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

Investment Guide for Community-Based Seed Entrepreneurs in Rice 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 Rice 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 978-978-131-418-6

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 Rice Production. International Institute of Tropical Agriculture (IITA). 41 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 Rice 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 the insurgent activities of armed groups have ravaged, USAID awarded 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 states, northeast 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; strengthens the institutions that form the market system and the networks that serve smallholder farmers who have been disenfranchised by conflict; and facilitates 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, Kayode 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 to 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

Introduction

Access to improved and quality seed plays a vital role in addressing low agricultural productivity, food insecurity, malnutrition, hunger, and poverty, especially within the context of smallholder farming systems in Nigeria. 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 5-year Activity that focuses on improving access to quality and improved seeds in the Rice value chain. The Activity facilitates access to quality and improved rice 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 rice 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 Rice value chain. The overall goal is to stimulate investment in rice 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, its usage, and 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 e-version 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 Rice 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.

Rice Seed Production

Rice (*Oriza sativa* L.) is the most economically important food crop in many developing countries and has also become a major crop in many developed countries where its consumption has increased considerably (Ajala & Gana, 2015). It is a staple food crop for over half of the world's population and the most important among all cereal crops (Mabrouk & Haoying, 2023). Rice is one of the major cereals widely grown for food in Nigeria as it is grown in paddies or on upland fields, depending on the requirements of the particular variety. Also, it is an important

crop that plays a significant role in sustaining national food security as well as the creation of employment and income in Nigeria. The crop is grown by farmers in a wide range of production ecologies all over the country.

Despite the considerable potential for rice production expansion in all the production ecologies, the rice sector has not been able to satisfy the demand of rice consumers. The demand for rice has been increasing more rapidly in Nigeria compared to other West African countries. Since the 1970s, rice has increasingly become a major staple food for the Nigerian household in both urban and suburban areas of the country. The rapid increase in rice demand is largely due to rapid population growth, increased urbanization,s and people's preference for rice as a convenient food.

Nigeria still has a large and serious deficit in rice production despite significant improvement in domestic production in recent years. The shortfall is due to a number of factors, including continuing population growth, low agronomic productivity, high cost of inputs, climate change, and various political and other conflicts. Presently, the population in Nigeria consumes between 7.3 and 7.5 million tons of rice annually, while Nigeria farmers are producing about 4–5 million tons per annum, leaving a gap of 2.9–3.5 million tons to be filled by imports of domestic production.

One of the feasible and sustainable ways to address the gap is to promote the adoption of the community-based seed entrepreneur (CBSE) model in the Nigerian seed sector. The CBSE model allows local farmers to act as seed producers, making improved and quality seeds available to smallholder farmers within their local communities and 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 the CBSE

activities in northeast Nigeria. The approach is growing in northeast Nigeria with the involvement of over 2,250 CBSEs.

However, considering the rate of engagement of youth in the seed business alongside the rapid change in weather and economic situations in the country, there is need to ensure that seed entrepreneurs are properly guided to effectively and successfully engage in the business. In addition, while a series of information has been published on agronomic practices on improved seed, there is no or limited information on economic guidance to enable existing or new CBSEs to make sound economic decisions to ensure the success of their operations. To this end, this handbook intends to offer guidance to community-based seed entrepreneurs (CBSEs) on sound economic and management decisions necessary to ensure sustainable investment in rice seed production.

The major rice-producing states in northern Nigeria are Borno, Kano, Kebbi, and Kaduna. Most farmers in the North rely on traditional technology and does not have access to improved seedlings which in turn affects output of rice.

Basic Agronomic Information

Different rice varieties come with varying agronomic requirements. The following varieties are the high-yielding varieties in Nigeria:

- FARO 60
- FARO 61
- FARO 62

However, for the purpose of this handbook development, attention will be focused on the variety commonly grown in the North due to its high yield and it is the FAR0 44 variety.

The variety has a production cycle of four (4) months from planting period to harvesting as seeds. This implies that the variety can only be grown at least twice a year. The recommended planting space for Lowland rice is a spacing of 20 cm or 30 cm apart. For transplanting method, transplant seedlings at a rate of 2−3 seedlings per hill, to a depth of 3−4 cm, and at a spacing of 30 × 30 cm (best suited for late-maturing cultivars), or 20 × 20 cm when soil is fertile or sufficient fertilizer is available and provides 6.3–8.0 tons/ hectare. And for the upland rice, 5–6 seeds at a spacing of 20 × 20 cm or 30 × 30 cm and later thin to 3–4 seedlings per stand at 2 to 3 weeks after sowing and this result to 4.0 – 6.0 tons/hectare. This gives an estimated seed harvested per hectare during the rainy season to be 1.8 tons/hectare and the estimated seeds harvested per hectare during the dry season be 2.75 tons/hectare.

Table 1. Basic information on rice seed production

General assumptions	Values
Land length (meter)	100
Land breadth (meter)	100
Interrow spacing (meter)	0.30
Intra-ow spacing (meter)	0.30
Number of stands per hole	3
Average weight per bag	50
Land area (meter square)	10,000
Required planting space (area per stand)	0.09
Bags of rice seed per hectare (kg/ha)	70/50

2

Methodological approach

The handbook was developed based on consultations with CBSEs in rice 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 CBSE 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, labor 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 seed entrepreneur business operations. All of the sheets are linked such that any adjustment made through the assumption sheet will reflect on the entire model. The

Table 2. Legend

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

assumption sheet has three main forms of cells, each having a different color code, as indicated below.

The table provides a guide to how the electronic version could be updated. The **orange cells** indicate cells in the Excel that should not be touched to avoid disruption in the model. To prevent the possibility of having such disruptions, the real cells are, however, locked. The **blue cells** contain figures based on the average business operation and actual market prices as elicited directly from the CBSEs. The cells, however, can be revised based on individual business status. Also, the **yellow cells** represent figures that are assumed based on the current happenings. This is also subject to change based on individual business operations. It should be noted, however, that the figures used in this handbook are a true reflection of the current CBSE business in northeast Nigeria as of October 2023. To adjust the handbook to reflect the current business reality at any point in time, only the blue and the yellow cells should be adjusted.

3

Rice seed production cost requirements

To standardize the cost and business operation reported in this handbook, each cost is estimated on a per-hectare basis. This is to allow for ease of extrapolations and scaling. Hence, the model/handbook presents a summary of the cost implications per hectare, per production cycle. It also presents different production scenarios. Scenario I represents the average yield of rice per hectare in northeast Nigeria in the rainy season, and this is 70 bags of 50 kg per hectare, while Scenario II represents the yield of rice in the dry season, which is 50 bags of 50 kg per hectare. It is in line with the average ton per hectare for rice yield being 3.0 t/ha by the International Production Assessment Division (Bin Rahman & Zhang, 2023).

Observations from the interaction held with farmers revealed that different capital items are owned by different CBSEs. The variation is influenced by a number of factors, including capital, production capacity, management practices, and so on. From the analysis, basic capital assets are required to operate a community-based production and these include land, storage house, water source, planters, harvesters, and basic farm implements.

From the investment model, an average capital of ₦1,031,970 will be required to establish a standard community-based rice seed business. Based on the model, the average cost requirement is presented in Table 3. The highest share of the

capital is largely dominated by the operating costs covering a total of 65.26 percent, followed by fixed costs, which cover 16.96 percent, while the administrative costs cover 13.42 percent of the total capital requirement.

The figures are average market values in northeast Nigeria as of October 2023. 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.

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, repairs, and phone calls. Again, these may vary depending on the aforementioned factors that influence the cost of investment/production.

Table 3. Basic capital and production cost for CBS business

N	List of items	Cost (~~₦~~)	% Share
1	Land (rented) 1 ha	20,000	1.93
2	Building/storehouse (rented)	50,000	4.84
3	Tractor (hired)	30,000	2.91
4	Vehicle (hired)	20,000	1.93
5	Water pump (purchased)	45,000	4.36
6	Boom sprayer (rented)	10,00	0.97
7	*Subtotal*	*175,000*	*16.96*
8	Total variable cost (Appendix 1)	673,500	65.26
9	Procurement of foundation seed	45,000	4.36
10	Administrative Expenses (App. 1)	138,470	13.42
11	*Subtotal*	*811,970*	78.68
12	Total Cost (Line 7 + 10)	*1,031,970*	*100.00*

4

Costs and returns analysis

Table 4 presents the summary of the costs and returns analysis per production cycle per hectare. As earlier reported, two (2) production scenarios were estimated to indicate possible income that could be generated if a CBSE is able to increase productivity. Scenario 1 represents yield in the rainy season while the second scenario represents yield in the dry season. From the first scenario, a CBSE is liable to generate a gross profit of ₦1,076,500 per hectare, while the expected net profit is ₦756,030. This indicates the amount of money a CBSE can re-invest into the business. The rice entrepreneurs in northeast Nigeria reported more yield in rainy season farming compared to dry season farming with diff aerence of 10 bags, which is a result of low access to water for irrigation in the dry season. Very few of the farmers are able to construct boreholes in their farms, while the majority depend on purchase of water. This figure shows that investing in rice production is now very profitable in the North as compared to a few years back before the intervention of USAID, IITA, and its partners.

Table 4. Costs and returns analysis

Financial summary	**Production Performance Scenarios**	
Description	Scenario I	Scenario II
Bags of seeds sold per hectare (50-kg bag)	70	60
Sales of Certified Seeds (Revenue(₦)	1,750,000	1,150,000
Operating Costs (Appendix 1)	673,500	673,500
Cost of Foundation Seeds	45,000	45,000
Gross profit	1,076,500	826,500
Admin Expenses	138,470	138,470
Profit Before Depreciation	938,030	683,030
Shared Cost of Fixed Asset (Ref to Table 3)	175,000	175,000
Profit Before Tax	763,030	513,030
Tax (zero for start-up businesses)	7,000	6,000
Net Profit from Production	(756,030)	(507,030)

From the analysis, the main differential factor is the yield per hectare in rainy and dry seasons. Thus, the analysis suggests the existing and upcoming CBSE must ensure to attain a minimum yield of 3500 kg/ha to operate favorably in the seed business. The yield agrees with the average yield reported in rice production in the northeast.

5

Decision-making in seed production

Considering that the average rice yield in northeast Nigeria stands at 3,500 kg/ha per hectare, it is highly recommended that a new CBSE start the operation with just one hectare and later scale up the production after attaining a reasonable level of yield. This will help to reduce risk in investment while lowering the cost of capital requirement to kick-start the business.

Also, starting the business with basic capital assets, as listed in Table 2, is highly recommended, especially when operating a one-hectare farm. This is to avoid an increase in depreciation costs, which consequently reduces the net profit. In addition, increasing capital assets will lead to an increase in maintenance costs and thus increase the overall administrative costs.

Considering that a community-based seed business can be established with an average of ₦1,031,970, it is recommended that an intending CBSE engages in little or no loan services with a repayment period of at least two years with a maximum interest rate of 10 percent, especially for starters. Under such conditions, it is recommended that the intending CBSE strive to attain a minimum recommended yield of 3,500 kg/ha by adopting the use of improved variety. This will enable an intending CBSE to attain a reasonable income level after the first year of production of two production cycles per year. 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.

6

Demand market analysis

Currently, there is an increasing demand for rice seeds due to increased awareness, and seeds of improved varieties are important in raising yields and ensuring food security, proper nutrition and prosperity for not only smallholder farmers but also the general population. The irony of the seed industry globally is that smallholder farmers who need seeds the most to make more from their small pieces of land have the least access to these seeds (Wise, 2020). The intervention from the donor communities through the IITA, developmental agencies, and nongovernmental organizations has widened the knowledge of farmers thereby leading to an increase in demand for rice seeds. Seed producers are really struggling to meet the demand in northeast Nigeria. Oftentimes, seeds are exhausted prior to planting seasons, precisely, mid-May to mid-June of every year, depending on the rains. This further justifies the need for increased participation of community-based seed entrepreneurs. As seed entrepreneurs, there is a need to acquire more land to be able to grow enough seeds to meet the demands to operate effectively in northeast Nigeria.

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 rice seed production. Consumption of rice is also at an all-time High; it is consumed across all the geopolitical zones and socioeconomic classes in Nigeria. This is an indication that there is a big market for the sale of rice grain and fodder in Nigeria.

Marketing channels

In northeast Nigeria, several marketing channels have been identified for the sale of seeds by a CBSE and these include agrodealers, direct engagement with farmers, open markets, and input fairs. Of all the available market channels, the strategic community approach-which implies engagement directly with farmers through the extension agents has proven to be the most effective market channel. Under this approach, CBSEs engage the services of extension workers to interact and sensitize the farmers on the quality of seeds, prices, location, etc. Thus, facilitating access to improved and quality seeds to smallholder farmers within their immediate communities. The other component of the strategic community approach is through the engagement of marketing agents. For effective demand, a CBSE is required to have marketing agents who are able to engage with farmers at all levels, including mosques, churches, and the community level, to sensitize farmers and stimulate demand. This approach has been extremely effective in increasing demand for notable agrodealers and CBSEs in northeast Nigeria.

Factors influencing seed marketing

The cost effectiveness of rice seed production is most important in rice cultivation by which a farmer feels interested in producing more rice seed for his economic development. The profitability of seed production means returns from every investment in rice seed production.

CBSEs are not only required to engage with buyers but must also adopt effective market logistics to be able to meet the demand of farmers. Sometimes, seed buyers come from afar, and reaching such may be a major challenge. One of the proven logistic arrangements in responding to such needs is to work closely with farmers to arrange for a representative who is able to travel the distance to bring seeds to other farmers in the community. This approach is recommended when demand from such communities is relatively low to warrant establishing sales outlets in such communities.

Opportunities in the rice market

There is considerable potential for extending and intensifying rice production in the five rice-growing ecosystems found in Nigeria (plateau, rainfed plains, irrigated plains, lowlands and mangroves). The land area that could be cultivated is roughly 79 million hectares. Less than 10% of the 3.4 million hectares that could be irrigated are currently irrigated. Rice yields in irrigated areas are between 3 and 3.5 t/ha, much lower than the potential yields estimated at between 7 and 9 t/ha. This production gap could be bridged by introducing improved varieties, with better use of water resources and integrated management of rice growing (Bamba et al., 2010).

Worldwide, rice is the most important food staple. It is grown on approximately 155 million hectares and accounts for one-fifth of the global calorie supply. Although traditionally an Asian crop, rice has long been a staple in parts of Africa and Latin America, and its importance is growing in those regions. Roughly 900 million of the world's poor depend on rice as producers or as consumers. Therefore, an abundant and stable supply of affordable rice is critical for reducing poverty and hunger (Wassmann et al., 2010).

10

Risk and risk management in rice business

In the rice 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 Rice farming and trade. Understanding and effectively managing these risks are essential to attain maximum profit at the minimum cost possible.

Rice crops are vulnerable to a range of pests and diseases, contributing about 35−45% to the loss in rice yield (Ogah and Nwilene, 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 rice varieties are essential for risk mitigation.

Rice 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 44.4% to the loss in revenue (Mojeed and Udegbunam, 2021), while climate variation alone contributes about an 18.1% loss in yield (Bello et al., 2023).

Also, managing the rice supply chain presents its own set of challenges. Issues related to transportation, storage, and logistics can lead to postharvest losses of about 20−40% of total yield (Danbaba et al., 2019), impacting both farmers and

businesses. Addressing these supply chain risks is vital for ensuring the quality and availability of rice in the market.

Potential investors can adopt various risk management strategies to navigate these risks and create a sustainable and successful rice 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 rice 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 rice 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

The community-based seed business is a profitable venture if all the recommended agronomic and economic principles are obeyed. Irrespective of the variety used, existing or prospective CBSE must target to attain the recommended minimum yield of 3,500 kg/ha. Begin business operation on one hectare with basic capital assets to minimize risk and reduce the cost of investment. Scale after at least the first successful production cycle and ensure to operate at least two (2) production cycles in a year. Above all, efforts must be put in place to ensure the producer−customer relationship to facilitate demand for sales.

References

Ajala, A. S., & Gana, A. (2015). Analysis of challenges facing rice processing in Nigeria. *Journal of Food Processing*, *2015*.

Bamba, I., Diagne, A., Manful, J., & Ajayi, A. (2010). Historic opportunities for rice growers in Nigeria. *Grain de Sel*, *51*, 1–5.

Bello, A.S., Ibrahim, A.A. and Yakubu, S. (2023). Analysis of adadptation to climate change among rice farmers in Western zone of Bauchi state, Nigeria. *Journal of Agripreneurship and Sustainable Development*, **6**(1)

Bin Rahman, A. N. M. R., & Zhang, J. (2023). Trends in rice research: 2030 and beyond. *Food and Energy Security*, *12*(2), e390.

Danbaba, N., Idakwo, P.Y., Bristone, C., Bakare, S.O., Aliyu, U., Kolo, I.N., Abo, M.E., Mohammed, A., Abdulkadir, A.N., Nkama, I., Badau, M.H., Kabaraini, M.A., Shehu, H., Abosede, A.O. and Danbaba, M.K. (2019). Rice post-harvest technology in Nigeria: An Overview of current status, constraints and potentials for sustainable development. *Open Access Library Journal*, **6**(8).

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 .

Mabrouk, M., & Haoying, H. (2023). Urban resilience assessment: A multicriteria approach for identifying urban flood-exposed risky districts using multiple-criteria decision-making tools (MCDM). *International Journal of Disaster Risk Reduction*, *91*, 103684.

Mojeed, A. and Udegbunam, O. (2021). How prices of rice, other cereals in Nigeria doubled in one year. www.premiumtimesng.com

Ogah, E.O and Nwilene, F.E. (2017). Incidence of insect pests on rice in Nigeria: A Review. *Journal of Entomlogy*, **14**(2): 58-72.

Robert, A., Rita, A. D., & James, O. M. (2014). Determinants of postharvest losses in tomato production in the Offinso North district of Ghana. *Journal of Development and Agricultural Economics*, *6*(8), 338–344. https://doi.org/10.5897/jdae2013.0545

Wassmann, R., Nelson, G. C., Peng, S. B., Sumfleth, K., Jagadish, S. V. K., Hosen, Y., & Rosegrant, M. W. (2010). Rice and global climate change. *Rice in the Global Economy: Strategic Research and Policy Issues for Food Security*, 411–432.

Wise, T. A. (2020). *Failing Africa's farmers: An impact assessment of the Alliance for a Green Revolution in Africa*. Tufts University Medford, MA.

Appendix – I

Table 5. Economics of production

Labor cost	Unit cost (₦)	Qty (Ha/L/kg	Freq	Total cost
Land clearing	20,000	1	1	20,000
Land preparation (rainy season)	30,000	1	1	30,000
Land preparation (dry season)	60,000	1	2	60,000
Planting	60,000	1	1	60,000
Weeding (rainy season)	30,000	1	1	30,000
Weeding (dry season)	20,000	1	1	20,000
Spraying plus 4000 wages	1,000	4	3	16,000
Harvesting/ loading (2 seasons)	70,000	1	2	140,000
Drivers (paid by vehicle owner)	0	0	0	0
Marketing/sales person	5,000	1	2	10,000
Pre-emergence herbicides	3,750	4	1	15,000
Post-emergence herbicides	5,000	1	1	5,000
Post-emergence herbicide 2	2,500	3	1	7,500
Pesticide	5,000	1	1	5,000
NPK fertilizer	25,000	4	1	100,000
Urea	28,000	2	1	56,000
Liquid fertilizer	5,500	2	1	11,000
Seed sorter	5,000	1	2	10,000
Seed bed preparation	10,000	1	1	10,000
Packaging bags (50 kg only)	400	70	1	28,000
Branded bags	500	50	1	25,000
Produce Aggregation	15,000	1	1	15,000
Total Variable Cost				**673,500**
Administrative costs	Unit Cost	Qty	Freq	Total Cost
Documentation and advisory services	3000	1	1	3,000
NASC inspection and certification	30,000	1	2	30,000
Service providers (F/Mapping)	5,000	1	1	5,000
Extension services	10,000	1	1	10,000
Insurance (2% of Variable Cost)	13,470	1	1	13,470
Fueling and transportation (dry season)	70,000	1	1	70,000
Phone calls	2,000	1	1	2,000
Maintenance cost of generator	5,000	1	1	5,000
Total Administrative Cost				**138,470**
Total Operating Cost				**811,970**

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): This 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 labour 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 rice. It is also known as the 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 rice 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 rice. Multiply the price of 1 kg of rice with the total yield realized on the farm (e.g., 4,500 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 costs
4	Total Cost (TC)	TFC + TVC + AC
5	Operating Cost (OC)	TVC + AC
6	Total Revenue (TR)	Unit price of 1 kg of Rrice ×Total yield (750 × 7000 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

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 hectare	#40,000
2.	20/09/2023	Harvesting	Harvester	1 hectare	#20,000

2. Labor Record

Date	No. of hired labor	No. of family labor	Total No. of labor used	Wage rate	Total cost of hired labor
25/06/2023	3	1	4	#5,000 / person	#20,000
28/06/2023	0	2	2	#5,000/ person	#10,000
					#30,000

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	#750	#7,500	1 kg
2.	21/09/2023	30 kg		#22,500	0

Rice model

Title:	**Investment Guide For Community-Based Seed Producers**
Filename:	**Rice Production**
Date created:	**12/9/2023**

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	Rice
	Production Cycle (Months)	3 Months
	Number of Cycle in a Year	2
	Number of Varieties Grown	2
	Names of the Commonly Grown Variety	FARO 44
	Differences in Varietal Yield (Yes/No)	Yes
	Name of the Variety Used for the Investment Model	FARO 44

	GENERAL ASSUMPTIONS	Values
B)	**Plot Information**	
	Land Length (meter)	*100*
	Land Breath (meter)	*100*
	Inter-row Spacing (meter)	*0.30*
	Intra-row Spacing (meter)	*0.3*
	Number of Stands Per Hole	*3*
	Average Weight Per Bag	*50*
	Bags of Rice Seed Per Hectare (Kg/Ha)	*70*
	Land Area (meter square)	*10,000*
	Required Planting Space (Area Per Stand)	*0.09*

C)	FIXED ASSET (Shared Cost)	Unit Cost	Quantity	Total Cost
	Land (The land was rented on a yearly basis)	20,000	1	20,000
	Tractor (rented per year)	30,000	1	30,000
	Building/Store House	50,000	1	50,000
	Vehicle (Hire during Harvesting)	20,000	1	20,000
	Water Pump	45,000	1	45,000
	Boom Sprayer (500 per day)	500	20	10,000
	Total			**175,000**

D)	Labour Cost Per Production Per Hecatare Per Cycle	Unit Cost	Quantity	Frequency	Total Cost
	Land Clearing	20000	1	1	20000
	Land Preparation (Tilling/Ploughing, Harrowing, etc. Raining season)	30,000	1	1	30000
	Land Preparation (Tilling/Ploughing, Harrowing, etc. Dry Season)	60,000	1	1	60,000
	Planting	30,000	1	2	60,000
	Weeding Dry season	20,000	1	1	20,000
	Weeding Raining season	30,000	1	1	30,000
	Spraying Workmanship	4,000	1	1	4,000
	Spraying (if different from weeding)	1,000	4	3	12,000
	Harvesting / Loading	70,000	1	2	140,000
	Drivers (Paid by Vehicle owner)	0	0	0	-
	Marketing / Distribution/ Sales Person	5000	1	2	10,000
	Total				**386,000**

E)	**Procurement of Foundational Seeds**	900	50	1	45,000

F)

Other Operating Costs	Unit Cost	Quantity	Frequency	Total Cost
Pre-Emergence Herbicide	3,750	4	1	15,000
Post-Emergence Herbicide	2,500	3	1	7,500
Post-Emergence Herbicide 2	5,000	1	1	5,000
Pesticide	5,000	1	1	5,000
Fertilizer NPK (3bags/hectare (dry season = I bag/hec)	25,000	4	1	100,000
Urea	28,000	2	1	56,000
Produce Aggregation	15,000	1	1	15,000
Liquid Fertilizer	5,500	2	1	11,000
Seed Bed Preparation	10,000	1	1	10,000
Seed Preparation / Sorters	5,000	1	2	10,000
Branded Bags	500	50	1	25,000
Packaging Bags (50kg only)	400	70	1	28,000
Total				**287,500**

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
	Insurance (2% of Variable Cost)	13,470	1	1	13470
	Fueling / Transportation (In Dry Season)	70,000	1	1	70000
	Maintenance Cost (Generator)	5,000	1	1	5000
	Phone Calls	2,000	1	1	2000
	Total				**138,470**

			Expected Yield	
H)	Market Information (average price/bag = N25000)	Unit Price/ bag	Actual bags Raining Season	Dry Season
	Price of Certified Seeds (50 kg bag) only	25,000	70	60
	Price of Certified Seeds (1kg) = N500			
	Total Sales		1,750,000	1,500,000

Cost Project	Per Production Cycle
Fixed Costs	
Land (The land was rented on a yearly basis)	20,000
Tractor (rented per year)	30,000
Building/Store House	50,000
Vehicle (Hire during Harvesting)	20,000
Water Pump	45,000
Boom Sprayer (500 per day)	10,000
Total Fixed Cost	**175,000**
Variable Cost	
Labour Cost Per Production Per Hecatare Per Cycle	386,000
Other Operating Costs	287,500
Total Variable Cost	**673,500**
Procurement of Foundational Seeds	**45,000**
Administrative Costs	
Utilities (Per Hectare Per Cycle)	**138,470**
Total Operating Cost	**811,970**
Total Cost	**1,031,970**

Finanacial summary	Production Performance	
Description	Actual Yield in Rain	Actual Yield in Dry
Average Yield Per Hectare(50Kg bags)	70	60
Total Revenue	1,750,000	1500000
Operating Costs	673,500	673,500
Cost of Foundational Seeds	45,000	45000
Gross profit	1,076,500	826,500
Admin Expenses	138,470	138470
Profit Before Depreciation	938,030	688,030
Shared Cost of Fixed Asset	175,000	175000
Profit Before Tax	763,030	513,030
Tax (zero for start up businesses)	7,000	6000
Net Profit from Production	756,030	507,030

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.