ACCESSING THE ROLE OF UMUDIKE SEEDS IN THE CASSAVA SEED VALUE CHAIN IN NIGERIA

A SPOTLIGHT ON CASSAVA VALUE CHAIN

PREPARED AND SUBMITTED BY

THANKGOD NZENWA

AGRICULTURAL PRODUCTION CHAIN MANAGEMENT- HORTICULTURE CHAIN, VAN HALL LARENSTEIN UNIVERSITY

ASSESSOR: Verschuur, Marco DATE: DEC 1, 2023

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

ACROYNMS

BASICS II: Building An Economically Sustainable Integrated Cassava Seed System
CBB: Cassava Bacterial Blight
CBD: Cassava Brown Streak Disease
CAD: Cassava Anthracnose Disease
CM: Cassava Mealybug
CMD: Cassava Mosaic Disease
CGM: Cassava Green Mite
CSEs: Cassava Seed Entrepreneurs
CSEs: Certified Commercial Seed Entrepreneurs
CRS: Catholic Relief Society
EGS: Early Generation Seed
FSPs: Foundation Seed Producers
FAO: Food and Agriculture Organization
FAOSTAT: Food and Agriculture Organization Statistic
GAP: Good Agronomic Practices
IFPRI: International Food Policy Research Institute
IITA: International Institute of Tropical Agriculture
LSIs: Licensed Seed Inspectors
MDAs: Ministries, Department, and Agencies
NASC: National Agricultural Seed Council
NAERLS: National Agricultural Extension and Research Liaison Services
NESG: Nigerian Economic Summit Group
NGOs: Non-Governmental Organizations
NRCRI: National Root Crops Research Institute
PESTEC: Political, Economic, Social, Technological, Environmental, Cultural
PWC: Price Water Cooperation
R&D: Research and Development
SAH: Semi-Autotrophic Hydroponics
SWOT: Strength, Weakness, Opportunities, Threat

EXECUTIVE SUMMARY

Over the years, farmers have consistently faced challenges in accessing improved, high-quality planting materials for cassava production. Farmers have relied mostly on saved seeds from previous production or from their fellow farmers to access planting materials. Occasionally, every 5-10 years, state and non-state actors, through their interventions, have distributed planting materials to farmers, but this practice has proven not to be sustainable in addressing the issues of availability, accessibility, and affordability of pure, clean, true-to-type cassava seeds.

Distortion of the breeding pipeline, poor investment in the seed system, non-integration of cassava seed actors and commercialization of the value chain, non-existent market segmentation, and a weak regulatory system have contributed to farmers' inability to access high-quality cassava seeds. Price fluctuations, supply-chain inefficiencies, farmers and herdsmen clashes leading to crop destruction, and rising costs of fuel have also hindered access to improved cassava seeds.

These factors have resulted in poor adoption of good agronomic practices (GAP), low productivity per unit hectare, a weak value chain finance mechanism, and low scaling capabilities of the farmers. There is a high dependence on the importation of cassava derivatives, leading to low income for the farmers. Farmers have found it difficult to meet local demands as the supply-demand gap widens. Low processing industries and soaring production costs have all resulted in negative livelihood outcomes for the farmers.

Cassava, as a staple food and nutrition crop, plays an important role in the livelihoods of farmers. It has become significant because of its numerous derivatives, making it an industrial crop. The importance of cassava lies in its value chain, ability to create wealth, improve farmers' livelihoods, and its job creation potential.

Umudike Seeds is a spin-off company established by the National Root Crops Research Institute (NRCRI) as an Early Generation Seed Company (EGS) to address the gaps in the cassava seed sub-sector in Nigeria by producing and commercializing EGS of cassava. These challenges have set Umudike Seeds on a course to contribute to creating a formal cassava seed system with its partners in the BASICS II project.

Boosting cassava production and productivity will entail farmers having access to clean and disease-free cassava planting materials. Umudike Seeds and its partners, as part of their strategy to formalize the cassava seed system, have established Cassava Seed Entrepreneurs (CSE) along the cassava seed value chain to leverage NRCRI and International Institute of Tropical Agriculture (IITA) breeding activities in developing improved high-quality cassava seed varieties and facilitating access to the same for the farmers.

CHAPTER 1

INTRODUCTION

According to the Food and Agriculture Organization (FAO, 2021), Nigeria is the world's largest producer of cassava, boasting an annual production capacity of over 63 million tons, with Africa contributing to 64% of global production in 2019. However, cassava production in Nigeria is predominantly driven by the expansion of cultivated areas rather than increased productivity. With an average yield of 8-10 tons per hectare, Nigeria ranks among the lowest in productivity compared to other major producers such as Thailand, Vietnam, and Cambodia, which achieve yields above 30 tons per hectare (FAO, 2021).

Cassava's significance lies in its climate resilience attributes, allowing it to thrive when other crops fail. This makes cassava a crucial crop for enhancing food security in Africa. Additionally, the biofortification of cassava and the fortification of its derivatives emerge as powerful strategies to combat micronutrient deficiency in the continent, reshaping the narrative of malnutrition in Africa (Sahel Consulting, 2021).

Globally, over 1 billion people rely on cassava products, and locally, millions of Nigerians depend on cassava for their livelihoods (GigaScience, 2022). With the global food crisis escalating, cassava has the potential to provide raw materials for food, nutrition, and industry within the state. Cassava can contribute to reducing Nigeria's over-dependence on wheat importation, create entrepreneurs and jobs through its various value chains, and simultaneously improve farmers' livelihoods and boost industrialization in the sector.

The cassava seed system in Nigeria is largely informal, as farmers often lack reliable access to improved high-quality seeds. Some still source their planting materials from open markets or use saved seeds from previous cultivation (Wossen et al., 2020). Farmers have cited non-availability of planting materials as a primary reason for dis-adopting a variety (Jeffrey Bentley et al., 2017). Efforts to address this challenge include the creation of two Early Generation Seed Companies, Umudike Seeds and IITAGOSEEDS, and the establishment of Cassava Seed Entrepreneurs (CSEs), which have partially alleviated issues of inaccessibility to improved high-quality seeds.

The development of the seed system is critical for improving farmers' access to high-quality improved seeds and increasing productivity. Umudike Seeds, as an Early Generation Seed (EGS) organization in the root and tuber crops industry, has been actively involved in the rapid multiplication of market-demanded and improved high-quality cassava varieties, utilizing cutting-edge technologies to ensure farmers have access to these planting materials. Addressing significant productivity challenges requires farmers to plant quality seeds, and Umudike Seeds is leveraging its expertise in root and tuber crops to scale the production of improved EGS cassava for farmers. Measures will be taken to boost and protect smallholder farmers' investments, enhance productivity, and increase their household income.

This spotlight paper aims to assess the role of Umudike Seeds in the cassava seed value chain in Nigeria, identifying gaps, bottlenecks, and leverage points to improve the sub-sector, better supporting farmers in accessing affordable, improved, high-quality seeds.

CHAPTER 2

METHODOLOGY

The methodology employed for the spotlighting paper predominantly relied on secondary data. A comprehensive review of relevant literature was conducted to gain a holistic understanding of the primary issues affecting the cassava seed value chain and their consequent impacts on the cassava sub-sector in Nigeria.

The spotlighting paper drew upon publications, books, reports, and government policy documents related to the cassava seed sub-sector. Resources from Greeni, Google Scholar, ScienceDirect, and ResearchGate were utilized to sift through relevant information, providing a clear view of the cassava seed landscape, the initiatives taken by stakeholders to formalize the seed system, and the emergence of Umudike Seeds as an Early Generation Seed company dedicated to increasing access to improved high-quality seeds for farmers.

My affiliation with Umudike Seeds, coupled with a thorough understanding of its operations and interactions with smallholder farmers (including seed entrepreneurs and outgrowers), provided a significant leverage point and contributed immensely to the spotlighting paper.

To visually represent the cassava seed value chain, a Value Chain Map was employed, depicting actors, functions, product flow, chain supporters, and enablers. Additionally, overlays were included to offer further insights into the cassava seed value chain. Qualitative data analysis tools such as PESTEC, SWOT Analysis, Stakeholder Matrix, and Problem Tree were employed to analyze and interpret external issues within the cassava seed value chain.

CHAPTER 3

SECTOR DESCRIPTION

Smallholder farmers play a pivotal role in cassava production, contributing to 60% of the total output in Nigeria (Wossen et al., 2020). Despite their significant role, these farmers face challenges such as unreliable access to improved high-quality cassava seeds, lack of technical expertise, and volatile market conditions, leading to a myriad of issues.

The term "smallholder farmer" refers to those cultivating 1-5 hectares of land (Onubuogu, 2014). Unfortunately, these farmers often experience losses in their agricultural investments, hindering their ability to scale food production and generate sufficient income for self-reliance.

Cassava goes beyond being merely a food and nutrition crop; it serves as an industrial crop due to its various derivatives, including starch, flour, ethanol, sorbitol, etc. Despite this versatility, a report from the Central Bank of Nigeria (CBN, 2019) reveals an annual spending of over 600 million USD on the importation of cassava derivatives, indicating an unmet local demand for cassava processing in Nigeria.

3.1 Cassava Seed Sub-Sector in Nigeria

The reliance on farmers' saved seeds is a common practice, directly impacting their productivity. Market imperfections contribute to the reduced productivity of cassava, hindering farmers' access to improved varieties. Government and donor agencies intermittently intervene by distributing planting materials, but this practice proves unsustainable in addressing the availability, accessibility, and affordability of pure, clean, true-to-type cassava seeds.

The distortion of the breeding pipeline has also affected farmers' access to high-quality cassava seeds. The National Root Crops Research Institute (NRCRI) has played a leading role in developing improved cassava varieties, but low funding hampers scaling these innovations to meet nutrition and industrial preferences. The National Agricultural Seed Council, responsible for regulating and ensuring quality control along the seed system, faces challenges in fulfilling its obligations (Wossen et al., 2020).

Recent developments have brought about a revolution in the cassava seed sub-sector in Nigeria. The Building An Economically Sustainable Integrated Cassava Seed System (BASICS) project, funded by the Bill and Melinda Gates Foundation, aims to formalize the cassava seed system. This project facilitates the establishment of Early Generation Seed Companies like Umudike Seeds and IITA GOSEED, contributing to the economic sustainability of cassava production.

3.2 Cassava Seed Value Chain Description and Analysis

Various actors in the cassava seed value chain play distinct function:

National Agricultural Research Institute
The National Root Crops Research Institute collaborates with partners to develop cassava varieties and utilizes cutting-edge technologies for rapid multiplication.

Seed Companies
Umudike Seeds, a spinoff company, depends on NRCRI and IITA for starter production materials. They ensure genetic purity and disease-free cassava seeds, with a focus on breeder seed production in the long run.

Cassava Seed Entrepreneurs (CSEs)
Categorized as Foundation Seed Producers (FSPs) and Certified Commercial Seed Producers (CSEs), they produce foundation and certified commercial seeds, respectively. The BASICS project established CSEs to enhance access to improved high-quality cassava seeds.

Processors
Processors require high-quality cassava roots for industrial processing. They integrate backward into their operational activities through in-grower and outgrower schemes, sourcing planting materials from Umudike Seeds and CSEs.

Smallholder Farmers
Farmers cultivating cassava for consumption or sale to processors, typically on less than 2 hectares of land.

Institutional Consumers
Public and private institutions involved in intervention projects, collaborating with research institutes, seed companies, and training farmers.

Supporters
Entities like Sahel Consulting and Nutrition support the processor-led model, influence the adoption of cutting-edge technologies for rapid multiplication, and conduct demand creation trials.

As the coordinator of the cassava seed value chain, the BASICS project provides value chain finance and collaborates closely with all actors.

The Catholic Relief Society (CRS) train and on-board Foundation Seed Producers in selected states in Nigeria to promote the BASICS model and ensure farmers have reliable access to improved, high quality cassava seeds.

Enabler
The National Agricultural Seed Council (NASC) promotes seed industry development, regulates seed activities, and provides legal backing for seed-related processes (NESG, 2020).

This collaborative approach ensures that all actors in the value chain derive maximum value, enhancing efficiency and traceability in the distribution of improved high-quality seeds to farmers.

Table 1: Stakeholder Matrix for Cassava Seed Value Chain

Functions	***Stakeholders***	***Source Material***	***Outcome***	***Technology***
Input Supplying/Breeding	NRCRI/IITA	Tissue Culture	Nucleus Seed	Tissue Culture Laboratory
Cassava Plantlet Production	NRCRI/IITA/Umudike Seeds	Nucleus Seed	Plantlets, Pencil Stem	Semi Autotrophic Hydroponics/Screen House
Primary/Breeder Seed Production	Umudike Seeds	Plantlets, Pencil Stem	Breeder Seeds	Field Production
Secondary/Foundation Seed Production	Umudike Seeds/FSPs	Breeder Seeds	Foundation Seeds	Field Production
Terrestrial/ Certified Seed Production	Umudike Seeds/CSEs	Foundation Seeds	Certified Commercial Seeds	Field Production

Consumption	Processors	Foundation Seeds/Certified Seeds	Cassava Root	Field Production
	Smallholder Farmers	Commercial Seeds	Cassava Root	Field Production
	Institutional Consumers	Foundation Seeds/Certified Seeds	Cassava Seed or Root	Field Production

Table 2: Stakeholder Matrix for Service Providers

Functions	***Stakeholders***	***Features***
Service Provision	BASICS Project	Cassava Seed value chain coordinator. The BASICS Project also provide value chain finance to the breeding institutions for development of improved cassava varieties and for the training and onboarding of Cassava Seed Entrepreneurs (CSEs)
Service Provision	Sahel Consulting	Support the processor-led model of the BASICS Project, conduct demand creation trial and training of the CSEs
Service Provision	Catholic Relief Services	Support in training and on-boarding of CSEs in selected states of operations, and facilitate access to improved high quality cassava seeds
Enabler	NASC	Regulating the cassava seed system

3.3. External Factors

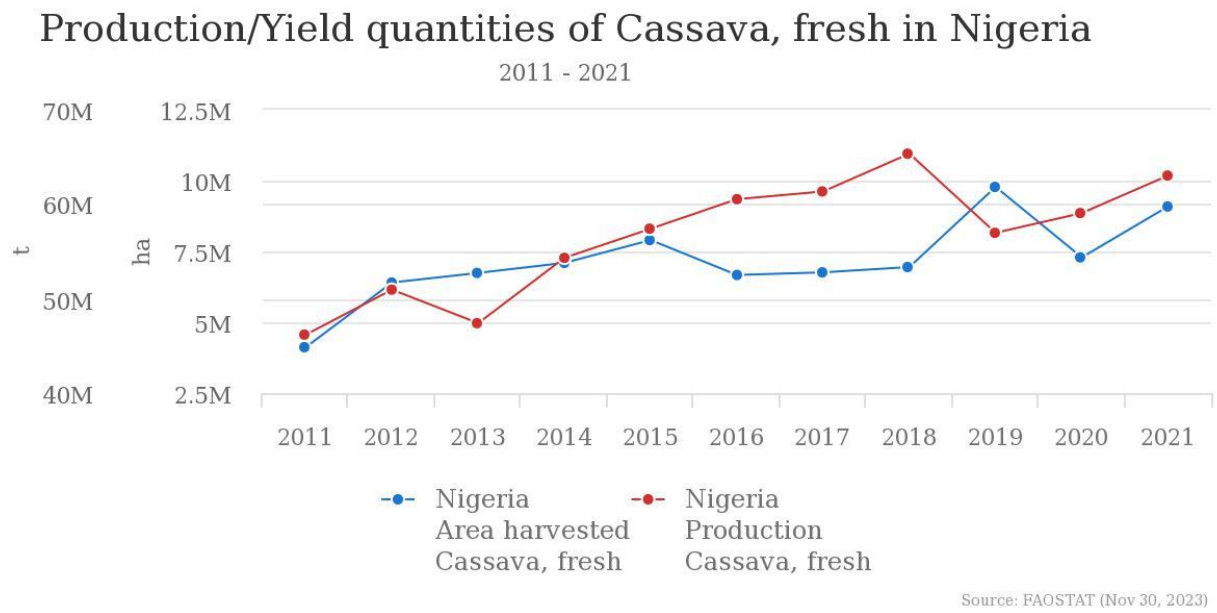
Despite cassava's prominence in Nigeria, external factors have significantly influenced the cassava value chain. The outbreak of COVID-19 in 2020 had a profound impact, especially considering the high demand for ethanol, a cassava derivative used in manufacturing alcohol-based hand sanitizers (PWC, 2020). The vulnerability of Nigeria's food systems to major shocks was further exposed by the Russia-Ukraine crisis (IFPRI, 2022).
Nigeria contributes approximately 20% of global cassava production, making it the largest producer of cassava and highlighting its substantial economic potential due to value addition compared to other crops (FAO, 2021). Despite these opportunities, challenges persist in the cassava sub-sector, particularly hindrances for farmers to access high-quality seeds.

External shocks also affected the operational activities of Umudike Seeds, particularly the rising cost of fuel, making the purchase of cassava seeds financially burdensome for farmers (Wossen et al., 2020). To address this challenge, Umudike Seeds implemented a full decentralization strategy, partnering with outgrowers and situating production in major cassava-growing regions. This decentralized approach reduced transportation costs for farmers. In 2023, similar measures were taken in training and onboarding Cassava Seed Entrepreneurs in various states to facilitate improved seed access.

3.4 Cassava Production in Nigeria

Although there is a continuous upward trend in land allocated for cassava production, productivity has witnessed a significant decline. Nigeria, being the largest global producer of cassava, produced over 63 million metric tons on 9 million hectares in 2021 (FAO, 2021). The paradox of increasing land allocation and decreasing productivity emphasizes the need for interventions and improvements in the cassava value chain to enhance overall efficiency and output.

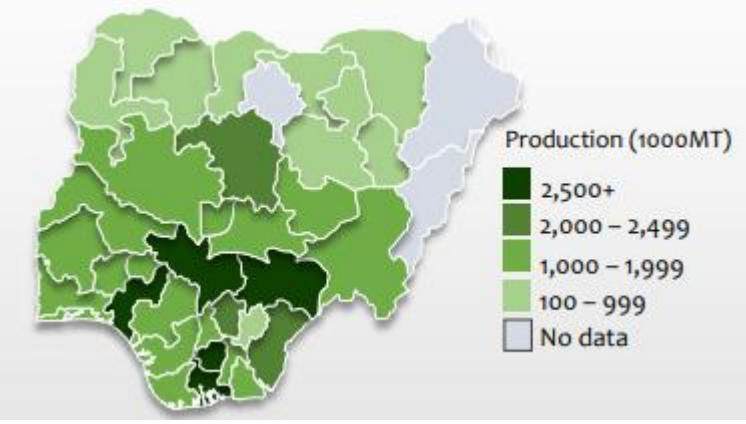
Figure 1: Production trends of cassava in Nigeria



Source: Faostat, 2021

Cassava is grown in all parts of Nigeria, but production thrives best in states in the rainforest and derived savannah areas. The largest cassava production is recorded in the North-Central, South-South, South-East and South-West regions of Nigeria (NAERLS, 2020).

Figure 2: Map of Nigeria Showing the Highest Producing States



Source: Sahel Consulting, 2021

The supply of cassava derivatives has fallen short of demand over the years. Despite demands for these products for industrial purposes, Nigeria has relied heavily on importation of cassava derivatives to meet local demands (PWC, 2020). The table below illustrates the supply-demand gap of the products, requirements to close the gap, and the potential economic value for meeting local and export demands of cassava derivatives in Nigeria.

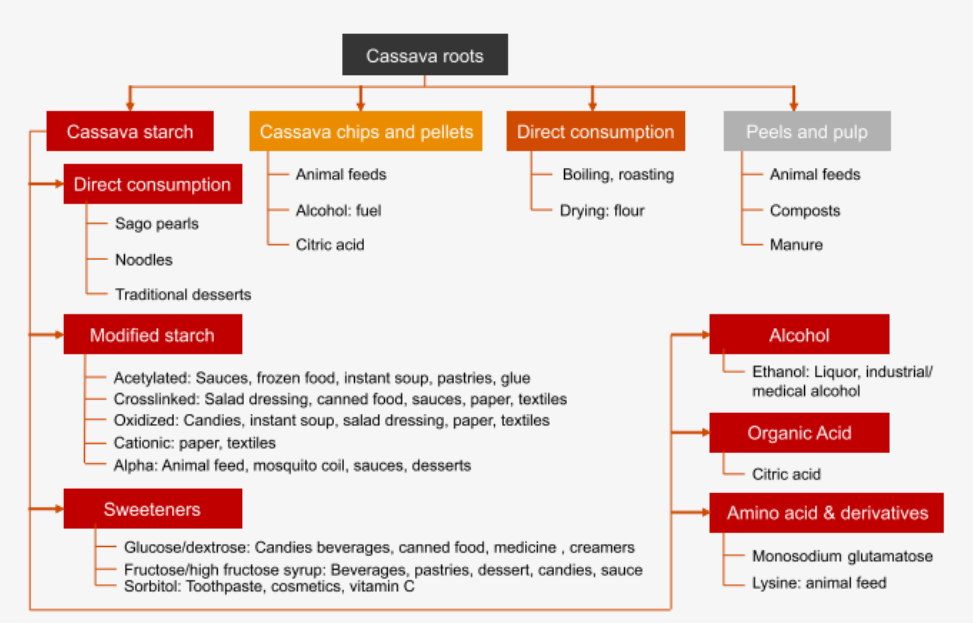
Table 3: PWC, Harnessing the Economic Potential of Cassava Production in Nigeria

Cassava Derivatives	*Potential Demand*	*Current Supply*	*Supply – Demand Gap*	*Fresh Root requirement to meet Estimated Demand (MT)*	*Acreage of land required (25tons/ha)*	*Potential Export Value*	*Potential value from meeting local Demands*
Starch	400,000 MT	Below 10,000 MT	390,000 MT	2,000,000	80,000	US $ 1.31 Billion	US $ 180 Million
HQCF	500,000 MT	Below 15,000 MT	485,000 MT	20,000	80,800	US $ 1.41 Billion	US $ 215 Million
Sugar Syrup	350,000 MT	-	-	1,750,000	70,000	US $ 7.52 Million	US $ 805,000
Dried Chips	1.5 MMT	-	-	5,600,000	224,000	US $ 68.7 Million	US $ 21 Million
Ethanol	Over 400 Million Liters	Near Zero	2.41 MMT	6,428,570	257,143	US $3.93 Million	US $ 2.89 Million
Garri/Fufu	2.8MMT	-		12,525,000	501,000	US $ 343,524	US $ 62,312
				28,323,570	**1,212,943**	**US $ 2.98 Billion**	**US $ 427.26 Million**

Source: PWC, 2020

Cassava and its byproducts hold enormous potential. This is reflected in the numerous cassava value additions and need in the industrial processing of cassava.

Figure 3: Cassava and cassava derivatives



Source: PWC, 2020

3.5. Case Study of Umudike Seeds and its Impact on the Cassava Seed Value Chain

Established in 2018 by NRCRI, Umudike Seeds aims to institutionalize a formal seed system for improved varieties of root and tuber crops in Nigeria, with a focus on producing and selling high-quality Early Generation Seed (EGS). The company initially concentrated on cassava Foundation seed sales, utilizing 100% of cassava Breeder seed for Foundation seed production in the first two years. From the third year onwards, Umudike Seeds expanded to sell cassava Breeder seed, aligning production with customer preferences and demand in focus States.

To actively promote the impact and profitability of improved seeds, Umudike Seeds employed a pull and push system, engaging with diverse customers, including Development Agencies, Government Ministries, Departments and Agencies, Medium-Large scale processors, and Certified Seed Entrepreneurs (CSEs). The company's core markets are the North-Central, South-East, and South-South regions. Besides seed sales, Umudike Seeds provides advisory services on good agronomic practices and farm setup to various customer categories.

Umudike Seeds adopts a value-based pricing model for seeds and advisory services, utilizing both screen-house and conventional methods in seed production. With projected production and sales volumes, the company handles its entire seed production activities on dedicated fields, overseen by field supervisors.

The company has established strong partnerships, with IITA GoSeeds being a key collaborator. A Memorandum of Collaboration was signed to foster synergies, information sharing, and cooperation in Breeder and Foundation seed sales. Governed by a dynamic Board of Directors, Umudike Seeds ensures credible and capable representation, including a reserved seat for an NRCRI representative.

Outgrower's Scheme

The out-grower scheme, a pivotal element of Umudike Seeds' business model, emerged to enhance the availability and accessibility of improved high-quality cassava seeds. Careful planning guides the selection of out-growers and locations. Under a contractual agreement with Umudike Seeds, out-growers have a buy-back clause at an agreed price. Supported with seeds, logistics, and training on responsible agricultural practices, out-growers take on the responsibilities of land preparation, labor, and field maintenance. Functioning as decentralized production points, out-growers facilitate easy accessibility and distribution of improved high-quality seeds by farmers. This scheme significantly contributes to Umudike Seeds' impact in strengthening the cassava seed value chain. Below Table 4 highlights Umudike Seeds' internal and external (out-growers) production from 2020-2023:

Table 4: Internal and External Production of Umudike Seeds

Year	*Production Capacity/Ha*	*South-East*	*South-South*	*North-Central*
2020	25 HA	20 HA	0	5 HA
2021	38 HA	33 HA	5 HA	0
2022	20 HA	10 HA	5 HA	5 HA
2023	31 HA	17 HA	14 HA	0

Source: Umudike Seeds, 2023

Cassava Seed Entrepreneurs (CSEs) in the BASICS II Framework

Under the facilitation of Building An Economically Sustainable Integrated Cassava Seed System (BASICS II), Umudike Seeds supported the establishment of Cassava Seed Entrepreneurs (CSEs) along the cassava seed value chain. This strategic move aimed to fortify the cassava seed system, enhance the integration of all value-chain actors, and reinforce the supply chain for the efficient distribution of high-quality improved seeds to the last-mile farmers.

Identifying and training cassava seed entrepreneurs across diverse regions in Nigeria was a key initiative. These entrepreneurs were equipped with the necessary skills to become effective seed producers. To maintain the required quality standards for seed production, the CSEs collaborated with the National Agricultural Seed Council, ensuring rigorous quality assurance and certification of their fields. Through the collaboration with cassava seed entrepreneurs, farmers gained reliable access to improved cassava varieties that were not only of high quality but also affordable within their local communities.

In 2023, the Foundation for Partnership Initiative in the Niger-Delta, in partnership with Umudike Seeds, expanded the BASICS II model to new geographies. This involved the on-boarding and training of farmers in three states in Nigeria, further extending the impact and reach of the initiative. The concerted efforts of BASICS II and Umudike Seeds in empowering CSEs contribute significantly to the resilience and sustainability of the cassava seed value chain.

Table 5: On-boarded and Trained CSEs by Umudike Seeds and NRCRI

	Year	***Number Trained***	***Male***	***Female***	***Ha Planted***
FSPs On-boarded	2020	14	7	7	100
CSEs On-boarded	2020	73	36	37	132
	2023	25	15	10	25

Source: Umudike Seeds

Table 6: Cassava seed cost and selling prices by formal and informal actors

Formal/Informal Market Actors	***Breeder Seed*** Cost Price/Bundle ₦	***Breeder Seed*** Selling Price/Bundle ₦	***Foundation Seed*** Cost Price/Bundle ₦	***Foundation Seed*** Selling Price/Bundle ₦	***Commercial Seed*** Cost Price/Bundle ₦	***Commercial Seed*** Selling Price/Bundle ₦	***Un-certified Seed*** Cost Price/Bundle ₦	***Un-certified Seed*** Selling Price/Bundle ₦
Umudike Seed/EGS Companies	850	1,500	770	1200	_	_	_	_
Foundation Producer	_	_	770	1200	_	_	_	_
Commercial Seed Producer	_	_	_	_	700	1000	_	_
Informal Actors	_	_	_		_	_	_	1,500

Source: Umudike Seeds

Umudike Seeds are promoting 11 best cassava varieties adopted by the BASICS II project in Nigeria. All varieties are high yielding with the best attributes.

Table 7: Profile of Best Cassava Varieties Promoted by Umudike Seeds

	Yield	***Dry Matter***	***Physiology***	***Maturity***	***Agroecology & Soil***	***Other Quality Features***
Ayaya (Beautiful)	35t/ha	40%	Erect growth habit	10 - 12 months	Sandy-loam	Purple petiole, Light brown stem, white root, drought tolerant, CMD tolerant, Multiple pest resistance excellent for flour and starch production, stable dry matter
Farmer's Pride	35 t/ha	39%	Erect plant type	10 - 12 months	Sandy-loam	Green purple petiole, light brown stem, white root, drought tolerant, CMD resistance, good garri quality, Good for starch and flour production, stable dry matter
Fine face	34t/ha	35%	Attractive umbrella shaped plant type good for weed control	10 - 12 months	Sandy-loam	Green purple petiole, silver green stem, white root, CMD resistance excellent for garri production
Sunshine	30t/ha	30%	Compact branch type	10 - 12 months	Sandy-loam	Purple green petiole, brown stem, yellow root, drought tolerant, multiple pest resistance, high carotenoid content, excellent for yellow garri and other bio-fortified food products
TME419	36 t/ha	40%	Erect, straight type excellent for mechanization	10 - 12 months	Suitable for all Nigeria ecology, Sandy-Loam	Green petiole, light brown stem, light/cream root,CMD resistance, low cyanide potential Good for starch, flour, garri, and fresh consumption
Dixon	35t/ha	35%	Erect plant type, excellent drought tolerance	10 - 12 months	Sandy-loam	Red petiole, silver-green stem, white root, CMD and CGM resistant drought telerant Good for garri production
Game Changer	38t/ha	44%	Compact branch type	10 - 12 months	Sandy-loam	Light brown stem, white root, thick peels preferred for Feed-meals, multiple pests and disease resistance excellent for starch and flour production, stable dry matter
Obasanjo-2	38.7 t/ha	40.7%; Starch 28.6%	Good umbrella plant types, greenish purple petiole, silver brown Stems. Morphology offers good weed control	10 - 12 months	Rain Forest and Southern Guinea Savanna, Loam and sandy loam	Resistant to cassava mosaic disease (CMD), cassava anthracnose disease (CAD), cassava mealybug (CM), cassava bacterial blight (CBB), cassava green mite (CGM). Variety has high starch, dry matter content and high fresh root yield and good for flour and starch production
Hope	40.1 t/ha	33.2%; Starch (24.3%)	Compact branching pattern	10 - 12 months	Rain Forest and Southern Guinea Savanna, Loam- Sandy-loam	Moderate dry matter, resistant to Cassava Mosaic Disease (CMD), cassava anthracnose disease (CAD), cassava mealybug (CM), cassava bacterial blight (CBB), and cassava green mite (CGM). Good for mechanization and has high fresh root yield. Excellent for gari and fufu production
Poundable	32t/ha	38%	Attractive umbrella	10 - 12 months	Sandy-loam	Dark brown stem, white root, moderate CMD resistance,

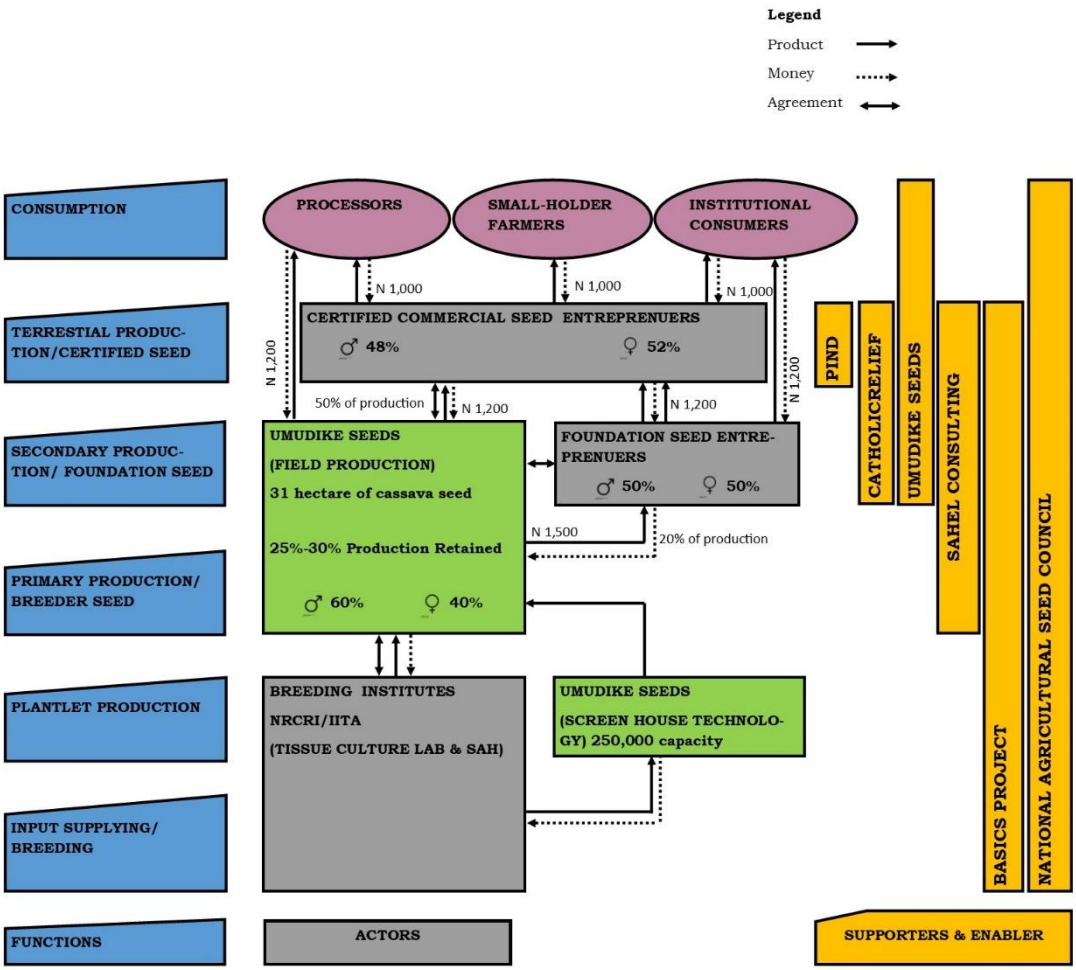
						low cyanide potential, highly poundable, best for fresh consumption, highly mealy
BABA-70	37.5 t/ha	38.5%; Starch (28.0%)	Compact plant type, light brown stem, and red petiole color	10 - 12 months	Rain Forest and Southern Guinea Savanna, Loam and sandy loam	High yielding and early bulking, good weed control, moderate dry matter content, resistant to Cassava Mosaic Disease (CMD), excellent for gari and fufu

Source: BASICS, Cassava Matters

CHAPTER 4

CASSAVA SEED VALUE CHAIN IN NIGERIA

Figure 4: Cassava Seed Value Chain



Actors in the cassava seed value chain are supported by a range of supporters who provide varying degree of support to chain actors. The input supplies come from the breeding institutions of NRCRI and IITA to the Early Generation Seed Companies. With technologies like the screen house, the EGS companies rapid multiple cassava plant-lets into breeder and foundation Seeds for distribution to the CSEs. The CSEs are responsible for last mile delivery of cassava seeds to the final consumers. The NASC is responsible for the overall regulation of the chain.

4.1. Value Share of Actors in the Cassava Seed Value Chain

The cassava seed business is profitable for farmers with value additions reflecting in increment in product pricing. It is difficult to calculate the value share of the actors in the cassava seed value chain because production output differ considerably among farmers and also the reduction of the selling price as the product moves along the chain. The unit of measurement of the cassava plant-lets differs from other products in the value stages, making aligning Umudike Seeds' costing to the other actors who buy and sell in bundles difficult.

A hundred bundles of cassava seed is required to plant a hectare of land with the planting spacing of 1m x 0.5m. The production output of the cassava seeds after 1st and 2nd ratooning is 400 and 600 bundles respectively, giving the farmers 1000% (1000 bundles) increase in their output. The scale in output drives down the cost of cassava seeds ensuring the affordability of the planting materials by the farmers.

Although factors like labor and input cost per location might affect the production cost, the reducing cost of the cassava seeds at each level in the chain affects the variable cost incurred per actor even though same production practices were carried out. The gross income differ per actor with Umudike Seeds getting the highest gross income of 650 Naira per bundle, followed by the Foundation Seeds Producers at 430 Naira per bundle and the lowest by the Certified Commercial Seed Producers at 300 Naira per bundle.

4.2. Relationship among Value Chain Actors and Chain Governance

Prior to the BASICS II project, relationships among value chain actors were informal and weak, leading to challenges such as a lack of research appropriability for farmers and the absence of seed companies and certified seed entrepreneurs for efficient seed delivery. The emergence of Umudike Seeds and the coordination by the BASICS project have strengthened integration and interaction among actors, fostering transparency. Umudike Seeds, as the chain lead, plays a pivotal role in building farmers' capabilities and demonstrating the profitability of becoming seed producers.

The integrated market governance approach exist in the cassava seed value chain. While the NASC provide the external environment regulatory framework, Umudike Seeds co-lead and co-coordinates with IITAGoSeed to ensure that their out-growers and seed producers adhere to quality standards and other regulatory requirements needed for a competitive value chain and quality assurance throughout the value chain. The major instrument in the value chain governance is the strong contractual agreements, a significant improvement from the previous lack of such agreements. These contracts define protocols for seed multiplication, management of seed producers, market linkage, and product off-taking.

4.3. Information Flow

Constant engagement among actors in the value chain has facilitated information sharing. Innovations from the Research Institute (NRCRI) are disseminated by Umudike Seeds through sensitization activities, radio jingles and training sessions to the farmers. There exists a sequential and overlapping process to information flow to farmers, often times this leads to collaborative activities among actors, supporters and enablers in providing information peculiar to the farmers from their perspective and mandate in the sub-sector. At varying degrees these farmers receive information through field demonstrations and trials on new seed production techniques, efficacy of using improved high-quality seeds, pest and disease detection and quality control methods, and agribusiness management.

4.4. Gender-Specific Constraints

The gender participation of men and women in cassava cultivation are relatively equal. Women mostly conduct the processing of cassava into garri and fufu. There exists some gender barriers to participation of women in the cassava seed value chain, for example women have limited access to land, credit and the use modern machinery in their production activities. Only women with the active support of the men in the family can access these production factors.

On the other hand, studies has shown that women are more likely to implement or practice new innovations when trained than their men counterpart. Supporting women in eliminating barriers to their participation is key to improving farmer's access to improved high quality seeds to farmer.

4.5. Quality Management

The qualities of the improved cassava varieties includes: high yielding varieties of up to 35 tons/ha, resistance or tolerance to pest and diseases, drought tolerance and other quality feature. Extensive analysis of the qualities of the improved cassava varieties can be seen above in *Table 7*.

Umudike Seeds follow strict quality control measures that are in compliance with National Agricultural Seed Council (NASC) regulations to ensure seed quality along the chain. The quality control measures include: periodic virus indexing, aseptic techniques/manipulation to minimize the risk of seed infection, restrictions on the number of visitors to the screen house, sterilization of the screen house regularly to prevent contamination and reintroducing plant-lets from the screen house production back to the culture for cleaning procedures and field inspection by NASC.

The BASICS II project introduced innovative solutions such as the Seed Tracker, a digital traceability tool accessible to all actors, enabling the tracking of planting material origins. Seed companies and producers are mandated to supply information on the Seed Tracker platform, including field Geo-coordinates.

The project also supported NASC in training and on-boarding Licensed Seed Inspectors (LSI), bringing seed certification closer to farmers. Additionally, the introduction of light-touch certification by NASC, with support from BASICS II, has expedited the seed certification process.

4.6. Sustainability Aspect of the Cassava Seed Value Chain in Nigeria

Table 8: Sustainability Profile of Cassava Seed Sub-Sector (3ps)

PEOPLE	• **Social Equity:** Most farmers still lack access to improved cassava seed. Ensuring fair and equitable access to improved cassava seeds for all farmers through establishment of more seed companies and certified seed entrepreneurs. • **Community Engagement:** The involvement of smallholder farmers in the decision-making processes in cassava seed production has addressed their needs, and brought their perspective into the breeding objectives. • **Farmers' Welfare:** Providing training, support will enhance farmer's livelihoods.
PLANET	• **Environmental Conservation:** Implementing sustainable agricultural practices in cassava seed production has minimized negative environmental impacts, such as soil degradation. Cassava stay green attributes even in the dry season help in carbon sequestration that contribute to ecosystem health and resilience. • **Biodiversity:** Cassava has helped promote the preservation of biodiversity. • **Climate Resilience:** Development of cassava seed varieties that are climate resilient have ensured farmers do not lose out on their investment while ensuring long-term viability of their business.
PROFIT	• **Economic Viability:** The commercialization of the cassava seed value chain have boosted the chain's sustainability thereby improving farmer's livelihood. • **Market Access:** The formal seed system promoted by the BASICS project have Facilitated access to markets for cassava seed producers, ensuring a fair and competitive environment that stimulates economic growth. • **Innovation and Efficiency:** Embracing technological advancements and efficient business practices have enhanced chain actor's productivity and profitability within the cassava seed sub-sector.

4.7. PESTEC Analysis

Table 9: PESTEC Analysis

POLITICAL	• Government policies and regulations on crop variety registration and release process is one of the lengthiest in Africa and is expensive. This is affecting timely release of varieties, seed production and distribution. • Support from governmental bodies in promoting cassava seed quality and availability. • Political instability in the country is impacting the overall business environment.
ECONOMIC	• Economic instability and its influence on investment in cassava seed production. • Currency exchange rates affecting production cost. • Economic disparities influencing affordability and demand for improved seeds.
SOCIAL	• Some farmers still hold on to obsolete cultural practices related to cassava cultivation. • Awareness and acceptance of improved cassava seed varieties among farmers. • Social attitudes toward sustainable and environmentally friendly farming practices.
TECHNOLOGICAL	• Advancements in agricultural technology impacting cassava seed production efficiency. • Integration of digital technologies for better seed traceability and quality control.
ENVIRONMENT	• Climate change effects on cassava cultivation and seed production. • Environmental regulations influencing sustainable seed production practices. • Biotic and abiotic factors affecting cassava seed quality and yield.
CULTURAL	• Traditional farming practices and their compatibility with improved cassava seed varieties. • Cultural perceptions of improved cassava varieties and their influence on seed adoption.

The PESTEC analysis tool was used to analyze the issue affecting the cassava seed value chain and helped in understanding the landscape of the seed system in Nigeria.

4.8. SWOT Analysis

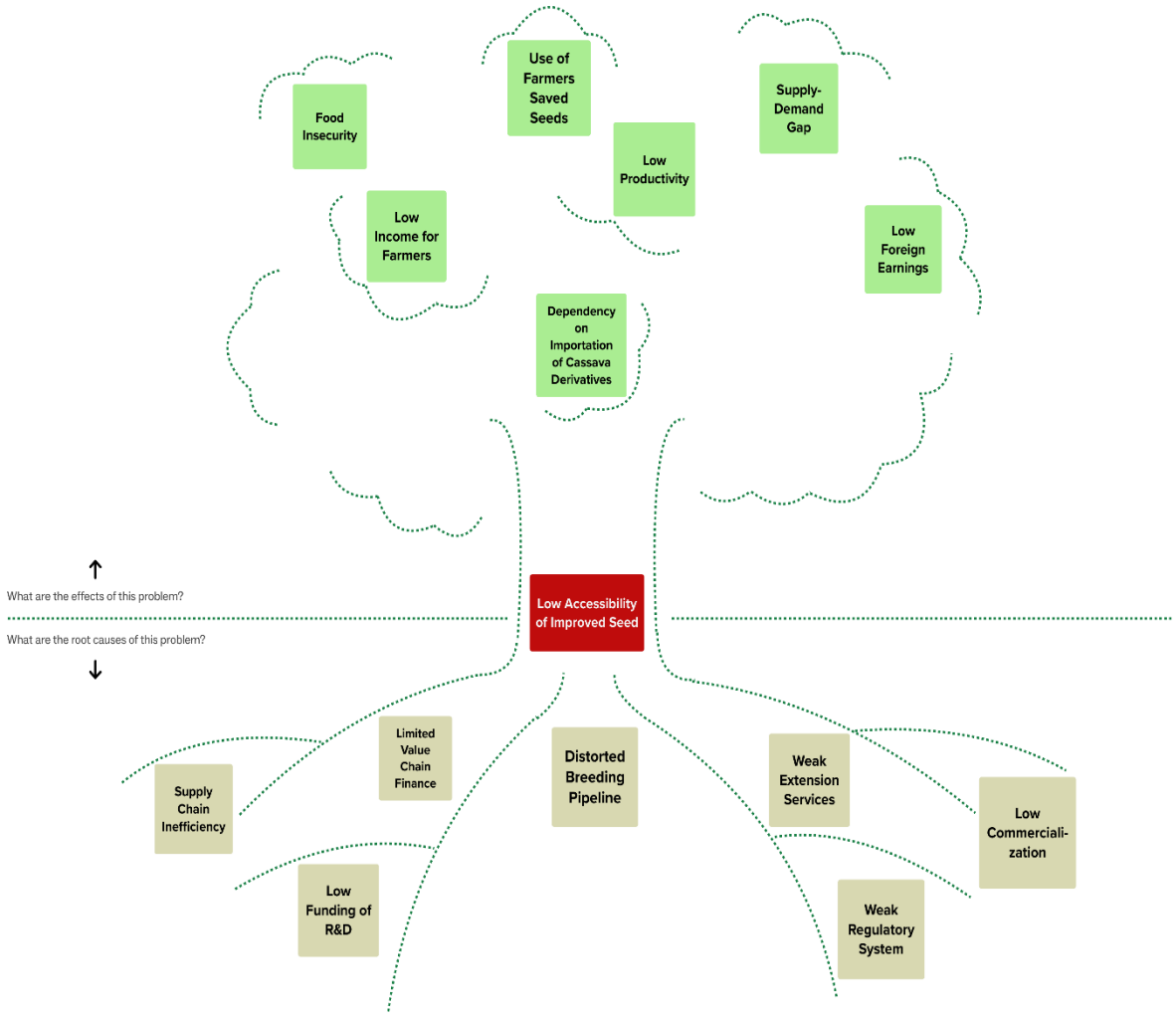
Table 10: SWOT Analysis

	FAVORABLE	UNFAVORABLE
INTERNAL	**Strengths**	**Weaknesses**
	1. Leverage on existing relationship with NRCRI and IITA to access EGS of yam	1. Limited production technology to scale production of EGS of cassava
	2. Leverage on our existing market to commercialize cassava seed	2. Unsteady supply of starter materials from NRCRI
	3. Collaboration with our existing and identify other scaling partners to improve accessibility of EGS of cassava and engage in market development activities in other geographies to expand markets	
	4. Build on existing relationship with NASC to ensure farmer's field are certified	
	5. Leverage on our active social media audience to promote and sell improved seeds of cassava	
	6. Ability to attract talents to support our cassava seed operations	
EXTERNAL	**Opportunities**	**Threats**
	1. Industrial purpose of cassava makes it an added incentive to produce	1. Lack of institutional policy to mitigate internal conflicts from its parent organization (NRCRI) might obstruct Umudike Seeds' production activities
	2. Deregulating the cassava sub-sector both national, regional and international will increase trade of cassava derivatives in Africa	2. Informality of the cassava seed system poses a significant challenge to accessibility of improved high quality seeds
	3. Proliferation of cassava processing industries will open market opportunities	3. Dis-empowerment of NASC to properly regulate the seed system will proliferate the activities of the open market and the use of farmer's saved seeds
	4. Alignment of various interventions in the cassava value chain will boost the resilience of the chain	4. Low productivity by farmers is a barriers to export of cassava derivatives and this poses threat to sustainability and profitability of the cassava value chain
		5. Low funding for R&D will impede scaling up of EGS production
		6. High cost of production input might impact on the affordability of cassava seed
		7. Supply Chain inefficiency

The SWOT analysis tool provided insights into the resilience level of the chain by analyzing the strength, weakness, opportunities and threats to the cassava seed value chain.

4.9. Problem Tree Analysis

Figure 5: Problem Tree Analysis



The problem tree analyses the issue inherent in the cassava seed value chain which is disrupting the supply-chain of improved cassava seeds. Some of the causes highlighted are: distortion of breeding pipeline, poor investment in the seed system, and weak regulatory system have contributed to farmer's inability to access high-quality cassava seeds. These underlying issues have resulted in food insecurity, low income and productivity per unit hectare, and use of farmers saved seeds, and high dependence on importation of cassava derivatives.

CHAPTER 5

CONCLUSION

Cassava holds significant importance as a staple food and nutrition crop in Nigeria, serving as a staple in households and a primary source of livelihood for farming communities. While Nigeria ranks as the world's largest producer of cassava, its global export market presence is not commensurate with this status, leaving domestic demands for cassava unmet. The substantial gap between supply and demand necessitates urgent measures to enhance farmer's productivity through access to improved cassava seeds.

The challenge of farmers' limited access to improved high-quality cassava seeds, even when available, can be traced to distortions in the seed access mechanism. Factors such as low commercialization of cassava seeds, inadequate funding for research and development, limited value chain finance, supply chain inefficiencies, and weak extension services collectively impede farmers' access to improved high-quality cassava seeds.

Recognizing that quality seeds are crucial inputs for enhancing cassava production and overall productivity, efforts to improve farmers' accessibility to improved high-quality seeds become paramount. The active involvement of Umudike Seeds and its partners in fostering a robust cassava seed value chain through initiatives like the BASICS II project is pivotal. This involvement ensures a consistent supply of improved seeds for farmers. The establishment of Cassava Seed Enterprises (CSEs) across the nation not only enhances access to improved high-quality cassava seeds but also generates employment opportunities and encourages youth participation in agribusiness. This collaborative effort is poised to positively impact both cassava production and the livelihoods of farming communities.

The following interventions will consolidate on the existing efforts of Umudike Seeds in improving farmers' accessibility to improved high quality seeds:

- **Scaling BASICS II Model:**
    - **Action:** Extend the BASICS II model to new geographical areas.
    - **Rationale:** Expanding the model to new regions will bring improved high-quality seeds closer to more farmers, enhancing accessibility.
- **Deepening Decentralization:**
    - **Action:** Strengthen efforts to decentralize seed production and distribution.
    - **Rationale:** Decentralization reduces transportation costs for farmers and ensures that seeds are more accessible, contributing to increased adoption.

By focusing on these interventions, Umudike Seeds and its partners can fortify their ongoing efforts, contributing to increased accessibility of improved seeds, productivity, improved livelihoods for farmers, and the overall development of a resilient cassava seed value chain in Nigeria.

REFERENCE

BASICS II. Retrieved from [https://cassavamatters.org/BASICS-II/].

Bentley, J., Olanrewaju, A., Madu, T., Olaosebikan, O., Abdoulaye, T., Wossen, T., Tokula, M. (2017). Cassava farmers' preferences for varieties and seed dissemination system in Nigeria: Gender and regional perspectives. P1.

Emefiele, G. I. (2019, November 21). Welcome Address at the Meeting With State Governors of Cassava Producing States and Signing of the Memorandum of Understanding Between: Nigeria Cassava Growers Association and Large Scale Cassava Processors.

FAO. (2021). Nigeria at a glance. Retrieved from [https://www.fao.org/faostat/en/#data/QCL/visualize].

GigaScience. (2022). The haplotype-resolved chromosome pairs of a heterozygous diploid African cassava cultivar reveal novel pan-genome and allele-specific transcriptome features. DOI: 10.1093/gigascience/giac028.

IITA. (2021, March 28). Nigeria releases five cassava varieties developed with genomics-assisted breeding and consumer preference studies. Submitted by Ismail Rabbi on: March 28, 2021. Reporting year: 2020.

IFPRI. (2022, June 9). Russia-Ukraine crisis presents threats to Nigeria's food security: Potential opportunities. Retrieved from [https://www.ifpri.org/blog/russia-ukraine-crisis-presents-threats-nigerias-food-security-potential-opportunities].

NAERLS. (2023). Agricultural Performance Survey of 2020 Wet Season in Nigeria. Retrieved from [https://naerls.gov.ng/reports/].

NESG. (2020). Fact Sheet: Understanding the National Agricultural Seed Council Act, 2019.

Onubuogu, G. C., Esiobu, N. S., Nwosu, C. S., & Okereke, C. N. (2014, June 12). Resource use efficiency of smallholder cassava farmers in Owerri Agricultural zone, Imo State, Nigeria. Department of Agricultural Economics, Extension and Rural Development, Imo State University, Owerri, Nigeria. P307.

PWC. (2020). Harnessing the Economic Potential of Cassava Production in Nigeria. Retrieved from [https://www.pwc.com/ng/en/publications/economic-potential-of-cassava-production-in-nigeria.html].

Sahel Consulting. (2021). Quarterly report, December 2021, volume 28.

Umudike Seeds. (2023). Component 2 BASICS II Monthly Report, January – September 2023.

Wossen, T., Spielman, D. J., Abdoulaye, T., & Kumar, P. L. (2020). The cassava seed system in Nigeria: Opportunities and challenges for policy and regulatory reform. International Institute of Tropical Agriculture (IITA), Nairobi, Kenya; International Food Policy Research Institute (IFPRI), Washington DC, USA; International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria. P1-3.

Wossen, T., Spielman, D. J., Abdoulaye, T., & Kumar, P. L. (2020). The cassava seed system in Nigeria: Opportunities and challenges for policy and regulatory reform. International Institute of Tropical Agriculture (IITA), Nairobi, Kenya; International Food Policy Research Institute (IFPRI), Washington DC, USA; International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria. P17.