FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

Investment Guide for Community-Based Seed Entrepreneurs in Millet Production

Esther Tolorunju, Feyisayo Ayeni, Ronke Adeniyi, Prakash K. Silwal, Olukayode Faleti, Bassey Archibong, Quadri Shakiru, Munir Ahmad, and Sini Luwa

USAID FROM THE AMERICAN PEOPLE
IITA Transforming African Agriculture
CGIAR
ICRISAT INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

www.iita.org

Investment Guide for Community-Based Seed Entrepreneurs in Millet Production

Esther Tolorunju, Feyisayo Ayeni,
Ronke Adeniyi, Prakash K. Silwal,
Olukayode Faleti, Bassey Archibong,
Quadri Shakiru, Munir Ahmad,
and Sini Luwa

October, 2023

Published by the International Institute of Tropical Agriculture (IITA), 2023

International address:
IITA, Grosvenor House,
125 High Street
Croydon CR0 9XP, UK

Headquarters:
PMB 5320, Oyo Road
Ibadan, Oyo State

ISBN 978-978-131-422-3

Printed in Nigeria by IITA

Citation: Esther Tolorunju, Feyisayo Ayeni, Ronke Adeniyi, Prakash K. Silwal, Olukayode Faleti, Bassey Archibong, Quadri Shakiru, Munir Ahmad, and Sini Luwa. 2023. Investment Guide for Community-Based Seed Entrepreneurs in Millet Production. International Institute of Tropical Agriculture (IITA). 38 pp.

Contents

Appendix

Tables

Foreword and Acknowledgements

This handbook is intended to guide seed farmers, entrepreneurs, agrodealers, extension workers, students of agriculture, and researchers on costs and returns analysis of millet seed production in northeast Nigeria.

The guide draws its lessons from the work and experience of IITA and partners in research for the development of seed systems in Nigeria. This publication is a production of the Feed the Future Nigeria Integrated Agriculture Activity implemented in targeted locations of Adamawa, Borno, Gombe, and Yobe states, Nigeria, between July 2019 and December 2024, and was made possible through funding support from the United States Agency for International Development (USAID).

As part of its contribution to the economic recovery process in northeast Nigeria, which has been ravaged by the insurgent activities of armed groups, USAID awarded to the International Institute of Tropical Agriculture (IITA) and its partners (International Crops Research Institute for the Semi-Arid Tropics and Catholic Relief Services) the five-and-a-half-year "Feed the Future Nigeria Integrated Agriculture Activity" which aims to advance the objectives of inclusive and sustainable agriculture-led economic growth; strengthened resilience among people and systems; and a well-nourished population, especially among women and children in targeted locations of Adamawa, Borno, Gombe and Yobe, Nigeria. The Activity seeks to support vulnerable populations to engage in basic farming activities that will improve food security, increase agricultural incomes, and improve resilience among smallholder farmers and their families. It works with a coalition of partners to facilitate improved agro-inputs and extension advisory services to serve vulnerable populations; strengthen the institutions that form the market system and the networks that serve smallholder

farmers who have been disenfranchised by conflict; and facilitate the engagement of youth and women in economic and entrepreneurial activities.

The team would like to thank the persons noted below and the facilitators in Adamawa, Borno, Gombe, and Yobe who were responsible for the successful pretesting of the investment guides with selected community-based seed producers and seed companies. In addition, the design and writing of the guides could not have been possible without input from the following individuals: Esther Tolorunju, Environmental and Economic Resource Centre, Feyisayo Ayeni, Environmental and Economic Resource Centre, Ronke Adeniyi, Environmental and Economic Resource Centre, Prakash Silwal, Feed the Future Nigeria, Integrated Agriculture Activity, Olukayode Faleti, Feed the Future Nigeria, Integrated Agriculture Activity, Bassey Archibong Feed the Future Nigeria, Integrated Agriculture Activity, Quadri Shakiru Feed the Future Nigeria, Integrated Agriculture Activity, Munir Ahmad, Feed the Future Nigeria, Integrated Agriculture Activity and Sini Luwa, Feed the Future Nigeria, Integrated Agriculture Activity.

The Activity would also like to recognize the support and guidance provided by the Management of IITA led by the Director General, Dr Simeon Ehui, Dr Alfred Dixon and others for their continued support of the Activity.

Finally, we thank Dr Ayoade Adetoye, Senior Agriculture Economist and the Activity's Agreement Officer Representative (AOR) and his other colleagues at USAID who have provided their active support in terms of providing technical guidance in making sure we follow USAID rules and regulations, and the documents are of quality.

Kenton Dashiell
Deputy Director General/Partnerships for Delivery/General Directorate
International Institute of Tropical Agriculture (iita.org) Headquarters & West Africa Hub. PMB 5320, Oyo Road, Ibadan 200001, Oyo State, Nigeria

Acronyms

AC:	Administrative Cost
CBSEs:	Community-Based Seed Entrepreneurs
GP:	Gross Profit
IITA:	International Institute of Tropical Agriculture
IAR:	Institute for Agricultural Research
MoU:	Memorandum of Understanding
NASC:	Nigeria Agricultural Seed Council
NP:	Net Profit
NIAA:	Nigeria Integrated Agriculture Activity
OC:	Operating Cost
PBD:	Profit before Depreciation
PBT:	Profit before Tax
TC:	Total Cost
TFC:	Total Fixed Cost
TR:	Total Revenue
TVC:	Total Variable Cost
USAID:	United States Agency for International Development

1

Introduction

Having access to improved and high-quality seeds is of the utmost importance in addressing low crop yields, food insecurity, hunger, malnutrition, and impoverishment, particularly in Nigeria's smallholder farming systems. To achieve this objective, the International Institute for Tropical Agriculture (IITA), through funding support from the United States Agency for International Development (USAID) under the Feed the Future Initiative of the United States Government, implements the Nigeria Integrated Agriculture Activity (NIAA). NIAA is a five-and-a-half-year Activity that focuses on improving access to quality and improved seeds in the millet value chain. The Activity facilitates access to quality and improved millet seeds through engagement with Community-Based Seed Entrepreneurs (CBSEs). The intervention has led to the establishment of over 2,250 CBSEs with high possibilities of emerging ones, leading to competitiveness in the seed markets.

This handbook is designed to offer some guidance on sound economic decisions to existing and upcoming CBSEs to enable them to compete favorably with other seed producers operating within the millet value chains in northeast Nigeria. The handbook focuses primarily on economic activities in seed production, processing, packaging, and sales. The objective is to present a clear understanding of the cost structure, risks, opportunities, and management decisions that could enhance increased productivity and income for CBSEs in the millet value chain. The overall goal is to stimulate investment in millet seed production by presenting information on investment cost implications, operating costs, return on investment, and the expected level of income per production.

The handbook presents detailed cost and returns analysis and brief information on the approach used to arrive at the estimation of the investment model and its usage, application, as well as its limitations, particularly due to changes in market prices at the time of its development. However, a soft copy of the investment model used for the handbook can be accessed online. The soft copy is designed to be updated to ensure its relevance irrespective of time and changes in market prices. The handbook is divided into sections to present clear information and a specific guide on each of the financial models. Details on how the electronic version was used to develop the handbook are presented under the model description.

It is important to note that this handbook is developed in relation to an earlier publication by IITA titled: Guide to Millet Production in Northern Nigeria. It is highly recommended that users first study the handbook to help them understand some of the basic assumptions made on the agronomic practices in this handbook.

Millet Seed Production

Millet, when we talk about resilience and versatility, is a cereal grain, which is a mainstay in Nigeria, especially considering the harsh weather conditions in northeastern Nigeria.

Millet, with its ability to thrive in a variety of agroecological zones and tolerate harsh climates, is essential for maintaining food security for millions of Nigerians. With its drought tolerance and short growing season, it has become a critical crop for smallholder farmers in Nigeria (Ajeigbe et al., 2020).

Millet feeds nearly 40 million people in northern Nigeria. It is critical to the nation's agricultural industry due to its high level of tolerance to stress settings such as severe drought, poor soils, and high temperatures, making it a huge relief to life in the Sahel (Rai & Kumar, 1994). Experts and stakeholders in agriculture have highlighted the need to explore further options in

the sector by boosting millet production as a key approach to not only solve hunger and malnutrition in the nation but also generate considerable cash in the global market.

The CBSE model allows local farmers to act as seed producers, making improved and quality seeds available to smallholder farmers within their local communities at affordable prices. IITA, through funding support from USAID, signed a memorandum of understanding (MoU) with the Nigeria Agricultural Seed Council (NASC) to promote the CBSE approach by ensuring validation and certification of CBSE activities in northeast Nigeria. The approach is growing in northeast Nigeria with the involvement of over 2,250 CBSEs.

However, given the high rate of youth participation in the seed industry and the country's rapidly changing climatic and economic conditions, it is critical to ensure that seed entrepreneurs are appropriately directed to engage in the company effectively and profitably. Furthermore, while a wealth of information on agronomic procedures for enhanced seed has been disseminated, there is no or inadequate economic advisory information available to help existing or future CBSEs make solid economic decisions that will ensure the success of their operations. To that end, the purpose of this handbook is to provide assistance to community-based seed entrepreneurs (CBSEs) on solid economic and management decisions required to ensure long-term investment in millet seed production.

Basic Agronomic Information

Pearl millet (*Pennisetum glaucum* L.R. Br.) varieties that are grown in northeast Nigeria include:

- 9702
- SOSAT-C88
- JIRANI
- SUPER SOSAT

However, for the purposes of this handbook, the focus will be on the agronomic qualities of SUPERSOSAT, a commonly grown variety in northeast Nigeria. LCICMV-3 (Supersosat), is high-yielding, downy mildew disease resistant, and has a sturdy stalk with a strong build and a yield potential of 5.0 t/ha. This variety was developed by ICRISAT-Niamey & LCRI, Maiduguri. It was released in 2011 and was registered the same year. This variety is often cultivated among CBSEs due to its high grain yield, resistance to downy mildew, and excellent flour quality (Ajeigbe et al., 2020)

It is recommended that planting should begin as soon as the rains begin. To avoid disease and pest infestations, it is best to sow early. Dry planting of pearl millet is practiced by farmers; this should be discouraged because early-season rains are generally erratic, and the seeds may die in the process of germination. When the soil is moist enough for the seed to germinate, farmers are encouraged to plant their seeds.

Planting can take place on either flatbeds or ridges. Interrow spacing of 75 cm is recommended, with an intrarow spacing of 50 cm. This can be reduced to 75 cm by 100 cm and 50 cm by 100 cm under very low fertility and dry conditions. Sow 5−8 high-quality seeds per hill. After a good rain, thin to two plants per stand.

Millet is grown in a range of agroecological zones in Nigeria, including the Sahel savanna, the Sudan savanna, and the Northern Guinea savanna. Each zone has millet varieties that are best suited to the local environment.

Cultivation

Farmers prepare their ground for seeding by plowing, harrowing, and leveling. Millet is well-known for its adaptability

to a wide range of soil conditions, from sandy to loamy. It provides a constant source of food, fodder, and revenue, especially in locations where rainfall patterns are unpredictable. Millet is an important component of the local cuisine because of its great nutritional value, which is strong in essential minerals and dietary fiber.

Millet is typically planted straight in the field. The planting period varies according to rainfall pattern; however, it usually occurs at the start of the rainy season.

To maximize millet production, proper weed control, fertilizer application, and pest management are required. Millet can be harvested 70−90 days after planting, depending on the type and growing circumstances. Harvesting the crop involves clipping the panicles, which are then threshed to extract the grains.

Table 1. Basic information on millet seed production

Plot Information	**Values**
Land length (meter)	100
Land breath (meter)	100
Interrow spacing (meter)	0.75
Intrarow spacing (meter)	0.5
Number of stands per hole	2
Average weight per bag	100
Land area (meter square)	10,000
Required planting space (area per stand)	0.38
Bags of millet seed per hectare (kg/ha)	20

2

Methodological approach

The handbook was developed based on consultations with CBSEs in millet production. A series of meetings were held with a total of 140 representatives of the existing seed producers of different production capacities to gain an understanding of their business operations, including the investment and operating costs. The sample size was estimated using a minimum sample size calculator covering about 90% of the population proportion of 2,250 CBSEs at a 95% confidence interval. The aim is to help arrive at a valid cost-benefit analysis to guide new or existing CBSEs. It was observed that the majority of the existing CBSEs operate as a group and share the cost of the fixed assets used for their production, such as tractors, planters, water sources, etc., especially the newly established ones, while a few CBSEs operate individually. As a result, the cost of production varies significantly due to the share of fixed assets costs. However, to ensure that a valid business model was developed irrespective of the mode of operation, a stakeholders' validation meeting was organized to review the business activity and validate each of the cost elements based on existing business operations and market prices.

Considering the variations that exist across CBSE business operations, including the scale of operations and management costs, a generic investment model was developed to accommodate this concern. As a result, the electronic version of the model is designed to be updated to suit the individual CBSEs' business scales, operations, and management

structure. To arrive at a standard investment guide, an average CBSE business structure and current market prices were used in designing the model. Thus, the estimation presented in this handbook represents standard CBSE business operations and the existing market prices at the time of production, precisely October 2023. It is important, however, to note that the model can be adjusted to either lower or higher CBSE business operations alongside the market prices. The rationale is to enable any existing or upcoming CBSEs to utilize the model irrespective of their scale of operations, locations, and market prices. Thus, the handbook presents brief information on the electronic version of the model that was used to guide CBSEs on how to adjust or update the handbook to meet their respective business operations. This, therefore, implies that figures used for estimation could be regarded as assumptions as the values may change due to several factors, including variation in capital assets, management structure, labour costs, market prices, frequency of sales, utility costs, etc. The discussion presented in the model is based on the final estimation as contained in each of the Tables.

The Model Description

The model is designed primarily with Microsoft Excel to facilitate ease of estimation and updating of the model. The Excel has a total of five worksheets, including the index, assumption sheet, depreciation, cost projection, and summary page. Each of the worksheets is named after a specific financial estimation. Of all the worksheets, only the assumption sheet is designed to be edited or updated to accommodate the variations that may exist across different CBSEs' business operations. All of the sheets are linked such that any adjustment made through the assumption sheet will reflect on the entire model. The assumption sheet has three main forms of cells, each having a different color code, as indicated below.

Table 2. Legend

Name	Color code	Explanations
Calculations		DO NOT CHANGE
Hardcoded assumptions		Can change
To be revalidated		Can change

The table shows how the electronic version could be updated. The **orange cells** in Excel indicate cells that should not be touched in order to prevent disrupting the model. The actual cells, on the other hand, are locked to avoid such disruptions. The statistics in the **blue cells** are based on average business operations and actual market pricing obtained directly from the CBSEs. However, the cells can be changed based on the current state of the business. Furthermore, the **yellow cells** represent figures that are assumed based on current events. This is also subject to change, dependent on the operations of specific businesses. However, it should be emphasized that the data presented in this handbook are an accurate representation of the current CBSE business in northeast Nigeria as of October 2023. Only the blue and yellow cells can be changed to represent the current business realities at any point in time.

3

Millet Production Cost Requirements

Each cost has been estimated on a per-hectare basis to harmonize the costs and business operations provided in this guidebook. This is done for easier extrapolation and scaling. As a result, the model and handbook summarize the cost implications per hectare per production cycle. It also depicts several production possibilities. The actual average yield of millet reported by seed entrepreneurs in northeast Nigeria is 1,800 kg per ha, compared to a potential yield of 2,500 kg per ha; our findings from the farmer's engagement indicated that various CBSEs possess varying capital assets. A number of factors impact the variation, including capital, production capacity, management strategies, and so on. According to the research, fundamental capital assets such as land, storage buildings, water supply, planters, harvesters, and basic agricultural equipment are necessary to conduct community-based production.

According to the investment model, a typical community-based millet seed producer will require an average capital of **₦585,440.**

The operative costs include the costs of labor (planting, weeding, spraying, harvesting, packaging, etc.), herbicides, packaging bags, and so on. On the other hand, the administrative costs include the cost of NASC inspection and certification, extension services, insurance, fuel costs, repairs, and phone calls. Again, these may vary depending on the aforementioned factors that influence the cost of investment/ production.

Table 3. Basic capital production cost for CBS business

S/N	***List of Items***	**Cost**	**% Share**
1	Land (rented yearly)	10,000	1.71
2	Tractor/Oxdrawn implement (rented yearly)	40,000	6.83
3	Building/store house	50,000	8.54
4	Vehicle (hired during harvesting)	10,000	1.70
5	Knapsack sprayer (hired)	5,000	0.85
6	***Total fixed cost***	115,000	19.64
7	**Total variable cost (**App. 1)	372,000	63.54
8	Procurement of foundation seed	4000	0.68
9	Administrative costs	94,440	16.13
10	***Total operating cost*** *(App. 1)*	466, 440	79.67
11	Total cost (line 6 + 8 + 10)	585,440	100.00

Note: To arrive at an actual cost project per specific business operation, it is advisable to make use of the e-version of the financial model. Refer to Appendix 1 for the Economics of production.

4

Costs and returns analysis

This table summarizes the costs and returns analysis per production cycle per hectare. Two (2) production scenarios were reported, as shown in Table 4. Scenario 1 represents the yield reported by farmers in northeast Nigeria, while Scenario 2 represents the potential yield reported by the IITA report. A net profit of ₦316,760 was attained from the sales of 18 bags reported by the farmers while a net profit of ₦666,060 will be generated if 25 bags of millet seeds were realized. This is the amount of revenue that a CBSE may reinvest in the business. A CBSE with the needed start-up capital of ₦585,440 will be able to increase production after the first production cycle.

Table 4. Cost and return analysis

Financial summary	Production Performance	
Description	Farmer's yield	Yield Potential
Bags of seeds sold per hectare (100-kg bags)	18	25
Sales of Certified seeds (Revenue)	900,000	1,250,000
Total Variable Costs (Appendix 1)	372,000	372,000
Cost of foundation Seeds	4,000	4,000
Gross Profit	528,000	878,000
Admin Expenses (Refer to Appendix 1)	94,440	94,440
Profit Before Depreciation	433,560	783,560
Shared Cost of Fixed Asset (Refer to Table 3)	115,000	115,000
Profit Before Tax	318,560	668,560
Tax (zero for startup)	1,800	2,500
Net Profit	316,760	666,060

5

Decision-making in seed production

Given that the average millet yield in northeast Nigeria is 1,800 kg/ha per hectare, it is strongly advised that a new CBSE begin with just one hectare and gradually increase production after achieving a respectable level of productivity. This will assist in decreasing the risk associated with investments while cutting the amount of cash required to get the firm started.

Furthermore, establishing the firm with the basic capital assets stated earlier is strongly advised, especially while managing a one-hectare farm. This is done to minimize an increase in depreciation charges, which would diminish net profit. Furthermore, increasing capital assets increases maintenance expenditures, which raises overall administrative costs.

Given that a community-based seed business can be established for an average of ₦585,440 it is recommended that a prospective CBSE engages in little or no loan services to kick-start the business, especially for beginners. To improve the chances of meeting the minimum acceptable yield of 1,800 kg/ha, it is recommended that the intending CBSE use an improved variety with high yield and early maturity. If there are insufficient funds, the CBSE may consider taking out a loan with a maximum payback duration of two years and a maximum interest rate of ten percent. With the increase in the number of new CBSEs, the existing and upcoming seed entrepreneurs should adopt strategic community engagement with farmers to boost demand and sales.

Demand market analysis

Currently, there is an increasing demand for millet seeds due to increased awareness of the importance of improved and quality seeds among the farming communities. The intervention from the donor communities through the IITA, developmental agencies, and nongovernmental organizations has widened the knowledge.

The area under cultivation in northeast Nigeria is about 243,000 hectares of arable land, and the active population of farmers in northeastern Nigeria is estimated to be between 3 and 5 million people (FAO, 2019). There are only 2,250 seed entrepreneurs who produce seeds that will be cultivated by these farmers. And not all 2,250 farmers are into millet seed production. Consumption of millet is also at an all-time high, according to global market research, the millet market will expand from $11.02 billion in 2023 to $13.80 billion by 2028, at a compound annual growth rate of 4.60 percent between 2023 and 2028 (Amuge, 2023). This is an indication that there is a big market for the sale of millet grain and fodder in Nigeria.

Channels of marketing

In northeastern Nigeria, CBSE has identified several marketing channels for seed sales, including seed companies, agro-dealers, direct engagement with farmers, open markets, and input fairs. The strategic community strategy, which entails direct involvement with farmers through extension agents, has shown to be the most effective market channel of all the market channels. Under this technique, CBSEs hire extension workers to connect with farmers and educate them about the quality of seeds, costs, location, and other issues, hence improving access to better quality seeds for smallholder farmers in their communities.

The participation of marketing agents is another component of the strategic community strategy. A CBSE must have marketing skills in order to generate effective demand. Agents may engage farmers at all levels, including mosques, churches, and the community level, in order to sensitize farmers and create demand. This strategy has been incredibly successful in creating demand for prominent agrodealers and CBSEs in northeast Nigeria.

Seed marketing factors

Planting, pricing, and increasing awareness of better and quality seeds among smallholder farmers all have an impact on the seed industry. While these variables are significant in boosting demand, logistics is still crucial in ensuring that smallholders have access to seeds.

CBSEs were expected not only to communicate with buyers but also to implement good market logistics in order to fulfill farmer demand. Sometimes, seed purchasers travel long distances, and reaching them might be difficult. This might be a significant difficulty. Working closely with farmers to arrange for a representative who is able to travel the distance to provide seeds to other farmers in the neighborhood is one of the established logistic solutions in responding to such demands. This technique is advised when the demand from such communities is insufficient to justify creating a sales location in such communities.

9

Opportunities in the millet market

There is an ever-increasing worldwide population that requires adequate and healthful food in the face of climatic emergencies and decreasing natural resources. Millets can contribute to the solution. These grains can withstand adverse weather conditions, providing answers to food crises. Millet may be a key food supply for people prone to food insecurity since they are typically the only crops that can be harvested during dry seasons (FAO, 2023).

10

Risk and risk management in the millet business

In the millet business, as with any agribusiness, there are inherent risks that potential investors should be aware of. These risks can impact the success and profitability of Millet farming and trade. Understanding and effectively managing these risks are essential to attain maximum profit at the minimum cost possible.

Millets crops are vulnerable to a range of pests and diseases. Contributing about 10−40% to loss in millet's yield. (Das, I.K., 2017). If not managed effectively, pest and disease outbreaks can result in substantial crop losses. Implementing timely and appropriate pest control strategies and utilizing disease-resistant millet varieties are essential for risk mitigation.

Millets prices are subject to fluctuations due to various factors. These may include variations in weather conditions, changes in supply and demand, and even speculative market behavior. These fluctuations contribute about 41% to loss in revenue while climate variation alone contributes about a 40% loss in yield. (Ogonma et al., 2015)

Also, managing the millet supply chain presents its own set of challenges. Issues related to transportation, storage, and logistics can lead to postharvest losses of about 30% of total yield (SUNT WIST., 2019), impacting both farmers and businesses. Addressing these supply chain risks is vital for ensuring the quality and availability of Millets in the market.

Seed farmers should ensure they meet the breakeven point in their production regardless of the risks encountered by not going below 1,800 kg/ha of millet-certified seeds.

Potential investors can adopt various risk management strategies to navigate these risks and create a sustainable and successful millet business by conducting thorough market analysis to understand demand trends, consumer preferences, and competitive dynamics. An in-depth understanding of the market can guide investors in making well-informed decisions.

Incorporating modern farming techniques and technology, such as precision agriculture and weather forecasting, can help predict and manage climate-related risks more effectively. Also, implementing robust pest and disease control measures, including crop rotation, integrated pest management, and the use of disease-resistant millet varieties, can reduce the threat of pest and disease outbreaks.

To resolve the issue of supply chain management, investing in appropriate storage facilities and transportation infrastructure is essential to minimize postharvest losses. Ensuring that millet reaches the market in optimal condition is crucial for profitability.

Above all, exploring partnerships with government agencies and nongovernmental organizations involved in agriculture and rural development, like IITA, FAO, USAID, etc., can provide valuable support and resources for risk management and sustainable growth.

Summary

If all of the necessary agronomic and economic criteria are followed, the community-based seed company can be viable. Regardless of variety, present or potential CBSEs must aim for the recommended output of at least 1,800 kg/ha. Start business operations on a single hectare of land, with basic capital assets to decrease risk and investment costs. Scale up after at least one successful production cycle and ensure at least two (2) production cycles per year by utilizing irrigation in order for optimum profit. Above all, efforts must be made to foster good relationships with customers in order to support sales demand.

References

Ajeigbe, H. A., Angarawai, I. I., Inuwa, A. H., Akinseye, F. M., &AbdulAzeez, T. (2020). Handbook on improved pearl millet production practices in northeastern Nigeria.

Amuge, O. (2023). *Africa Finance Corporation secures $300M loan facility from CEXIM to facilitate trade finance in Africa*. Businessamlive. https://www.businessamlive.com/revamping-millet- production-to-unlock-nigerias-potential-in-11bn-millet- market/

Das, I.K (2017). Millet Diseases: Current Status and their management in J.V Patil (Ed), Millets and Sorghum. Biology and Genetic Improvement (pp 291-322). John Wiley & Sons Ltd. https://doi.org/10.1002978111913076 5CH11.

FAO. (2019). Northeast Nigeria Rapid Gender Analysis in Livestock, Fisheries and Apiculture of Affected Population in Borno, Adamawa and Yobe states.ReliefWeb.https://digitalarchive.worldfishcenter.org/handle/20.

Ogonma et al. (2015): Impact of climate variability on the yield of staple grain.

Rai, K.N. & Murty, D.S. & Andrews, D.J. & Bramel, Paula. (1999). Genetic enhancement of pearl millet and millet for the semi-arid tropics of Asia and Africa. Genome. 42. 617–628. 10.1139/gen-42-4-617.

SEED, P. (2023). Pearl Millet (*Pennisetum glaucum*) - NigerianSeed Portal Initiativehttps://www.seedportal.org.ng/variety.php?cropid=8&task=viewPearl millet(Accessed, September 28, 2023).

Appendix – I

Table 5. Economics of production

Labor cost	**Unit cost (₦)**	**Qty (Ha/L/ kg)**	**Freq**	**Total cost**
Land clearing	30,000	1	1	30,000
Land preparation (incorporated into Ox drawn implement)	0	1	1	0
Planting	25,000	1	1	25,000
Weeding	40,000	1	2	80,000
Spraying	400	10	1	4,000
Harvesting/Loading	23,000	1	1	23,000
Threshing	24,000	1	1	24,000
Drivers	0	0	0	0
Non-selective herbicides	4,500	4	1	18,000
Fertilizer NPK 15:15:15	25,000	4	1	100,000
Urea	25,000	2	1	50,000
Seed sorter	5,000	1	2	10,000
Packaging bags (100 kg only)	400	20	1	8,000
Total Variable Cost				**372,000**
Administrative costs	Unit Cost	Quantity	Freq	Total Cost
Documentation and Advisory services	3,000	1	1	3,000
NASC Inspection and Certification	30,000	1	1	30,000
Service providers (F/Mapping)	5,000	1	1	5000
Extension Services	10,000	1	1	10000
Electricity	5000	1	3	15,000
Insurance (2% of Variable Cost)	7,440	1	1	7,440
Water (for spraying of chemicals etc.) (100 per paint bucket)	100	10	3	3,000
Phone Calls	1,000	7	3	21,000
Total Administrative Cost				**94,440**
Total Operating Cost				**466,440**

Appendix – II

Explanation of the cost and returns analysis method

This section explains the cost analysis, i.e., the values of the input used in production, and the returns analysis, i.e., the yields realized in production per hectare. How they are estimated is shown in the table in Appendix II.

1. The Total Fixed Cost (TFC) is the total cost of all physical assets like buildings, land, tractor, rent, etc.; sum up all your fixed assets to get the TFC.

2. The Total Variable Cost (TVC): These are expenses incurred on variable inputs like labor cost, seed procurement, cost of fertilizer, seed preparation, and other operating costs. Sum all these costs to get your TVC.

3. Administrative Cost (AC): These are costs incurred by the farmer to support the functioning of his farm that are not directly related to the production of millet. It is also known as utility cost. Add all utility costs, like the cost of maintenance or repair of the tractor, water supply, payment of security personnel, telephone communication, etc., together to get (AC).

4. Total Cost (TC): This is the actual cost that must be incurred to produce your Millet yield. This can be calculated by adding Total Fixed Cost (TFC), Total Variable Cost (TVC), and Administrative Cost (AC).

5. Operating Cost (OC): All expenses the farmer incurs in his day-to-day farm operations during the production cycle are operating costs. Add TVC as explained in (2) and AC as explained in (3) to get OC.

6. Total Revenue (TR): This is the total money the farmer generates from the sales of his millet. Multiply the price of 1 kg of millet with the total yield realized on the farm (e.g., 2,500 kg/ha) to get the TR.

7. Gross Profit (GP): This is the profit the farmer realizes after deducting all operating costs from his Total Revenue, i.e., TR- OC.

8. Profit before Depreciation (PBD): This is the farmer's profit before deducting depreciation of assets, i.e., Gross profit – Administrative Cost.

9. Profit before Tax (PBT): This is the farmer's profit before deducting Tax. i.e., Profit before Depreciation – Total Fixed Cost.

10. Net Profit (NP): This is the real or actual profit the farmer earned after deducting all operating, interest, and tax expenses during that particular production cycle, i.e., Profit before Tax – Tax.

Appendix – III

Table 6. Cost and Returns Analysis Method

N	Production Cost	Formula
	Total Fixed Cost (TFC)	Add the cost of all fixed assets together, e.g., Land + Tractor cost.
2	Total Variable Cost (TVC)	Add all the labor costs and other operating costs together
3	Administrative cost (AC)	Sum up all costs of utilities, e.g., maintenance cost.
4	Total Cost (TC)	TFC + TVC + AC
5	Operating Cost (OC)	TVC + AC
6	Total Revenue (TR)	Unit price of 1 kg of millet × Total yield (1000 x 2800 kg)
7	Gross Profit (GP)	TR – OC
8	Profit before Depreciation (PBD)	GP – AC
9	Profit before Tax (PBT)	PBD – TFC
10	Net Profit (NP)	PBT – Tax

Appendix IV

Table 7. Farm Production Record Guide

1. Machinery and Equipment Record

	Date	Types of Operation	Machinery or Equipment Used	Total Area Covered	Cost of Services
1.	25/06/2023	Planting	Tractor	1	N40,000
2.	20/09/2023	Harvesting	Harvester	hectare	N20,000
				1	
				hectare	

2. Labor Record

Date	Number of hired labor	Number of family labor	Total No. of labor used	Wage rate	Total cost of hired labor
25/06/2023	3	1	4	N5000	N20,000
28/06/2023	0	2	2	/person	N10,000
				N5000/	N30,000
				person	

3. Sales Record

S/N	Date	Quantity Sold	Price per unit	Total Sales (Quantity sold × Price per unit)	Quantity given out as a gift.
1.	20/09/2023	10 kg 30 kg	N750	N7,500 N22,500	1 kg 0
2.	21/09/2023				

Millet model

Title:	**Investment Guide For Community-Based Seed Producers**
Filename:	**Millet Production**
Date created:	**27/10/2023**

Legend

Name	Colour code	Explanations
Calculations		DO NOT CHANGE
Hardcoded assumptions		Can change
To be revalidated		Can change

Sheet	Explanation
Index	*Table of contents and legend*
Assumptions	*Key input assumptions*
Cost projections	*Details of costs elements*
Financial Summary	*Summary of key financial items*

Key	
Estimated Areas (No need to touch)	
Input Areas (Areas to update)	
Estimated cells (no need to touch)	

	Basic Information	**Response**
A)	Crop Name	Millet
	Production Cycle (Months)	3 Months
	Number of Cycle grown in a Year	1
	Number of Varieties Grown	1
	Names of the Commonly Grown Variety	Supersosat
	Differences in Varietal Yield (Yes/No)	Yes
	Name of the Variety Used for the Investment Model	Supersosat

	GENERAL ASSUMPTIONS	Values
B)	**Plot Information**	
	Land Length (meter)	*100*
	Land Breath (meter)	*100*
	Inter-row Spacing (meter)	*0.75*
	Intra-row Spacing (meter)	*0.5*
	Number of Stands Per Hole	*2*
	Average Weight Per Bag	*100*
	Bags of Millet Seed Per (Kg/Ha)	*20*
	Land Area (meter square)	*10,000*
	Required Planting Space (Area Per Stand)	*0.38*
	Average Seed Hole Per Land Aread	*26,667*
	Average Number of Millet Stands Per Land Area	*53,333.33*

C)	FIXED ASSET (Shared Cost)	Unit Cost	Quantity	Total Cost
	Land (The land was rented on a yearly basis)	10,000	1	10,000
	Tractor/ Ox drawn implement (rented per year)	40,000	1	40,000
	Building/Store House (Rent)	50,000	1	50,000
	Vehicle (Hire during Harvesting) Pick up	10,000	1	10,000
	Knapsack Sprayer (Hired) #1000/ day	1,000	5	5,000
	Total	111,000		***115,000***

D)	Labour Cost Per Production Per Hecatare Per Cycle	Unit Cost	Quantity	Frequency	Total Cost
	Land Clearing	30,000	1	1	30000
	Land Preparation (Incorporated into Ox drawn Implement)	0	0	0	0
	Planting	25,000	1	1	25,000
	Weeding	40,000	1	2	80,000
	Spraying (if different from weeding)	400	10	1	4,000
	Harvesting / Loading	23,000	1	1	23,000
	Threshing	24,000	1	1	24,000
	Total				**186,000**

E)	Procurement of Foundation Seeds (4Kg)	1,000	4	1	4,000

F)	Other Operating Costs	Unit Cost	Quantity	Frequency	Total Cost
	Non-selective Herbicides	4,500	4	1	18,000
	Fertilizer NPK 15:15:15	25,000	4	1	100,000
	Urea	25,000	2	1	50,000
	Seed Preparation / Sorters	5,000	1	2	10,000
	Packaging Bags (100kg only)	400	20	1	8,000
	Total				**186,000**

G)	Utilities (Per Hectare Per Cycle)	Unit Cost	Quantity	Frequency	Total Cost
	Documentation and Advisory services	3000	1	1	3000
	NASC Inspection and Certification	30,000	1	1	30000
	Service providers (F/Mapping)	5,000	1	1	5000
	Extension Services	10,000	1	1	10000
	Electricity	5,000	1	3	15000
	Insurance (2% of Variable Cost)	7,440	1	1	7440
	Water (for spraying of chemicals etc.) (100/paint bucket)	100	10	3	3000
	Phone Calls(#1000 per staff)	1,000	7	3	21000
	Total				**94,440**

			Expected Yield	
H)	**Market Information (average price/bag = N50,000)**	**Unit Price/ bag**	**farmer's yield**	**Yield potential**
	Price of Certified Seeds (100 kg bag) only Price of Certified Seeds per kg = **N**500	50,000	18	25
	Total Sales		900,000	1,250,000
I)	**Tax Information (Exempted) But its #100/ bag**	100	1800	2500

Cost Project	Per Production Cycle
Fixed Costs	
Land (The land was rented on a yearly basis)	10,000
Tractor/ Ox drawn implement (rented per year)	40,000
Building/Store House (Rent)	50,000
Vehicle (Hire during Harvesting) Pick up	10,000
Knapsack Sprayer (Hired) #1000/ day	5,000
Total	**115,000**
Variable Cost	
Labour Cost Per Production Per Hecatare Per Cycle	186,000
Other Operating Costs	186,000
Total Variable Cost	**372,000**
Procurement of Foundation Seeds (4Kg)	**4,000**
Administrative Costs	
Utilities (Per Hectare Per Cycle)	**94,440**
Total Operating Cost	**466,440**
Total Cost	**585,440**

FINANACIAL SUMMARY	Production Performance	
Description	Farmer's yield	Yield Potential
Average Yield Per Hectare(100Kg bags)	18	25
Operating Costs	372,000	372,000
Total Revenue	900,000	1,250,000
Procurement of Foundational Seeds	4,000	4,000
Gross profit	528,000	878,000
Admin Expenses	94,440	94,440
Profit Before Depreciation	433,560	783,560
Shared Cost of Fixed Asset	115,000	115,000
Profit Before Tax	318,560	668,560
Tax (zero for start up businesses)	1,800	2,500
Net Profit from Production	316,760	666,060

Who we are

IITA is the lead research partner facilitating agricultural solutions for hunger and poverty in the tropics. It is a member of the CGIAR Consortium, a global research partnership that unites organizations engaged in research for sustainable development for a food-secure future.