Feed the Future
Innovation Lab for Peanut

A Groundnut Value Chain and Market Systems Analysis in Uganda: An in-depth literature review

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ACRONYMS

COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community
FAO	Food and Agriculture Organization
FOB	Free On Board
FTE	Full time employment
Ha	Hectare
ICT	Information and Communication technology
ITC	International Trade Center
GMs	Gross Margins
MT	Metric Tons
NAADS	National Agricultural Advisory Services
NARO	National Agricultural Research Organisation
NGOs	Non-Government Organizations
NPV	Net Present Value
PBP	Pay Back period
UBOS	Uganda Bureau of Statistics
UCA	Uganda Cooperative Alliance
UCE	Uganda Commodity Exchange
UEPB	Uganda Export Promotion Board
UGX	Uganda Shillings
UNBS	Uganda National Bureau of Standards
UNFFE	Uganda National Farmers Federation
USA	United States of America
USAID	United States Agency for International Development
USD	United States Dollars
ZARDI	Zonal Agricultural Research and Development Institutes

ABSTRACT

Groundnuts have emerged as the second most significant crop among legumes and oilseed crops in Uganda, with 29% of agricultural households cultivating them on 420,000 hectares of land, yielding an average national yearly production of 133,000 metric tons. The main regions for groundnut production are concentrated in the Eastern and Northern regions, specifically the Ngetta, Buginyanya, and Serere Zonal Agricultural Research and Development Institutes (ZARDIs).

Despite its importance, groundnut productivity in Uganda remains relatively low compared to other Eastern African Community States, ranking second lowest after Rwanda. Between 2016 and 2021, Uganda's average groundnut yields stood at 0.597 metric tons per hectare (MT/Ha), while Kenya recorded an average of 1.2 MT/Ha during the same period, creating a consistent imbalance between demand and domestic supply capacity.

The primary markets for Ugandan groundnuts are local markets within the country and the export market in Kenya. While Uganda has increasingly relied on imports from Tanzania, 75% of its groundnut exports are directed towards the Kenyan market.

Target markets for shelled groundnuts are the East African Community (EAC) countries, with potential markets for Ugandan groundnut oil in African nations like Ethiopia, Togo, and Mauritania. The USA market also offers lucrative prospects for groundnut oil cake. However, competition is notable, with Tanzania as the primary competitor in the markets of Burundi and Rwanda for shelled groundnuts, and Malawi holding a competitive position in Kenya and Tanzania's markets.

The groundnut sector in Uganda faces several key challenges that hinder its growth and potential. Low yields, limited access to improved seeds and fertilizers, and poor farming practices limit production and profitability. Inadequate storage facilities and handling practices result in significant post-harvest losses, spoilage, mold growth, and aflatoxin contamination. Limited value addition activities and an unstructured value chain further restrict market opportunities and profitability. Insufficient access to finance, inputs, and market information add to the sector's challenges.

To address these issues and unlock the sector's potential, three major recommendations were made: (1) Invest in the adoption of improved varieties, (2) invest in structuring the groundnut value chain, and (3) invest in improved processing technologies and facilities. These investments can lead to yield improvements from the current average of 0.5 MTs to a potential 1.7 MTs for varieties like Serenut 8R, 10R, 12R, and 14R. Furthermore, the latter varieties attract higher prices estimated at UGX 6,000 per kg compared to the current range of UGX 2,000 to 4,000 per kg, significantly increasing farm-level margins from negative (-UGX 37,000 per acre) to UGX 10,563,000 per acre. Structuring the value chain will reduce risks of post-harvest losses and aflatoxin incidences, ensuring consistent supply of good quality produce for processors. At the processing level, investment in improved technologies and facilities will increase businesses' margins from the current estimated UGX 41,835,000 per month to UGX 869,050,000 per month. By implementing these recommendations, the groundnut sector can overcome its challenges and achieve higher yields, improved profitability, and better market access.

1. INTRODUCTION

1.1. Background and Context: Feed the Future Innovation Lab for Peanut

The Feed the Future Innovation Lab for Peanut is an initiative of the U.S. government aimed at combating hunger and poverty worldwide. The Global Food Security Act, passed by Congress in 2016, acknowledges the importance of promoting global food security, resilience, and nutrition as part of national security interests. Feed the Future is a crucial component of this strategy, harnessing American expertise and innovation to empower farmers in partner countries to produce nutritious food for their populations.

The U.S. Agency for International Development (USAID) leverages the expertise of leading U.S. universities, including the Peanut Innovation Lab and other Innovation Labs, to address challenges related to food production, storage, processing, and marketing that hinder partner countries' ability to meet their food needs. These Innovation Labs are collaborative networks of researchers based in the United States and abroad, working together to improve food security and reduce poverty in key countries.

In Uganda, researchers from both the U.S. and Uganda are focused on breeding improved peanut varieties that enhance productivity, quality, and marketability. This includes developing varieties resistant to diseases and pests like groundnut rosette disease and leaf miners. Additionally, projects are investigating the nutritional and social impacts of peanuts, such as studying the effects of peanut consumption on gut health.

The Peanut Innovation Lab also aims to conduct various research activities, including updates on the value chain and market systems. This involves gathering and updating information on the current state of the groundnut sub-sector, conducting a comprehensive analysis of the market trends in Uganda and the East African region. This rapid appraisal of the groundnut/peanut value chain was undertaken in line with these objectives.

1.2. Objectives of the study

1.2.1. General Objective of the assignment:

The main objective of this assignment is to review and update information on the current state of the groundnut sub-sector and conduct a thorough analysis of the market trends in Uganda and the East African region. This analysis will serve as the basis for providing well-founded recommendations for potential funding by donors.

The review aims to deepen the understanding of the groundnut market systems and the dynamics along the value chains. By doing so, the study seeks to identify untapped opportunities within these markets that can be leveraged by smallholder farmers to enhance their income. Additionally, this analysis will benefit researchers, particularly those working in breeding and post-harvest handling technologies, by identifying areas where further advancements can be made. The goal is to explore and exploit these opportunities to the benefit of farmers and researchers alike, ultimately contributing to the improvement of the groundnut sector.

1.2.2. Specific objectives

Specifically, the study's objectives are:

1. To map the supply chain structures, major actors, their roles, organization, and levels of relationships in marketing, and distribution channels in domestic and export markets.

2. To identify the supply and demand dynamics and trends for the various by-products of groundnuts Uganda
    a. Final sales market(s) and market segments (including sales volumes per variety), market channels and trends, chain actors, their roles, and interrelationships.
    b. Identification of market segments and their critical success factors.
3. To examine the level of Trade (Local, National and Regional) and describe the current and potential markets and their requirements: Analysis of competitiveness within the groundnut market (by products) in the local, national, and regional markets.
4. To assess gross margins, drivers and market share along different value chains and Investment scenario analysis to tap into these market opportunities: Calculate gross margins and value addition along the groundnut market chains according to various groundnut products (e.g., paste, powder, roasted etc.)
5. To conduct an analysis of the enabling environment and market dynamics within the local, national, and regional groundnut markets.
6. Identify the constraints and emerging market opportunities in the groundnut sub-sector (domestically and regionally) including potential innovations in the PHH space.
7. To propose recommendations to engage and tap into the identified opportunities by the Peanut Lab.

2. METHODOLOGY, APPROACH AND LIMITATIONS

2.1. Methodology, Approach

The assignment was carried out by conducting a comprehensive review of secondary literature and gathering secondary data related to production from the major groundnut-growing regions in Uganda. Additionally, the study examined demand and consumption trends to gain a holistic understanding of the agricultural market. The analysis covered all key aspects and stakeholders involved in the groundnut value chains in Uganda, ensuring that no relevant areas were overlooked. Throughout the study, various opportunities that are crucial for the national and regional groundnut trade were identified and documented.

2.2. Limitations

One of the limitations of this study is the limited availability of literature on groundnuts, which is further compounded by the outdated nature of the existing literature. This scarcity of up-to-date information poses a challenge in accurately capturing the current state of the groundnut sector. The reliance on outdated data may result in gaps or inaccuracies in the findings and recommendations of the study. To mitigate this limitation, efforts were made through discussions with key stakeholders such as representatives of processors, supermarkets and local however, a more comprehensive primary data collection with representative sample is necessary to understand more the groundnut sector in order to inform decision-making and policy development effectively.

2.3. Measurement of Key Performance Variables

a. Current and potential Markets

The current markets were identified based on the current export destinations of groundnuts products from Uganda. Their level of importance was based on volumes exported to the particular market. The potential markets were identified based on the global major importers of groundnuts products. Their magnitude was assessed based on the volumes of imported products, the distance from Kampala to the market, and the prices offered for the product in the specific market.

b. Competitors in the current and potential markets

The competitors in the current and potential markets were assessed based on other supplying countries to the identified current/potential market. Their level of importance was judged based on the volumes supplied, the distance separating the supplier to the market and the existing trade agreement and facilities between the supplier and the identified market.

c. Jobs

Existing and potential jobs at farm level were estimated following Balgos and Digal (2017)[1]. Family labour was included in estimating labour cost. Man-days per activity were calculated based on the existing daily wage at farm level estimated at UGX 5,000 and the total labor costs per acre. Thereafter, the current jobs were estimated based on Full-Time Equivalent (FTE) units. FTE unit assumes that a man-day is equivalent to 8 working hours per day, 26 working days a month and 12 months a year. This translates to 312 days or 2,496 hours of work per year[2].

d. Gross Margin (GM)

The GM was measured according to (Barnard and Nix, 1979)[3] as the difference between revenue and variable cost for each enterprise. It is a short run measure of enterprise performance. Its limitation is that it does not control for time value of money (Lampkin and Measures, 1994)[4]. In this study, GM was used to assess performance of farmers per acre and per season and that of groundnuts processing businesses per month. It was computed as shown in Equation 1.

$GM = (Q*p) - (TVC)$ ---------- (Eqn. 1)

Where, GM is the gross margin, Q is the quantity of a product sold, p is the price per unit sold and TVC is total variable cost.

e. Net present value

NPV is the difference between discounted cash inflow and outflow over time. The strength of NPV is that it controls for time value of money (Ardalan, 2012)[5]. In this study, the NPV technique was applied on groundnut processing enterprises since these require high cost of initial investment. The NPV was computed as illustrated in Equation 3.

$$NPV = -C_0 + \frac{C_1}{(1+i)^1} + \ldots + \frac{C_t}{(1+i)^t} \text{ ---------- (Eqn. 3)}$$

Where: C_o is the initial investment, C_1 is the net benefit in Month 1, C_t is net benefit at Month t, i is the market rate of borrowing, t is the Month of reference.

f. Payback period

PBP was used to estimate the effect of alternative interventions on the number of years it takes cash inflow to offset initial capital investment. Interventions that shorten the PBP are preferred (Brigham and Ehrhardt, 2005)[6]. PBP was computed as presented in Equation 4.

$$PBP = CI - (TCF_t) \text{ ---------- (Eqn. 4)}$$

Where: CI is capital investment and TCF_t is the total cash inflow over time (Months) that reduce CI to zero.

g. Share of value

SoV was applied to compare GMs of actors operating at various levels for of the groundnut VCs based on a specific final product value. The level with actors depicting highest contribution to the final value captures the highest SoV in the VC. In this study, the SoV was computed as shown in Equation 5.

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[1] Carol Q. Balgos and Larry N. Digal (2017) Employment Generation Potential of the Rice Value Chain: The Case of Mlang, North Cotabato in Mindanao. Available at https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidspjd2016-1_rice.pdf accessed on May 6rh 2023

[2] University of California,2023. FTE Calculation. Available at https://hr.berkeley.edu/sites/default/files/attachments/FTE-to-Standard-Hours.pdf accessed on June 6th 2023

[3] Barnard, C.S. and Nix, John S. (1979). Farm Planning and Control. 2nd Edition. Cambridge University Press: Cambridge

[4] Lampkin, N., & Weinschenck, G. (1996, August). Organic farming and agricultural policy in Western Europe. In *Fundamentals of Organic Agriculture. Proceedings of the 11th IFOAM International Scientific Conference. August* (pp. 11-15).

[5] Ardalan, K. (2012). Payback period and NPV: their different cash flows. Journal of economics and finance education, 11(2), 10-16.

[6] Brigham, E. F., & Ehrhardt, M. C. (2005). Financial management theory and practice. 11.

SoV = (Pi-Po)*100/Pf ---------- (Eqn. 5)
Where, Pi is the price of one Kg of groundnuts from the previous seller, Po is an estimated selling price of a kg of groundnut after value addition Pf is the final price at consumer level.

3. KEY FINDINGS

3.1. Importance of groundnuts against other complementary crops in Uganda

The figure 1 illustrates a comparative analysis of major oil crops and legumes cultivated in Uganda. The comparison considers the area value of grains in Ugandan Shillings (UGX) at the time of harvest and the percentage of households engaged in cultivating each commodity as of 2019[7]. The value at harvest was estimated based on the average retail price Groundnut and the volume of production in 2019.

The results depicted in Figure 1 further indicate that beans exhibited the highest value, contributing significantly to the income generation of numerous households and occupying the largest portion of cultivated land. Although sunflower seeds yielded a higher value at harvest (1.5 billion UGX) in comparison to groundnuts (0.5 billion UGX), the latter offered income opportunities to a greater proportion of agricultural household. UBOS (2019) reports that 29% of the national agricultural households grow groundnuts while only 2% of the households grow sunflower. The high value at harvest observed is explained by the volume of the crop produced per year: an annual average of 260,000MT against a yearly average of 133,000 MT for ground nut. Furthermore, groundnuts covered a larger land area, occupying 420,000 hectares, as opposed to sunflower's 265,000 hectares.

Other oil crops and legumes, namely soybeans, cowpeas, sesame (sim sim), and pigeon peas, demonstrated lower values at harvest. These crops were cultivated by a smaller percentage of agricultural households and occupied a smaller proportion of the national agricultural land compared to groundnuts. Therefore, groundnuts emerge as the second most important legume and oil seed in Uganda. These findings from the Uganda Bureau of Statistics (UBOS,2019) support the assertions made by the National Agricultural Advisory Services (NAADS) that groundnuts, also known as peanuts, rank as the second most significant legume after beans in Uganda[8].

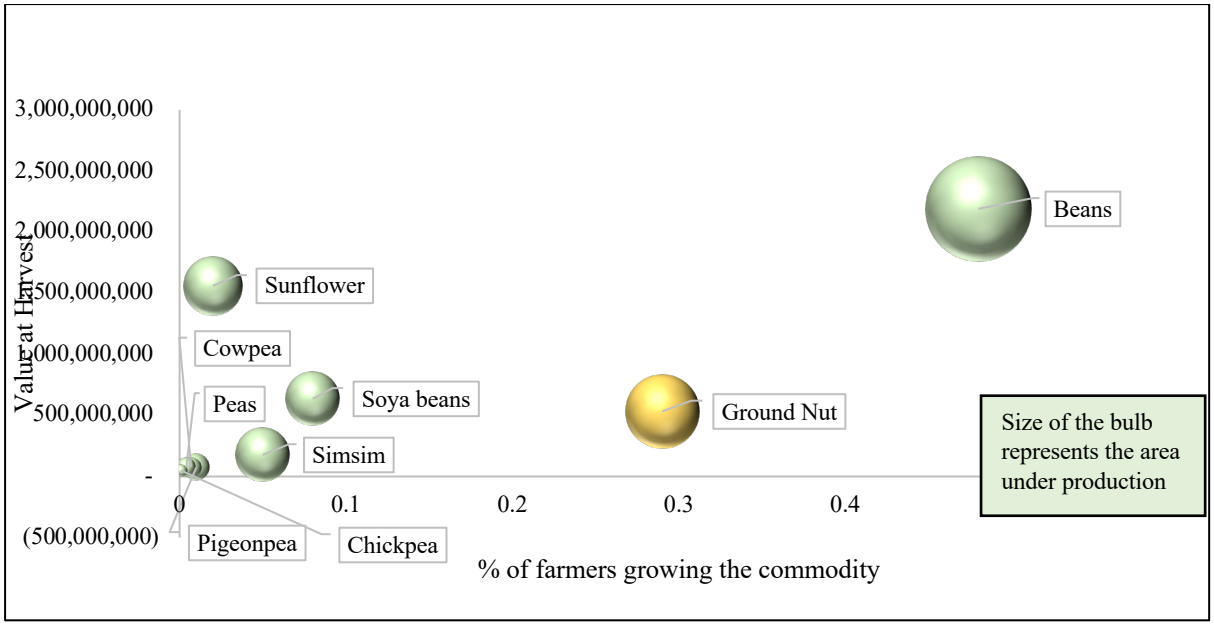


Figure 1: Rank of groundnuts among the oil seeds and legumes
Source[7]

[7] UBOS, 2019. Annual Agricultural Survey, 2019
[8] NAADS,2023. Ground Nuts (Peanuts) production in Uganda. Retrieved at https://naads.or.ug/ground-nuts-peanuts-production/#:~:text=Groundnut%2C%20also% 20known%20as%20peanut, oilseed% 20crop%20in%20the%20world. Accessed on June 2nd 2023

Groundnuts play a vital role in Uganda's agricultural sector, contributing to food security, income generation, employment, soil health, crop diversification, and export earnings. The cultivation and utilization of groundnuts have both economic and social benefits for farmers and the wider population[9].

3.2. Groundnuts Demand and Supply Analysis

3.2.1. Production trends

From 2016 to 2021, Uganda experienced an average annual groundnut production of 212,436 metric tons, displaying an annual average decline rate of -2.9%. This decline in production can be attributed to the gradual reduction in the cultivated area for groundnut farming, which experienced an average annual decrease of 3.5% during the same period. The Uganda Bureau of Statistics (UBOS) reported that in 2019, approximately 29% of farming households engaged in groundnut cultivation.

At the household level, the UBOS findings indicate that 34% of the harvested groundnuts were sold without undergoing any processing, while 9% were consumed domestically. Additionally, households retained 13% of the harvest in storage facilities, while approximately 3.5% of the total production was lost during post-harvest handling processes.

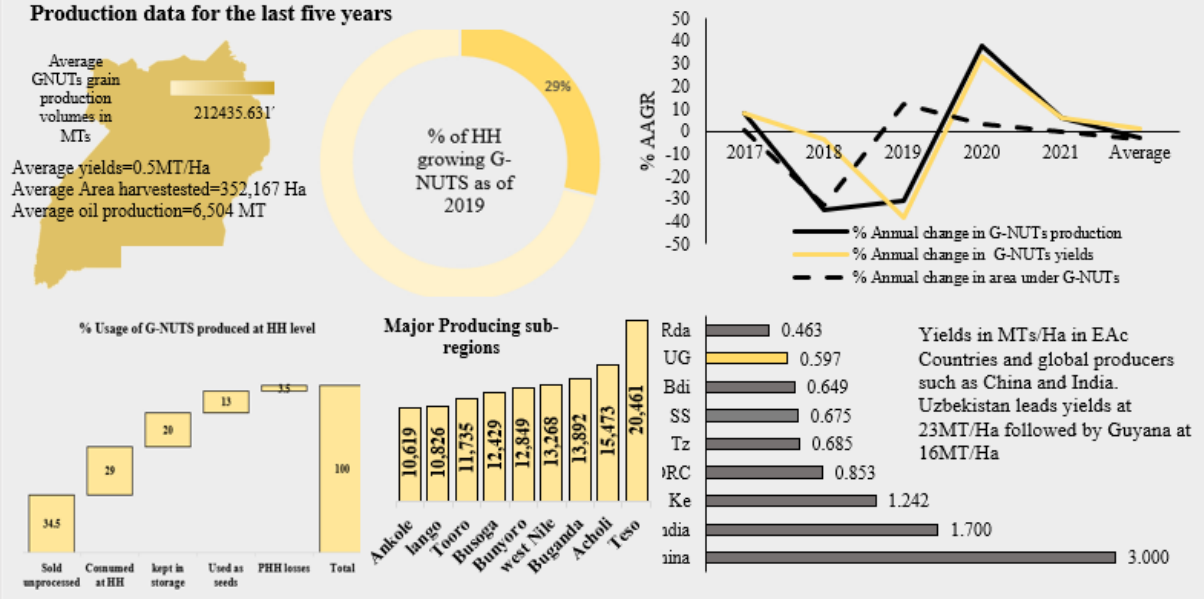


Figure 2: Groundnut Production data for the last five years in Uganda
Sources[10;11]

Groundnut productivity in Uganda is comparatively low within the Eastern African Community States, ranking second lowest after Rwanda. Over the period of 2016 to 2021, Uganda's average groundnut yields stood at 0.597 metric tons per hectare (MT/Ha), whereas Kenya recorded an average of 1.2 MT/Ha during the same period. Notably, major groundnut-producing countries such as China and India achieved significantly higher average yields, reaching 3 MT/Ha and 1.7 MT/Ha respectively.

[9] Mugisha, J., Lwasa, S., & Mausch, K. (2014). Value chain analysis and mapping for groundnuts in Uganda, Socioeconomics Discussion Paper Series Number 14.

[10] FAOSTAT,2023. Groundnut production data available at https://www.fao.org/faostat accessed on June 4th 2023

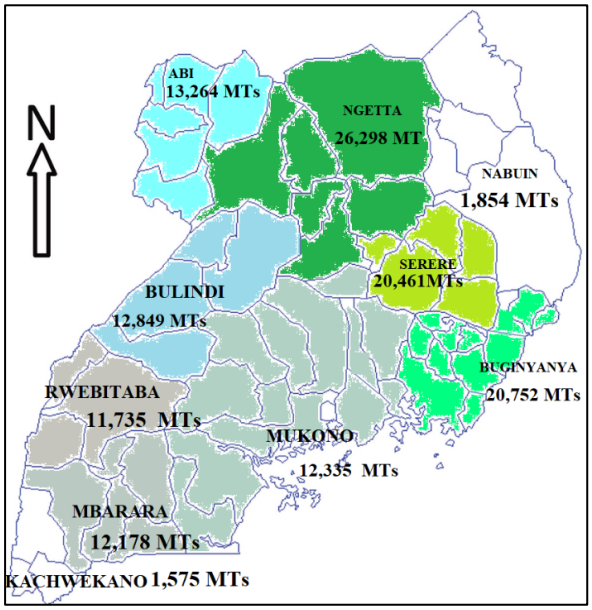
[11] UBOS, 2019. Annual Agricultural Survey, 2019

When considering global groundnut yields, Uzbekistan stands out as the leading country with an impressive yield of 23 MT/Ha in 2021. Following closely is Guyana, with an average yield of 16 MT/Ha during the same year.

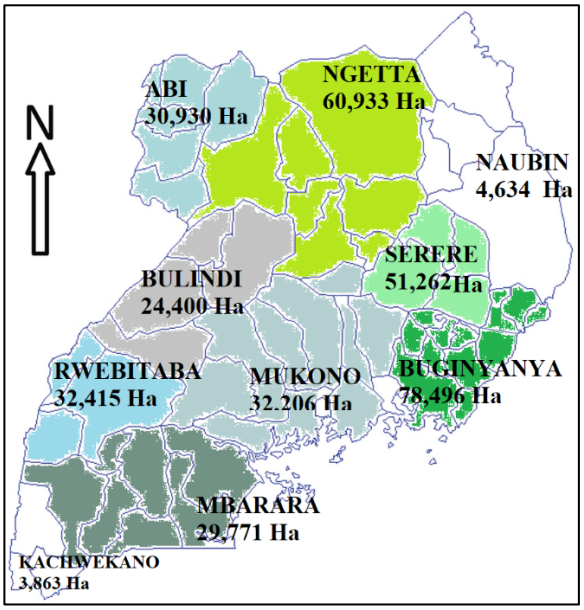
These figures highlight the substantial disparity in groundnut productivity between Uganda and other countries, emphasizing the need for improvements in cultivation techniques, agronomic practices, and technology adoption to enhance yields in Uganda's groundnut sector.

The primary regions in Uganda where groundnut production is concentrated include the Eastern and Northern regions, specifically the Ngetta, Buginyanya, and Serere ZARDIs. These regions play a crucial role as major production areas, contributing significantly to the overall groundnut output in the country. As of 2019, Ngetta ZARDI alone accounted for 51% of the national production, utilizing only 55% of the total country's arable land (Map 1 and 2). Despite this, these three regions did not lead in yields.

According to data from UBOs (Uganda Bureau of Statistics), Bulindi ZARDI emerged as the national leader in groundnut yields, attaining an impressive yield of 0.6 MTs/Ha. Buginyanya ZARDI stood at 0.3 MT/Ha, while Ngetta and Serere ZARDIs averaged at 0.4 MTs/Ha each.



Map 1: Volume producer per year per ZARDI in 2019



Map 2: Area Harvested under each ZARDI in 2019

Source: Author computation based on UBOS data[12]

To enhance groundnut production volumes, initiatives should target the Ngetta, Buginyanya, and Serere ZARDIs, as they offer a larger portion of suitable land for groundnut production with high potential for increasing productivity.

3.2.2. Demand and Supply deficit

From 2016 to 2020, there has been a consistent imbalance between the demand for groundnuts and the domestic supply capacity in terms of production. During this period, the deficit in groundnut supply doubled, increasing from 26,000 metric tons (MTs) to 55,000 MTs (Figure 3). The growing deficit can

[12] *UBOS, 2019. Annual Agricultural Survey, 2019*

primarily be attributed to a decline in production levels and a decrease in the area dedicated to groundnut cultivation.

This shortfall in supply poses challenges for Uganda in meeting the daily demand for groundnut consumption, which amounts to an average of 10.3 grams per capita, corresponding to a per capita consumption of 3.7 kilograms. Furthermore, the deficit can be attributed to the vulnerability of most groundnut varieties to Aspergillus infection, leading to aflatoxin contamination. This susceptibility to contamination contributes to a sharp decline in both production and consumption observed particularly in 2019. The NARO reported in 2019 that levels of aflatoxin were substantially exceeding the safety threshold recommended by WHO have been identified in Ugandan maize, sorghum, and groundnuts, according to researchers at the National Agricultural Research Organisation (NARO)[13]

It is evident that the sustained increase in groundnut demand, coupled with reduced production and planting area, along with the susceptibility of groundnut varieties to fungal infections and aflatoxin contamination, have significantly influenced the widening deficit between supply and demand in the groundnut sector during the specified period.

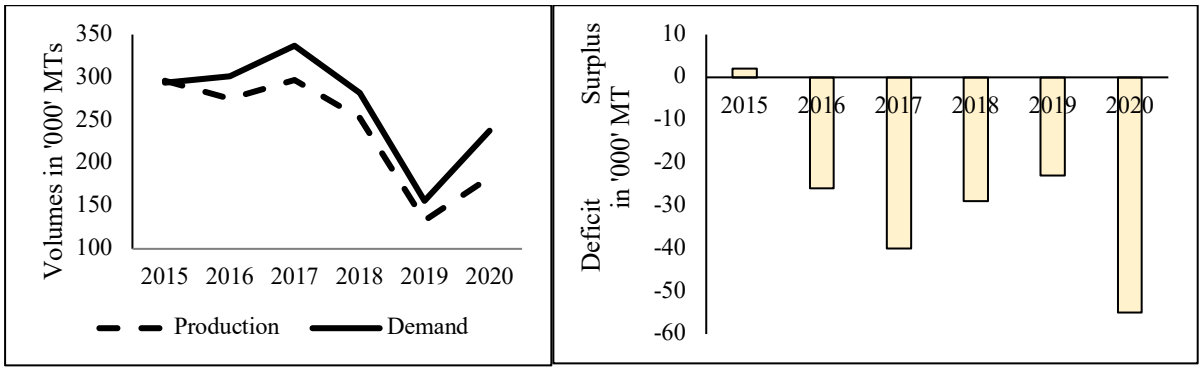


Figure 3: Production, demand, and surplus/deficit
Source[14]

3.3. Level of Trade of groundnuts and Products in Uganda

3.3.1. Domestic (National) trade

According to findings from the Uganda Bureau of Statistics (UBOS), it has been determined that, on average, approximately 34.4% of the annual groundnut production from households is sold without undergoing any processing. However, alternative studies indicate that up to 64% of the groundnut production at the household level is sold, while the remaining 36% is retained for home consumption and seed purposes. Among the volume of groundnuts sold, 20% is directed towards processors, while 44% is sold to local traders. The local traders further distribute the groundnuts, with 10% being sold to urban consumers and 20% being sold back to farmers as shelled groundnuts for both planting and consumption during the offseason, primarily in weekly rural markets. The remaining 70% of the groundnuts are sold to processors. The primary role of the processors is to remove the shells from the groundnuts and produce various products such as paste, flour, and unshelled or shelled grains. These processed groundnut products are predominantly sold to distributors, including retail shops,

[13] Diversity of *Aspergillus* Species and Aflatoxin Contamination along Maize and Groundnut Value Chains in Eastern and Southern Africa Producer, aggregator and consumer Survey of Awareness Levels of Aflatoxin Contamination in Maize and Groundnut Products in Uganda

[14] FAOSTAT,2023. Groundnut production data available at https://www.fao.org/faostat accessed on June 4th 2023

market stalls, mom-and-pop shops, and supermarkets. These distributors, in turn, cater to both urban and rural consumers, ensuring a wider reach and availability of groundnut products in the market.

Consumer Market: This segment includes households, individuals, and institutions that consume groundnut products for direct consumption. Groundnuts are a popular snack and ingredient in various dishes, and there is a significant demand for roasted groundnuts, groundnut butter (paste), groundnut oil, and groundnut flour. The consumer market segment seeks products that are of high quality, well-packaged, and reasonably priced.

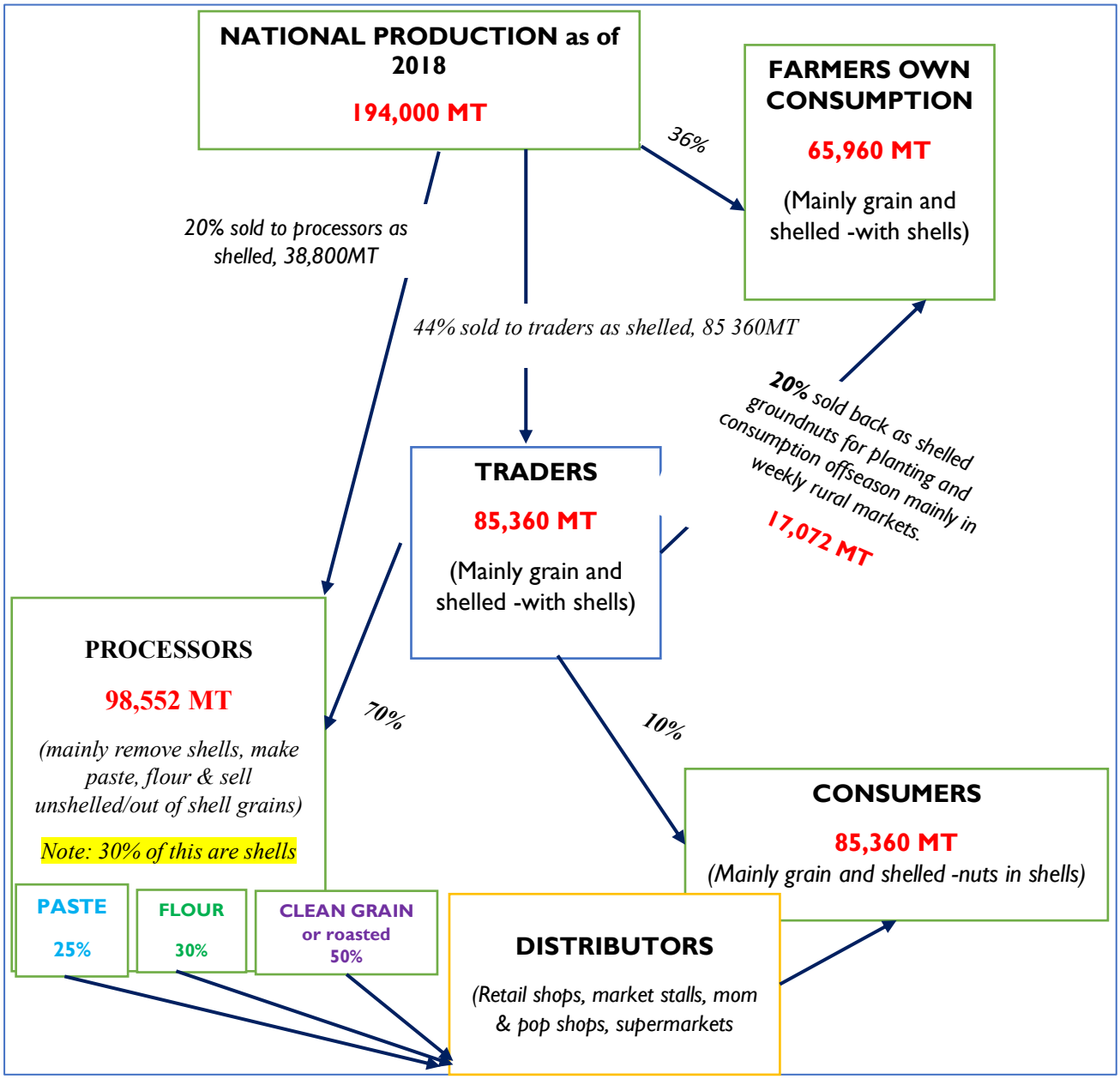


Figure 4: Groundnut marketing channels and quantification

Source: Author extrapolation from ICRISAT project report: Tropical Legumes III: Final Report[15]

[15] ICRISAT,2019. Tropical Legumes III: Final Report Available at https://tropicallegumeshub.com/rc/tropical-legumes-iii-final-report/ accessed on June 5th 2023

The key market segments for groundnut products in Uganda can be categorized as follows:

Industrial Market: The industrial market segment encompasses food processing companies, bakeries, confectionery manufacturers, and other industries that utilize groundnut products as ingredients in their production processes. Groundnut oil, groundnut paste, and groundnut flour are commonly used in food processing for making snacks, baked goods, sauces, dressings, and other food products. This segment requires a consistent and reliable supply of groundnut products in bulk quantities.

Animal Feed Market: Groundnut cake, a by-product of groundnut oil extraction, is commonly used as a protein-rich ingredient in animal feed formulations. The livestock industry, including poultry, dairy, and livestock feed manufacturers, forms a significant market segment for groundnut cake. The demand for high-quality groundnut cake as an animal feed ingredient is driven by the need for improved animal nutrition and productivity.

Value-Added Products Market: This segment focuses on innovative and value-added groundnut products, such as groundnut snacks, groundnut-based energy bars, groundnut-based spreads, and groundnut-based beverages. The market for healthier and alternative snacks and products is growing, and there is an opportunity to cater to health-conscious consumers seeking nutritious and convenient options.

Export Market: Uganda has the potential to tap into the regional and international export market for groundnut products. Neighbouring countries in East Africa, such as Kenya, Tanzania, Rwanda, and South Sudan, present opportunities for exporting groundnuts and groundnut products. Additionally, there is a global demand for groundnut products, including groundnut oil and groundnut paste. Export market segments require adherence to quality standards, certifications, and competitive pricing.

It's important for groundnut producers and processors to identify and target specific market segments based on their capabilities, product offerings, and market demand. Understanding the needs and preferences of each segment and adapting production, processing, and marketing strategies accordingly can help capture market share and drive the growth of the groundnut sector in Uganda.

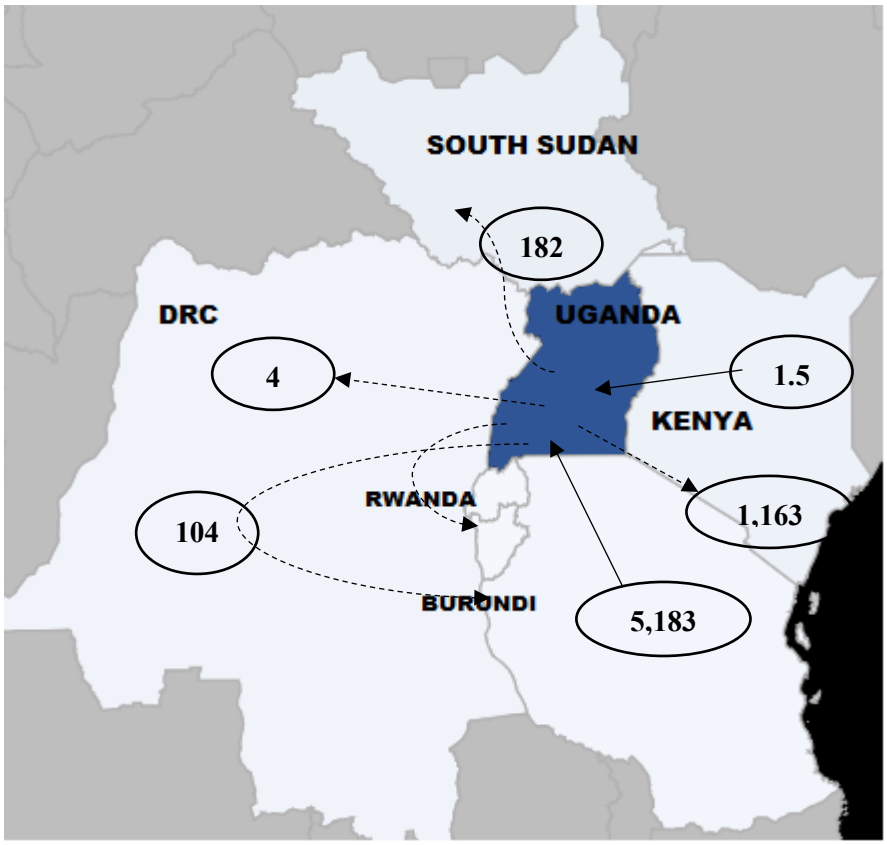
3.3.2. Cross border trade of Groundnut and products

The groundnuts trade dynamics between Uganda and other countries within the East African Community (EAC) are primarily influenced by the form of shelled or broken groundnuts. From 2016 to 2021, Uganda's imports of groundnuts, groundnut whether shelled or broken, had an average annual value of 5.2 million. Notably, 99% of these imports originated from Tanzania, indicating a significant trade relationship between the two countries in this commodity.

Conversely, Uganda's exports of groundnuts, whether shelled or broken, during the same period amounted to a value of 1.5 million. Among these exports, approximately 75% were destined for Kenya, while 11% went to South Sudan and 6% to Burundi. This demonstrates the prominence of Kenya as a major export market for Ugandan groundnuts within the EAC region.

According to the International Trade Centre (ITC) reports, there is negligible regional trade observed in other forms of groundnut products, such as oil, oil cake, paste, and grilled groundnuts. These findings suggest that the focus of cross-border trade in groundnut products primarily revolves around the groundnut grain, whether or not shelled or broken. Furthermore, the extra-regional trade in groundnut products is also negligible, indicating that Uganda's trade activities related to groundnuts are primarily concentrated locally and within the EAC region.

Tanzania serves as the primary source of imports, while Kenya, South Sudan, and Burundi are key export destinations for Ugandan groundnuts. However, the trade in other forms of groundnut products within the region and beyond remains insignificant.



Map 3: Intra regional trade between Uganda and EAC
Source[16]

The provided table (Table 1) illustrates the seasonal calendar, indicating that Uganda has a favourable opportunity for trade with other East African Community (EAC) countries. During the months of May, June, and July, when other countries are still in the planting or mid-season phase, Uganda can capitalize on this window to sell its groundnuts. Additionally, Uganda's second season harvest extends until January, a period when none of the EAC countries are harvesting groundnuts. This timing aligns with Tanzania's groundnut harvest in both seasons, presenting a potential competitive advantage for Uganda in the local market, provided that local production can meet the demand.

Table 1: Seasonal Calendar for groundnut in EAC

Country	Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Uganda	Season 1												
	Season 2												
Tanzania	Season 1												
	Season 2												
Kenya	Main Season												

Key: Planting | Harvesting | Mid season

Source[17,18]

[16] ITC,2023. Trade Map. Available at https://www.trademap.org/ accessed on June 3rd 2023
[17] URT,2020. Crop Calendar of some Crops in Tanzania. Available at http://riskprofilesundrr.org/documents/1658 Accessed on June 6th 2023
[18] USA,2023. Crops Calinder in EAC. Available at https://ipad.fas.usda.gov/rssiws/al/crop_calendar/eafrica.aspx Accessed on June 6th 2023.

During the peak harvesting season, when groundnuts are abundant and readily available, the increased supply can lead to a decrease in prices. This is because the market is flooded with groundnuts, and traders and buyers have more options to choose from. To avoid losses, Ugandan groundnut actors can tap into readily available regional markets. Conversely, during the off-season when groundnuts are scarce, the limited supply can drive prices up. Traders and buyers may struggle to find sufficient quantities of groundnuts, leading to increased competition and higher prices. This is especially true if there is high demand for groundnuts, such as during festive seasons or when there are specific market demands. Therefore, Ugandan traders can source groundnut from Tanzania to meet the local demand.

The staggered harvest periods between Uganda and Tanzania create opportunities for trade and cooperation as countries can supply each other with groundnuts during their respective off-seasons. This can help stabilize prices and ensure a more consistent supply of groundnuts throughout the year. This can lead to enhanced cross-border trade as countries with excess supply seek to export their surplus to neighboring countries with higher demand or lower production. This trade can contribute to enhanced regional integration and economic cooperation.

3.4. Market System Analysis for groundnuts in Uganda

3.4.1. Seed Market Analysis in Uganda

The government of Uganda acknowledges the significance of both formal and informal seed systems in the agricultural sector. As of 2015, the formal seed industry comprised 23 registered and active seed companies operating within the market. These companies effectively utilized the services of approximately 2,300 registered agro-dealers, who were spread across the country.

Additionally, these seed companies relied on public institutions like the National Agricultural Research Organization (NARO), which provided improved seed varieties, basic seed, and quality control services. However, it is important to note that these public services faced limitations in terms of their capacity to deliver these crucial services, resulting in restricted growth and professionalism within the seed sector.

Consequently, there has been intervention from the informal sector, facilitated by non-governmental organizations (NGOs) and through the utilization of farmer-saved seeds and community-based seed systems. These interventions aim to bridge the gap between the formal and informal seed systems by empowering farmer groups in various aspects, including seed production, quality assurance, agribusiness management, and seed marketing. By strengthening these farmer groups, NGOs play a vital role in fostering the development and integration of both formal and informal seed systems within the agricultural landscape of Uganda.

3.4.2. Current Markets of groundnuts in Uganda.

This study has confirmed that the primary market for groundnuts produced in Uganda consists of local markets within the country and the export market in Kenya. It has been widely recognized that from 2016 to 2021, national groundnut production has been insufficient to meet the domestic demand, resulting in a deficit. As a result, Uganda has increasingly relied on imports from Tanzania, with an annual average value of 5.2 million USD. Furthermore, data from the International Trade Centre (ITC) indicates that 75% of Uganda's groundnut export capacity is directed towards the Kenyan market. Hence, the current major markets for Ugandan groundnut products are the local market within Uganda and the export market in Kenya.

3.4.3. Potential Markets of groundnuts and related products in Uganda

In assessing the potential markets for Uganda's groundnut products, the analysis considered several factors, including the annual average import values in USD '000' for each country over the past five

years. Additionally, the distance between Uganda and each market, as well as the Free on Board (FOB) prices, were taken into account to account for logistics associated with market access and potential profitability due to higher prices.

The findings revealed two general categories of markets for all groundnut products. Firstly, there are markets that are geographically closer to Uganda, characterized by lower annual import values and lower prices. Secondly, there are markets located further away from Uganda, exhibiting higher import values and higher prices.

Figure five illustrates the outcomes of the analysis for potential markets specifically pertaining to groundnuts, whether shelled or not. East African countries such as Burundi, Kenya, the Democratic Republic of Congo (DRC), and Tanzania are among the closer markets that Uganda can target. Despite their relatively low import values and prices, their proximity to Uganda and the existence of trade agreements within the East African Community (EAC) offer a competitive advantage to these markets.

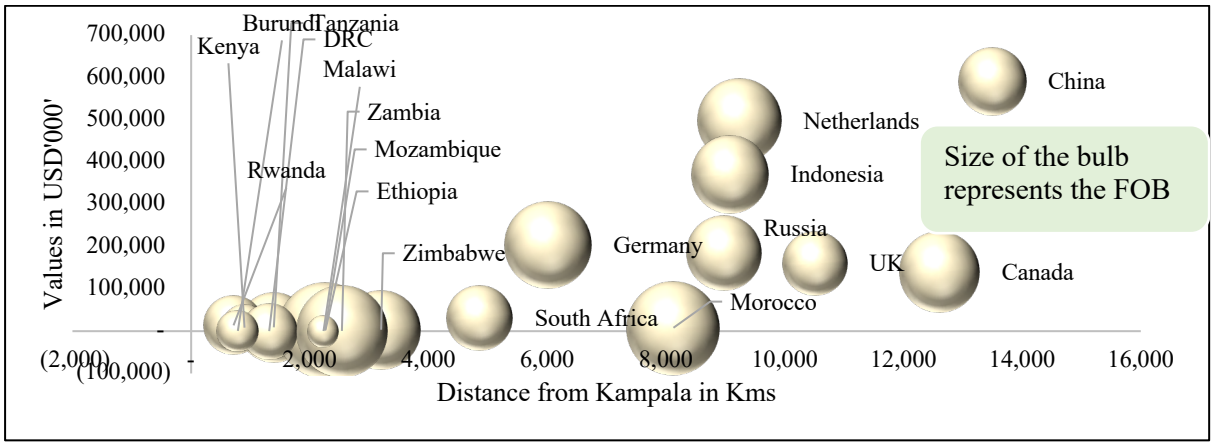


Figure 5: Potential markets for Groundnuts
Source[19]

The potential markets for groundnut oil and its fractions are depicted in figure six. Similar to the previous analysis, these results also highlight the distinction between closer and more distant markets. African countries like Ethiopia, Togo, and Mauritania are geographically closer to Uganda in comparison to larger markets such as the United States and China. Notably, China represents half of the global groundnut oil market.

The proximity of the African markets, coupled with the existence of bilateral trade agreements under the Common Market for Eastern and Southern Africa (COMESA), provides a competitive advantage for Uganda in these regions. On the other hand, the price competitiveness of markets such as China, the United States, the Netherlands, Belgium, and Italy presents an attractive opportunity for the Ugandan groundnut sector to explore investments and trade agreements with these major markets, potentially leading to significant profits for the national groundnut sector. However, tapping into these larger markets requires substantial investments in processing high-quality oil and adherence to the

[19] ITC,2023. Trade Map. Available at https://www.trademap.org/ accessed on June 3rd 2023

quality standards, rules, and regulations of the oil sector. It is crucial for the Ugandan groundnut sector to focus on these requirements to capitalize on the profit potential offered by these lucrative markets.

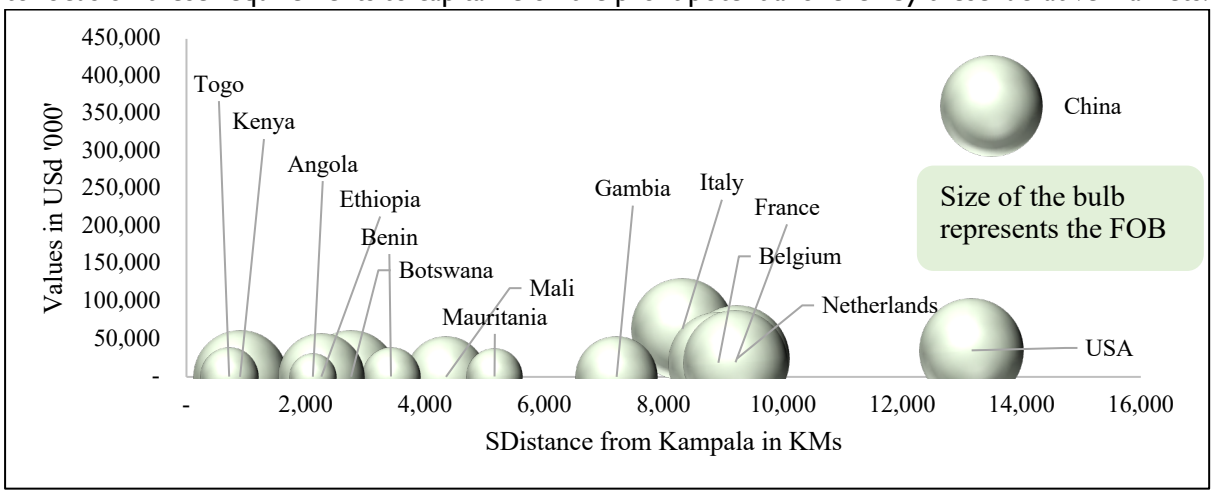


Figure 6: Potential market for groundnut oil and its fraction
Source[20]

Figure 7 depicts the potential markets for groundnut cakes derived from oil extraction. Groundnut oil cake, also known as groundnut meal or groundnut oil residue, serves various purposes across diverse industries, including animal feeds, fertilizers, mushroom cultivation, biogas production, and industrial applications. It finds application as a raw material for chemical production, biofuels, and as a binder in the manufacture of pressed blocks or pellets.

The analysis presented in Figure 7 reveals that several East African Community (EAC) countries, such as Burundi and Rwanda, import groundnut cakes. Additionally, other African countries, namely Cameroon, Chad, Mali, and Nigeria, constitute significant markets for groundnut cakes. Notably, China stands out as the largest importer, accounting for 64% of the global groundnut cake market.

Furthermore, despite the limited volumes of oil cake imports compared to China, the United States offers an average Free on Board (FOB) price of USD 3,115 per metric ton, which is six times higher than China's FOB price of USD 535 per metric ton. This price difference suggests that targeting the USA market could potentially yield lucrative opportunities for the Ugandan groundnut sector.

Based on these findings, expanding export efforts towards the USA may prove advantageous for the Ugandan groundnut industry, considering the higher price incentives available.

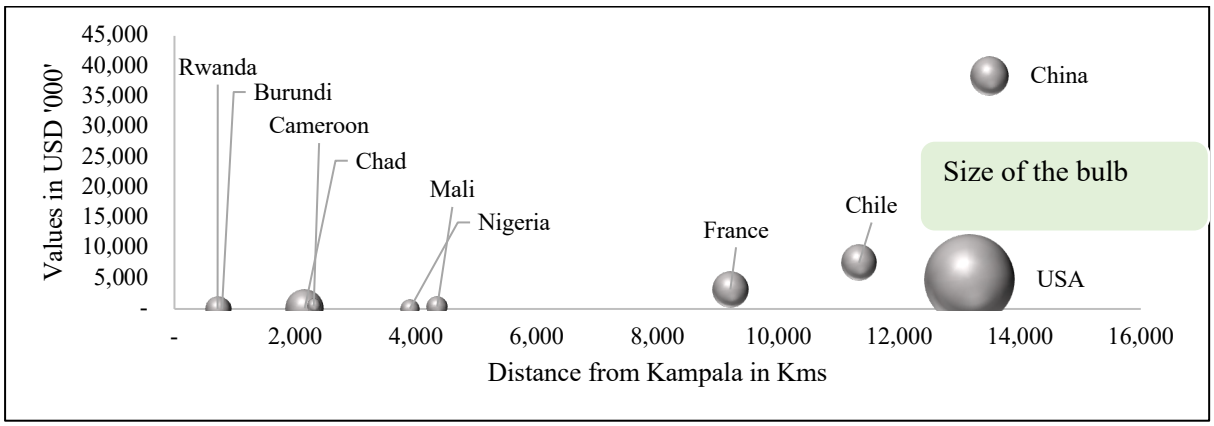


Figure 7: Potential market for groundnut cakes
Source[7]

[20] ITC,2023. Trade Map. Available at https://www.trademap.org/ accessed on June 3rd 2023

3.4.4. Competitive Analysis within the major current and potential groundnuts markets

Considering the findings presented in the preceding section, the East African Community (EAC) countries emerge as the primary target markets for shelled groundnuts. In the case of groundnut oil, African nations such as Ethiopia, Togo, and Mauritania hold potential as target markets for Ugandan groundnut oil. Additionally, despite the logistical challenges associated with distance, the USA market demonstrates lucrative prospects for groundnut oil cake.

To further analyze these markets, a comprehensive assessment of the competitors was conducted, taking into account the major exporters to these markets, the geographical proximity to the target markets, and the Free on Board (FOB) prices. This analysis helps identify key competitors and evaluate their market positions in relation to Uganda's groundnut products.

By focusing on these target markets and conducting a thorough analysis of competitors, distance considerations, and price dynamics, the Ugandan groundnut industry can make informed decisions and develop effective strategies to enhance market competitiveness and maximize export potential.

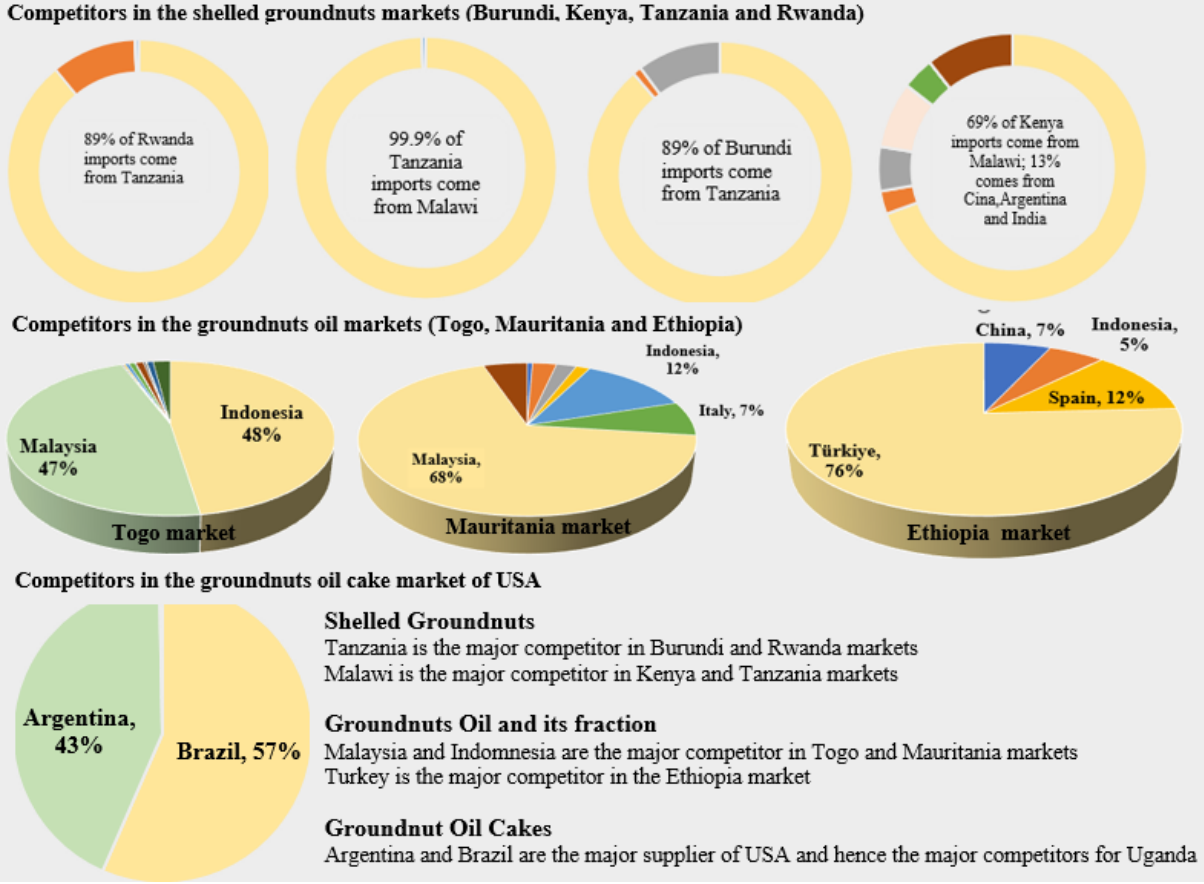


Figure 8: Uganda competitors in the current and potential markets
Source[21]

The summarized findings in Figure 8 highlight the major competitors in different target markets. In the case of Shelled Groundnuts, Tanzania emerges as the primary competitor in the markets of Burundi and Rwanda. Furthermore, Malawi holds a significant competitive position in the markets of Kenya and Tanzania for shelled groundnuts. For Groundnut Oil and its fractions, Malaysia and Indonesia are the

[21] ITC,2023. Trade Map. Available at https://www.trademap.org/ accessed on June 3rd 2023

major competitors in the markets of Togo and Mauritania. Turkey, on the other hand, poses strong competition in the Ethiopia market for groundnut oil.

When it comes to Groundnut Oil Cakes, Argentina and Brazil emerge as the major suppliers to the USA market and thus act as significant competitors for Uganda.

To successfully penetrate these markets, especially considering the presence of neighboring competitors, strategic lobbying efforts through strong bilateral trade deals will be necessary. By establishing robust trade agreements and leveraging diplomatic channels, Uganda can enhance its market position and overcome competitive challenges in these target markets.

3.5. Groundnuts Value Chain Organization/ Maps

3.5.1. Value Chain actor mapping, roles and functions

Inputs Suppliers: Both formal and informal actors are involved in the groundnut seed supply system in Uganda. The informal sector consists of NGOs like AT Uganda, CARITAS, and DANIDA, as well as other development partners such as UNHCH. Additionally, local markets play a role in the distribution of home-saved seeds, and individual farmers who save their own seeds contribute to the informal sector. On the other hand, the formal sector comprises registered seed companies that collaborate with public research institutions like NARO (National Agricultural Research Organization) and NAADS (National Agricultural Advisory Services). These formal players are responsible for producing and supplying certified groundnut seeds within the country.

Producers: The groundnut production in Uganda involves smallholder farmers who cultivate the crop on small plots of land, typically less than 2 acres. These small-scale farmers play a significant role in the groundnut value chain, although their productivity levels are relatively low. During favorable seasons, they generate surplus production, which they sell to rural traders, often through intermediaries or brokers, either in shelled or unshelled form. Based on empirical findings, small-scale farmers typically sell around 500 kilograms of groundnuts per year. The decision to sell their produce is often driven by immediate family needs, such as school fees or healthcare expenses, as previously mentioned[22].

The main groundnut varieties cultivated by these farmers include Red Beauty, Serenut, and other local Valencia types. Red Beauty is the preferred variety due to its appealing bright color. However, a major challenge associated with Red Beauty is its high susceptibility to rosette virus disease, which can cause significant yield losses ranging from 30% to 100%. As a result, Serenut varieties 1, 2, 3, and 4 have been developed as alternatives to address this issue[23].

Village agents: These intermediaries play a crucial role in connecting groundnut producers with buyers in the market. Often, these agents are farmers themselves or members of the local farming community. Their primary function is to assist buyers who may not be familiar with the locations of individual farmers. They facilitate the transportation of groundnut produce and serve as a source of market information within the value chain. In some cases, these intermediaries also purchase farmers' produce and store it in trading and urban centers that are easily accessible to buyers, particularly urban wholesalers.

Large traders: Large traders play a significant role in the groundnut value chain, primarily engaged in the aggregation and sale of produce to other wholesalers, retailers, or processors. Their operations are mainly concentrated in urban centers, and they deal with various agricultural products such as groundnuts, maize, rice, and beans. Additionally, some large traders may also venture into retail business as a means of diversification. Compared to retailers, they handle larger volumes of produce

[22] USAID,2019. Value Chain Assessment: Maize, Beans, and Groundnuts

23 Mugisha, J., Lwasa, S., & Mausch, K. (2014). Value chain analysis and mapping for groundnuts in Uganda, Socioeconomics Discussion Paper Series Number 14.

and tend to earn higher profit margins. The main products they trade in are unshelled and shelled groundnuts, with a few of them also involved in trading groundnut flour, paste, and butter.

Local Processors: Local groundnut processors in Uganda play a crucial role in adding value to groundnuts and transforming them into various processed products. These processors operate at a local level and are involved in activities such as shelling groundnuts, producing groundnut oil, making groundnut paste, and manufacturing groundnut flour. They utilize rudimentary machinery and equipment to process the groundnuts. These processors contribute to the availability of groundnut-based products in the local market, catering to both consumer and industrial demands.

Groundnut processing in Uganda occurs at two levels, involving shelling the nuts and transforming them into different forms. At the first level, some farmers take the initiative to shell the groundnuts before selling them. Rural agents who purchase unshelled groundnuts also engage in shelling before selling to urban traders. Shelling is typically carried out manually or with the use of small-scale equipment. However, the locally fabricated shelling methods often result in damage to the nuts, negatively impacting their quality.

The next level of processing involves grinding the groundnuts into paste, which is then sold either packed or unpacked, depending on the capabilities of the processor. Most actors in the value chain opt to pack the paste in plastic containers for sale. However, there are very few processors who have taken the additional step of packaging the paste in proper packets. Unfortunately, the quality of the processed groundnut paste remains poor due to the use of inadequate equipment and inadequate hygiene practices in the processing units. This poses a significant health risk to consumers, as the paste can become contaminated and infected with aflatoxin[24].

Large Processors: Large groundnut processors in Uganda are significant players in the groundnut value chain, operating at a larger scale and often with more advanced processing facilities. These processors handle substantial volumes of groundnuts and are involved in various stages of processing, such as shelling, roasting, grinding, and extracting oil. They typically have the capacity to process groundnuts in large quantities and produce a range of products, including shelled groundnuts, groundnut oil, groundnut paste, and other groundnut-based derivatives. These large processors often have wider distribution networks, supplying their products to both domestic and international markets. They play a crucial role in meeting the demand for processed groundnut products and contribute to the overall growth and development of the groundnut industry in Uganda.

Retailers and distributors: Groundnut products retailers and distributors in Uganda play a crucial role in connecting producers with end consumers. These entities operate at different levels within the distribution chain and handle various groundnut products. Retailers primarily focus on selling groundnut products directly to consumers, while distributors act as intermediaries, supplying products to retailers and other market outlets.

Retailers in Uganda's groundnut industry offer a diverse range of groundnut products to cater to consumer preferences. They sell both unprocessed and processed groundnut products, including shelled groundnuts, groundnut flour, groundnut paste, and groundnut butter. These retailers often source their products from wholesalers or directly from producers, ensuring a steady supply to meet consumer demand.

Distributors, on the other hand, play a pivotal role in the broader distribution network. They act as middlemen, sourcing groundnut products from large-scale processors or wholesalers and distributing them to various retail outlets such as grocery stores, market stalls, and supermarkets. Distributors

24 Mercy Corp Uganda, 2011. ASSESSMENT OF GROUNT NUTS, MAIZE, SESAME AND UPLAND RICE VALUE CHAINS IN KITGUM AND PADER DISTRICTS

have a wider reach and help to bridge the gap between producers and retailers, ensuring a smooth flow of groundnut products throughout the market.

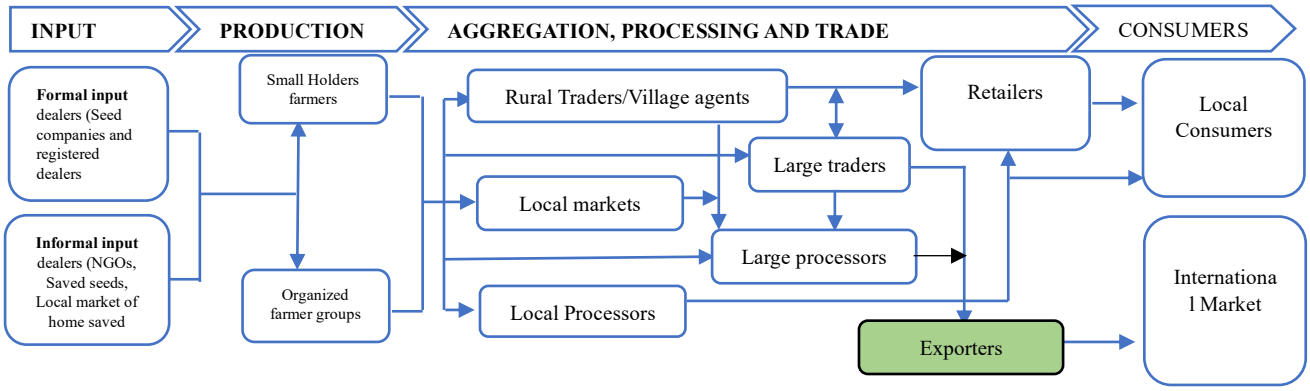


Figure 9: Groundnut Value Chain map

Source: Author restructuring based on the following sources the USAID study on Value Chain Assessment: Maize, Beans, and Groundnuts

Both retailers and distributors face the challenge of maintaining product quality and freshness. They strive to handle and store groundnut products properly to preserve their taste, nutritional value, and overall quality. Additionally, retailers and distributors rely on market information to make informed decisions about pricing, product selection, and marketing strategies.

Exporters: Only a limited number of traders engage in cross-border trade of groundnuts to neighboring countries, such as Kenya, Democratic Republic of Congo (DRC), South Sudan, Rwanda, and Tanzania. The primary mode of export is in the form of shelled groundnuts. Currently, both formal and informal channels are involved in the export of Ugandan groundnuts. However, this aspect of the value chain requires closer examination to enhance its profitability. It necessitates active participation and collaboration from all stakeholders involved. For instance, farmers need assistance to increase their production capacity and improve the quality of their crops, ensuring an ample supply for both local consumption and export markets. By addressing these aspects, the cross-border trade of Ugandan groundnuts can become more lucrative and contribute to the overall growth of the industry.

3.5.2. Analysis of Groundnut Value Chain Support Functions

The Uganda Groundnut Value Chain comprises various support functions that play crucial roles in facilitating the development and success of the sector. These support functions include:

Research and Development: Research institutions such as the National Agricultural Research Organization (NARO) and the National Agricultural Advisory Services (NAADS) provide valuable support by conducting research on groundnut varieties, agronomic practices, pest and disease management, and other relevant areas. Their findings and recommendations help improve the overall productivity and quality of groundnut production.

Input Supply: Both formal and informal input suppliers play a crucial role in providing quality inputs such as certified seeds, fertilizers, pesticides, and machinery to groundnut farmers. These suppliers ensure that farmers have access to high-quality inputs that contribute to better crop yields and quality.

Market Information and Linkages: Market information systems and platforms provide timely and relevant market data, including prices, demand trends, and market opportunities. This information helps farmers, traders, and processors make informed decisions regarding production, marketing, and value addition. Additionally, market linkages are established to connect producers with buyers, both within the country and internationally. Some of the institutions involved in market information and linkages that the groundnut sector can leverage on include:

In Uganda, several institutions play important roles in providing market information and facilitating linkages within the groundnut value chain. Some of these institutions include:

(a) Uganda National Farmers Federation (UNFFE): UNFFE serves as an umbrella organization for various farmer groups and associations in Uganda. It provides market information and facilitates linkages between farmers and potential buyers through its network and partnerships.
(b) Uganda Commodity Exchange (UCE): The UCE is a regulated market platform that facilitates the trading of agricultural commodities, including groundnuts. It provides market information, price discovery, and facilitates transactions between buyers and sellers. The exchange plays a crucial role in connecting farmers with buyers and improving market transparency.
(c) Uganda Export Promotion Board (UEPB): UEPB is responsible for promoting and facilitating the export of Ugandan products, including groundnuts. It provides market intelligence, trade information, and organizes trade missions and exhibitions to connect exporters with international buyers.
(d) Uganda Cooperative Alliance (UCA): UCA is an apex body for cooperative societies in Uganda. It provides support to agricultural cooperatives involved in groundnut production and marketing. UCA facilitates market linkages for cooperative members and helps them access market information and opportunities.
(e) District Agricultural Offices: At the district level, agricultural offices play a role in collecting and disseminating market information to farmers. They provide updates on prices, demand, and market trends specific to the local region. Farmers can access market information through these offices and seek guidance on market linkages.
(f) Non-Governmental Organizations (NGOs): Several NGOs operating in Uganda focus on agricultural development and market information dissemination. These organizations work with farmers, provide training, collect market data, and help farmers connect with potential buyers.
(g) Agribusiness Associations: Various agribusiness associations in Uganda, such as the Uganda Agribusiness Alliance (UAA) and sector-specific associations, play a role in facilitating market linkages for their members. They organize trade fairs, business matchmaking events, and provide market information to their members.
(h) These institutions, among others, contribute to the flow of market information, establish linkages between producers and buyers, and promote market access for groundnut farmers and other value chain actors in Uganda.

Policy and Regulatory Support: Government institutions and agencies formulate policies, regulations, and standards that govern the groundnut value chain. They provide an enabling environment for market development, ensure quality and safety standards, and support trade facilitation. Policy and regulatory support contribute to building trust, enhancing market access, and promoting fair practices within the value chain. Some of the key policies, strategies and initiatives that groundnut sector development can leverage on include:

(a) National Agricultural Policy: The National Agricultural Policy provides a framework for agricultural development in Uganda. It emphasizes value addition, market access, and promoting commercialization of agriculture. The groundnut sector can align its strategies with the policy objectives to enhance its competitiveness.
(b) National Export Development Strategy: The National Export Development Strategy aims to promote exports and increase foreign exchange earnings. It identifies key export sectors, including agriculture, and provides support measures such as market intelligence, export promotion, and trade facilitation. The groundnut sector can tap into this strategy to access international markets and increase export opportunities.
(c) National Seed Policy: The National Seed Policy focuses on ensuring availability and access to quality seeds for farmers. It emphasizes the use of certified seeds, which can improve

productivity and quality in the groundnut sector. The policy encourages the private sector's involvement in seed production and distribution, creating opportunities for seed companies to support groundnut farmers.

(d) Agricultural Credit Facility: The Agricultural Credit Facility is a government initiative that provides affordable credit to farmers and agribusinesses. Groundnut farmers and processors can access loans through this facility to invest in their operations, improve productivity, and expand their businesses.

(e) National Agricultural Advisory Services (NAADS): NAADS provides extension services and technical support to farmers. It offers training, advice, and information on best practices in groundnut production, processing, and marketing. Groundnut farmers can benefit from the services provided by NAADS to enhance their productivity and improve the quality of their produce.

(f) Value Addition and Agro-Processing Strategy: The Value Addition and Agro-Processing Strategy aims to promote value addition in the agricultural sector. It encourages the establishment of agro-processing industries and provides support for processing and packaging of agricultural products. The groundnut sector can leverage this strategy to enhance its processing capabilities and produce value-added products.

(g) By aligning with these policies and initiatives, the Uganda groundnut sector can access various support mechanisms, funding opportunities, market information, and technical assistance to enhance its competitiveness, improve productivity, and expand market reach.

Capacity Building and Training: Organizations and agencies involved in the groundnut value chain provide training and capacity-building programs to farmers, millers, processors, and other stakeholders. These programs focus on enhancing technical skills, knowledge of best practices, and business management skills, enabling participants to improve their efficiency and competitiveness.

Extension Services: Agricultural extension officers play a vital role in disseminating information, providing guidance, and offering technical support to farmers. They visit farming communities, provide advice on groundnut cultivation techniques, pest and disease management, post-harvest handling, and market opportunities. Extension services help farmers adopt improved practices and technologies, leading to increased productivity and profitability.

These support functions collectively contribute to the growth, sustainability, and competitiveness of the Uganda Groundnut Value Chain, promoting increased production, improved quality, enhanced market access, and better livelihoods for all stakeholders involved.

3.5.3. Access to Finance

Accessing financing in the Uganda groundnut sector poses challenges for most farmers, small millers, and rural agents. Existing financial institutions are often inaccessible to them, and even those who can access banks face difficulties due to the lack of collateral. The communal land ownership system prevents them from using land as collateral. Although Savings and Credit Cooperative Societies (SACCOs) are common providers of financial services to farmers in other regions, they are only beginning to emerge in the groundnut sector due to recent relative peace. While some microfinance institutions and SACCOs like Agaro and UML have introduced agricultural loans, they can only work with clients who meet certain criteria for bankability. However, in the context of recent agricultural resurgence, there are limited farmers who possess the necessary capacity in record keeping and marketing to be considered bankable clients.[25]

[25] USAID,2008. Stabilization-Driven Value Chain Analysis of Rice, Groundnuts and Maize in Northern Uganda

3.5.4. Gross Margin Analysis along the value chain

The National Agricultural Advisory Services has revealed that the new variety, SereNut2, is significantly more profitable compared to both the local varieties and the Red Beauty varieties. According to the analysis, the gross margin (GM) per acre for local varieties was only UGX 17,140, which is just a tenth of the GM per acre for the Red Beauty Variety, registering at UGX 178,500. Furthermore, the Red Beauty variety only represents a third of the profitability of SereNut2, with a GM per acre of UGX 477,210 (as shown in Table 1). It is important to note that the GMs are mainly driven by the yields per acre. Although Red Beauty varieties have lower GMs compared to SereNut2, they do fetch higher prices in the market, estimated at UGX 98,076 per bag. In contrast, SereNut2 and the local varieties are estimated to sell at UGX 69,915 and UGX 67,872 per bag, respectively.

Table 2: GMs of Local, SereNut2 and Red Beauty Varieties per Acre

	Local	Serenut 2	Red Beauty
Output (Bags/Acre)	9.4	16.7	8.6
Price (UGX/Bag)	67,872	69,915	98.076
Total Revenue	638,000	1,167,580	843.45
Land preparation (UGX/Acre)	8000	9319	9103
Ploughing (UGX/Acre)	125000	149530	156270
Seeds (UGX/Acre)	68700	63374	111990
Planting (UGX/Acre)	19600	20752	21030
Weeding (UGX/Acre)	168000	189,450	187030
Harcesting (UGX/Acre)	206000	217130	151500
Post-Harvest (UGX/Acre)	15000	19,683	17413
Bagging (UGX/Acre)	10560	21132	10614
Total Variablr costs	620860	690370	664950
Gross Margin (UGX/Acre)	**17,140**	**477,210**	**178,500**
Gross Margin (UGX/Bag)	1823	28575	20756

Source[26]

These results align with a comprehensive analysis conducted in 2015 by the National Research Organization (NARO). The analysis of production costs for NaSARRI released varieties and two local varieties demonstrated positive returns for improved varieties. Notably, the groundnut seed varieties that were more recently released exhibited higher returns. The authors attributed this to the fact that the newer varieties were developed as improvements over their earlier counterparts, incorporating virus resistance and drought tolerance. The summarized results in Table 3 below reveal that gross margins (GMs) for improved varieties ranged from UGX 1,323,000 to 6,323,000, with SereNut 1 and 2 having the lowest GMs, while SereNut 8, 12, and 14 exhibited the highest GMs. Generally, the GMs were influenced by both yields and selling prices. The local varieties fetched lower yields and commanded lower prices. While SereNut 1 and 2 had higher yields compared to SereNut 3, 5, 7, 9, 11, and 13, the former had lower selling prices, standing at UGX 2,900 per kg. In contrast, the selling prices for the latter varieties ranged between UGX 3,600 and 6,000 per kg.

Investing in high-yielding varieties is one of the key intervention areas that stakeholders should focus on to increase profitability at farm level and therefore improve livelihoods of groundnut farmers.

[26] The National Agriculture Advisory Services (NAADS), PROFIT MARGINS ON GROUNDNUT PRODUCTION available at https://naads.or.ug/profit-margins-on-groundnuts-production/ accessed on August 1st 2023

Table 3: Gross margins at farm level per year per acre

Description	Units	Serenut 1R & 2	Serenut 3R	Serenut 4T	Serenut 5R & 6T	Serenut 7T, 9T, 11T, 13T	Serenut 8R, 10R, 12R, 14R	Amasoga	Red beauty
Output (dry in shell)									
Mean Yield	Kg	900	812	750	850	1,120	1,180	520	500
Maximum Yield	"	1750	1,060	870	1450	1,750	1,800	620	600
unit (price/kg)		2,900	3,600	3,600	4,800	6,000	7,000	2,400	3,800
Total revenues under mean yields		2,610,000	2,923,200	2,700,000	4,080,000	6,720,000	8,260,000	1,248,000	1,900,000
Total revenues under maximum yields		5,075,000	3,816,000	3,132,000	6,960,000	10,500,000	12,600,000	1,488,000	2,280,000
Labor	UGX/Acre	925000	925000	925000	925000	925000	925000	925000	925000
Seed	Kg	350,000	400,000	400,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Planting lines	Bundle	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000
Total variable costs		1,287,000	1,337,000	1,337,000	1,937,000	1,937,000	1,937,000	1,937,000	1,937,000
Gross Margin Mean		**1,323,000**	**1,586,200**	**1,363,000**	**2,143,000**	**4,783,000**	**6,323,000**	**-689,000**	**-37,000**
Gross Margin Max		3,788,000	2,479,000	1,795,000	5,023,000	8,563,000	10,663,000	-449,000	343,000
Fixed costs									
Land rental/season	shs	100000	100,000	100,000	100,000	100,000	100,000	100,000	100000
Total Fixed costs		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Total Expenditure		1,387,000	1,437,000	1,437,000	2,037,000	2,037,000	2,037,000	2,037,000	2,037,000
PROFIT Mean		**1,223,000**	**1,486,200**	**1,263,000**	**2,043,000**	**4,683,000**	**6,223,000**	**-789,000**	**-137,000**
PROFIT Max		3,688,000	2,379,000	1,695,000	4,923,000	8,463,000	10,563,000	-549,000	243,000
Break Even Yield	kg/ha	478	399	399	424	340	291	849	536

Source[27]

[27] Kalule Okello, D., Monyo, E., Michael, D. C., Jane, I., & Herbert Kefa, O. (2015). Groundnut production guide for Uganda: Recommended practices for farmers.

3.5.5. Share of value along the Value chain for different products

An earlier study conducted by USAID on Stabilization-Driven Value Chain Analysis of Rice, Groundnuts, and Maize in Northern it was exhibited that both village and urban traders obtain similar gross margins per kilogram, which amount to UGX 200. However, city traders achieve higher gross margins ranging from UGX 300 to UGX 600, depending on the specific type and product they handle. Value-added products fetch higher gross margins compared to raw products in the market.

Table 4: GM at trade level

	Type/Product	Buying Price (USh/kg)	Selling Price (USh/kg)	Margin (USh/kg)
Village traders	Serenut (white)	1,600	1,800	200
	Red Beauty	1,700	1,900	200
Urban Traders	Serenut (white)	1,800	2,000	200
	Red Beauty	1,900	2,100	200
City Traders	Red Beauty	1,900-2,000	2,300	300 _ 400
	Serenut	1,600- 1,700	2,200	500-600
	Ebinyeebwa	1,600- 1,700	2,200	500-600
	Butter	1,900-2,000	2,400	400-500

Source[25]

Discussions with retailers from local shops and supermarkets have validated the findings from USAID regarding Gross Margins (GMs); however, there have been some changes in buying and selling prices. At the retail level, a kilogram of roasted groundnuts is sold at UGX 25,000 and sourced at UGX 22,500, resulting in a profit of UGX 2,500 per kilogram. Groundnut paste is retailed at UGX 7,500 per kilogram while sourced at UGX 6,000 from processors, yielding a profit of UGX 1,500 per kilogram. Regarding groundnut oil, the seeds yield approximately 44.5-50% oil and 50-55% meal during the oil extraction process. Therefore, one litre of oil is extracted from 2 kg of groundnut seeds, leaving half a litre of oil and half a kilogram of meal in one kilogram of groundnut seeds. Groundnut oil is retailed at UGX 19,000 per litre while sourced at UGX 16,000. Groundnut meal is sold at UGX 3,000 per kilogram to livestock keepers.

The share of value analysis along the supply chains of different products revealed that more value is added at the processing level. This value reaches up to 72% for roasted groundnuts, 50% for oil and meals, 61% for butter and 45% for paste. Despite the high final value for roasted groundnuts, its business turnover is low compared to other products. Retailers from local shops and supermarkets mentioned that they can only sell half a kilogram of roasted groundnuts, while they can sell 5 to 10 litres of oil and 5 to 10 kilograms of paste in a day.

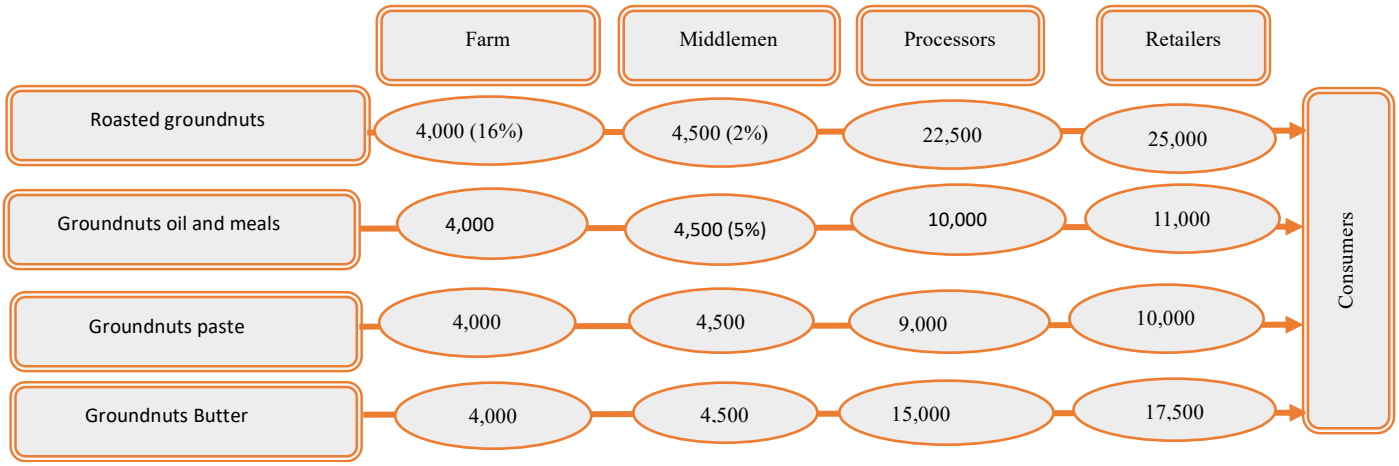


Figure 10: Share of value along the VC per supply channel

Source: Stakeholder consultation

3.6. Analysis of Employment Opportunities long the groundnuts value chain

Existing and potential jobs at farm level were estimated following Balgos and Digal (2017)[28]. Family labour was included in estimating labour cost. Man-days per activity were calculated. Thereafter, the current jobs were estimated based on Full-Time Equivalent (FTE) units. FTE unit assumes that a man-day is equivalent to 8 working hours per day, 26 working days a month and 12 months a year. This translates to 312 days or 2,496 hours of work per year[29].

Based on the gross margin analysis conducted by NARO, the main labour-intensive activities at the farm level include land clearing, land ploughing, weeding, and harvesting. The labour cost for these activities on one acre amounts to UGX 925,000. Assuming a daily wage of UGX 5,000 in the agricultural sector in Uganda, we can estimate that this amount can provide a daily wage for 185 people. This translates to a total of 185 man-days required for one acre per year. According to FAOSTAT, an average of 352,167 hectares, equivalent to 870,223 acres, are cultivated each year. Therefore, at the national level, this would amount to approximately 160,991,255man-days of labour. This generates a full time employment (FTE) of 515,997

Table 5: Farm level FTE at national level

Item	Value
Labor cost per acre in UGX (1)	925,000
Daily wage in Uganda (2)	5,000
Number of man days per acre (3)	185
Average area harvested at national level in Ha (4)	352,167
Number of acres at national levels (5)	870,223
Number of man days at national level:(3)*(5)=(6)	160,991,255
Number of working days in a year according to FTE theory (7)	312
FTE at National level (6)/(7)=(8)	515,997

Source: Author Computation based on NAADS data

3.7. Analysis of the Enabling Environment Groundnut Value Chain

3.7.1. Infrastructures & logistics services

In the Uganda groundnut value chain, there are various infrastructure and logistics services involved to facilitate the movement and processing of groundnuts. Some of these services include:

Transportation: This involves the transportation of groundnuts from farms to various destinations such as local markets, processing facilities, or export terminals. It can involve both road and rail transportation, depending on the location and infrastructure available.

Storage facilities: Proper storage facilities are essential to preserve the quality of groundnuts. These facilities can include warehouses, silos, or storage sheds where groundnuts are stored before processing or distribution. Adequate storage helps prevent spoilage, pests, and moisture damage. However, according to the National Planning Authority (NAPA), Uganda is faced with an acute shortage of modern storage facilities[30]. Various public and private efforts are being implemented to provide solution to limited access to storage facilities. For instance, The Global Livingstone Institute

[28] Carol Q. Balgos and Larry N. Digal (2017) Employment Generation Potential of the Rice Value Chain: The Case of Mlang, North Cotabato in Mindanao. Available at https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidspjd2016-1_rice.pdf accessed on May 6rh 2023

[29] University of California,2023. FTE Calculation. Available at https://hr.berkeley.edu/sites/default/files/attachments/FTE-to-Standard-Hours.pdf accessed on June 6th 2023

[30] Ministry of Trade industry and cooperative. Available at http://npa.go.ug/wp-content/uploads/2018/04/PEC-Storage-Infrastructure.pdf accessed on June 5th 2023

is planning to build a communal storage facility for farmers to store their crops for months after harvest[31]

Processing facilities: Groundnuts often go through processing stages such as shelling, sorting, cleaning, and drying. Processing facilities provide the necessary equipment and infrastructure for these activities. This can include small-scale processing units operated by farmers or larger processing plants run by commercial entities. However, the ICRISAT reported in 2017 that there is a limited number of large processing facilities in Uganda and that processing is done by traders and wholesalers based in urban areas as a means of adding value before selling[32].

Packaging and labeling: Once groundnuts are processed, they need to be properly packaged and labeled for distribution and sale. Packaging materials should be suitable for preserving the quality and preventing spoilage. Proper labeling provides important information such as product details, nutritional content, and expiry dates. The Uganda national bureau of Standards UNBS specifies that Full fat groundnut flour shall be packaged in food grade containers which will safeguard the hygienic, nutritional, and organoleptic qualities of the product. The UNBS also specifies the labelling regulations. [33].

Market infrastructure: This includes physical marketplaces where groundnuts are bought and sold. It can range from local village markets to larger regional or national market centers. These marketplaces provide a platform for farmers, traders, and buyers to interact and conduct transactions.

Quality control and certification: Infrastructure for quality control and certification under UNBS ensures that groundnuts meet the required standards and regulations. This involves laboratory facilities for testing the quality and safety of groundnuts, as well as certification bodies that verify compliance with international or national standards[33].

Information and communication technology (ICT) infrastructure: In today's digital age, ICT infrastructure plays a crucial role in facilitating communication, market information dissemination, and coordination among stakeholders in the groundnut value chain. This can include internet connectivity, mobile applications, and online platforms that provide market information, pricing data, and real-time updates.

These infrastructure and logistics services contribute to the efficient functioning of the Uganda groundnut value chain, enabling the timely movement, processing, and distribution of groundnuts while maintaining quality and reducing post-harvest losses.

3.7.2. Extension services

In the Uganda groundnut sector, agricultural extension services are primarily provided by government agricultural extension departments. However, there is a recognized challenge of inadequate extension services in the sector. As a result, non-governmental organizations (NGOs) and other development partners play an important role in addressing this gap. These organizations intervene in the groundnut sector by offering extension services to farmers. These services aim to build the capacity of farmers, improve their farming techniques, increase crop yields, and enhance overall productivity and profitability in the groundnut sector. The involvement of NGOs and development partners helps to supplement and strengthen the extension services available to farmers, contributing to their knowledge and skill development for sustainable and successful groundnut farming practices.

[31] GLI,2020. **Ugandan Crop Storage** Available at https://www.globallivingston.org/dir/research/ugandan-crop-storage Accessed on June 5th 2023.
[32] ICRISAT,2017: STRENGTHENING THE GROUNDNUT VALUE CHAIN IN UGANDA Available at https://www.icrisat.org/strengthening-the-groundnut-value-chain-in-uganda/ accessed on June 5th 2023

[33] UBS,2019. Groundnut Flour Specification.

3.8. Investment Scenarios

The Uganda groundnut sector presents opportunities for investors and donors to promote the sector and improve the livelihoods of those involved in the value chain. The sector currently faces challenges such as low yields, limited value addition, and an unstructured value chain. To address these issues, the following investment scenarios are suggested:

i. **Doubling yields through investment in high yielding varieties and Good Agricultural Practices (GAP):** Currently, Uganda produces an average of 212,436 MT of groundnuts annually. With this scenario, the production volume would double to 424,871 MT. This increase in yields would result in doubling the gross margins (GMs) for farmers and other value chain actors, while also creating additional employment opportunities.

ii. **Structuring the value chain and improving value addition:** By structuring the groundnut value chain in Uganda, supply chain efficiency can be enhanced, leading to a reduction in transaction costs. This restructuring would contribute to increased profitability at each node of the value chain, benefiting all actors involved.

By implementing these investment scenarios, the Uganda groundnut sector can overcome its challenges and unlock its potential for growth and development. This, in turn, will improve the economic outcomes and livelihoods of farmers and other stakeholders in the value chain.

3.9. Challenges/constraints along the Peanut value chain

The groundnut sector in Uganda faces several key challenges that hinder its growth and potential. Firstly, low yields compared to other countries limit production and profitability, resulting from factors such as limited access to improved seeds and fertilizers, as well as poor farming practices. Additionally, post-harvest losses are significant due to inadequate storage facilities and poor handling practices, leading to spoilage, mould growth, and aflatoxin contamination. Limited value addition activities further restrict market opportunities and profitability. The unstructured nature of the value chain, characterized by a lack of coordination and collaboration among stakeholders, leads to inefficiencies and limited market access. Inadequate access to finance and inputs, aflatoxin contamination, and limited market information and linkages add to the challenges faced by the sector.

The table below summarises the key challenges per value chain node/level and their implications to the value chain actors and supporting institutions.

Table 6: Challenges and their implication in the groundnut value chain

Value chain node/Level	Challenge, Constraint	Implication
Input Supply	• Individual farmers' lack sufficient capital for and access to credit for improved G.nuts seeds, inputs, & tractor/ ox-plough services • Farmers' distrust due to widespread seed counterfeiting • Laxity by government enforcement of seed quality standards • Farmer's unperceived benefits of enhanced agricultural techniques (e.g., use of last season's seed) • Farmers' risk aversion to investments without assured markets and/or clearly demonstrated returns	For Farmers • Low adoption of high-quality seeds results into less bountiful and lower quality peanut harvests for farmers • Unrealized opportunities to open additional available land (esp. in Acholi/ Lango and Eastern Uganda) **For Input Providers/Suppliers** Lower sales of seeds, agrochemicals, and services
Production *(Farmers and Farmer Groups)*	• Low yields - Average yield is 800 kg/ha of dry pods, far below the world average of 1,520kg/ha and the 3,000kg/ha recorded on research stations (Okello & Deom, 2008). • High levels of seed recycling and low adoption of improved varieties and GAPs – (i.e., It takes approximately 3 years for a new variety to be adopted by farmers, but this is solely dependent on the strength of the seed distribution system) • There is a low level of commercialization at farm level – (i.e., about 70% of groundnut farmers in Uganda are Semi-commercial, 24% are subsistence while only 6% are commercial - (ICRISAT/NASARRI, 2020) • Low penetration rates, fragmentation, and difficulties maintaining long-term cohesiveness of peanut farmer groups in most areas • Limited access agricultural extension services: programs that do occur tend to be temporary - Highly susceptible to rosette disease and drought of red beauty variety and Groundnuts are very labour-intensive at the time of harvest.	**For Farmers** • Lower adoption rates of productive farming techniques and productivity boosting inputs • Decreased access to credit • Increased difficulty accessing output markets **For Commodity Purchasers** • Challenges securing sufficient supply
Post Harvest Handling	• Traditional agricultural practices persist (e.g., home storage,) • Limited access to PHH tech. (e.g., motorized shellers, manual shellers) • Low utilization and disrepair of NGO-built storage facilities due to poor management, lack of farmer trust and problematic implementation of WRS	**For Farmers** • High levels of waste (Between 20 – 40% PHH losses) • Missed opportunities to "smoothen" income (through sales of stored crops throughout year) **For Commodity Purchasers** • Challenges securing quality supply
Trade	**Selling -side (Farmers)** • Need for immediate "cash in hand" due to lack of savings • Lack of information about market opportunities/ market prices • Impeded access to markets due to remote locations • Poor quality inputs and PHH techniques **Buying-side (Agents, Brokers, Processors, etc.)** • Considerable additional costs (transportation, taxes) to access remote regions for buying • Higher transactional / operational costs working with fragmented supply base	**For Farmers** • Greater susceptibility to price gouging by opportunistic traders • Missed opportunities to sell to better markets and/or higher quality outputs with better margins **For Buyers** • Quality issues of purchased commodities • Difficulties securing sufficient supply

Value chain node/Level	Challenge, Constraint	Implication
	• Frequently unfulfilled contract obligations by farmers due to price competition and/or convenience of traders	• Increased apprehension to invest in longer term agreements with farmers
Processing	• Few peanut processors within the growing regions (majority are small-scale, unregulated, and non-Certified) • Relatively undeveloped linkages with farmers (primarily short-term spot buys through agents) • Difficulties securing sufficient supply because of scattered and un-organized farmer groups • Poor quality commodities (e.g., mixed-up varieties, high insect infestation).	**For Processors** • Underutilization of existing capacity • Difficulties accessing export markets due to their more stringent quality standard • Underdevelopment of peanut agro-processing industry – no apex body of peanut traders
Financial Institutions	**For Formal Banks (e.g., Stanbic, Absa, Equity, Centenary, etc.)** o Higher operational expenses of working with farmers – Additional staff required to reach remote areas – Increased travel expenses – Training of staff to work with farmers – Financial literacy training of farmers o Farmers are riskier customers – Higher rates of default / repayment issues – Agriculture risky by nature – No available collateral (land ownership system) o Farmers' loan amounts are comparatively small o Many farmers distrustful of / uninformed about banks o Often require monthly payments (which doesn't match the peanut harvest season) **For SACCOS** o Many highly leveraged with big, high interest rate loans from Microfinance institutions o Widely held misperception of farmers that loans from SACCOs don't need to be paid back o Largely unregulated and not backed by government **For VSLAs** o More prone to theft (informal / unregulated) o Annual payouts recurrently re-sets resource pool	**For Banks** o Severe difficulties implementing sustainable (profitable) standalone, agriculture programs with small, individual farmers **For SACCOs** o Relatively high failure rate o Perceived as risky by farmers o Limited ability to provide sizeable loans **For VSLAs** o Hindered growth prospects beyond small scale o Very limited ability to provide sizeable loans **For Farmers** o Decreased access to meaningful levels of credit with affordable terms
Government	o Lack of available resources o Multiple organizational restructurings e.g., NAADS, PDM, EMYOGA etc. o Increased fragmentation and creation of new government districts	o Limited size and scope of government agricultural development programs o Shifts in focus of government programs
Infrastructure	o Comparatively poor roads in rural peanut producing regions vs. other regions o Unreliable electricity grids / expensive generator costs o Railway lines (which link the North to Central Uganda and Mombasa) have not operated since 1993	o Inhibited domestic trade and international trade o Increased transportation costs and effort o Greater difficulty establishing the agro-processing industry in the region
Climate Change	o Weather patterns have shifted over the past decade so that the 2nd season is now more reliable than the 1st (instead of vice versa)	o Food security a greater challenge o Decreased / less reliable output

Value chain node/Level	Challenge, Constraint	Implication
	○ Increased droughts / delayed rains	○ Urgency for adoption of drought resistant varieties

Addressing these challenges requires collaborative efforts from various stakeholders, including government agencies, development organizations, farmers' associations, and private sector actors. It involves investing in research and development, promoting good agricultural practices, strengthening post-harvest management and value addition capacities, improving market information systems, and providing access to finance and inputs. By addressing these challenges, the groundnut sector in Uganda can unlock its potential and contribute to improved livelihoods and economic development.

3.10. Attractiveness of the Groundnuts Value Chain

The Groundnuts Value Chain in Uganda holds several attractive features that make it a promising sector for investment and development. Here are some factors that contribute to the attractiveness of the Groundnuts Value Chain:

Market Demand: Groundnuts have a strong domestic and international demand due to their versatile uses in food processing, oil extraction, confectionery, and snack industries. The demand for groundnuts and groundnut-based products continues to grow, providing a stable market for farmers and value chain actors.

Economic Importance: The groundnut sector contributes significantly to Uganda's economy, providing income and employment opportunities for numerous stakeholders along the value chain. It supports the livelihoods of smallholder farmers, traders, processors, and other service providers, thereby enhancing rural development and poverty alleviation.

Export Potential: Uganda has the advantage of accessing regional and international markets for groundnuts. There is a growing demand for Ugandan groundnuts in neighboring countries and international markets, offering opportunities for export-oriented production and trade.

Value Addition Potential: The groundnut value chain offers various opportunities for value addition, including oil extraction, processing of groundnut flour, paste, butter, and other groundnut-based products. Value addition enhances the profitability of the sector and opens doors for diverse market segments.

Natural Resources and Climate: Uganda has suitable agro-ecological conditions for groundnut cultivation, including fertile soils and favorable rainfall patterns. The country's diverse climate zones allow for the production of different groundnut varieties, enabling year-round cultivation and a consistent supply to the market.

Government Support and Policies: The Ugandan government has implemented policies and programs to support the groundnut sector, including research and development initiatives, access to credit and finance, infrastructure development, and market facilitation. These efforts create an enabling environment for growth and investment in the value chain.

Technological Advancements: The availability of improved groundnut varieties, modern farming practices, and innovative processing technologies contribute to increased productivity and quality in the groundnut sector. Adopting these advancements can lead to higher yields, reduced post-harvest losses, and improved product standards.

Sustainability and Health Benefits: Groundnuts are considered a nutritious and sustainable crop, providing essential nutrients and protein. The cultivation of groundnuts promotes crop diversification, soil health, and sustainable agricultural practices, contributing to food security and environmental sustainability.

The Groundnuts Value Chain in Uganda presents a promising investment opportunity, driven by market demand, export potential, value addition options, favourable climate, government support, technological advancements, and the promotion of sustainable agriculture.

4. CONCLUSION

The Groundnut Value Chain and Market Analysis conducted in Uganda was primarily intended to review and update information on the current groundnut sub-sector and conduct an in-depth analysis of the prevailing market trends in the Ugandan to come up with sound recommendations for possible funding by donors.

Results revealed that groundnut holds a significant position as the second most important legume crop after beans in Uganda. However, the country's groundnut productivity lags behind other East African Community (EAC) and global producers, resulting in an insufficient capacity to meet national demand. Despite this shortfall, Uganda manages to export groundnuts to neigh boring countries such as Kenya, Burundi, and Rwanda.

The study highlighted various market opportunities for groundnut products at the local, regional, African, and international levels. However, it also emphasized the presence of competitors such as Tanzania, Malawi, and Malaysia, posing a threat to Uganda's market position.

Furthermore, the study identified that the groundnut value chain in Uganda is largely unstructured, with farmers and other actors operating independently, lacking horizontal and vertical integration. Nevertheless, the value chain has shown profitability and contributes to employment opportunities within the country.

5. RECOMMENDATIONS FOR INVESTMENTS

5.1. Recommended investments

Based on the analysis conducted on the groundnut sector in Uganda, the following key investments can be recommended to upgrade the efficiency of the value chain:

1. **Promote adoption of high-yielding varieties**

Encourage farmers to adopt high-yielding groundnut varieties that have proven to be more productive and resilient. This can be achieved through awareness campaigns, training programs, and partnerships with research institutions and seed companies to ensure the availability and accessibility of improved seed varieties. To unlock potential of the varieties,

The assessment underscores the significance of yields and prices as key drivers of profitability at the farm level. Consequently, local varieties such as Amasoga and Red Beauty, which exhibit lower yields and prices, lead to negative gross margins (GMs) when considering family labor as paid labor. Conversely, the newer varieties demonstrate higher GMs. Reports indicate that even the top-performing farmers from Bulindi ZARDI achieved yields of only 0.6 MT, indicating that, based on current production practices, farmers struggle to reach even the average yields and often barely break even. This disparity in GMs based on the level of yields per acre is illustrated in Figure 10.

To unlock the full potential of these varieties, there is a need to enhance agricultural extension services by strengthening the capacity and reach of government agricultural extension departments. This will enable them to provide comprehensive and up-to-date information, training, and guidance to farmers on modern farming techniques, improved seed varieties, pest and disease management, and best practices for groundnut cultivation.

Additionally, investment in appropriate infrastructure and equipment for post-harvest handling, storage, and processing of groundnuts is crucial to minimize losses and maintain quality. This includes

promoting proper drying, cleaning, and packaging techniques, as well as encouraging value-added processing such as roasting, grinding, and oil extraction.

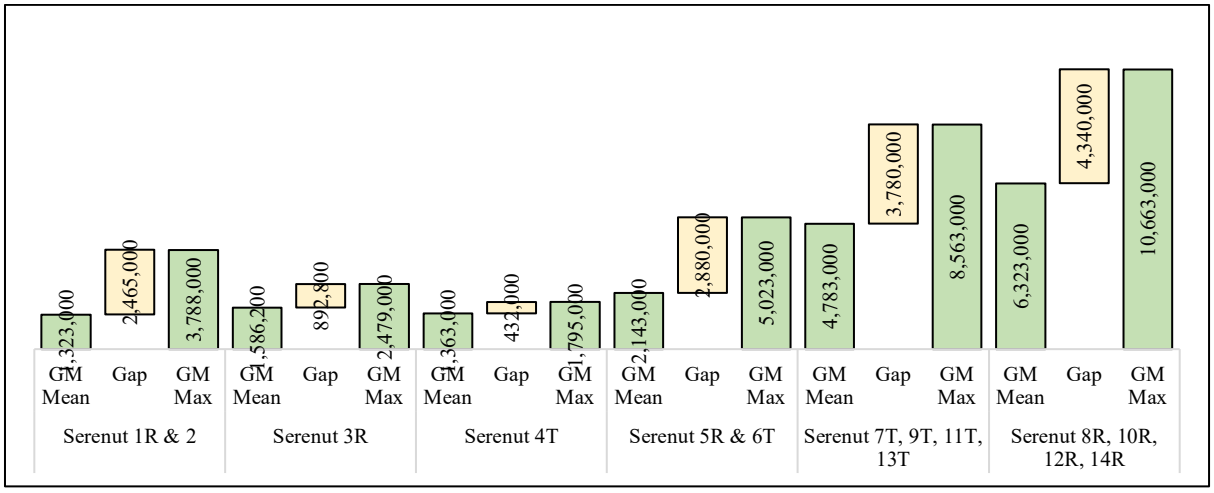


Figure 11: Difference in GMs per variety based on Mean and Max Yields

Other accompanying measures to increase yields will include:

- Enhance access to finance and credit: Improve access to affordable and flexible financing options for groundnut farmers, small-scale processors, and traders. This can be achieved through collaboration with financial institutions, microfinance organizations, and government programs to develop tailored financial products, promote financial literacy, and provide technical assistance in financial management. The establishment of financial mechanisms, such as revolving funds or dedicated credit facilities, specifically designed to meet the financing needs of different actors in the groundnut value chain can help address the limited access to finance faced by farmers, processors, and traders, enabling them to invest in productivity-enhancing technologies, post-harvest infrastructure, and market linkages.
- Invest in research and development: Allocate resources for research and development activities to address key challenges in the groundnut sector, such as disease management, pest control, soil fertility improvement, and climate resilience. This includes supporting research institutions, promoting collaboration with international partners, and disseminating research findings to farmers and other stakeholders.

2. **Structuring and strengthening the groundnut VC through Local and Regional Market Linkages**

The strategic intervention would be to facilitate the establishment of effective market linkages between farmers, traders, processors, and exporters. This can be achieved by supporting the formation of farmer cooperatives or associations, providing market information and intelligence, fostering partnerships with buyers and processors, and exploring opportunities for value chain integration. This would enable farmers to produce high quality and aflatoxin free groundnuts that are fetching higher prices in local and international markets. It has been established that groundnuts 1fetch lower prices at farm level with an average of UGX 4,000 per kg. Assuming a 5% increase in prices offered at farm level with effective market linkages and therefore direct linkages between farmers and processors, there would be in crease by an average of 8% in the GMs as specified in the table 7. The varieties Serenut 8R, 10R, 12R, 14R would fetch gross margins of UGX 11,293,000.

Table 7: Change in GMs per acre after 5% increase in farm-level prices

Description	Units	Serenut 1R & 2	Serenut 3R	Serenut 4T	Serenut 5R & 6T	Serenut 7T, 9T, 11T, 13T	Serenut 8R, 10R, 12R, 14R
Maximum Yield	"	1750	1,060	870	1450	1,750	1,800
unit (price/kg)		3,045	3,780	3,780	5,040	6,300	7,350
Total revenues under max yields		5,328,750	4,006,800	3,288,600	7,308,000	11,025,000	13,230,000
Labor	UGX/Acre	925000	925000	925000	925000	925000	925000
Seed	Kg	350,000	400,000	400,000	1,000,000	1,000,000	1,000,000
Planting lines	Bundle	12,000	12,000	12,000	12,000	12,000	12,000
Total variable costs		1,287,000	1,337,000	1,337,000	1,937,000	1,937,000	1,937,000
Initial Gross Margin Max		3,788,000	2,479,000	1,795,000	5,023,000	8,563,000	10,663,000
Current Gross Margin Max		4,041,750	2,669,800	1,951,600	5,371,000	9,088,000	11,293,000
% Change		7	8	9	7	6	6

Source: Author computation based on NAADS data

Oher accompanying measures to ensure proper VC strengthening and market linkages could be the following:

- Establish coordination and collaboration mechanisms: Facilitate the formation of multi-stakeholder platforms or associations that bring together key actors in the value chain, including farmers, processors, traders, exporters, and government agencies. These platforms can serve as forums for dialogue, information sharing, and joint decision-making, helping to align efforts, coordinate activities, and promote vertical and horizontal integration.
- Strengthen farmer organizations and cooperatives: Support the establishment and strengthening of farmer organizations and cooperatives to enhance collective bargaining power, improve market access, and enable joint investments in infrastructure, equipment, and value-added processing. Provide capacity building support to these organizations in areas such as governance, financial management, and market intelligence.
- Promote contract farming arrangements: Encourage the development of contract farming arrangements between farmers and processors/buyers. This can provide farmers with a guaranteed market and price, while also ensuring a consistent supply of quality groundnuts for processors. Develop model contracts and provide legal and technical support to facilitate the implementation of contract farming.

3. Promote value addition and market diversification through processing technology enhancement.

Encourage the production of value-added groundnut products such as roasted nuts, peanut butter, oil, and confectioneries to capture higher-value markets. Foster innovation and entrepreneurship within the sector, support product development and quality assurance, and explore opportunities for export diversification.

Other accompanying measures to ensure promotion of value addition and market diversification.

i. Ensuring constant supply by making sure the recommendation one and two are implemented.

ii. Improve policy and regulatory environment: Review and update policies and regulations related to the groundnut sector to create an enabling environment for investment, market access, and sector development. This includes addressing trade barriers, streamlining licensing and certification processes, and implementing supportive policies for sustainable agriculture and rural development.

iii. Enhance information and communication systems: Invest in the development and implementation of information and communication technologies (ICT) solutions to improve market information dissemination, traceability, and coordination along the value chain. This can include the use of mobile applications, SMS alerts, online platforms, and databases to share real-time market prices, weather information, best practices, and other relevant data.

iv. Strengthen market intelligence and research: Invest in market research and intelligence to gather data on consumer preferences, market trends, and demand for different groundnut products. This information can guide value chain actors in making informed decisions regarding product diversification, quality improvement, and market targeting. Support research institutions and organizations in conducting studies and disseminating findings to stakeholders.

By implementing these recommendations, the groundnut sector in Uganda can be revitalized, leading to increased productivity, income generation, food security, and overall socioeconomic development.

Case of SAMZ_ Psalms Food Industries Limited

Psalms Food Industries Limited is a prominent groundnut processing company operating in Uganda, with its headquarters located in Wakiso district, Nansana Municipality. The company specializes in processing two primary groundnut products: roasted groundnuts and peanut butter. Currently, the factory price for roasted groundnuts stands at UGX 22,500 per kilogram, while peanut butter is priced at UGX 15,000 per kilogram.

However, the company is faced with several key challenges, primarily related to the limited supply of groundnuts in terms of both quality and quantity. The sourced groundnut seeds are of mixed varieties and do not meet the desired quality standards for each product, making it challenging for the company to obtain sufficient high-quality raw materials.

Despite having the capacity to process around 1.5 metric tons per day, the company processes an average of only 200 kilograms daily due to the limited availability of suitable groundnut seeds. Additionally, another major challenge is the use of rudimentary technology, resulting in poor-quality processed products.

Currently, Psalms Food Industries Limited has a strong market coverage, with its products present in 90% of supermarkets at the national level. However, the company has only 30% of retail markets in Kampala. Nevertheless, the company aims to expand its market coverage to include the East African Community (EAC) both in terms of inputs and outputs, starting from 2024. Local roasters and peanut makers are the main competitors in both urban and rural areas.

Given the low volume of available high-quality raw materials, investing in modern processing technology may not be economically feasible at the moment. Instead, the company should prioritize addressing the supply chain issues and improving the quality of sourced groundnuts to enhance its overall competitiveness before considering significant technological upgrades.

5.2. Summary of the recommended investments Scenarios

1. **Scenario 0 (Current Scenario):** Currently, farmers are cultivating low-yielding local groundnut varieties, yielding an average of 0.4 metric tons per acre and fetching low prices at an average of UGX 4,000 per acre. The produce is of mixed varieties and poor quality. As a result, farmers incur negative Gross Margins (GMs) of UGX -37,000 per acre, which is compensated by family labour. Middlemen play a role in aggregating groundnuts from farmers and selling them to both small local processors and larger ones, such as SAMZ and NEWMAN, charging a commission fee of UGX 500 per kilogram.
   The larger processors rely on rudimentary technologies and face challenges related to inconsistent supply and price fluctuations. For instance, SAMZ, with a daily processing capacity of 1.5 metric tons, processes an average of only 200 kilograms per day. Despite these challenges, large processors can generate GMs of UGX 41,835,000 per month. This level of

profitability allows the business to recoup its investment costs in just 9 months. After 10 Monts of operation, the Net Present Value of the business would be UGX 17,578,265.
Considering the current situation, if processors choose to invest in improved processing technologies and facilities, the breakeven point can be reached in 33 months (Fig 12). This investment would help address current challenges and potentially lead to higher profitability and efficiency in the long term.

2. **Scenario 1: Increased Yields and enhanced Market Linkages**

- **First investment sub-scenario (Yields improvement):** Under this scenario, farmers are adopting improved varieties such as Serenut 8R, 10R, 12R, 14R. The yields are improved from the actual 0.4MTs to One MT. In addition, farmgate prices are increased from the actual average of UGX 4,000 to UGX 6,000. Their average GMs become UGX 6,323,000 per acre. Middlemen still link farmers to processors with a commission fee of UGX 5,00 for aggregation and storing. At this stage the poor PHH increases losses and incidences of aflatoxin. Large processors benefit from full capacity utilization based on the availability of good quality supply. They fetch Monthly GMs of UGX 311,000,000 while doubling the number of full-time employees from 10 to 20. They still use rudimental technologies that they can pay back in 2 Months. If processors are to invest in improved processing technologies at this point, the breakeven point can be reached in 5 Months. The net present value after 10 Months of operation would be estimated at UGX 2,158,075,709 (Fig.12)
- **Second investment sub-scenario (Structured markets):** Under this scenario, farmers have already embraced new high-yielding groundnut varieties. However, the post-harvest losses and incidences of aflatoxin contamination remain high due to poor post-harvest handling (PHH) practices during the aggregation process. To address these issues, the investment strategy involves strengthening value chain actors through farmers' groups and cooperatives that are directly linked to small and large processors. By establishing this direct linkage, processors can be assured of obtaining groundnuts with the desired variety and quality characteristics, while farmers benefit from fetching higher prices for Serenut 8R, 10R, 12R, and 14R varieties, ranging from UGX 6,000 to UGX 6,300. As a result of this improved value chain and efficient linkage, farmers' gross margins increase significantly to UGX 9,088,000 per acre, assuming maximum yields. This positive outcome demonstrates the potential for mutually beneficial collaborations within the value chain, resulting in increased profitability for both farmers and processors, while reducing post-harvest losses and aflatoxin incidences. By prioritizing post-harvest handling and value chain strengthening, this scenario offers a promising pathway towards improved sustainability and profitability in the groundnut sector.

3. **Scenario 2 (Investment in improved processing technologies):**

Under this scenario, processors are guaranteed a steady supply of good quality and quantity of groundnut produce from farmers. Furthermore, they have successfully expanded their input and output market, now covering the East African Community (EAC) countries. As a result of these positive developments, the daily processing capacity increases to 4.5 metric tons of groundnuts. With a strategic investment in improved processing technologies and facilities, the processors achieve a Monthly Gross Margin (GM) of UGX 909,550,000. For the processors, the initial investment required for these improvements is estimated at UGX 2,642,950,000 (Table8). However, due to the implementation of advanced processing technologies and the extended market reach, the payback period is estimated to be just two months. This rapid payback period underscores the significant financial benefits of their investment.

Furthermore, the Net Present Value (NPV) after 10 Months of operation is projected to reach an impressive UGX 5,971,675,036 (Figure 10). This substantial NPV highlights the long-term profitability and sustainability of the investment in improved processing technologies. Overall, this scenario showcases the potential for processors to achieve remarkable financial gains and increased competitiveness in the market by adopting advanced technologies and expanding their market presence within the EAC region.

Table 8: Summary of the proposed interventions at farm and processing levels

		Current Scenarios	Increased Yields and enhanced Market Linkages	Investment in machinery
Farm level	Yield (MT/Acre)	0.4	1	1
	Price (UGX/Kg)	4,000	6,000	6,300
	GM (UGX/Acre)	-37,000	6,323,000	9,088,000
Processors	Volume handled (MT/Day)	200	1,500	4,500
	Initial investment	379,415,000	787,500,000	2,642,950,000
	GM (UGX/Month)	41,835,000	311,000,000	909,550,000
	Pay Back period (In Months)	9	2	2
	Pay Back period after investing in machinery (in Months)	33	5	2
	NPV after 10 Months	17,578,266	2,158,075,709	5,971,675,036

Source: Data from Stakeholder Interviews (Annex 4)

5.3. NPV and PBP at processing levels under the proposed scenarios

The Net Present Value (NPV) and the payback period were determined using secondary data and information provided by stakeholders. The analysis revealed that the most favorable scenario is Scenario 2, which involves investing in improved processing technologies while ensuring a consistent supply of high-quality groundnut produce. Under this scenario, the NPV after 10 months of full-time operations is projected to be UGX 5,971,675,036, significantly higher than UGX 2,158,075,709 for Scenario 1 and only UGX 17,578,266 under the current scenario.

Several key assumptions were considered during the analysis:

- **Discount Rate**: The discount rate was estimated at 10% in June 2023, as declared by the Bank of Uganda.
- **Average Volumes Handled:** Processors currently handle 200 kg per day, while under Scenario 1, it increases to 1.5 metric tons due to improved yields and market structuring. After investing in improved processing technologies and facilities, the average daily processing capacity rises to 4.5 metric tons.
- **Market Availability:** The market is available both locally and regionally. Currently, SAMZ has only 30% presence in Kampala local shops while they absent in rural areas. In addition, they plan to expand the market reach to cover the whole EAC.
- **Average Farmgate Prices:** The average farmgate prices stand at UGX 4,000 per kilogram under the current scenario, UGX 6,000 under Scenario 1, and UGX 6,300 under Scenario 3.
- **Considered Products:** The analysis focuses on two products: roasted groundnuts and groundnut butter. Roasted groundnuts are sold at UGX 22,500 per kilogram, while groundnut butter is priced at UGX 15,000 per kilogram.

- **Taxes:** Taxes are estimated to be 30% of the margins.
- **Full-Time Staff:** Scenario 0 involves 5 full-time staff, Scenario 1 has 10 full-time staff, and Scenario 2 employs 20 full-time staff. The monthly salaries are estimated at UGX 400,000 per staff.
- **Casual Staff:** Casual staff costs are accounted for under aggregation and transport fees.
- **Processing Facilities:** The processing facilities include office premises, stores, warehouses, and office equipment.
- **Machinery:** 5 Roasting machines and 5 grinders and their accessories will be sourced at a total cost of USD 150,000 translating into UGX 540,000,000 considering an exchange rate of UGX3,600 per USD. Shipment and installation costs are estimated at 20% of the machinery costs.
- **Marketing Fee:** The marketing fee is estimated to be UGX 200,000 under the current scenario, UGX 2,000,000 under Scenario 1, and UGX 10,000,000 under Scenario 2.

Overall, the analysis demonstrates that investing in improved processing technologies and ensuring a consistent supply of quality produce leads to the most favorable financial outcomes for the groundnut processing industry.

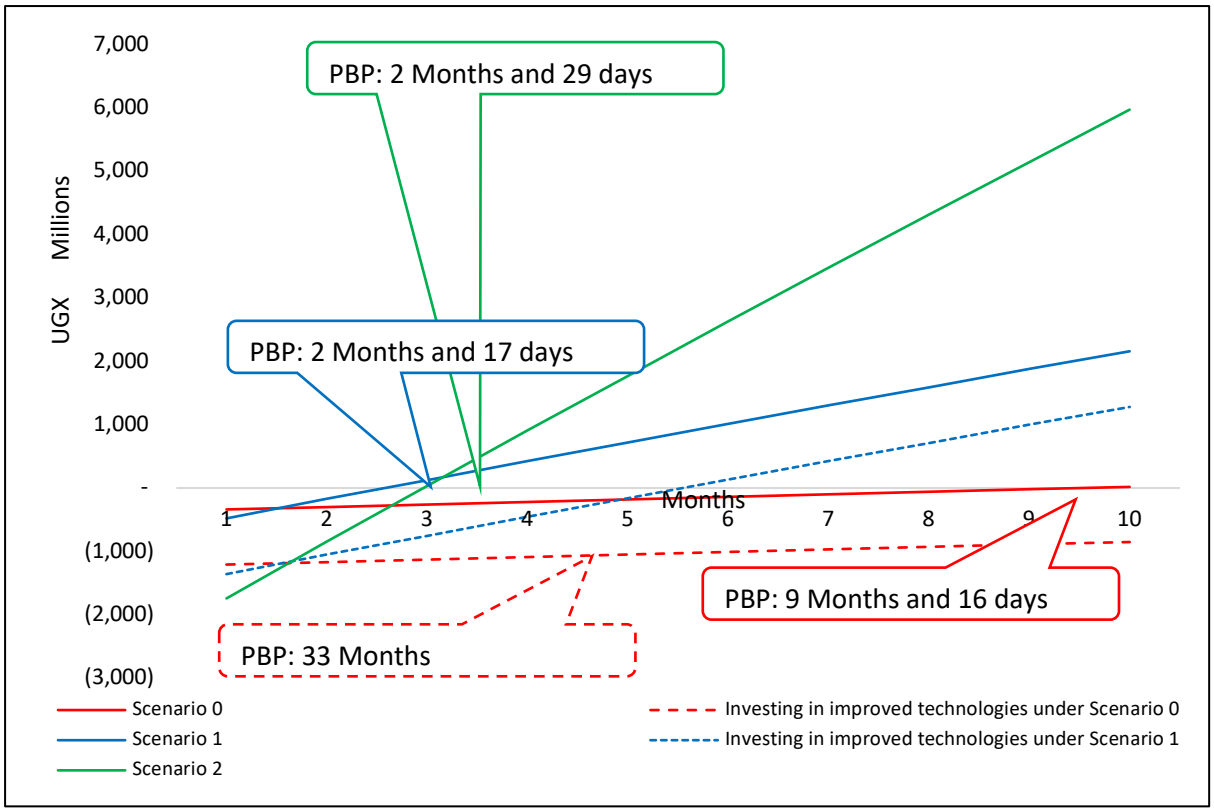


Figure 12: NPV and PBP for the strategic intervention at processing level
Source: Data from Stakeholder Interviews (Annex 4)

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7. ANNEX

I. INTERVIEWED STAKEHOLDERS

S/N	NAME	CONTACT	COMPANY	LOCATION
1	PAUL RUDAGYA	**0758356790**	**SAMZ_ Psalms Food Industries Limited**	NANSANA-KAMPALA
2	SUZAN NSIIMA	0786882880	SUPER MARKET AT HASS GAS STATION	KASANGATI
3	NICHOLAS MATSELELE	0780242327	SUPERMARKET AT TOTAL GAS STATION	KASANGATI
4	MILTON OLUKA	0772319220	SUPERMARKET AT SHELL GAS STATION	GAYAZA
5	ACHIRO CAROLINE	0776598362	SUPERMARKET	MPERERWE
6	TUSIIME BRYANA	0750703151	SUPERMARKET	KYANJA
7	JEANINE NAHAYO	0742611944	LOCAL SHOP	KIWALIMU
8	BRENDA MBAMBU	0776700270	LOCAL SHOP	KISASI
9	RUTH NAMAKULA	0741908629	LOCAL SHOP	GAYAZA
10	RONALD KULE	0762819280	LOCAL SHOP	GAYAZA
11	PAUL ZIRIMARA	0741923059	LOCAL SHOP	MPERERWE

2. DISCUSSION GUIDE FOR GROUNDNUT PROCESSORS AND TRADERS

1. What groundnut by-products do you produce, and what are the required input and output quantities for each product?

Product	Desired Volumes per season (Liters Kg)	Actual Volumes produced per season (Liters Kg)	Selling Price per Unit	The volume of raw material used (GNuts seeds in Kg)	The desired volume of raw material per season	Cost per Kg
Snacks						
Groundnut Oil						
Groundnut Cake/Meal						
Butter						
Flour						

2. What are the additional variable costs involved in the processing of groundnut by-products?

Product	Snacks	Groundnut Oil	Groundnut Cake/Meal	Butter	Flour	Other Specify
Labor						
Electricity						
Tax						
Packaging Material						
Chemical and additives						
Transportation						
Maintenance and repair						
Waste disposal						
Quality testing						
PHL						
Other Specify						

3. What are the main fixed costs associated with the processing of groundnut by-products?

Product	Snacks	Groundnut Oil	Groundnut Cake/Meal	Butter	Flour	Other Specify
Rent and Mortgage						
Machinery/Depression						
Taxes						
Insurance						
Salaries of fixed staff						
Licenses and permits						

Security and Maintenance						

4. Who are the other stakeholders operating in this sector that you may be aware of?

5. What are the main challenges encountered and what are the recommendations?

Challenges	Recommendations

3. Data used for NPV and PBP calculations

	Current Scenarios	Increased Yields and enhanced Market Linkages	Investment in machinery
Volume Sourced	200 Kg	1.5 MT	4.5MT
Sourcing Price in UGX per Kg	4000	6000	6300
Sourcing cost per Month	24,000,000	270,000,000	850,500,000
Aggregation and Transport (UGX 500 per Kg)	3,000,000	9,000,000	27,000,000
Labor (UGX 400,000 per Month per staff)	2,000,000	4,000,000	24,000,000
Packaging Material (Lumpsum)	500,000	4,000,000	12,000,000
Utilities (Lumpsum)	500,000	500,000	2,000,000
Other Ingredients (Lump sum)	5,000,000	30,000,000	90,000,000
Transport (UGX 500 per Kg)	3,000,000	9,000,000	27,000,000
Taxes (30% of estimated margins)	19,215,000	144,000,000	421,950,000
Security (security staff at UGX 250,000 per Month)	1,000,000	3,000,000	9,000,000
Machinery maintenance (Lump sum)	1,000,000	1,000,000	20,000,000
Marketing costs (Lumpsum)	200,000	2,000,000	10,000,000
Total variable Costs	59,415,000	476,500,000	1,493,450,000
Revenues from groundnut	33,750,000	337,500,000	1,012,500,000
Revenues from peanuts	67,500,000	450,000,000	1,350,000,000
Total Revenues	101,250,000	787,500,000	2,362,500,000
Fixed Costs			
Machinery and accessories	50,000,000	50,000,000	540,000,000
Machinery shipping and installation	10,000,000	1,000,000	100,000,000
Office and Warehouses	250,000,000	250,000,000	500,000,000
Office equipment	10,000,000	10,000,000	50,000,000
Total Fixed Costs	320,000,000	311,000,000	1,190,000,000
Gross margins	41,835,000	311,000,000	869,050,000

Source: Stakeholder consultations, NAADS, NARO, ALIBABA.COM