags to 21 million bags in 5 years.

b) Assuming primary processing to shelled dry cherries, the yield per acre would amount to 75 (60kg) bags. To achieve the target of 21 million bags, we would need to have at least 291,143 acres of coffee within the next two years.

c) At a total cost of about Ush.1.6 million for inputs into production, the required cumulative acreage would cost inputs worth Ush.461 billion.

d) Government proposes to spend a total of Ushs.74 billion on inputs in the first year of production, a subsidy of 32% on inputs to the farmer if half the required acreage is planted in year 1.

e) Assuming annual revenue of USh.20.3 million per acre of shelled dry cherries as seen above, the total revenue that would be generated from meeting the production target would amount to Ush.5,896 billion.

1.3 DAIRY

1.3.1 Dairy has potential to remarkably contribute to 'increasing rural incomes and improving livelihoods, and food and nutrition security. As of 2018, milk production was 2.51 billion liters while marketed milk stood at 84% in 2017. The value of marketed milk increased by 8% from USD 784 million in 2017 to USD 850 million in 2018. The value of our dairy exports increased from USD 50 million in 2015 to USD 60 million in 2016 and rose to US$ 150 million in FY 2018/19. Today, the demand for milk in Uganda is only 800 million litres, leaving a growing surplus of about 1.8 billion litres of raw milk annually. Most processors prefer to specialise in processing raw milk into low value livestock products such as yogurt mainly for the local market, leaving out high value products such as infant formulas and casein. This has led to continued import of such products and loss of Uganda's valuable foreign currency.

1.3.2 The number of milk processing facilities (small, medium and large) increased by 52% from 79 in 2017 to 120 in 2018. Currently there are over 9 large dairy manufacturing firms who control over 95 percent of the market share of high value products in the country. These include Pearl dairy farms limited, Amos dairies, Brookside limited, Jesa farm dairy, Lakeside dairy limited, GBK dairy products limited, Vital Tomosi dairy, Birunga dairy industries(u) limited, and Rainbow industries(u) limited. These firms operate at an average of 57% of the installed capacity in processing.

1.3.3 Nevertheless, there is a huge market potential for both large scale and small-scale milk processing plants in Uganda. In addition, there is large export market for processed milk (UHT) in neighboring countries and high value milk products like casein and whey protein in USA and India. For example, the demand for dairy products is much larger in countries like Kenya—which are relatively high cost producers of dairy due to heavy reliance on purchased animal feeds (Uganda relies more on open grazing).

1.3.4 However, Uganda's milk products are losing out on market competitiveness due to quality issues. Efforts to strengthen the legal framework of livestock identification and traceability, local vaccine and drug manufacture, food standards and statutory regulations needs to be intensified. Government will look to finance the establishment of centers and coolers linked to farmer cooperatives to strengthen the formal milk collection network and enhance capacity utilization of existing plants. Uganda Crane Creameries Cooperative Union in Mbarara processing plant will be supported to be completed. Over the medium term, two dairy processing plants are planned to be established in Gulu and Soroti. The Ministry shall also continue to sensitise Ugandans on the nutritional value of milk so as to increase domestic consumption of milk from the current 80 litres to 210 litres per person per annum as recommended by the World Health Organization (WHO).

1.3.5 With some of the above interventions and those detailed below, the sector targets to increase production from 2.5 billion litres to about 3.6 billion litres in five years.

Table 6: Required Dairy value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Building local capacity in animal feed production, marketing of dairy products, & water harvesting.	MAAIF	16.0
	Conduct training of farmers in fodder production, conservation, and marketing	MAAIF	5.0
	Scale up public investment in disease control and Certifications services (Creation of Internationally recognized FMD zones or compartments).	MAAIF	15.0
	Skill more Artificial Insemination (AI) technicians and expand Artificial Insemination (AI) sub centres and bulking centres.	NAGRC&DB	12.0
	Support the development of technology incubation centers for dairy farmers.	MAAIF, DDA	12.0
Aggregation	Promote private sector investment in physical agricultural markets, improvement in the stock and quality of commodity storage facilities including cold chain storage facilities, and commodity quality preserving transport systems along the value chains through Public Private Partnerships (PPP).	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
Processing	Collaboration with milk Associations to capitalize processing firms with cheap credit for them to be more competitive both in the local and international markets.		-
	Finance the establishment of centers and coolers linked to farmer cooperatives to strengthen the formal milk collection network and enhance capacity utilization of existing plants. Uganda Crane Creameries Cooperative Union in Mbarara processing plant com	DDA	15.0
Marketing	Promote local consumption of dairy products through educational programs, school milk consumption campaigns, print, indoor and outdoor media.	DDA	1.0
	Strengthen the legal framework of livestock identification and traceability system, local vaccine and drug manufacture Food standards and statutory regulations.	MAAIF	5.0
Grand Total			81.0

Table 7: Profitability Analysis of dairy production under a paddock system

Description	Stage	Sub-stage	Item	Item type	Quantity per 100 acres	Frequency per year	Unit cost	Total cost (UGX)
This analysis assumes a paddock method of feeding. It is estimated that every animal will require/feed on 2 acres of land annually. Taking an example of a farmer raising 50 cross breeds on 100 acres of land, 1-year old heifers will cost about Ush.1 million. Infastructure for water supply is set up at a total cost of about Ush.18.75 million. The heifer is serviced at 2.5 years and it produces a calf after 9 months. The farmer therefore incurs operational costs on the heifer for 2 years before it produces and is ready for milking. The total initial investment cost per heifer would be about Ush.2.522 million.	Costs for establishment of dairy farm before production	Inputs	Heifer	Number	50	1	1,000,000	50,000,000
			Milking cans	Number	5	1	50,000	250,000
			Sub-total					50,250,000
		Infrastructure	Water dam (water source)	Number	1	1	8,000,000	8,000,000
			Pumping machine	Number	1	1	750,000	750,000
			Concrete water troughs	Number	5	1	2,000,000	10,000,000
			Sub-total					18,750,000
		Operational costs to raise heifer to servicing age	Spraying	Misc.	12	2	100,000	2,400,000
			Vaccination	Misc.	1	6	200,000	1,200,000
			Deworming	Misc.	1	6	150,000	900,000
			Other treatment	Misc.	1	2	800,000	1,600,000
			Artificial Insemination (at 2.5 years)	Heifers	50	1	60,000	3,000,000
			Farm clearing	Acres	100	2	150,000	30,000,000
			Salary	People	5	24	150,000	18,000,000
			Sub-total					57,100,000
		Total initial investment before the heifers grow and produce						**126,100,000**
		Initial investment per heifer						**2,522,000**
Annual operating expenses per cow per year will amount to Ush.457,000 while revenue per cow per year will be about Ush.4.5 million; a profit of Ush.4.043 million. The farmer will therefore recover the initial investment cost within one year of dairy production.	Annual operating expenses following production	Inputs	Spraying	Misc.	12	1	100,000	1,200,000
			Vaccination	Misc.	1	3	200,000	600,000

Description	Stage	Sub-stage	Item	Item type	Quantity per 100 acres	Frequency per year	Unit cost	Total cost (UGX)
			Deworming	Misc.	1	3	150,000	450,000
			Other treatment	Misc.	1	1	800,000	800,000
			Sub-total					3,050,000
		Other maintenance expenses	Artificial Insemination	Cows	50	1	60,000	3,000,000
			Farm clearing	Acres	100	1	150,000	15,000,000
			Salary	People	1	12	150,000	1,800,000
			Sub-total					19,800,000
		Total annual expenses						**22,850,000**
		Annual expenses per cow per year						**457,000**
		Cross breeds	Milk revenue (300 days of lactation, 15 litres of milk per cow)	Litres	750	300	1,000	225,000,000
		Profit						**202,150,000**
		Revenue per cow per year						**4,500,000**
		Profit per cow per year						**4,043,000**

1.4 MEAT

1.4.1 Livestock production for meat is a key pillar in the livelihoods of rural Uganda, with 3.9 million people owning livestock of which 92% are subsistence. Cattle production and goat production in Uganda increased by 7.0% and 17% respectively between 2014 and 2018; and the value of meat exports was US$6.1 million in 2018. The national herd, consisting of about 14.2 million cattle, 16 million goats, 4.5 million sheep, 47.6 million poultry and 4.1 million pigs, currently produces about 211,358 MT of beef; 39,990 MT of goat/mutton; 24,197 MT of pork; 907 billion eggs; 2.6 billion litres of milk; 12,440 MT of honey and 3,700 MT of silk yarn every year worth about US$ 290 million while the global demand for meat is estimated at US$945.7 billion. Most of Uganda's livestock products are presently marketed both locally and globally in raw form thus attracting low prices while the jobs that would be created along the value chain are exported to our trading partners where manufacturing and value addition is done.

1.4.2 There are over 8 major cattle farmers involved in ranching of beef professionally namely; Enos Tumusiime, Rainball Ranchers, Munyawera John, Ruhombe Jones Kamugisha, Walter Okello, Onen Charles, Temupe Farm (U) Ltd and Uganda Meat Producers Cooperative Union (UMPCU). The UMPCU and Temupe Farm (U) Ltd are among the key players in the industry. The UMPCU has over 2,600 farmers of which 350 are beef farmers supplying over 6,000 cattle annually for slaughter and earning over Ushs.5.4 billion. Temupe Farm (U) Ltd, earned over Ushs. 1.5 billion in 2019 from 962 cattle and projected their earnings to be over UGX.7.5 billion from over 48,077 cattle by 2025. In order to meet this demand, there has to be an increase in the number of beef cattle as current numbers are still low.

1.4.3 Currently there are 5 professional abattoirs in Uganda which slaughter and cut meat. Of these, only 3 meet international requirements namely; Egypt Uganda Food Security (EUFSC) in Bombo Luwero with capacity of 300 cows and 1,500 shorts per day; Sanga Meat Abattoir in Kiruhura district with capacity of 200 cows and 200 shorts per day and Pearl Meat abattoir in Nakasongola with capacity of 500 cows and 1,000 shorts per day.

1.4.4 Uganda has over five big beef exporters namely; Fresh Cuts Uganda Limited, Your Choice, Sausage Master, Truong Giang Mong Ca1. Co. Ltd, Tri Duc Trade & Svc Joint Stock Company. Of these, Fresh Cuts is a key player accounting for about 50% percent of Uganda' beef processing sector, with a weekly processing output of 10 tonnes of meat (Approximately 150-200 carcasses per week). Despite the large market share, the firm is only using about half of its installed capacity (400 carcass) which increases operational costs. More still the requirements on quality of animals supplied for slaughter (280 live weight, less than 3yrs) are hard to meet by farmers since most of them don't raise beef breeds specifically for the beef industry but supply cull animals primarily raised for dairy production.

1.4.5 Government plans to work with private breeders, the Uganda Beef Producers Association and religious dioceses in all regions to breed and fatten cattle to ensure steady supply of slaughter animals for export so that actors can benefit from the large global market demand for their livestock products. The support shall, among others, include provision of quick maturing breeds, high grade embryos including Artificial Insemination services; improving livestock feeding and nutrition; providing water for production; as well as strengthening disease control and prevention. Local manufacture of vaccines to be spearheaded by NARO shall also be supported.

1.4.6 The Ministry has also identified animal feed production, in the livestock sub-sector, as a flagship programme and will continue to work with key actors particularly the private sector to fast-track the production, enhance domestic utilisation, improve standards and promote export

of animal feed. Uganda imports animal feed estimated at about Ushs28 billion annually and yet the ingredients used in the manufacture of animal feed are massively grown locally. These include cassava, maize, soya bean, oil palm fruit, fish meal (mukene) and cotton seed cake. National production of cassava is estimated at 4.1 million MT per annum; maize production is estimated at 5 million MT, soya bean production is estimated at 181,000 MT; oil palm production is estimated at 44,000 MT; fish meal (mukene) production is estimated at 260,499 MT and cotton seed cake production is estimated at 17,000 MT per annum. Despite increased development efforts in the animal feed industry over the past few years, the installed capacities of the commercial feed millers remain underutilised. Often, the quality of outputs does not meet the required standards for efficient production of poultry, livestock and fish. This has led to the importation of large quantities of animal feed into the country. This flagship programme shall not only promote the production of crops that constitute ingredients to produce animal feed but will also increase productivity in the livestock and fisheries subsectors. The animal feed programme shall also save the country wasteful foreign exchange expenditure on importation of animal feed.

1.4.7 With some of the above interventions and those detailed below, the sector targets to increase exports earnings from US$6.11 million to about US$7 million in five years.

Table 8: Required Meat value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Collaborations with meat Associations and Unions to provide farmers with working capital through Uganda Development Bank (UDB) to improve the capacity to supply quality breeds and increase investment in the sector.	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
	Establish a ready source of improved goat breed within the country through partnership with the private sector	N A G R C & D B , MAAIF	12.0
	Facilitate religious dioceses of Masaka, Ankole, Kigezi, Bukedi, Busoga, Fort Portal, Bunyoro-Kitara, Northern Uganda to breed and fatten beef cattle to ensure steady supply of slaughter animals for export	MAAIF	20.0
	Procure adequate quantities of livestock vaccines and acaricides- FMD, CBPP, PPR and invest in local vaccine and veterinary drug manufacture.	MAAIF	50.0
	Strengthen MAAIF's capacity to provide on water for livestock among farming communities (heavy earth moving equipment and digging/desilting of bore holes, dams and valley tanks)	MAAIF	50.0
	Strengthening Artificial insemination and embryo transfer services to improve beef breeds within farming communities.	NACRC&DB	14.0
	Strengthening of capacity of local governments, central government, farmers and partners to effectively manage pests and diseases. This shall be undertaken by establishing an effective passive and active disease surveillance system for real time reporting of disease outbreaks/cases and investing in disease diagnostic infrastructure.	MAAIF	17.0
	Support pasture breeding and research	NARO	10.0
	Support pasture multiplication through nucleus farmers	MAAIF	12.0
	Support the private sector and the religious dioceses to multiply kuroiler and indigenous poultry in order to ensure incomes, with focus on women and youth	MAAIF	8.0

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
	Support private investor to produce high quality compounded animal feeds	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
	Work with private breeders/entrepreneurs through MoUs to breed/multiply beef cattle and ensure steady supply of slaughter animals for export		-
	Work with Uganda Beef Producers Association to breed/multiply beef cattle to ensure steady supply of slaughter animals for export	MAAIF	20.0
Marketing	Rehabilitation of public abattoirs in a planned manner through MAAIF and local authorities and work with the private sector to establish meat processing plants. Support will be provided to the renovation of 2 regional abbatoirs and 30 local market slaughterhouses.	MAAIF	60.0
Grand Total			**273.0**

Table 9: Profitability Analysis of beef production for local and improved breeds under a paddock feeding system

Description	Stage	Sub-stage	Item	Item type	Quantity per 100 acres	Frequency per cycle	Unit cost	Total cost (UGX)
This analysis assumes a paddock method of feeding. It is estimated that every animal will require/feed on 2 acres of land annually. 1-year old steers of a local breed will cost about Ush.600,000. Infastructure for water supply is set up at a total cost of about Ush.18.75 million. The total initial investment cost per steer would be about Ush.975,000.	Establishment expenses - local breed	Inputs	1-year steer (local breed)	Number	50	1	600,000	30,000,000
			Sub-total					30,000,000
		Infrastructure	Water dam (water source)	Number	1	1	8,000,000	8,000,000
			Pumping machine	Number	1	1	750,000	750,000
			Concrete water troughs	Number	5	1	2,000,000	10,000,000
			Sub-total					18,750,000
		Total initial capital investment						**48,750,000**
		Initial investment per steer						**975,000**
The steer is slaughtered at 3 years and it produces 120kgs of carcass weight. Annual operating expenses per steer will amount to Ush.842,000 while revenue per steer will be about Ush.1.44 million; a profit of Ush.598,000. The farmer will therefore recover the initial investment cost within after two feeding cycles.	Operating expenses - local breed	Inputs	Spraying	Misc.	12	2	100,000	2,400,000
			Vaccination	Misc.	1	4	100,000	400,000
			Deworming	Misc.	1	4	150,000	600,000
			Other treatment	Misc.	1	2	500,000	1,000,000
			Sub-total					4,400,000
		Other maintenance expenses	Farm clearing	Acres	100	2	150,000	30,000,000
			Salary	People	2	24	100,000	4,800,000
			Transport to slaughter facility	Bulls	50	1	48,000	2,400,000
			Slaughter costs	Bulls	50	1	10,000	500,000
			Sub-total					37,700,000
			Total annual expenses					42,100,000
			Annual expenses per steer per feeding cycle					842,000
	Revenue	Local breed	Carcass (120kg per steer)	Kgs	6000	1	12,000	72,000,000
		Profit						29,900,000
		Revenue per steer per feeding cycle						1,440,000
		Profit per steer per feeding cycle						598,000

Description	Stage	Sub-stage	Item	Item type	Quantity per 100 acres	Frequency per cycle	Unit cost	Total cost (UGX)
1-year old steers of an **improved breed** will cost about Ush.800,000. Infastructure for water supply is set up at a total cost of about Ush.18.75 million. The total initial investment cost per steer would be about Ush.1.175 million.	Establishment expenses - improved breed	Inputs	1-year steer (improved breed)	Number	50	1	800,000	40,000,000
			Sub-total					40,000,000
		Infrastructure	Water dam (water source)	Number	1	1	8,000,000	8,000,000
			Pumping machine	Number	1	1	750,000	750,000
			Concrete water troughs	Number	5	1	2,000,000	10,000,000
			Sub-total					18,750,000
		Total initial capital investment						**58,750,000**
		Initial investment per steer						**1,175,000**
The steer is slaughtered at 3 years and it produces 300kgs of carcass weight. Annual operating expenses per steer will amount to Ush.1.046 million while revenue per steer will be about Ush.3.6 million; a profit of Ush.2.553 million. The farmer will therefore recover the initial investment cost within one feeding cycle, unlike the case of the local breed.	Operating expenses	Inputs	Spraying	Misc.	12	2	100,000	2,400,000
			Vaccination	Misc.	1	8	100,000	800,000
			Deworming	Misc.	1	8	150,000	1,200,000
			Other treatment	Misc.	1	2	800,000	1,600,000
			Feeding	Steers	50	2	86,400	8,640,000
			Sub-total					14,640,000
		Other maintenance expenses	Farm clearing	Acres	100	2	150,000	30,000,000
			Salary	People	2	24	100,000	4,800,000
			Transport to slaughter facility	Bulls	50	1	48,000	2,400,000
			Slaughter costs	Bulls	50	1	10,000	500,000
			Sub-total					37,700,000
		Total expenses						**52,340,000**
		Expenses per steer per feeding cycle						**1,046,800**
	Revenue	Local breed	Carcass (300kgs per steer)	Kgs	15000	1	12,000	180,000,000
		Profit						127,660,000
		Revenue per steer per feeding cycle						3,600,000
		Profit per steer per feeding cycle						2,553,200

1.5 FISH

1.5.1 The Fisheries subsector in Uganda contributed 2.1% of the total Agricultural GDP in FY 2018/19. The sector employs close to 1.3 million people and over 3.6 million indirectly. The subsector earned the country US$175.97 million in 2019 from the 12 factories currently operating, and earnings are expected to increase to US$698 million in five years.

1.5.2 Nile perch continues to dominate the exports to international markets and it earned the country US$153.2 million. It is mainly exported to European Union, United Arab Emirates, United States of America, Japan, Kenya, Democratic Republic of Congo, Rwanda, South Sudan and Burundi. The fish maws exported in 2019 brought in US$52 million and are mainly exported to China and Hong Kong. The fish maws have a high potential to generate more revenue if the business is properly regulated.

1.5.3 The Uganda Fish Processors and Exporters Association (UFPEA) is an umbrella organization that brings together the 12 fish factories in Uganda. These include Lake Bounty Limited, Iftra Uganda Limited, Mpongo Limited, Ngege Limited, Lake Perch Limited, Karmic Foods Limited, Greenfields Uganda Limited, Fresh Perch limited –Entebbe, Sese Fresh Packers – Rubaga, Gomba/Nyanza Limited-Jinja, Fresh Perch Jinja, and Byansi Fisheries – Kyotera. The 12 factories have an installed capacity of 410 tonnes per day but currently process about 100 tonnes per day meaning they operate below capacity.

1.5.4 Uganda has a total of 45 gazetted landing sites and only 30 landing sites are operational on Lake Victoria. The functional landing sites are distributed in 10 districts that is, 3 in Masaka, 6 in Wakiso, 1 in Mpigi, 1 in Kyotera, 8 in Kalangala, 1 in Mukono, 3 in Buikwe, 5 in Jinja, 1 in Mayuge and 2 in Namayingo.

1.5.5 There is need restock the major water bodies to increase fish production. Government will also work with Uganda Fish Processors and Exporters Association (UFPEA) to provide cheap financing to fish processors in order to overcome effects caused by COVID19 and other national and international economic shocks.

1.5.6 Aquaculture production alone currently contributes about US$389,000 from 120,000 MT produced, with input of about 200 million fish seedlings and 80,000 tonnes of feeds. This means that there are still opportunities in aquaculture production. If the country is to produce 1,000,000 more tonnes of fish from aquaculture in the next five years, it will require 2.5 billion fish seedlings (fingerlings/fry) and about 1.5million tonnes of fish feeds. This will support livelihoods of approximately 4million Ugandans along the value chain.

1.5.7 Many companies and farms have started investing in fish seed. These include the Source of Nile fish farm in Buikwe Njeru town council, Aqua tech Uganda, Luuka fish farm, Kabeihura fish farm and Salama integrated fish farm. Ugachick, Nsava fish feed and Kajjansi aquaculture research and development center are investing in fish feed.

1.5.8 In terms of profitability, one acre of a pond would cover an area of 4000 square metres. The stocking rate is 20 fish per square metre giving 80,000 fish per pond. Considering a harvest size of 250g per fish, each pond would yield 20,000kg. Assuming a flat mortality of 10% and farm gate sales price of 7000 per kg, a farmer would earn income of Ushs.138,600,000 per 6-month season.

1.5.9 Government will promote fish-farming using the miiga (edges of our papyrus swamps), to do fish-farming. MAAIF will design, construct and stock one thousand (1000) one-acre ponds. This will be implemented in the following areas: Kigyezi wetland system; Ankole (Rwizi-Bukoola wetland system); Bukedi (Mpologoma wetland system); Buganda (Katonga and Mayanja wetland system); Busoga (Wetland system); Teso (Kyoga-Bisina wetland system);

Bunyoro (Kafu wetland system); Toro (Mpanga wetland system); West Nile wetland system; Acholi-Lango (Aswa, Olweny system). The increased fish production resulting from the above initiatives will enable Uganda to benefit from the huge global demand for fish and fish products, which is currently estimated at US$125.6Billion.

1.5.10 With some of the above interventions and those detailed below, the sector targets to increase exports earnings from US$175.97 million MT to about US$698 million in five years.

Table 10: Required Fish value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Provision of technical services and inputs to improve aquaculture productivity	NAADS	5.0
	There is need to acquire additional heavy earth moving equipment's to support robust mechanical removal of the mass water weed in all major water bodies. The mass water weed affects the fish ecosystem	MAAIF	11.0
	There is need to attract private investors in the fish feed, fish seed and fish cage investments.	MAAIF	1.2
	There is need to restock the major water bodies through a phased manner.	MAAIF	6.0
	Through SACCOs there is urgent need to support youth and women groups in setting up communal water ponds and also support provision of inputs in those ponds.	MAAIF	12.0
	MAAIF will design, construct and stock one thousand (1000) one-acre ponds.	MAAIF	20.0
Processing	Support private sector to establish a fish processing factory in Jinja	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
	There is need to work with Uganda Fish Processors and Exporters Association (UFPEA) to provide cheap financing to fish processors in order to overcome effects caused by COVID19 and other national and international economic shocks.		-
Marketing	Increase surveillance and enforcement of fisheries regulations in order to increase the stock of fish to support increased demand for fish in order to boost nutrition and to ensure that the12 factories operate at full capacity thus increasing exports.	MAAIF	8.0
	Link fish farmers to profitable markets through collection and provision of market information	NARO, DFR	3.0
	There is need for investment in the national fisheries laboratory to revamp it and also set up new regional ones to ensure quality assurance of the fish produced and exported.	MAAIF	1.0
	There is need to support private sector investors in the fish cold chain at the major border points and airport.	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
Cross-cutting	There is need to support alternative live hood for youth and women in previously fishing communities which were affected by the rise in water levels within the lake Victoria Nile basin and also due to the increased enforcement and vigilance, some people who were depending on illegal fishing have been left with no alternative source of income.	MAAIF	12.0
Grand Total			**79.2**

Table 11: Profitability Analysis of aquaculture and cage farming

Description	Enterprise	Sub-stage	Item	Item type	Quantity per acre	Frequency per cycle	Unit cost	Total cost (UGX)
1. AQUACULTURE POND - TILAPIA								
The total costs for constructing a pond with capacity to hold 10,000 fingerlings, buying the fingerlings, feeding the fish and supervision comes to about Ush.32.8 million. The expected harvest of tilapia fish per cycle of 10 months is 4,250Kgs at a survival rate of 85%. Assuming the farmer sells the fish at USh.10,000 per Kilogram, the farmer will get Ush.42.5 million, giving a profit of Ush.9.7 million.	Aquaculture ponds - Tilapia (Half acre, 2000sq. Metres)	Inputs	Fish seed (3g fingerlings)	Number	10,000	1	200	2,000,000
			Transport of fish seed	Car	1	1	100,000	100,000
			Fish feeds	Kgs	2,000	3	3,800	22,800,000
			Transport of fish feed	Car	1	3	100,000	300,000
			Utility bills	Months	10	1	50,000	500,000
			Farm equipment (hire for sampling and harvest)	Months	10	1	50,000	500,000
			Sub-total					26,200,000
		Labour	Construction costs	Misc.	1	1	4,000,000	4,000,000
			Technical Supervision	Misc.	1	1	600,000	600,000
			Staff Salaries	Months	10	1	200,000	2,000,000
			Sub-total					6,600,000
			Total expenses					32,800,000
		Revenue	Revenue	Kgs	4,250	1	10,000	42,500,000
		Profit						**9,700,000**
2. AQUACULTURE POND - CATFISH								
For catfish, the cost of the fingerlings and the amount of feed required will differ from the tilapia. Other costs will remain the same. Total costs will amount to about Ush.59.45 million while revenue from selling each fish at about Ush.8,000 at a yield of 8500kgs will provide revenue of Ush.68 million; a profit of Ush.8.55 million.	Aquaculture ponds - Catfish (Half acre, 2000sq. Metres)	Inputs	Fish seed (3g fingerlings)	Number	10,000	1	300	3,000,000
			Transport of fish seed	Car	1	1	100,000	100,000

Description	Enterprise	Sub-stage	Item	Item type	Quantity per acre	Frequency per cycle	Unit cost	Total cost (UGX)
			Fish feeds	Kgs	4,250	3	3,800	48,450,000
			Transport of fish feed	Car	1	3	100,000	300,000
			Utility bills	Months	10	1	50,000	500,000
			Farm equipment (hire for sampling and harvest)	Months	10	1	50,000	500,000
			Sub-total					52,850,000
		Labour	Construction costs	Misc.	1	1	4,000,000	4,000,000
			Technical Supervision	Misc.	1	1	600,000	600,000
			Staff Salaries	Months	10	1	200,000	2,000,000
			Sub-total					6,600,000
			Total expenses					59,450,000
		Revenue	Revenue	Kgs	8,500	1	8,000	68,000,000
		Profit						**8,550,000**
3. POLYCULTURE – TILAPIA AND CATFISH								
A farmer can also explore the possibility of mixing the two types of fish. Under similar conditions as in the two earlier cases, total costs would amount to Ush.39.47 million while revenue would amount to about Ush.52 million; giving a profit of about Ush.13.2 million. This turns out to be a more profitable option than mon-cropping as a mix of high yield potential for catfish and higher sales prices for tilapia tip up the gross margins.	Aquaculture ponds - Tilapia and Catfish Polyculture (Half acre, 2000sq. Metres)	Inputs	Fish seed - tilapia (3g fingerlings)	Number	6,000	1	200	1,200,000
			Fish seed - catfish (3g fingerlings)	Number	4,000	1	300	1,200,000

Description	Enterprise	Sub-stage	Item	Item type	Quantity per acre	Frequency per cycle	Unit cost	Total cost (UGX)
			Transport of fish seed	Car	1	1	100,000	100,000
			Fish feeds - tilapia	Kgs	850	3	3,800	9,690,000
			Fish feeds - catfish	Kgs	1,700	3	3,800	19,380,000
			Transport of fish feed	Car	1	3	100,000	300,000
			Utility bills	Months	10	1	50,000	500,000
			Farm equipment (hire for sampling and harvest)	Months	10	1	50,000	500,000
			Sub-total					32,870,000
		Labour	Construction costs	Misc.	1	1	4,000,000	4,000,000
			Technical Supervision	Misc.	1	1	600,000	600,000
			Staff Salaries	Months	10	1	200,000	2,000,000
			Sub-total					6,600,000
			Total expenses					39,470,000
		Revenue	Revenue - Tilapia	Kgs	2,550	1	10,000	25,500,000
			Revenue - Catfish	Kgs	3,400	1	8,000	27,200,000
		Profit						**13,230,000**
4. CAGE FARMING								
A locally manufactured cage of dimensions 7x7x6 would require 26,950 fingerlings (5g) for optimal capacity utilisation. Total costs would amount to Ush.87.7 million. This cage would yield about 10,780 kgs of fish, and with each going at Ush.10,000, revenue of Ush.107.8 million would be generated. Profit with cage farming would therefore be approximately Ush.20 million.	Cage farming - Tilapia (7x7x6 cage)	Inputs	Fish seed (5g fingerlings)	Number	26,950	1	300	8,085,000
			Transport of fish seed	Car	1	1	200,000	200,000
			Fish feeds	Kgs	5,390	3	3,800	61,446,000
			Transport of fish feed	Car	1	3	200,000	600,000
			Utility bills	Months	10	1	100,000	1,000,000
			Farm equipment (hire for sampling and harvest)	Months	10	1	100,000	1,000,000
			Sub-total					72,331,000
		Labour	Cost of cage	Misc.	1	1	9,000,000	9,000,000
			Technical Supervision	Misc.	1	1	2,400,000	2,400,000
			Staff Salaries	Months	10	1	400,000	4,000,000
			Sub-total					15,400,000
			Total expenses					87,731,000
		Revenue	Revenue	Kgs	10,780	1	10,000	107,800,000
		Profit						**20,069,000**

1.6 TEA

1.6.1 In Uganda close to 80,000 farming households in 26 districts are involved in tea production. Presently the tea estates produce 54% of the tea while the small holder tea growers contribute 46% of the total acreage. Tea contributes 3.6% to Uganda's exports earnings. The Ministry targets to increase tea production from the current 60 million kgs of processed tea to about 100 million kgs in the next five years.

1.6.2 There are 32 tea processing factories operated under three different arrangements (plantation-based factories, tea factory investment companies, and smallholder factories). The gaps in processing capacity are mainly in Kabalore/Kyenjojo, Kanugu, Kibale, Mukono, and Buikwe. Ugandan tea processing facilities are either unevenly distributed or are concentrated in one area with many of the potential tea growing areas having no processing facilities. The ideal proposed number of processing lines is 71 and the actual number is 63 leaving a gap of 8 processing lines.

1.6.3 Government will support farmers through incentives from UDB, to procure processing machinery. Additionally, support will be provided for the completion of Kayonza, Mabale and Zombo tea factories.

1.6.4 With some of the above interventions and those detailed below, the sector targets to increase production from 60 million kgs to about 100 million kgs in five years. Exports earnings are expected to increase from US$91 million to US$338 million.

Table 12: Required Tea value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Enhance provision of tea seedlings in new tea growing areas efficiently and effectively to avoid wastage and other challenges earlier noted in the tea seedlings distribution programs.	NAADS	30.0
	Provide financial incentives through UDB for farmers to acquire fertilizers, herbicides, and processing machinery at concessional terms.	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
	Streamline and increase vigilance and supervision of tea nurseries in all tea growing areas and increase facilitation for both small farmers and private sector to multiply and distribute foundation/basic planting materials on a commercial scale.	NAADS, MAAIF	8.0
	Strengthen extension services: Educate farmers, trades and exporters on fair trade practices.	MAAIF	6.0
	Strengthen tea research activity leading to development of suitable clone which will be high yielding, drought resistance and disease resistance: Develop the suitable clone taking to account yield, quality, large pluck size and higher unit weight, high density of plucking points, healthy and robust branches	NARO	10.0
Processing	Kayonza, Mabale and Zombo tea factories completed	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
Marketing	Set up plucking standards for green leaf and manufacturing standards for made tea.	MAAIF	2.0
Grand Total			**56.0**

Table 13: Profitability Analysis of tea production and processing

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
A tea plantation is ready for harvest 18 months after plantation and goes on for seven years before the need to replant. The farmer will spend about Ush.5.78 million for establishment of the tea plantation. 4500 seedlings are required on an acre.	Plantation establishment expenses for 18 months, before harvest	Inputs	Seedlings	Number	4500	1	400	1,800,000
			Fertiliser NPK (25-5-5)	Bags	7	2	110,000	1,540,000
			Herbicides	Litres	5	2	15,000	150,000
			Sub-total					3,490,000
		Labour	Land preparation	Persons	10	1	49,000	490,000
			Planting	Persons	20	1	14,000	280,000
			Weeding	Persons	10	3	14,000	420,000
			Herbicide application	Persons	10	2	30,000	600,000
			Applying fertiliser	Persons	10	2	25,000	500,000
			Sub-total					2,290,000
		Total initial investment before year of harvest						**5,780,000**
Following harvest, the plantation requires maintenance in terms of weeding, fertiliser, and herbicide application. Harvesting is done every two weeks. Total operational expenses will amount to Ush.4.9 million per acre per year	Annual production expenses starting in year of harvest	Inputs	Fertiliser NPK (25-5-5)	Bags	7	2	110,000	1,540,000
			Herbicides	Litres	5	2	15,000	150,000
			Bags for harvesting	Number	15	1	1,000	15,000
			Sub-total					1,705,000
		Labour	Weeding	Persons	10	2	14,000	280,000
			Herbicide application	Persons	10	2	30,000	600,000
			Applying fertiliser	Persons	10	2	25,000	500,000
			Harvesting	Persons	10	26	7,000	1,820,000
			Sub-total					3,200,000
		Total annual expenses starting in year of harvest						**4,905,000**

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
In the first year after harvest, 1500kgs of Greenleaf is harvested every two weeks. In the second year, this goes up to 1650 kgs. Tea picking goes up to seven years before clearing of the land for replanting. Factories that process the green leaf to made tea sell about 10% of the tea to the domestic market and export about 90%. This is a result of the low consumption rate of tea domestically, despite the more favourable price. Factories produce about 21kgs of made tea for every 100kgs of greenleaf. Annual revenues from made tea per acre of harvest range over Ush.55 million.	Revenues	Green leaf	Year one revenue	Kgs	1,500	26	480	**18,720,000**
			Year one profitability					**13,815,000**
			Year two revenue	Kgs	1,650	26	480	**20,592,000**
			Year two profitability					**15,687,000**
		Processing to made tea	Year one revenue	Kgs	8,580			**55,282,656**
			Local market	Kgs	858	1	10,000	8,580,000
			Auction market - exports	Kgs	7,722	1	6,048	46,702,656
			Year two revenue	Kgs	9,022			**58,130,550**
			Local market	Kgs	902	1	10,000	9,022,000
			Auction market - exports	Kgs	8,120	1	6,048	49,108,550

1.7 COTTON

1.7.1 Cotton production has increased by 25% over the past four years, from 151,081 (185 kg) bales of lint in 2016/17 to 189,443 (185 kg) bales of lint in FY 2018/19. Lint exports also increased by 8% from 167,542 (185 kg) bales of lint valued at US$48 million in 2016/17 to 180,290 (185 kgs) bales of lint valued at US$54 million in FY 2018/19.

1.7.2 Uganda's textile factories mainly produce knitted garments, woven garments, fabrics in different varieties, bed linens, cotton spun yarn and cotton sewing threads. The biggest textile manufacturers are Southern Range Nyanza Ltd and Fine Spinners with an installed capacity of 904,000 pieces of garments per month, but only produce 570,000 garments per month (63%).

1.7.3 Uganda's cotton wool manufactures mainly produce surgical cotton wool and Mama Kits. The largest cotton wool manufacturers are Anik Industries Limited, Mutuma Commercial Agencies Ltd, Nile Surgicot Limited, South base Agro Industries Limited, Viva Holding Limited and Gulf Cotton Limited with a combined installed capacity of 2010 MT per year but only utilize 678 MT per year (34%). Over 70% of the Mama Kits demand is met by imports; which presents an opportunity for cotton wool manufacturers.

1.7.4 The country's cotton seeds/cake processors mainly produce vegetable oil (refined, single refined, semi-refined and crude oil) which is sold locally and regionally to Kenya, South Sudan, DRC and Rwanda. The biggest cotton seed processors are Nile Agro Industries, Gulu Seed Processors Limited, Agri Exim Limited, Singo United Investment Limited, Mutuma Commercial Agencies, Western Uganda Cotton Co. Limited and Twin Brothers Co. Limited. The top 13 cotton seed processors in the country have an installed capacity of 77,420 MT per year but only utilize 27,470 MT per year (35%).

1.7.5 Government will support efforts to intensify production through provision of inputs and support manufacturers to diversify their cotton products.

1.7.6 With some of the above interventions and those detailed below, the sector targets to increase production from 189,443 bales to about 217,000 bales in five years.

Table 14: Required Cotton value chain interventions and budget

Value chain stage	**Interventions**	**Responsibility**	**Annual Government Budget requirement (UGX. billions)**
Production	Procurement and distribution of other production inputs (fertilizers, pesticides, spray pumps, ox- ploughs) to farmers including women and youth groups and PWDs	CDO	20.0
	Recapitalize CDO to support farmer field mechanization since cotton growing is capital intensive	CDO	8.0
	Research and development for high yielding, early maturing, disease, pest, pest and flood tolerant varieties.	NARO	6.0
Aggregation	Recapitalize CDO to create funds for implementation of the revolving buffer stock fund for provision of lint and cotton seed to local manufacturers	CDO	15.0
Processing	Provide affordable finance to the private sector to set up factories and mills through Uganda Development Bank and Uganda Development Corporation. Support is to be provided for 2 new spinning and textile mills; 5 new garment making factories; and expansion works on Pader cotton seed processing plant	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
Grand Total			**49.0**

Table 15: Profitability Analysis of cotton production

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
A. **TRADITIONAL FARMER**								
A traditional farmer will spend a total of Ush.449,500 per acre on inputs, labour and post-harvest handling. Labour will mainly originate from within the family members given that cotton production is largely small scale oriented.	Production expenses	Inputs	Seeds	Kgs	Free			
			Herbicides	Litres	5	1	3,000	13,500
			Hoes	Misc.	2	1	6,000	12,000
			Rakes	Number		1	4,000	-
			Pangas	Number	2	1	4,000	8,000
			Spray Pump	Number	1	1	80,000	80,000
			Packaging bags	Number		1	5,500	-
			Sub-total					113,500
		Labour	Land clearance	Man days	1	2	10,000	20,000
			Land preparation	Man days	1	1	10,000	10,000
			Planting	Man days	10	1	2,000	20,000
			Thinning	Man days	8	1	2,000	15,000
			1st weeding	Man days	20	1	2,000	40,000
			1st spraying	Man days	4	1	2,000	8,000
			2nd weeding	Man days	20	1	2,000	40,000
			2nd spraying	Man days	4	1	2,000	8,000
			3rd weeding	Man days	15	1	2,000	30,000
			3rd spraying	Man days	4	1	2,000	8,000
			4th weeding	Man days	10	1	2,000	20,000
			Sub-total					219,000
		Postharvest handling and marketing	Transport to the farm house	Litres	5	1	3,800	19,000
			Picking	Man days	20	1	2,000	40,000
			Sorting	Man days	10	1	2,000	20,000
			Transport to the market	Litres	10	1	3,800	38,000
			Sub-total					117,000
		Total operating expenses						**449,500**

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
An acre of cotton yields about 800kgs, which at a unit cost of Ush.600 will provide revenue of Ush.480,000. Profits for a farmer applying improved methods are as therefore as low as Ush.30,500 an acre.	Revenues	Cotton	Revenue	Kgs	800	1	600	480,000
		Profitability per acre						30,500
B. IMPROVED FARMER								
An improved farmer will spend a total of Ush.738,000 per acre on inputs, labour and post harvest handling. Labour will mainly originate from within the family members given that cotton production is largely small scale oriented.	Production expenses	Inputs	Seeds	Kgs	Free			
			Herbicides	Litres	2	1	3,000	6,000
			Fertiliser	Bags	2	1	110,000	220,000
			Hoes	Misc.	2	1	40,000	80,000
			Rakes	Number		1	4,000	-
			Pangas	Number	2	1	4,000	8,000
			Spray Pump	Number	1	1	80,000	80,000
			Packaging bags	Number		1	5,500	-
		Labour	*Sub-total*					394,000
			Land clearance	Man days	1	2	10,000	20,000
			Land preparation	Man days	1	1	10,000	10,000
			Planting	Man days	10	1	2,000	20,000
			Fertilizer application	Man days	4	1	2,000	8,000
			Thinning	Man days	8	1	2,000	15,000
			1st weeding	Man days	20	1	2,000	40,000
			1st spraying	Man days	4	1	2,000	8,000
			2nd weeding	Man days	20	1	2,000	40,000
			2nd spraying	Man days	4	1	2,000	8,000
			3rd weeding	Man days	15	1	2,000	30,000
			3rd spraying	Man days	4	1	2,000	8,000

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
			4th weeding	Man days	10	1	2,000	20,000
			Sub-total					227,000
		Postharvest handling and marketing	Transport to the farm house	Litres	5	1	3,800	19,000
			Picking	Man days	20	1	2,000	40,000
			Sorting	Man days	10	1	2,000	20,000
			Transport to the market	Litres	10	1	3,800	38,000
			Sub-total					117,000
		Total operating expenses						738,000
An acre of cotton yields about 1800kgs, which at a unit cost of Ush.600 will provide revenue of Ush.1.08 million. Profits for a farmer applying improved methods are as therefore as low as Ush.342,000 an acre.	Revenues	Cotton	Revenue	Kgs	1,800	1	600	1,080,000
	Profitability per acre							**342,000**

COTTON PRODUCTION PROFITABILITY OVER THE MEDIUM TERM

a) Cotton production is targeted to increase to 200,000 MT in 5 years.

b) Assuming yield per acre of 1800 kgs (1.8MT), the country would need to have a total of about 120,000 acres of cotton under cultivation.

c) At a total cost of about Ush.394,000 for inputs per acre, the required total acreage would cost inputs worth Ush.47 billion.

d) Government proposes to spend a total of **Ushs.20 billion** on inputs in the first year of production.

e) With revenue per acre as shown above, cotton production has the potential to generate Ush.130 billion if the target production levels are attained.

1.8 BANANAS

1.8.1 Bananas are cultivated by 47% of the agriculture households in Uganda, covering over 544,971 hectares and with an average yield of 11.9 MT per hectare. In 2019 alone, Uganda produced about 10 million MT of bananas and the sector targets to increase production to about 14 million MT in five years. Majority of the banana trade is through bulk traders who purchase bananas from the major rural trading points and transport the bananas to the major urban centers. These bulk traders also supply the few exporters who do basic value addition and distribute banana products to the region and international markets. Due to consumer unawareness, processors operate on a small-scale.

1.8.2 The Ministry plans to intensify efforts to increase the production of bananas; and process them into industrial products. As guided by scientists, banana flour can be used to make many products including better and safer bread than wheat flour, which contains gluten that is not good for human nutrition. Banana flour shall therefore be processed and used in the manufacture of confectionaries, baby foods, pharmaceuticals, wines and juices. Banana combs shall be processed into industrial starch while the pseudo-stems will be processed into fiber and the peelings shall be transformed into charcoal brickets. These deliberate actions by the Ministry shall save Uganda over US$300 million in foreign exchange which is currently spent on the importation of wheat, its products and animal feed alone.

1.8.3 The Presidential Initiative on Banana Development will also be upscaled to increase the marketing of flour, drive volumes and decrease the cost of flour, promote small scale processing and penetration of technology.

1.8.4 With some of the above interventions and those detailed below, the sector targets to increase production from 10 million MT to about 14 million MT in five years.

Table 16: Required Banana value chain interventions and budget

Value chain stage	**Interventions**	**Responsibility**	**Annual Government Budget requirement (UGX. billions)**
Production	Develop the seed system to commercial standards, with functional and enforceable certification mechanism	MAAIF, NARO	7.0
	Mobilisation of farmers into farmer groups and formation of a banana platform to bring together the different value chain actors	MAAIF, UCA	1.5
	Research and development for high yielding, early maturing, disease, resistant banana varieties with taste characteristics demanded by the local and regional markets	NARO	5.0
Aggregation	Improve facilities at the collection centers and support value addition technologies at different market levels to minimise wastage	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
Processing	Expand the existing capacity of domestic value addition, both in terms of knowledge, skills, human and financial resources. There is also need to standardise banana derived products.	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
Marketing	Upscale the strategy for the Presidential Initiative on Banana Development to increase the marketing of flour, drive volumes and decrease the cost of flour, promote small scale processing and penetration of technology.	MAAIF, UNIDO, OP	8.0
Grand Total			**21.5**

Table 17: Profitability Analysis of Banana production

Sub-stage	Item	District Scenario 1 (Sheema)			District scenario 2 (Isingiro)			District Scenario 3 (Bukomansimbi)		
		Traditional	Low input	High input	Traditional	Low input	High input	Traditional	Low input	High input
Input	Suckers (Depreciated)	0	135,000	135,000	0	112,500	90,000	0	135,000	135,000
	Fertilizers	0	0	270,850	0	0	270,000	0	0	245,000
	Animal manure	0	0	685,700	0	0	545,700	0	0	835,714
	Support poles	25,600	289,800	342,000	45,000	135,000	270,000	45,600	65,800	150,182
	Mulch	0	0	685,600	0	0	650,000	0	0	578,267
	Herbicides	0	0	155,850	0	0	150,000	0	0	124,000
	Sub-total	25,600	424,800	2,275,000	45,000	247,500	1,975,700	45,600	200,800	2,068,163
Labour costs	Land clearing	45,600	25,000	25,000	35,000	40,000	40,000	45,000	45,000	45,000
	First ploughing	54,800	45,600	45,680	75,000	75,000	75,000	70,000	70,000	70,000
	Second ploughing	0	42,320	43,350	0	44,500	35,000	0	70,000	70,000
	Digging holes	45,000	135,000	135,000	45,000	112,500	112,500	45,000	112,500	112,500
	Planting	22,500	45,000	67,500	22,500	22,500	22,500	45,000	45,000	45,000
	Weeding	65,650	24,670	25,850	75,600	45,000	45,000	120,000	60,000	30,000
	Application of manure	0	0	225,680	0	0	50,000	0	0	20,000
	Mulching	0	0	305,600	0	0	150,000	0	0	150,000
	Fertilizer and pesticide application	0	0	194,400	0	0	150,000	0	0	120,000
	Desuckering and deleafing	25,600	40,000	72,000	25,000	45,000	135,000	30,000	50,000	90,000
	Removal of rhizomes, spliting of pseudostems	0	60,000	240,000	0	65,800	185,600	0	40,000	120,000
	Staking banana plants bearing fruits	0	450,000	85,800	0	20,000	45,000	0	25,600	46,400
	Banana weevil trapping	0	85,600	172,800	0	120,000	265,600	0	120,000	240,000
	Harvesting	0	141,750	224,438	0	101,250	160,313	0	150,000	675,000
	Sub-total	259,150	1,094,940	1,863,098	278,100	691,550	1,471,513	355,000	788,100	1,833,900

Sub-stage	Item	District Scenario 1 (Sheema)			District scenario 2 (Isingiro)			District Scenario 3 (Bukomansimbi)		
		Traditional	**Low input**	**High input**	**Traditional**	**Low input**	**High input**	**Traditional**	**Low input**	**High input**
	Total Variable cost (TVC)	**284,750**	**1,519,740**	**4,138,098**	**323,100**	**939,050**	**3,447,213**	**400,600**	**988,900**	**3,902,063**
	Marketable yield	3,698	13,156	25,055	2,734	12,211	28,364	1,890	9,113	24,368
	Average price (Ug shs/kg)	230	246	270	200	250	265	175	200	225
	Total Revenue (TR)	**849,240**	**3,238,321**	**6,764,937**	**546,750**	**3,052,688**	**7,516,399**	**330,750**	**1,822,600**	**5,482,800**
	Gross margin (TR-TVC)	**564,490**	**1,718,581**	**2,626,840**	**223,650**	**2,113,638**	**4,069,187**	**-69,850**	**833,700**	**1,580,737**
	Benefit-cost ratio (TR/TVC)	2.98	2.13	1.63	1.69	3.25	2.18	0.83	1.84	1.41
	Unit cost of production	87	71	138	104	124	146	211.96	108.52	160.13
	Marginal returns on investment (Unit price-Unit cost of production)	143	175	132	96	126	119	-36.96	91.48	64.87

The analysis shows that the Profitability Analysis of bananas widely varies across areas pf production. However, across the regions, a farmer with improved inputs consistently makes higher profits in comparison to low input and traditional farmers. For traditional farmers, profits range from losses to Ush.500,000 per acre while profits for low input farmers range from Ush.800,000 to Ush.2 million per acre. With improved inputs, profits range from Ush.2 million to Ush.4 million per acre.

1.9 CASSAVA

1.9.1 Cassava is the second most important staple food after banana; a food security crop that also contributes over 22% of cash incomes to farming households in Uganda. The country currently produces 4.1 million MT of cassava and targets to increase this to about 5.8 million MT. Growth in cassava production over the years has been attributed to government support provided to the farmers through programmes and projects like Acholi bur project (championed by Bishop Odama), AgriTT and Agriculture Cluster Development Project.

1.9.2 The biggest processors of cassava are Bukona Agro Processors in Amuru district that produces industrial ethanol; Uganda Breweries Limited that uses high-quality cassava flour (HQCF) for "Engule" and "Senator" brands of beer; Adyaka Flash drier in Apac; Windwood Flash drier in Lira that produces HQCF; and Farm Uganda Limited in Kiryandongo. Other consumers are food processors like Maganjo Grain Millers in Kawempe and Kaina Foods in Gulu. Most processors mill cassava into flour and package it for local consumption.

1.9.3 However, there is potential for import replacement of starch and ethanol if there is more value addition to cassava. Of all the imported starch and ethanol, 53 percent is for pharmaceutical industries, 32 percent for Paperboard industries, 13.5 percent for food processors and 1 percent for laundry operators. In the short term, the sector plans to support the private sector to establish a starch processing factory in Northern Uganda. 1 additional starch factory and 3 ethanol factories are expected to be set up in the medium term.

1.9.4 With some of the above interventions and those detailed below, the sector targets to increase production from 4.1 million MT to about 5.8 million MT in five years.

Table 18: Required Cassava value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Support commercially oriented out grower farmers to produce cassava roots for an out-grower scheme. Support will be in access of labour saving technologies and training in cassava agronomy, ICM, IPM.	MAAIF	5.0
	Support distribution of disease-free cassava cuttings to 160,000 farmers	MAAIF, NAADS	13.0
	Support establishment of 1 private nucleus farm in the Northern, Midwestern and Eastern regions	MAAIF	12.0
	There is need to increase support to cassava seed multipliers	Private sector, UDB, Microfinance Support Center, Pride, ACF	
	Work with the private sector and research to develop the right varieties required for a particular industrial product (starch, ethanol) of interest. This shall help build regional market niches depending on which variety performs best in a given region	NARO	4.0
Aggregation	Support farmer cooperatives in Northern, Mid-Western and Eastern Uganda, through NAADS, to access small scale drying equipment	MAAIF	18.0
Processing	Invest in setting up regional flash driers, complemented by batch driers at the community level to ensure that the FCR can be turned into HQCF/HQCC. These interventions should be undertaken through consultation with the commodity platform and area cooperatives.	NAADS	12.0

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
	Mobilise and support farmer cooperatives to process high quality cassava chips or flour as a marketable product for industrial use.	Private sector, UDB, Microfinance Support Center, Pride, ACF	
	Support SMEs to process high quality chips, and flour for industrial use	Private sector, UDB, Microfinance Support Center, Pride, ACF	
	Support the private sector to establish a starch processing factory in Northern Uganda	MAAIF, MTIC	20.0
Marketing	Support implementation of quality assurance systems for fresh roots in Northern, Mid-Western and Eastern Uganda to avoid aflatoxins and contamination	DPCs	4.0
Grand Total			**88.0**

Table 19: Profitability Analysis of cassava production and processing

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
A casssava farmer will spend a total of Ush.1.02 million per acre on land preparation, inputs and labour.	Land preparation expenses	Labour	Land clearing	Man days	1	1	50,000	50,000
			First and second ploughing	Man days	2	1	100,000	200,000
			Sub-total					250,000
	Production expenses	Inputs	Stem cuttings		8	1	30,000	240,000
			Fertiliser	Bags	1	1	150,000	150,000
			Sub-total					390,000
		Labour	Planting	Man days	1	1	100,000	100,000
			Weeding	Man days	1	2	40,000	80,000
			Fertiliser application	Man days	1	1	100,000	100,000
			Harvesting	Man days	1	1	100,000	100,000
			Sub-total					380,000
		Total expenses						1,020,000
Cassava stem cuttings, fresh cassava roots, processing into chips and flour are options that a farmer may choose singly or in combination to maximise income from a unit area planted.	Revenues	Fresh cassava roots	Revenue	Kgs	9,000	1	200	1,800,000
		Profit per acre						**780,000**
		Certified stem cuttings	Revenue	Bags	120	1	25,000	3,000,000
		Profit per acre						**1,980,000**
		Cassava chips	Revenue	Kgs	3,600	1	700	2,520,000
		Profit per acre						**1,500,000**
		High Quality Cassava Flour	Revenue	Kgs	3,600	1	1,350	4,860,000
		Profit per acre						**3,840,000**

CASSAVA PRODUCTION PROFITABILITY OVER THE MEDIUM TERM

a) Cassava production is targeted to increase to 5.8 million MT in 5 years.

b) Assuming yield per acre of 9000 kgs (9MT), the country would need to have a total of about 650,000 acres of cassava under cultivation.

c) At a total cost of about Ush.390,000 for inputs per acre, the required total acreage would cost inputs worth Ush.253 billion.

d) Government proposes to spend a total of **Ushs.18 billion** on inputs in the first year of production.

e) With revenue per acre as shown above, cassava roots have the potential to generate about Ush.1,168 billion if production targets are met. If processed to cassava chips, the revenue potential increases to Ush.1,635 billion; and if further processed to High quality Cassava Flour, the revenue potential doubles to Ushs.3,154 billion.

1.10 BEANS

1.10.1 Beans are cultivated by 54% of the 5.94 million agriculture households for mainly food and income security. Major beans producing areas in Uganda include: South-Western (Kabale and Kisoro); Northern (Arua, Nebbi, Lira, and Apac); Western (Masindi, Hoima, Kibaale, Bushenyi, Kamwenge, Kasese and Fort Portal); and Eastern (Mbale, Sironko, and Kapchorwa). Beans are a valuable food and cash crop with low price volatility, thus giving farmers and traders a stable source of income. Beans offer the cheapest and most reliable source of protein and micronutrients mostly Vitamin B, iron, calcium and zinc. The crop offers a good source of balance nutrition for rural households especially the poor who can barely afford animal protein. Furthermore, beans are an important source of income, especially for women and youth.

1.10.2 Beans production in 2019 amounted to 1.76 million MT and is expected to increase to about 2 million MT. Research on bean value addition at the School of Food Technology, Nutrition and Bio-systems Engineering, Makerere University under the Bean Collaborative Research Support Program (CRSP) with VEDCO and Iowa State University has developed bean flour for making highly nutritious porridge for infants and other tertiary products, such as bread and cakes.

1.10.3 The sector plans to intensify support to research in beans, in order to establish suitable varieties and increase productivity in the agroecological zones of production. Procurement and distribution of sorters and other post-harvest handling equipment through NAADS, will go a long way in alleviating post-harvest handling and thus quality challenges in this commodity.

1.10.4 In terms of profitability, when ready for harvest, one acre of a beans plantation provides about 800kgs of dry beans which would earn a farmer about Ushs.1.28 million. Together with the costs of setting up the plantation, total costs for a season's harvest, drying, threshing, cleaning and sorting would amount to about Ushs. 899,000, giving a profit of Ush. 1,101,000 (see **Table 21**).

1.10.5 With some of the above interventions and those detailed below, the sector targets to increase production from 1.76 million MT to about 2 million MT in five years.

Table 20: Required Beans value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Enhance research to establish suitable varieties to increase productivity in the agro-ecological zones	NARO	4.0
	Support bean seed multipliers through PPPs with MAAIF and NARO	MAAIF	10.0
Aggregation	Facilitate provision of sorters and other beans post-harvest handling equipment through NAADS	NAADS	6.0
Grand Total			**20.0**

Table 21: Profitability Analysis of beans production

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
A farmer will spend a total of Ush.899,000 per acre on inputs, labour and post-harvest handling. The use of hematic bags for storage enable the farmer to avoid expenses incurred in using chemicals during storage.	Production expenses	Inputs	Seeds	Kgs	30	1	4,500	135,000
			Fertiliser DAP	Bags	1	1	135,000	135,000
			Sacks for harvest	Number	8	1	1,500	12,000
			Pesticides for beans in garden (dimethane)	Litres	1	1	25,000	25,000
			Hermetic bags for storage	Number	8	1	8,000	64,000
			Sub-total					371,000
		Labour	Land preparation	Man days	1	1	150,000	150,000
			Sowing	Man days	1	1	60,000	60,000
			DAP application	Man days	1	1	100,000	100,000
			Weeding	Man days	1	1	80,000	80,000
			Sub-total					390,000
		Postharvest handling	Harvesting and collection	Man days	1	1	50,000	50,000
			Drying, cleaning and sorting	Kgs	800	1	100	80,000
			Storage	Bags	8	1	1,000	8,000
			Sub-total					138,000
		Total expenses						**899,000**
Profits for a farmer using good agronomic practices as seen above are about Ush.1.1 million per harvest per acre	Revenues	Dry beans	Revenue	Kgs	800	1	2,500	2,000,000
		Profitability per acre						1,101,000

BEANS PRODUCTION PROFITABILITY OVER THE MEDIUM TERM

a) Beans production is targeted to increase to 2.5 million MT in 5 years.

b) Assuming yield per acre of 0.8MT, the country would need to have a total of 3 million acres of beans under cultivation.

c) At a total cost of about Ush.371,000 for inputs per acre, the required total acreage would cost inputs worth Ush.1,163 billion.

d) Government proposes to spend a total of **Ushs.10 billion** on inputs in the first year of production.

e) With revenue of about Ush.2 million per acre, the total revenue that would be generated from meeting the production target would amount to Ush.6,267 billion.

1.11 SUGAR

1.11.1 The sugar industry remains important to the economy of Uganda as it provides direct employment to over 20,000 and indirectly employs over 50,000 people. Sugar production amounted to 500,000 MT in 2019, an increase by 15% from 2018. With the population projected at about 55 million by 2030 (assuming a population growth rate of 3.3%) and with the per capita sugar consumption of 18kg per person per year as recommended by World Health Organisation (WHO), Uganda will need about 660,000MT of sugar for local consumption alone by 2030.

1.11.2 Currently there are eleven (11) operational sugar processing mills which include Kakira Sugar Works Ltd, Kinyara Sugar Works Ltd Mayuge Sugar Ltd, Kaliro and Allied industries Ltd, Kamuli Sugar Ltd, Seven Star Sugar Ltd, GM Sugar Ltd, Sugar Cooperation of Uganda Ltd (SCOUL), Hoima Sugar Ltd, Ndibulungi Sugar Works and Uganda Farmers' Crop Industries Ltd. Government has also licensed 8 other sugar mills that will begin operations soon, including Atiak sugar factory in Amuru. The 3 major players in the Sugar industry are Kakira Sugar Works Ltd with current sugar production of 173,806 MT against the annual production capacity of 180,000MT; Kinyara Sugar Works with current sugar production of 104,279MT against annual production capacity of 120,000MT; and SCOUL with current sugar production at 84,001MT against the annual production capacity of 90,000MT.

1.11.3 Apart from sugar there are a number of biproducts from sugar cane including electricity from bagasse, ethanol from molasses, fertilisers from bagasse ash, gin and rum, fiber board (ceiling boards), particle board, furfural and acetic acid. The sugar factories are mainly generating electricity and distilling ethanol. Kakira Sugar works generates its own power from bagasse and has a 52MW thermal plant which supplies 32MW to the national grid. It also has a 60KL ethanol distillery which produces 20 million tonnes of ethanol annually. Kinyara sugar has a 14.5MW power plant of which 4.5MW is sold to the national grid. SCOUL also boasts of a 9.5MW power plant for own use and an ethanol distillery with a capacity of 30KL. Other sugar millers involved in power generation are Kaliro and Allied Sugar Ltd with a 12MW plant which supplies 7MW to the national grid and Mayuge Sugar which generates 1.6MW for internal use.

1.11.4 Government will work with Uganda Sugar Manufactures Association (USMA) to support millers to process industrial sugar, which will increase productivity thereby producing more crushable material. Out growers will also be supported with irrigation facilities to facilitate all-year production.

1.11.5 With some of the above interventions and those detailed below, the sector targets to increase production from 500,000 MT to about 660,000 MT in five years.

Table 22: Required Sugar value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Establishment of a national Sugar Research Institute to help in the breeding of sugar cane varieties suited for the various Agro-ecological zones.	NARO	9.0
	Provide irrigation facilities to out-grower farmers and the sugar companies.	MAAIF	10.0
Processing	Construct 1 farmer-based sugar factory in Busoga, with support from UDB	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
	Support millers to improve the production capacities of their plants and technologies through Uganda Development Bank.		-
	Support millers to process industrial sugar through Uganda Development Bank (UDB). This will result in increased productivity thereby producing more crushable material in less land.		-
	Support the completion of Atiak sugar factory	MAAIF, MTIC	15.0
Grand Total			**34.0**

Table 23: Profitability Analysis of sugarcane production

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
The plantation is ready for harvest after 18 months and goes on for about six years before the need to replant. The farmer will spend about Ush.4.775 million for establishment of the plantation. 5000kgs of seed cane are required per acre.	Plantation establishment expenses for 18 months, before first plant harvest	Inputs	Seed cane	Kgs	5000	1	250	1,250,000
			Pesticides	Misc.	1	1	90,000	90,000
			Fertiliser DAP	Bags	2	1	135,000	270,000
			Fertiliser Urea	Bags	2	3	90,000	540,000
			Seed cane (for gap filling)	Kgs	500	1	250	125,000
			Sub-total					2,275,000
		Labour	Seed cane harvesting	Man days	1	1	60,000	60,000
			Seed cane transportation	Man days	1	1	200,000	200,000
			Seed cane loading	Man days	1	1	50,000	50,000
			Bush clearing	Man days	1	1	100,000	100,000
			Land clearing	Man days	1	1	300,000	300,000
			Chemical weeding	Man days	1	15	72,000	1,080,000
			Hilling	Man days	1	1	50,000	50,000
			Hand weeding	Man days	1	3	60,000	180,000
			Ploughing	Man days	1	1	100,000	100,000
			Ridging	Man days	1	1	90,000	90,000
			Seed cane planting	Man days	1	1	70,000	70,000
			Seed cane gap filling and transport	Misc.	1	1	200,000	200,000
			Fertiliser application	Man days	1	1	20,000	20,000
			Sub-total					2,500,000
		Total initial investment before first harvest						4,775,000
Following harvest, operations to maintain the plantation are largely labour intensive. Total expenses will amount to about Ush.3.82 million per acre per year	Annual production expenses following first harvest	Inputs	Fertiliser Urea	Bags	2	3	90,000	540,000
			Sub-total					540,000
		Labour	Chemical weeding	Man days	1	15	72,000	1,080,000
			Hilling	Man days	1	1	50,000	50,000

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
			Seed cane gap filling	Man days	1	1	130,000	130,000
			Gap filling	Man days	1	1	200,000	200,000
			Hand weeding	Man days	1	3	60,000	180,000
			Stable shaving	Man days	1	1	60,000	60,000
			Trash lining	Man days	1	1	60,000	60,000
			Harvesting	Man days	1	1	300,000	300,000
			Transportation	Misc.	1	1	900,000	900,000
			Loading	Man days	1	1	320,000	320,000
			Sub-total					3,280,000
		Total annual expenses starting in year of harvest						3,820,000
The first harvest comes 18 months after planting and will provide revenues of about Ush.5.76 million. The second harvest (ratoon one) comes 10 months later and also provides revenue of Ush.5.76 million. The third harvest (ratoon two) comes 10 months later and also provides revenue of Ush.5.76 million. Considering the profitability, it takes three harvests (38 months) for the farmer to recover the initial investment cost to set up the farm for its first harvest.	Revenues	Sugarcane	First plant revenue	Tones	48	1	120,000	5,760,000
		First plant profit						**1,940,000**
			Ratoon one revenue	Tones	48	1	120,000	5,760,000
		Ratoon one profit						**1,940,000**
			Ratoon two revenue	Tones	47	1	120,000	5,640,000
		Ratoon two profit						**1,820,000**
			Ratoon three revenue	Tones	45	1	120,000	5,400,000
		Ratoon three profit						**1,580,000**

SUGARCANE PRODUCTION PROFITABILITY OVER THE MEDIUM TERM

a) Production of sugar cane is targeted to increase to 660,000 MT in 5 years.

b) Assuming yield per acre of 48 MT, the country would need to have a total of about 13,750 acres of sugarcane under cultivation.

c) At a total cost of about Ush.2.275 million for inputs per acre, the required total acreage would cost inputs worth Ush.31 billion.

d) Government proposes to spend a total of **Ushs.10 billion** on inputs in the first year of production.

e) With revenue per acre of Ush.5.76 million, sugarcane has the potential to generate about Ush.79.2 billion if production targets are met.

1.12 COCOA

1.12.1 Uganda's cocoa is globally perceived to be of high natural quality and taste. The processed product is a key ingredient in foods, pastries and cosmetics around the world. Cocoa is currently generating US$65.126 million from only 30,752 MT, and production is expected to increase to over 100,000 MT in five years.

1.12.2 Currently, there are 13 cocoa processors in Uganda mainly exporting cocoa beans. These include Bakwanye Trading Company, Esco Uganda, Olam Uganda, Kawacom Trading Company, Bundicao, Icam Trading Company, Agri Exim, Tropical Trade International, African Trade Winds Company, UGACOF and Kalvic Commodities. Only Latitude Trade company and Pink Foods Company are processing cocoa to the chocolate level.

1.12.3 Government will provide cheap financing to the chocolate manufacturing companies to boost their capacity hence supporting import substitution. Work will also be undertaken with Uganda Cocoa Association (UCA) to ensure high quality of seedlings produced and equitable distribution of seedlings by government agencies.

1.12.4 With some of the above interventions and those detailed below, the sector targets to increase production from 30,752 MT to about 100,000 MT in five years.

Table 24: Required Cocoa value chain interventions and budget

Value chain stage	**Interventions**	**Responsibility**	**Annual Government Budget requirement (UGX. billions)**
Production	Increase funding for cocoa research and make a stand-alone cocoa research unit in NARO.	NARO	4.2
	Work with Uganda Cocoa Association (UCA) to ensure quality of seedlings produced and equitable distribution of seedlings by government agencies.	MAAIF	4.8
Processing	Provide cheap financing to chocolate manufacturing companies to boost their capacity hence leading to import substitution and youth employment.	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
	Support private sector to establish a Cocoa processing factory with finance through UDB		-
Marketing	Support cocoa nursery operators in the cocoa growing hubs like Bundibugyo, Mbale, Masaka to boost the quality of seedlings.		-
	Work with Uganda Cocoa Association (UCA) to provide cheap financing (for the firms above) to expand their capacity and operations in order to provide guaranteed off-taking to farmers and to increase exports of processed beans.		-
Regulation	Set up a stand-alone cocoa liaison unit in the MAAIF and complete/approve the cocoa Policy.	MAAIF	1.0
Grand Total			**10.0**

Table 25: Establishment and operational expenses of a cocoa plantation

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
A cocoa plantation starts yielding 2 to 3 years after plantation. We use 3 years in this analysis. The plantation establishment costs therefore reflect the farmers' expenditure in the first 3 years where the farmer does not harvest. We also consider both a traditional farmer and one that uses good agronomic practices i.e. applies fertilisers and pesticides. The traditional farmer will spend about Ush.2.3 million per acre over 3 years while the advanced farmer will spend about Ush.5.2 million per acre over 3 years.	Plantation establishment expenses for 3 years before year of first harvest	Inputs	Seedlings	Number	440	1	560	246,400
			Compost manure	Trucks	4	3	120,000	1,440,000
			Fertiliser DAP	Bags	2	3	135,000	810,000
			Fertiliser MOP	Bags	1	3	110,000	220,000
			Chemicals and pesticides	Misc	1	3	90,000	270,000
			Sub-total					2,986,400
		Labour	Land clearing	Man days	1	1	120,000	120,000
			Ploughing	Man days	1	1	120,000	120,000
			Hallowing	Man days	1	1	120,000	120,000
			Planting and digging holes for shade trees	Man days	1	1	24,000	24,000
			Planting and digging holes	Man days	1	1	350,000	350,000
			Weeding	Man days	1	12	80,000	960,000
			Pruning	Man days	1	12	30,000	360,000
			Pesticide application	Man days	1	3	30,000	90,000
			Applying fertiliser	Man days	1	3	25,000	75,000
			Sub-total					2,219,000
		Total initial investment before year of harvest (Traditional methods)						**2,300,400**
		Total initial investment before year of harvest (Proper agronomic practices)						**5,205,400**
This part of the analysis shows the expenses the farmer incurs starting in the year of harvest. A traditional farmer who doesn't go into processing will spend Ush.660,000 per year per acre planted; while an advanced farmer that practices good agronomic methods will spend Ush.1.765 million per year per acre.	Annual production expenses starting in year of harvest	Inputs	Compost manure	Trucks	4	1	120,000	480,000
			Fertiliser DAP	Bags	2	1	135,000	270,000
			Fertiliser MOP	Bags	1	1	110,000	110,000

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
			Chemicals and pesticides	Misc	1	3	60,000	180,000
			Bags	Number	10	1	1,000	10,000
			Sub-total					1,050,000
		Labour	Weeding	Man days	1	4	80,000	320,000
			Pruning	Man days	1	2	30,000	60,000
			Pesticide application	Man days	1	1	30,000	30,000
			Applying fertiliser	Man days	1	1	25,000	25,000
			Sub-total					435,000
		Postharvest handling	Collecting and pod breaking	Man days	1	4	70,000	280,000
			Sub-total					280,000
		Total annual expenses starting in year of harvest (Traditional Methods)						**660,000**
		Total annual expenses starting in year of harvest (Proper Agronomic Practices)						**1,765,000**
Processing the fresh cocoa beans into dry cocoa beans will involve fermentation, drying, and storage costs of up to Ushs.336,000 per acre of harvest.	Processing expenses	Dry cocoa beans	Fermentation	Misc	1	1	240,000	240,000
			Drying	Bags	1	1	84,000	84,000
			Storage	Bags	1	1	12,000	12,000
			Sub-total					336,000
		Total annual expenses starting in year of harvest (Traditional Methods)						**996,000**
		Total annual expenses starting in year of harvest (Proper Agronomic Practices)						**2,101,000**

Table 26: Revenue and Profitability Analysis of cocoa production and processing

Description	Stage	Sub-stage	Item	Item type	Quantity per tree	No. of trees/ Acre/Year	Unit price	Gross Revenue
The advanced farmer of proper agronomic practices will yield much higher profits than the traditional farmer. For the traditional farmer, processing to dry cocoa beans provides the optimal profits. However, the farmer that follows best agronomic practices gains more profitability from the harvest of fresh cocoa beans. This is because the additional cost from more processing outweighs the additional income. Based on the Profitability Analysis of cocoa, it would take over one year to recover the initial cost of setting up the plantation.	Revenues	Fresh cocoa beans	Revenue (Traditional Methods)	Kgs	3	440	2,000	2,640,000
			Revenue (Proper Agronomic Practices)	Kgs	9	440	2,000	7,920,000
			Profitability per acre per year (Traditional methods)					**1,980,000**
			Profitability per acre per year (Proper Agronomic Practices)					**6,155,000**
		Dry cocoa beans	Revenue (Traditional Methods)	Kgs	1	440	6,000	3,168,000
			Revenue (Proper Agronomic Practices)	Kgs	3	440	6,000	7,920,000
			Profitability per acre per year (Traditional methods)					**2,172,000**
			Profitability per acre per year (Proper Agronomic Practices)					**5,819,000**

COCOA PRODUCTION PROFITABILITY OVER THE MEDIUM TERM

a) Cocoa production is targeted to increase from 30,752 MT to about 100,000 MT in five years.

b) Assuming a farmer follows good agronomic practices and sells fresh cocoa beans, one acre of 440 trees yielding 9kgs per tree would yield 3960kgs (3.96MT) of fresh cocoa beans a year. To achieve the target of 100,000MT, we would need to therefore plant at least 28,800 acres of cocoa trees within the next two years.

c) At a total cost of about Ush.1.2 million for inputs into production, the required total acreage would cost inputs worth Ush.37 billion.

d) Government proposes to spend a total of Ushs.4.8 billion on inputs in the first year of production, a subsidy of 26% on inputs to the farmer if half the required acreage is reached in year 1.

e) Assuming annual revenue of USh.7.9 million per acre of fresh cocoa beans as seen above, the total revenue that would be generated from meeting the production target would amount to Ush.228 billion.

1.13 VEGETABLE OILS

1.13.1 The national, regional and international markets for vegetable oils continue to grow each year due to population growth and increase in the alternative products that can be got from the oils. In 2018 alone, Uganda, imported over US$240 million worth of vegetable oils and fats. The private sector investment in the vegetable oil sub-sector also continues to grow partly due to the production opportunities in Northern and Eastern Uganda but also the increasing demand for vegetable oils and related products domestically and abroad. The major vegetable oil products are cooking oil and seed cake which is also used to make animal feeds, soap and related products.

1.13.2 The largest processors of vegetable oils are BIDCO Uganda Limited, Mukwano, Mt. Meru, Nile Agro, Ngetta Tropical Holdings and Guru Nanak. The different factories are currently crushing 1,500 MT of produce daily and are projected to increase daily production to 6,000 MT of produce daily in 5 years. The largest markets are Kenya, Tanzania, Rwanda, South Sudan and DR Congo, although some Ugandan companies like Mukwano are exporting refined cooking oil to Switzerland and the EU market; and seed cake to India.

1.13.3 Government will strengthen research in oil palm, sunflower and soybeans to provide essential materials for seed multiplication and reduce the dependence on imported seed. Expansion of the vegetable oil refinery in Jinja will also be supported.

Table 27: Required Vegetable oil value chain interventions and budget

Value chain stage	**Interventions**	**Responsibility**	**Annual Government Budget requirement (UGX. billions)**
Production	Strengthen research in oil palm, sunflower and soybeans to provide essential materials for seed multiplication to reduce the dependence on imported seed.	NARO	3.0
	Support private sector involvement to complement Government efforts through the National Oil Palm Project, NUSAF, PRDP all geared towards making production more efficient and reducing cost of production.	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
	Increase Government support in the Kalangala Oil Palm Growers Trust to compensate the funding originally provided through the IFAD support to further consolidate the investments in oil palm sub sector	MAAIF	20.0
Processing	Support setting up a nucleus estate for soya bean and sun floor in one of the bid maize hubs in order toc create synergies for Animal feed production (PPP)	MAAIF	20.0
	There is need to financially support the private sector players involved in the processing of Vegetable Oils (through UDB) in order to boost their capacity and guarantee off taking to the farmers. Support will be provided to expand the vegetable oil refinery in Jinja.	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
Regulation	Draft and complete the Vegetable Oil Policy which will guide the vegetable oil sub-sector. Government needs to formulate and support a Vegetable Oil Producers and Processors Association in order to support production and quality control.	MAAIF	1.8
Grand Total			**44.8**

Table 28: Profitability Analysis of oil palm production

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
An oil palm plantation starts yielding in the 3rd year after plantation. The plantation establishment costs therefore reflect the farmers' expenditure in the first 2 years where the farmer does not harvest. The farmer will spend about Ush.2.15 million per acre over 2 years.	Plantation establishment expenses for 2 years before year of first harvest	Inputs	Seedlings	Number	60	1	10,000	600,000
			Seedlings transport	Seedlings	60	1	1,000	60,000
			Tools	Trucks	1	1	70,000	70,000
			Fertilizer	Bags	1	4	110,000	440,000
			Sub-total					1,170,000
		Labour	Land preparation and planting	Man days	1	1	280,000	280,000
			Maintenance	Man days	1	2	350,000	700,000
			Sub-total					980,000
		Total initial investment before first harvest						**2,150,000**
This part of the analysis shows the expenses the farmer incurs starting in the year of harvest (3rd year). The farmer will spend Ush.1.15 million per year per acre.	Annual production expenses starting in year of harvest	Inputs	Tools maintenance	Trucks	1	1	10,000	10,000
			Fertilizer	Bags	1	4	110,000	440,000
			Sub-total					450,000
		Labour	Farm maintenance	Misc	1	1	300,000	300,000
			FFB harvesting	Misc	1	1	200,000	200,000
			FFB transport	Misc	1	1	200,000	200,000
			Sub-total					700,000
		Total annual expenses						**1,150,000**
On one acre of land, it will take approximately 5 years for the farmer to recover the initial costs of establishment. With subsidies in inputs, especially fertiliser, and larger scale of cultivation, this amount of time reduces. Over the long term, profits will stabilise per year to about Ush.4.5 million per acre per year	Revenues for 25 years	Fresh Fruit Bunches	Revenue year 3	Kgs	1,619	1	830	1,343,770
			Profit					**- 193,770**
			Revenue year 4	Kgs	3,238	1	830	2,687,540
			Profit					**1,537,540**

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
			Revenue year 5	Kgs	4,856	1	830	4,030,480
			Profit					**2,880,480**
			Revenue year 6	Kgs	5,666	1	830	4,702,780
			Profit					**3,552,780**
			Revenue year 7	Kgs	6,475	1	830	5,374,250
			Profit					**4,224,250**
			Revenue (18 years, 7000kgs per acre)	Kgs	126,000	1	830	104,580,000
			Profit for 18 years					**81,730,000**
			Profit per acre per year					**4,540,555**

Table 29: Profitability Analysis of Sunflower and Soybeans

Entreprise	Item	Model A*	Model B*	Model C*
Sunflower	Gross Income	121,902	223,486	446,973
	Variable Cash Costs	40,024	65,217	185,494
	Gross Margin/acre/season	**81,877**	**158,269**	**261,479**
	Unpaid Family Labour Used	25	31	43
	Returns/day Family Labor	1,321	2,082	2,490
Soybeans	Gross Income	227,550	365,705	609,508
	Variable Cash Costs	47,338	68,671	162,671
	Gross Margin/acre/season	**180,211**	**297,034**	**446,837**
	Unpaid Family Labour Used	25	31	37
	Returns/day Family Labor	2,907	3,908	4,703

**Model A: Uncertified seed, weeding (twice)*

**Model B: Hybrid seed/ improved varieties, follow extension advise, no fertilizer*

**Model C: Hybrid seed/ improved varieties, follow extension advise, apply fertilizer, herbicides and rhizobium inoculum*

1.14 **FRUITS AND VEGETABLES**

1.14.1 Uganda is endowed with a wide variety of succulent fruits and vegetables which largely contribute to the country's non-traditional agricultural exports at both regional and international levels. Major fruits and vegetables produced include citrus, pineapple, mango, avocado, apples banana, passion fruit, papaya, jackfruit, watermelon, guava, among others. The vegetables commonly grown include tomatoes, carrots, onions, garlic and peppers. Most of the fruits in Uganda are generally consumed in the fresh form. The total export earnings from fruits and vegetables in 2018 was US$40.6 million against the total revenue of US$22.3 million spent on fruit imports of both fresh and dried products.

1.14.2 There are a few fruit processing firms like Britannia Allied Industries, Jakana Foods Ltd, RECO industries, Elgonia Ltd, Bella International, Coca-Cola, Nzori, Fruits of the Nile, Delight, and Nile Natural Fruits limited. These companies process fruits into juice, dried fruits and fruit salads. However, most of them are also extracting juice from imported fruit pulp. These companies have differing capacities but they are mainly faced with the same challenges.

1.14.3 Fruit processing is still under exploited, and perishable fruits are usually wasted or sold at very low prices during the peak seasons because of inadequate post-harvest handling and storage facilities and lack of effective processing or preservation techniques. Government will support small holder farmers to acquire solar powered fruit extraction machinery to avoid loss of quality of fresh fruits on-farm due to delayed transportation. Additionally, the fruit factory in Soroti will be upgraded while a fruit factory will be constructed in the Greater Masaka area. Over the medium term, fruit factories are planned to be constructed in Arua, Kanungu and Bundibugyo.

Table 30: Required Fruits and vegetables value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Facilitate NARO, and private horticulture seed multiplication nurseries to ensure enhanced quality of planting material, including Hass Avocado support	NARO, MAAIF	8.0
	Invest in specialised extension systems for horticulture through contracting and subcontracting of internationally accredited firms in horticulture agronomy to support farmers	MAAIF	8.0
Aggregation	Government to support small holder farmers acquire solar powered fruit extraction machinery to avoid loss of quality of fresh fruits on-farm due to delayed transportation.	MAAIF	14.0
Processing	Construct fruit factory in the Greater Masaka area	Private sector, UDB, Microfinance Support Center, Pride, ACF	
	Fruit factory in Soroti upgraded		
	Government to invest in setting up horticulture export zones/ fields with necessary irrigation and production infrastructure, cages, drips irrigation typing, sprinklers, green houses etc. Farmers will be requested to lease these established facilities for production under specialised extension system provided by government.	MAAIF	20.0

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Marketing	Government to facilitate the private sector to set up fruit stores and cold chains around Entebbe international airport and big borders to maintain the quality of fresh produce destined for export.	UDB	
	Government to set up pest detection and radiating infrastructure at border posts and park houses beginning with Entebbe International Airport to further scientifically clean up the horticulture exports destined for Europe, Middle East, China etc.	MAAIF	38.0
Grand Total			**88.0**

Fruits - Citrus

Table 31: Profitability Analysis of citrus production

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
The plantation is ready for harvest after 3 years and goes on for about 10 years before the need to replant. The farmer will spend about Ush.5.99 million for establishment of the plantation. An acre can accommodate up to 120 trees.	Plantation establishment expenses for 3 years, before first plant harvest	Inputs	Seedlings	Number	120	1	2,000	240,000
			Fertiliser Superglo	Misc.	8	2	20,000	320,000
			Fertiliser NPK	Bags	1	2	110,000	220,000
			Fungicides	Litres	2	1	20,000	40,000
			Pesticides	Litres	5	1	55,000	275,000
			Sub-total					1,095,000
		Labour	Land clearing (oxen)	Man days	1	1	80,000	80,000
			Ploughing (oxen)	Man days	1	1	80,000	80,000
			Digging holes	Number	120	1	500	60,000
			Planting per hole	Number	120	1	500	60,000
			Watering	People	5	90	5,000	2,250,000
			Fertiliser application	People	5	6	10,000	300,000
			Spraying	People	5	36	5,000	900,000
			Weeding	Man days	3	6	50,000	900,000
			Light pruning	People	5	1	5,000	25,000
			Heavy pruning (per tree)	Trees	120	1	2,000	240,000
			Sub-total					4,895,000
		Total initial investment before first harvest						**5,990,000**
Following harvest, operations to maintain the plantation and harvesting will cost about Ush.2.01 million per acre per year	Annual production expenses following first harvest	Inputs	Fertiliser Superglo	Misc.	8	1	20,000	160,000
			Fertiliser NPK	Bags	1	1	110,000	110,000
			Fungicides	Litres	2	1	20,000	40,000
			Pesticides	Litres	5	1	55,000	275,000
			Sub-total					585,000
		Labour	Watering	People	5	30	5,000	750,000

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
			Fertiliser application	People	5	1	10,000	50,000
			Light pruning	People	5	1	5,000	25,000
			Heavy pruning (per tree)	Trees	120	1	2,000	240,000
			Sub-total					1,065,000
		Postharvest handling	Harvesting	Bags	300	1	500	150,000
			Gummy bags	Bags	300	1	700	210,000
			Sub-total					360,000
		Total annual expenses starting in year of harvest						**2,010,000**
The first harvest comes 3 years after planting and will yield about 30 MT, which provide revenues of about Ush.12 million. Considering expenses of Ush.2.01 million, this provides profits of Ush.9.99 million. The farmer therefore recovers the initial investment to set up the plantation after one harvest. Over a period of 10 years, the farmer will collect revenues of about Ush.120 million	Revenues	Revenue	First harvest revenue at 3 years	Kgs	30,000	1	400	12,000,000
			First harvest profit					9,990,000
			Total revenue for 10 years	Kgs	300,000	1	400	120,000,000
		Profit						**99,900,000**

Fruits - Mangoes

Table 32: Profitability Analysis of mangoes production

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
The plantation is ready for harvest after 4 years, and goes on for about 10 years before the need to replant. The farmer will spend about Ush.5.873 million for establishment of the plantation. 60 seedlings are required per acre.	Plantation establishment expenses for 4 years, before first plant harvest	Inputs	Seedlings	Number	60	1	2,000	120,000
			Fertiliser Compost manure	Misc	1	2	100,000	200,000
			Fungicides	Litres	4	1	40,000	160,000
			Pesticides	Litres	4	1	12,000	48,000
			Sub-total					528,000
		Labour	Land clearing (oxen)	Man days	1	1	80,000	80,000
			Ploughing (oxen)	Man days	1	1	80,000	80,000
			Digging holes	Number	60	1	500	30,000
			Planting per hole	Number	60	1	500	30,000
			Watering	People	5	120	5,000	3,000,000
			Fertiliser application	People	5	6	10,000	300,000
			Spraying	People	5	36	5,000	900,000
			Weeding	Man days	3	6	50,000	900,000
			Light pruning	People	5	1	5,000	25,000
			Sub-total					5,345,000
		Total initial investment before first harvest						5,873,000
Following harvest, operations to maintain the plantation and harvesting will cost about Ush.1.414 million per acre per year	Annual production expenses following first harvest	Inputs	Fertiliser Compost manure	Misc	1	1	100,000	100,000
			Fungicides	Litres	4	1	20,000	80,000
			Pesticides	Litres	4	1	55,000	220,000
			Sub-total					400,000
		Labour	Watering	People	5	30	5,000	750,000
			Fertiliser application	People	5	1	10,000	50,000
			Light pruning	People	5	1	5,000	25,000
			Sub-total					825,000
		Postharvest handling	Harvesting	Bags	70	1	2,000	140,000
			Gummy bags	Bags	70	1	700	49,000
			Sub-total					189,000
		Total annual expenses starting in year of harvest						**1,414,000**

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
The first harvest comes 4 years after planting and will yield abouy 5.6 MT, which provide revenues of about Ush.5.6 million. Considering expenses of Ush.1.4 million, this provides profits of Ush.4.186 million. It therefore takes more than a year after harvest to recover the investment to set up the plantation. Over a eriod of 10 years, the farmer will collect revenues of about Ush.120 million	Revenues	Revenue	First harvest revenue at 4 years	Kgs	5,600	1	1,000	5,600,000
			First harvest profit					4,186,000
			Total revenue over 10 years	Kgs	300,000	1	400	120,000,000
		Profit						**41,860,000**

1.15 IRISH POTATOES

1.15.1 Irish potatoes have over the years been regarded as an important food crop but have also proven to be a viable cash crop. Nutritionally, Irish Potato is considered a well-balanced major plant food with a good ratio protein and calories and substantial amounts of vitamins, especially vitamin C, minerals, and trace elements.

1.15.2 Irish potatoes are mainly grown by small scale farmers in the south western region (accounting for about 87% of production), the central and eastern region (at 9% and 3% respectively) and the northern region (at only 1%). Irish potatoes production in 2019 was estimated at 218,000 MT, and is projected to increase to 300,000 MT. The demand for Irish potatoes is however estimated to be over 850,000 MT per annum with urban demand outpacing rural demand. With increasing urbanisation, changing eating habits by the majority of the youth and high population growth, chips consumption has risen by over 30% over the past 5 years which offers the potato industry huge opportunities for enterprise development and economic growth.

1.15.3 Over the past few years, several Small and Medium Enterprises (SMEs) processing Irish potatoes into crisps and chips have been established in the country. SMEs such as Tomchris enterprises, BRINA superior, Tam-Tam Crisps, Psalms Food Industries Ltd (SUMZ) and Newman Foods (U) Limited, are some of the medium scale enterprises that have over the years become a household name in the sale of processed Irish and have a major presence in most retail shops and supermarkets in the country.

1.15.4 Newman's Limited was established in 2013 producing several food snacks including Potato Crisps in two flavours (Plain and Chilli). Currently, Newman is processing at full capacity of 300 MT per annum and sells all its produce within the country. The company spends over 1 billion shillings annually to purchase raw materials from farmer groups in Kisoro District. Sumz was founded in 2010, and also produces Deep-fried crisps from Irish potatoes produced in five different flavours namely: Chilli, Salt and Vinegar, Tomato and Tangi Lemon. Sumz is also processing at full capacity of 350 MT per annum. The company employs several youths plus a chain of co-operative societies which supply the company with raw materials.

1.15.5 All the processors are operating at full capacity despite the current production but the demand for the products is far from being exhausted. Another big source of market for the Irish potato industry is the fast food industry in the urban centres such as KFC, Javas, Chicken Tonight, the hotel industry and the roadside snacks outlets which have created employment opportunities for youth and women. Going forward, farmers will be supported with critical inputs, including seed, in order to boost production to meet the demand.

1.15.6 With some of the above interventions and those detailed below, the sector targets to increase production from 218,000 MT to about 300,000 MT in five years.

Table 33: Required Irish potato value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Support increased access to critical inputs and services for production	NAADS	10.0
	Support research in better Irish varieties	NARO	3.0
	Support the multiplication of improved potato seed	MAAIF	4.5
Processing	Support other processing facilities that use potato as raw materials though acquisition of cheap financing under UDB	UDB	-
	Support the establishment of potato cottage industries and other processing and value addition facilities	UDB	-
Grand Total			**17.5**

Table 34: Profitability Analysis of irish potatoes production

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
A farmer will spend a total of Ush.5.1million per acre on inputs, labour and post-harvest handling.	Production expenses	Inputs	Seeds (80kg bags)	Kgs	12	1	200,000	2,400,000
			Fertiliser NPK (50kg bags)	Bags	4	1	110,000	440,000
			Fungicides (macozeb)	Misc	10	1	13,000	130,000
			Pesticides	Litres	2	1	20,000	40,000
			Bags	Number	100	1	1,000	100,000
			Sub-total					3,110,000
		Labour	Land preparation	Man days	1	1	400,000	400,000
			Planting	Man days	1	1	250,000	250,000
			Second cultivation	Man days	1	1	250,000	250,000
			Deholming	Man days	1	1	35,000	35,000
			Fertiliser and pesticide application	Man days	4	1	56,000	224,000
			Weeding	Man days	1	2	140,000	280,000
			Sub-total					1,439,000
		Postharvest handling	Harvesting and collection	Man days	1	1	280,000	280,000
			Transport	Bags	84	1	2,500	210,000
			Storage	Misc	1	1	70,000	70,000
			Packing and loading	Misc	1	1	70,000	70,000
			Sub-total					560,000
		Total expenses						5,109,000
Profits for a farmer using good agronomic practices as seen above are about Ush.5.8 million per harvest per acre	Revenues	Potatoes	Revenue (120kg bags)	Bags	84	1	130,000	10,920,000
		Profitability per acre						**5,811,000**

IRISH POTATOES PRODUCTION PROFITABILITY OVER THE MEDIUM TERM

a) Production of irish potatoes is targeted to increase to 310,000 MT in 5 years.

b) Assuming yield per acre of 10 MT, the country would need to have a total of about 30,805 acres of irish potatoes under cultivation.

c) At a total cost of about Ush.3.1 million for inputs per acre, the required total acreage would cost inputs worth Ush.96 billion.

d) Government proposes to spend a total of **Ushs.10 billion** on inputs in the first year of production.

e) With revenue per acre of Ush.10.9 million, irish potatoes have the potential to generate about Ush.336 billion if production targets are met.

1.16 **SWEET POTATOES**

1.16.1 Sweet potatoes are one of the important food security crops in Uganda and is also an important source of income for households, Uganda is among the largest growers of sweet potatoes in the world with annual production estimated at 2.5 million MT. It can be kept for some time in the soil as a reserve crop and withstands extreme weather conditions. One of the varieties being promoted is the Orange-fleshed sweet potato (OFSP) which is rich in vitamin A and has been adopted by over 237,000 Ugandan farming households to date.

1.16.2 Post-harvest handling of the Sweet potato is still low and done mainly by a few SMEs such as Sesaco Uganda Ltd, Devine foods, Farm Africa, Senga Sourcing Ltd and mama care. Some SMEs have started processing the sweet potato to make composite flour, combined with other floors such as maize and rice flour to make nutritious porridge recommended for children and mothers. Communities are also using sweet potato flour in combination with wheat flour and other ingredients, to make chapati, donuts and bread. Government will intensify support to research and the scaling up of cottage industries processing this commodity.

1.16.3 With some of the above interventions and those detailed below, the sector targets to increase production from 2.5 million MT to about 3.6 million MT in five years.

Table 35: Required Sweet potato value chain interventions and budget

Value chain stage	**Interventions**	**Responsibility**	**Annual Government Budget requirement (UGX. billions)**
Production	Invest in increased access to quality seedlings and other inputs and services;	NAADS	6.0
	Promote investment in Sweet Potato research for new technologies and products	NARO	4.5
Processing	Support /fund innovations to scale out cottage industries, making flour, confectioneries, cakes, etc., from Sweet Potato flour;	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
Marketing	Expand national and regional markets for sweet potato.	MAAIF, MTIC	3.5
Regulation	Focused attention on legal and regulatory environment;	MAAIF	2.5
Grand Total			**16.5**

Table 36: Profitability Analysis of sweet potatoes production

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
A farmer will spend a total of Ush.1.45million per acre on inputs, labour and post-harvest handling.	Production expenses	Inputs	Vine cuttings (1000 per bag)	Bags	12	1	20,000	240,000
			Fertiliser Ving Max	Misc	2	1	25,000	50,000
			Herbicides (striker)	Misc	1	1	50,000	50,000
			Bags	Number	100	1	1,000	100,000
			Sub-total					440,000
		Labour	Land preparation (oxen)	Man days	1	1	70,000	70,000
			Ploughing	Man days	1	1	70,000	70,000
			Hipping/Ridging	Man days	1	1	130,000	130,000
			Planting	Man days	1	1	50,000	50,000
			Fertiliser and herbicide application	Man days	6	1	50,000	300,000
			Weeding	Man days	1	1	100,000	100,000
			Sub-total					720,000
		Postharvest handling	Harvesting (Oxe cart)	Man days	1	1	70,000	70,000
			Transport	Bags	60	1	2,500	150,000
			Storage	Misc	1	1	70,000	70,000
			Packing and loading	Misc	1	1	70,000	70,000
			Sub-total					290,000
		Total expenses						**1,450,000**
Profits for a farmer using good agronomic practices as seen above are about Ush.3.95 million per harvest per acre	Revenues	Potatoes	Revenue (140kg bags)	Bags	60	1	90,000	5,400,000
		Profitability per acre						**3,950,000**

SWEET POTATOES PRODUCTION PROFITABILITY OVER THE MEDIUM TERM

a) Production of sweet potatoes is targeted to increase to 3,560,955 MT in 5 years.

b) Assuming yield per acre of 8.4 MT, the country would need to have a total of about 423,923 acres of sweet potatoes under cultivation.

c) At a total cost of about Ush.440,000 for inputs per acre, the required total acreage would cost inputs worth Ush.187 billion.

d) Government proposes to spend a total of **Ushs.6 billion** on inputs in the first year of production.

e) With revenue per acre of Ush.5.4 million, sweet potatoes have the potential to generate about Ush.2,289 billion if production targets are met.

1.17 MILLET

1.17.1 Millet is cultivated by 13% of the 5.94 million agriculture households for food and income security. It is the second most widespread cereal in the country after maize and its production amounted to 392,000 MT in 2019 of which 37.7% was consumed at household level. Production is concentrated in the East, North and Southwest of the country; and is projected to grow to over 550,000 MT in five years.

1.17.2 Millet has high potential for food security because of its high productivity, short growing season under dry, high temperature conditions and long storage time. More so, millet is known for having high resistance to pests and diseases and being highly responsive to fertilizers and pesticides once applied to enhance its production. Millet can also be used for other purposes such as animal fodder, biofuel and brewerage. Millet is highly nutritious, with about three times more calcium than milk and it is an alternative source of income for farmers who grow it for flour milling and baked products. NUMA feeds limited, an agro-processing company, processes about 4 tonnes of millet a day.

1.17.3 With strategic affirmative action put in place, millet can greatly contribute to development of the agricultural sector because of its high import substitution potential on wheat. Government plans to support private sector processors with access to soft credit and also boost production through provision of inputs for production.

1.17.4 With some of the above interventions and those detailed below, the sector targets to increase production from 392,000 MT to about 550,000 MT in five years.

Table 37: Required Millet value chain interventions and budget

Value chain stage	**Interventions**	**Responsibility**	**Annual Government Budget requirement (UGX. billions)**
Production	Enhance production of millet through provision of inputs	MAAIF	1.8
	Supply farmers with small tractors to promote mechanised production	MAAIF	4.0
Processing	Enable access to soft credit to boost processing	Private sector, UDB, Microfinance Support Center, Pride, ACF	-
Grand Total			**5.8**

Table 38: Profitability Analysis of millet production and processing

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
A traditional farmer will spend a total of Ush.686,000 per acre on inputs, labour and post harvest handling. An advanced farmer that practices good agronomic methods will spend Ush.1.433 million per acre.	Production expenses	Inputs	Seeds	Kgs	25	1	2,000	50,000
			Improved seed	Kgs	4	1	4,200	16,800
			Herbicides	Litres	2	1	30,000	60,000
			Fertiliser DAP	Bags	1	1	135,000	135,000
			Fertiliser Urea	Bags	1	1	135,000	135,000
			Pesticides	Misc.	1	1	40,000	40,000
			Sub-total					386,800
			Herbicide application	Man days	1	1	20,000	20,000
			First and second ploughing	Man days	1	1	60,000	60,000
			Planting	Man days	1	1	100,000	100,000
			DAP application	Man days	1	1	100,000	100,000
		Labour	Weeding	Man days	1	1	80,000	80,000
			Urea application	Man days	1	1	100,000	100,000
			Pesticide application	Man days	2	1	30,000	60,000
			Harvesting	Man days	1	1	50,000	50,000
			Sub-total					570,000
		Postharvest handling for traditional farmer	Bags (for harvest and storage)	Number	4	1	1,500	6,000
			Tarpaulins	Misc.	2	1	60,000	120,000
			Pounding	Misc.	1	1	20,000	20,000
			Transportation (from garden)	Misc.	1	1	20,000	20,000
			Sub-total					166,000
		Postharvest handling for improved farmer	Bags (for harvest and storage)	Number	11	1	1,500	16,500
			Tarpaulins	Misc.	6	1	60,000	360,000
			Pounding	Misc.	1	1	60,000	60,000
			Transportation (from garden)	Misc.	1	1	40,000	40,000
			Sub-total					476,500
		Total expenses for a harvest (Traditional Methods)						**686,000**
		Total expenses for a harvest (Proper Agronomic Practices)						**1,433,300**

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per season	Unit cost	Total cost (UGX)
Profits for a farmer applying traditional methods are as low as 114,000 and acre, but remarkably increase to 766,700 if good agronomic practices are used. A farmer who further processes the grain for millet flour makes Ush.1.367 million per acre.	Revenues	Millet grain	Revenue (Traditional Methods)	Kgs	400	1	2,000	800,000
			Revenue (Proper Agronomic Practices)	Kgs	1,100	1	2,000	2,200,000
			Profitability per acre (Traditional methods)					114,000
			Profitability per acre (Proper Agronomic Practices)					766,700
		Millet flour	Revenue (Proper Agronomic Practices)	Kgs	800	1	3,500	2,800,000
		Profitability per acre (Proper Agronomic Practices)						**1,366,700**

1.18 MACADAMIA

1.18.1 Macadamia is a genus of four species of trees that was introduced in the 1880s and grown as a commercial crop in Australia, Brazil, Israel, Thailand, USA, Kenya, Malawi, Switzerland, Zimbabwe, South Africa, Guatemala, among other countries.

1.18.2 Macadamia plantation is one of the most desirable Agro-forestry crops since a macadamia tree can last for over 50 years while giving continuous income to the farming household.

1.18.3 Most soil types in Uganda are suitable for the production of macadamias, provided they are well drained and have no restrictive layers in the top 1metre of the soil. The ideal temperature for macadamias is between 16 and 30 °C making Uganda suitable for Macadamia production with temperatures ranging from 25-29°C. The recommended spacing for macadamia is 5 by 8 metres between rows rendering it suitable for intercropping.

1.18.4 The world is waking up to the importance of organic foods, as per Transparency Market Research. The organic food industry has been pushed to provide innovative options for a population interested in healthy foods. There is scientific evidence about positive health benefits from eating macadamia, oils and the other by-products.

1.18.5 Macadamia nuts are the major dietary sources of vitamins B6, B12, E and Zinc which are strong immune boosters. Apart from nuts; oil is also extracted from macadamia. Macadamia oil is non-volatile; is used in food as a frying or salad oil, and in cosmetic formulations as an emollient or fragrance fixative. The current price is between US$ 12 - 16 per litre and contains about 68-79% oil, which can be extracted from the kernels. This oil is a natural source of palmitoleic acid (omega-7) which has both good nutritional and cosmetic properties. Due to the health benefits associated to Macadamia oils, consumers would prefer it to other oils increasing its demand.

1.18.6 In 2018, the worldwide demand of macadamia Kernels was 261,672 MT whereas the production was limited to 58,821 MT. The demand for macadamia nut is expected to increase at a rate between 10-13%. Europe is the second largest importing region for macadamia nuts after the United States, with more than half of their macadamia nuts requirements from developing countries.

1.18.7 Currently, there are about 1000 macadamia farmers in Uganda and one macadamia nut processor (NUT processor (U) limited) under the Amafh Farm Limited.

1.18.8 M/s Amafh Farms Ltd. (“AFL”) in Mityana is the leading producer and exporter of macadamia in Uganda. The farm has a nucleus of 650 acres. The company runs its own nurseries for seedlings and also supplies seedlings to prospective farmers. It is currently propagating seedlings for 170 farmers to plant on 16,240 acres across the country. Several farmers with clear stretches of lands are in discussions with the firm for seedlings and extension services for macadamia nuts growing.

1.18.9 The total production of macadamia kernels in Uganda is estimated at 495MT and projected to reach 227,500MT by 2040. There is no doubt, therefore, that all the present and future Macadamia production from Uganda can be easily exported considering the country's potential to produce.

1.18.10 MAAIF plans to support macadamia production and value addition in order to increase the number of macadamia out growers to 20,000 in the medium term.

Table 39: Required Macadamia value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Organising large scale farmers under the Nucleus Farm model to work with small holder. Mobilization of small holder farmers into organised producer groups.	MAAIF, MLG, DLG, MTIC	0.5
	Invest in research into high yielding, disease resistant and drought tolerant macadamia varieties,	MAAIF, NARO	3.0
	Strengthen the existing Agriculture extension system to support the macadamia value chain activities.	MAAIF, MLG, DLG	3.0
	Support 400 private sector operators to establish macadamia nurseries in different ecological zones.	MAAIF, NARO	4.0
	Strengthen mechanisms for inspection and certification for quality assurance.	MAAIF	2
	Increase access to Agriculture mechanization services to enable interested farmers open up land for macadamia cultivation.	MAAIF, MWT	1.0
	Opening up community access roads within the production areas to have access to storage and market facilities.	MAAIF, MWT	1.0
Post-Harvest Handling	Develop 14 Regional collection centres around the nucleus farms for Macadamia Fruits.	MAAIF, PS	8.0
	Support to simple storage facilities for post-harvest handling.	MAAIF, MTIC	2.0
	Semi-processing mechanisms: Develop macadamia semi-processing (de-husking) plants near farmer groups for preliminary processing of the produce (Macadamia Fruits) being harvested.	MAAIF, NAADS	2.5
Value addition	Support to upgrade the existing processing Facilities to offtake and process the nuts being harvested in the country.	MAAIF, MTIC	4.0
	Working with the Ministry of Energy and Mineral Development to connect of the rural nucleus farms to the national electricity grid to enable processing and value addition at the nucleus farms.	MAAIF, Min. of Energy	0
Marketing	Support to quality assurance along the macadamia value chain to penetrate the international markets.	MAAIF, MTIC	1.0
	Organising macadamia producers into organised marketing groups to mobilize the marketable volumes of macadamia nuts.	MAAIF, MTIC	1.0
Grand Total			**33.0**

Table 40: Profitability Analysis of Macadamia production

Description	Stage	Sub-stage	Item	Item type	Quantity (per acre) KG	Sum of Total price	Comment
One acre will require up to 100 trees, which grow for about 5 years before they are ready for harvest. A farmer will spend a total of Ush.24.9million per acre on production.	Production expense	Inputs	Seedlings (@10,000) 100 seedlings per acre	Number	100	1,000,000	
		Labour	Land clearing	Tractors services	1	500,000	2x2 ft holes
			Land preparation/ploughing	Tractors services	1	1,000,000	
			Drains & contours	Tractors services	1	500,000	
			Establishment & Maintenance. Labour	Man days	1	3,137,000	UGX.650,000 is required for the 1st year then UGX 287,000 every year considering 12 years
			Fertilizer (NPK and DAP)	Man days	1	2,820,000	Fertilisers are applied once a year for all the years (150,000@year) considered up to the 12 year
			Pesticides/Herbicides		1	3,820,000	
			Weed Control/Slashing (twice a year)	Man days	1	2,650,000	Done twice a year considering 12 years
			Tree Training/Pruning	Man days	1	1,085,000	Starting the second year for 12 years
			Plantation management cost	Man days	1	3,000,000	Done for the first 5 years only
Full maturity after 15 years with a yield of 200kgs per tree and cost of 5000 per kg, the revenue from harvest is about Ush.267.5million. The tree continues to provide produce for up to 30 years	Harvesting	Labour	De-husk/Store/Dry (Ugx60/kg Dry nut in shell)	Man days	1	5,350,000	
	TOTAL EXPENSES					**24,862,000**	**Total expenses considering 12 years**
	Production revenue	Production sales	5y dry nut in shell	Number	500	2,500,000	5th year harvest
			6y dry nut in shell	Number	1500	7,500,000	6th year harvest
			7y dry nut in shell	Number	3500	17,500,000	7th year harvest
			8y dry nut in shell	Number	5500	27,500,000	8th year harvest
			9y dry nut in shell	Number	7500	37,500,000	9th year harvest
			10y dry nut in shell	Number	10,000	50,000,000	10th year harvest
			11y dry nut in shell	Number	11,500	57,500,000	11th year harvest

			12y dry nut in shell	Number	13,500	67,500,000	12th year harvest
	TOTAL REVENUE					**267,500,000**	
	PROFIT					**242,638,000**	Profit realized after the 12th year

1.19 CASHEW NUT

1.19.1 Cashew nut (Anacardium occindentale), is a hardy drought resistant tree crop with enormous commercial potential. Globally, cashew nuts are grown in about 32 countries in the world. However, the major producers are Cambodia, India, Indonesia, Sri Lanka, Thailand, Vietnam and Korea in Asia; Benin, Ghana, Guinea-Bissau, Ivory Coast, Nigeria, Senegal and other small producers of West Africa, Kenya, Madagascar, Mozambique and Tanzania in East Africa and Brazil, Peru and other small producers in Latin America.

1.19.2 The current efforts to promote cashew are being spearheaded by the National Forestry Research Institute (NaFORRI) working with private sector players including Uganda Cashew nut and Trees Limited, North East Chili Producers Association (NECPA), Uganda Cashew nut and Processors Limited (UCPL).

1.19.3 The favourable climatic conditions across the country mostly districts across the cattle corridors and other districts outside the cattle corridors and the strong market demand offers great opportunity for Cashew production. Currently, the cashew nut has over 1000 smallholder farmers particularly in the Northern and Eastern regions of Uganda with an estimated 6,553 planted cashew trees in production. The sector has identified over 2000 farmers to be supported with Cashew Seedlings for production and will establish cashew demonstration gardens.

1.19.4 Nutritionally, cashew nuts are a valuable source of macro and micronutrients, such as protein (18 g/100 g), fats (44 g/100 g) and iron (7 g/100 g). They also contain high levels of magnesium, zinc, copper, manganese and essential fatty acids (USDA, 2015). The cashew apple is rich in nutrients and produces a juice that contains 3 to 6 times more vitamin C than orange juice. In addition, cashew offers a number of socio-economic and environmental benefits to small holder farmers. The perennial nature of the crop and its tolerance to dry condition offers very good opportunity to withstand weather shocks, hence offering sustainable income generation to small holder households.

1.19.5 Furthermore, cashew offers enormous economic benefits with limitless industrial uses. Cashew is used in confectionery and as dessert, and also yields edible oil. Fleshy swollen pedicel popularly known as cashew apple is juicy and edible. Juice is fermented and made into wine, and pulp is used for production of preservatives.

1.19.6 With support to cashew nuts, the sector targets to increase smallholder farmers to 100,000 in the short term.

Table 41: Required Cashew nuts value chain interventions and budget

Value chain stage	Interventions	Responsibility	Annual Government Budget requirement (UGX. billions)
Production	Support at least 1000 Nursery Operators engaged in production of seedlings	MAAIF	3.0
	Support cashew nut farmers to reach at least 100,000 smallholder farmers in at least 30 districts; there is also need to support processors, traders, and extension workers.	MAAIF	3.0
	Support the provision of at least 10 million Quality Cashew Seedlings to be accessed by Farmers.	MAAIF, NAADS	5.0
	10 Sub-regional model demonstration farms established	MAAIF, DLG	15.0
	10 Sub-regional laboratory/diagnostic centers established and equipped.	MAAIF	2.0
	15 Million Cashew nut tree seedlings of improved varieties procured and planted	MAAIF, NAADS	14.8
Post-harvest handling	9 Sub-regional satellite Cashew nut Collection Centers established and equipped with dryers, cleaners and functional	MAAIF, MTIC	4.0
	50 primary bulking centres established in each district	MAAIF, MTIC	2.1
	4 regional Cashew nut processing and value addition Hubs established, equipped and functional	MAAIF, MTIC	6.0
Grand Total			**54.9**

Table 42: Profitability Analysis of cashew nuts production

Description	Stage	Sub-stage	Item	Item type	Quantity per acre	Frequency per year	Unit cost	Total cost (UGX)
One acre of land can accommodate up to 81 cashew nut plants. It takes up to 3 years before it is ready for harvest and keeps producing for 15 years. The total costs to set up the plantation amount to Ush.1.734 million. When ready for harvest, a plant produces a 15kgs of raw cashe nut and 30 kgs of cashew apples. With unit costs per kg of Ush.7000 and Ush.2500 respectively, total revenues amount to Ush.29 million.	Plantation establishment	Inputs	Seedlings	Number	81	1	4,000	324,000
			Fertiliser	Bags	1	2	150,000	300,000
			Pest and disease management	Misc.	1	2	60,000	120,000
			Sub-total					744,000
		Labour	Ploughing	Man days	1	2	90,000	180,000
			Digging holes	Man days	1	1	40,000	40,000
			Planting	Man days	1	1	50,000	50,000
			Weeding	Man days	1	6	70,000	420,000
			Applying fertiliser	Man days	1	2	150,000	300,000
			Sub-total					990,000
		Total initial investment (3 years)						**1,734,000**
	Revenues	Raw cashew nut	Revenue (15 kgs per plant)	Kgs	1,215	2	7,000	17,010,000
		Cashew apples	Revenue	Kgs	2,430	2	2,500	12,150,000
		Total	Revenue					29,160,000
		Profit						**27,426,000**

CASHEW NUT PROFITABILITY IN THE MEDIUM TERM

a) With a target of mobilising farmers to reach 100,000 in the short term, potential revenue from cashew nut production per acre in 4 years would be about Ush.2,700 billion.

b) Government plans to spend Ush.54.9 billion in the first year.

1.20 VEGETABLE – HASS AVOCADO

1.20.1 Avocados are a stone fruit that grows in warm climates for both home use and domestic markets all year round. Avocado can be used in almost all meals eaten as salads. By-products such as oils can be used to make cosmetics to improve skin, breath, scalp and facial appearances, and consequently lower volume of cosmetic imports. Seeds can be used in the pharmaceutical industry. Avocado is also an important cash crop for small-scale growers with a potential for increasing income in rural areas, improving the living standards, and creating employment opportunities for women and youth.

1.20.2 Their potential health benefits include improving digestion, decreasing risk of depression, and protection against cancer. Avocados are a naturally nutrient-dense food and contain nearly 20Vitamins and minerals and is the only fruit that provides a substantial amount of healthy mono-unsaturated fatty acids. For these reasons and more, the global fruit consumption knows no Geographical boarders which renders the entire world a Market, not easily satisfiable because the fruit can only be grown in the tropics

1.20.3 Global avocado imports stood at US$6.1 billion, having grown at a rate of 18% between 2014 – 2018. (ITC Trade map, 2019). The United States is by far the largest importer of avocado fruit. In 2018 the USA imported 1 million tonnes valued at US$ 2.4 billion. Mexico and Costa Rica were the major suppliers taking 80% of the market share. The Netherlands is the world's second-largest import market followed by France and Germany. Though China took the 8th position as an importer, it registered impressive growth in terms of value and volume of 77% and 71% between 2014 – 2018. The potential in these markets is huge as they are currently already importing largely thus important export markets for Ugandan avocado. Therefore, its potential in Uganda unlike neighboring countries like Kenya and Rwanda is still underexploited.

1.20.4 The presence of avocado in the world market has been growing steadily in the past two decades, and it is no longer considered an exotic fruit but part of the everyday diet of many countries. This tendency has been reinforced by the consumer tendency to look for natural products. Avocado has a large market as fresh fruit, besides its use in the oil, cosmetic, soap, and shampoo industry; as well as processed foods derived from it, such as guacamole, frozen products, and avocado paste.

1.20.5 Avocado demand has grown rapidly in recent years, particularly in developed (USA, EU) and emerging markets (China) where the high nutritional content and taste of avocados is driving robust demand. The strong demand trend is well illustrated by import growth which has grown at 17% per annum over the last decade. Between 2014 – 2017 the total value of global avocado imports almost doubles from US$ 3.4 billion to the US$6.1 billion.

1.20.6 In Uganda, Avocado growing is one of the most promising areas for horticultural expansion and development. Ugandan avocado is exported both dry and fresh. Uganda's top export markets include Qatar, Canada, Belgium, Norway, Sweden, Spain and Egypt among other countries. Hass avocado is the most trending fruit at the moment with demand for it stretching to Europe, China, the United States, and the Middle East.

1.20.7 Despite its many uses, literature on the market potential, Hass Avocado production and productivity in Uganda is meagre with Musubi farm limited as the largest producer. Thus, technology promotion of Hass Avocado, and ecosystem services is still in its infancy. Knowledge of the availability of Hass Avocado not only for purposes of market but also for use in broadening of the nutritional base is critical.

1.20.8 Musubi Farm Limited, is a private liability company engaging in production and productivity, post-harvest handling, value addition and export of Hass avocado with an established farm seated on 2500 acres land in Mayuge District of which 1,500 acres of land are under avocado production working with the network of 2,800 out-grower farmers country wide.

1.20.9 Interventions in this value chain will seek to empower the farming community to adopt and commercialize Avocado production through increase awareness of the importance of Avocado with the view of promoting its production, conservation, consumption, commercial and industrial exploitation in Uganda.

1.2.10 MAAIF plans to mobilize at least 50,000 out grower farmers (targeting 10,000 farmers each year) to establish at least 80,000 hectares of Hass avocado.

Table 43: Required Hass Avocado value chain interventions and budget

Value chain stage	**Interventions**	**Responsibility**	**Annual Government Budget requirement (UGX. billions)**
Production	Organising large scale farmers under the Nucleus Farm model to work with small holder. Mobilization of small holder farmers into organised producer groups.	MAAIF, MLG, DLG, MTIC	0.6
	Invest in research into high yielding, disease resistant and drought tolerant hass avocado varieties,	MAAIF, NARO	4.0
	Strengthen the existing Agriculture extension system to support the Hass Avocado value chain activities.	MAAIF, MLG, DLG	3.0
	Support 400 private sector operators to establish Hass Avocado nurseries in different ecological zones.	MAAIF	4.0
	Strengthen mechanisms for inspection and certification for quality assurance.	MAAIF	2.0
	Increase access to Agriculture mechanization services to enable interested farmers open up land for hass avocado cultivation.	MAAIF	1.0
	Opening up community access roads within the production areas to have access to storage and market facilities.	MAAIF	1.0
Post-Harvest Handling	Support to simple storage facilities for post-harvest handling.	MAAIF. MTIC	3.0
Value addition	Support to upgrade the existing processing Facilities to offtake and process the fruit being harvested in the country.	MAAIF, MTIC, NAADS	4.0
Marketing	Support to quality assurance along the Hass Avocado value chain to penetrate the international markets.	MAAIF,MTIC	1.5
	Organising Hass Avocado producers into organised marketing groups to mobilize the marketable volumes of the fruit.	MAAIF,MTIC	0.6
Grand Total			**24.7**

Table 44: Profitability Analysis of Hass Avocado production

Stage	Sub-stage	Item	Item type	Quanti-ty (per acre)	Sum of Total price (ugx)	Comment
Production expense	Inputs	Seeds	Number	166	664,000	
	Labour	Land clearing	Misc	1	120,000	2x2 ft holes
		Weeding	Misc	1	1,800,000	Done thrice a year, budgeted for 10 years
		Fertiliser application	Misc	1	102,000	34000 for first application and 68000 for second application 6 months later
		Pitting and planting	Holes	166	132,800	2x2 ft holes
TOTAL EXPENSES					**2,818,800**	
Production revenue	Production sales	2y fruits	Number	8,300	5,810,000	2nd year harvest
		3y fruits	Number	33,200	23,240,000	3rd year harvest
		4y fruits	Number	66,400	46,480,000	4th year harvest
		5y fruits	Number	132,800	92,960,000	5th year harvest
		6y fruits	Number	166,000	116,200,000	6th year harvest
		7y fruits	Number	182,600	127,820,000	7th year harvest
		8y fruits	Number	215,800	151,060,000	8th year harvest
		9y fruits	Number	249,000	174,300,000	9th year harvest
		10y fruits	Number	290,500	203,350,000	10th year harvest
TOTAL REVENUE					**941,220,000**	
PROFIT					**938,401,200**	

THE REPUBLIC OF UGANDA

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