



BUILDING A SUSTAINABLE & INCLUSIVE
HORTICULTURE SECTOR

RAPID ASSESSMENT OF PROTECTED CULTIVATION IN NIGERIA

An overview of protected cultivation production size and market potentialities in Nigeria. This document would serve as a reference tool for developing advocacy strategies, policies, and action plans in addressing the critical challenges of protected cultivation in Nigeria.

By **Maisha Mazuri** Consultancy on behalf of IFDC HortiNigeria Program, May, 2023.



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List of acronyms

Capex – Capital Expenses

EOP - Estimates of productions

Ha- Hectare

MGF - Medium Sized greenhouse Farm

Msq - Meter Square

NVIVO - Qualitative collaborative analysis software

OPEX – Operating Expenses

SGF - Smallholder greenhouse farm

SQM - Square meter

SOP – Standard Operating Procedure

TVET – Technical and vocational education and training

Introduction

Nigeria was ranked 94th in the Global Food Security Index (GFSI) consistently for a decade (2013-2021) until the post-pandemic period when it dropped to 107th (2022) out of a total number of 113 countries ranked in the world. In addition, the Food and Agricultural Organization (FAO 2022) projected that around 660 million people may still face hunger in 2030, due to the lasting effect of Covid19 pandemic on global food security. Hence, Nigeria needs to make an increased effort to stabilize and strengthen its food systems. This can be done by adopting improved agricultural practices and climate-smart technologies that boost productivity and profits and provide adaptive mechanisms for future shocks in her food system.

The agricultural sector is contributing greatly to the Nigeria economy, with more potential to improve the annual Gross Domestic Product (GDP) through the horticultural sector, increasing the numbers of food processing factories, creating job opportunities for youth, contributing to gender equity, and influencing the consumer behavior in food utilization. Therefore, growing economic value crops under an enabling environment can assist in this transition.

The horticultural sector is particularly important for the development and economic growth of Nigeria. A country with an increasing population with an urgent need to reduce its dependence on imported foods to meet its nutritional needs. To ensure food and nutritional security in Nigeria, crop diversification and protected cultivation are key tools in ensuring the availability, affordability, and accessibility of quality and safe foods to this growing population.

Vegetable production under protected cultivation stands a better chance due to reduced pest and disease infestation. In addition, there is the benefit of improving water and land use efficiency while mitigating the adverse environmental effect of climate change on the food system.

Protected cultivation of vegetables also has the potential to give an enabling growing conditions, yielding produce with prolonged shelf life. This ensures that post-harvest losses attributed to the production level are reduced, extending the seasons of production, and improving the livelihood of farmers by allowing them to compete in the local and international markets.

HortiNigeria is a four-year (2021-2025) horticultural sector development program funded by the Embassy of the Kingdom of the Netherlands (EKN) in Abuja, Nigeria. IFDC and its consortium partners: East-West Seed Knowledge Transfer (EWS-KT), Wageningen University & Research (WUR), and Royal Tropical Institute (KIT) are implementing the program in Kaduna, Kano, Ogun, and Oyo states. The program aims to facilitate a sustainable gender- and youth-inclusive horticulture sector that will contribute to food and nutrition security in Nigeria. The program kicked off on the 1st of November 2021 and is focusing on Okra, Onions, Pepper, and Tomato in the selected states.

In the two southwestern states (Ogun and Oyo), the program focuses on piloting production system innovations and regional diversification amongst 2,000 entrepreneurial farmers. Other efforts include increasing farmers' productivity and income, improving farmers' access to financial services, and enhancing sector coordination and Business-to-Business (B2B) linkage.

Protected cultivation of vegetables using low to mid-tech greenhouse systems have been identified as a popular innovation/technology that attracts a lot of youth and female entrepreneurs in these locations towards vegetable production. Greenhouse farming has therefore drawn an important level of interest from the private sector but faced with a plethora of problems that are unique to this farming system. Conducting a rapid assessment of this

sub-sector of horticulture is believed to be a first step in the process of better understanding of the state of greenhouse farming within the country, market size and potentialities, and challenges while engaging with partners in transforming these challenges into solutions that contribute to sector transformation through advocacy, reinforce their relationships with relevant stakeholders, inform local, regional and national stakeholders in the process of strategic development and ultimately embed their actions in the overall objectives of the HortiNigeria project.

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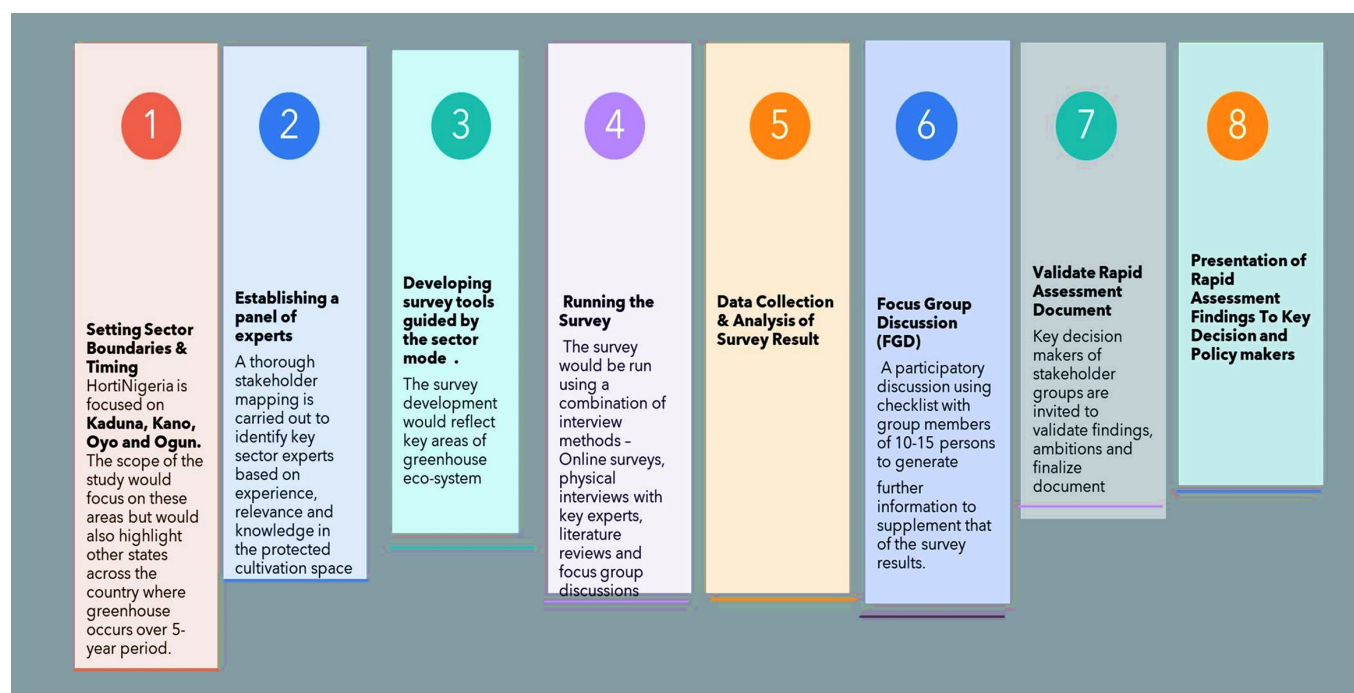
The scope of this study focuses on the following -

- Measuring the greenhouse farming size across the country with major focus into the number of new greenhouses installed and commercially functional over the past 3 years within Abuja, Kaduna, Kano, Lagos, Ogun, and Oyo.
- Get information on input utilization in greenhouse farming compared to open field cultivation with focus on the value and volume for input use amongst greenhouse farmers in Nigeria.
- Develop a protected cultivation mapping across regions of the country
- Get an understanding of the main markets for greenhouse vegetables in Nigeria.
- Generate EOPs, CAPEX and OPEX indicators for greenhouse farming in Nigeria.
- Assess the average production yield per hectare of protected cultivation and compare with open field.
- Assess limiting factors for production yield and expansion of greenhouse farming business model.
- Highlight the labour profile for management of greenhouses in Nigeria.
- Develop stakeholder mapping to highlight the input suppliers, greenhouse technology suppliers and investors.
- Understand the trend of adoption of greenhouse technology over the past 5 years across the country.
- Study potential challenges for greenhouse farming and propose mitigation plan to reduce those challenges.
- Gain insight into the environmental impact of protected cultivation.
- Develop a chart/map of greenhouse farms activities based around crop and seasonality.

Objective

The objective of the rapid assessment is to gain an overview insight of protected cultivation production size and market potentialities in Nigeria. The assessment would serve as a reference tool for developing advocacy strategies, policies, and action plans under the HortiNigeria program that would address the critical challenges of protected cultivation in Nigeria.

Methodology



The rapid assessment was conducted using the standard methodology developed by Wageningen Centre for Development and Innovation (WCDI) during the Covid-19 pandemic (Agricultural Sector Alerts: Methodology for Rapid Assessment). The steps in brief are as follows –

Setting Sector Boundaries & Timing- Project Location Review

HortiNigeria is focused on Kaduna, Kano, Oyo, and Ogun. The scope of the study was focused on these areas and other states across the country where greenhouse farming is currently in practice to increase impact of advocacy activities that would stem from this assessment and in developing a robust strategy that would be inclusive of various stakeholders in the protected cultivation space across the country. The time frame of assessment was limited to the last 5 years.

Establishing a panel of experts

A thorough base setting stakeholder mapping exercise was conducted in close collaboration with the HortiNigeria program to form a representative panel in terms of knowledge, experience, relevance, sample size, and profile that aligns with the target of farmer categories for this component on piloting innovation systems in the South-West under HortiNigeria. Discussions were held with other key players and actors in the protected cultivation space nationally. The geographic distribution over regions, states, or other value-chain levels of the sub-sector was taken into consideration.

Developing survey tools guided by the sector mode.

Survey tools and questionnaires were developed modeling the sector of interest to ensure that all categories of stakeholders were reached. The sector model ensures that the key functions and potentially vulnerable interactions within the sector were diagnosed, to direct the need for strategies contributing to its transformation or coping with changed conditions. In the context of greenhouse farming in Nigeria, functions such as services, production systems, market development, revenue generation and re-investment, and governance and coordination were included as well as consumption and communities.

Running the Survey

The survey was run using a combination of information-gathering methods. A blended approach of digital online surveys and telephone interviews as well as physical interviews via farm visits were conducted. Questionnaires were tailored to the various stakeholder groups.

Data Collection & Analysis of Survey Result

Data collection was conducted by the trained enumerators and supervisors by means of the methods discussed above. Appropriate survey tools that fit the methods of data collection were prepared and used. Kobo collect was used for data collection and NVIVO was used for data analysis. The results of the survey were processed transforming the level of impact into numeric scores; for each question, the frequency over the various scores was calculated.

Focus Group Discussion (FGD)

Data was collected through FGD with the representatives of the selected stakeholders. The members of the FGD include representative panels of the various actors and players in the greenhouse farming sector of Nigeria which include the implementing partners, government stakeholders, knowledge institutions, greenhouse farmer groups, and input suppliers in the protected cultivation sector. A participatory discussion using checklist with group members of 10-15 persons to generate further information to supplement that of the survey results. FGD was conducted in Ogun, Oyo, and Abuja physically while virtual FGDs were held for the other regions of the country.

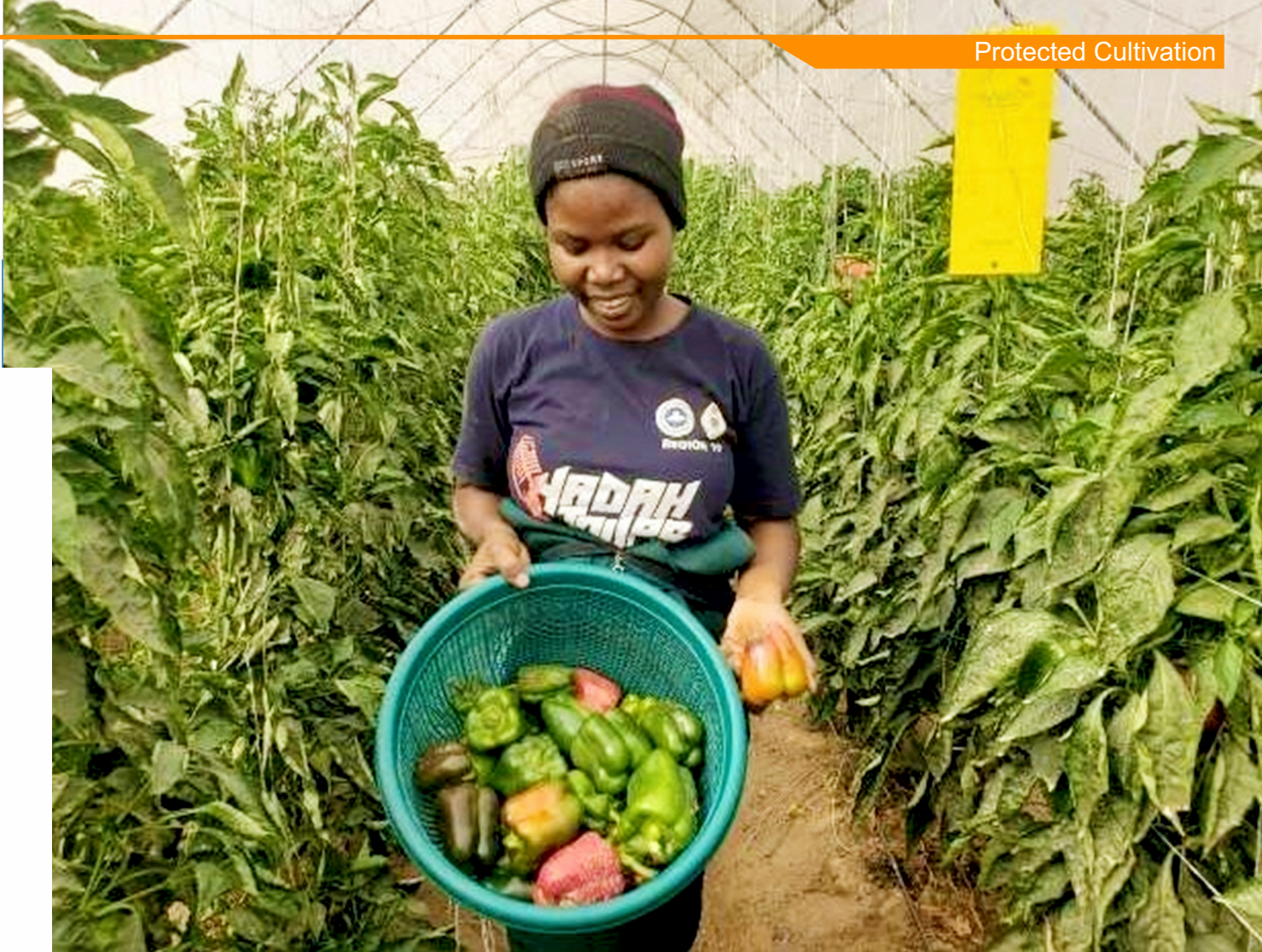
Draft narrative writing and assessment outcomes

Employing all data collated from the survey and FGD, preliminary versions of the rapid assessment outcomes were shared with high-level stakeholders and HortiNigeria implementing team particularly in C2, C3 & C4. Email and document reviews were used as well as virtual meetings to finalize and validate findings.

Presentation of Rapid Assessment Findings & Final Document

The findings and complete results from the rapid assessment was presented in a standard report format to HortiNigeria and results presented to key stakeholders of industry, government institutions, greenhouse farmer groups. This was hosted by NABC Nigeria which is the leading organization for facilitating trade and investment between Netherlands and the African economy. The advantaged proffered win partnering with NABC for such an event lies in leveraging the vast network it has in reaching the target stakeholders of this activity.





RESULTS & ANALYSIS

All results and analysis are generated from a mix of data generated from online surveys, personal interviews, field visits, desk reviews and three focus group discussions (FGD).

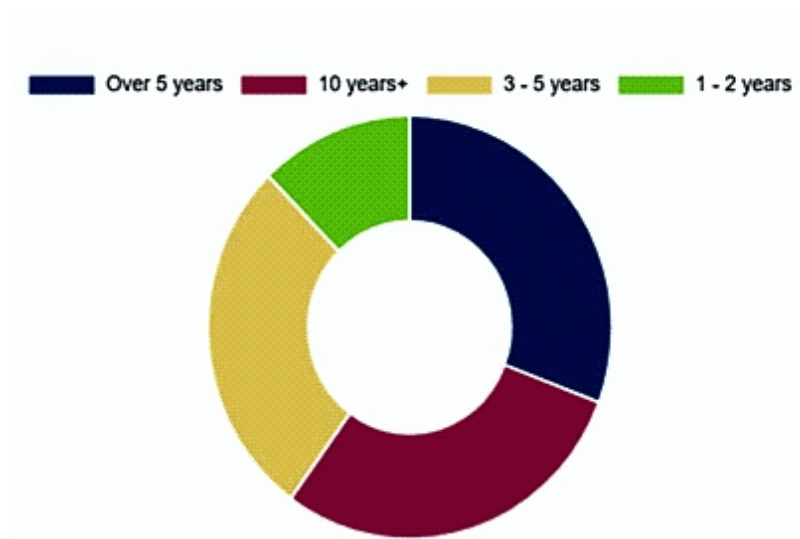


Socio-Economic Profile

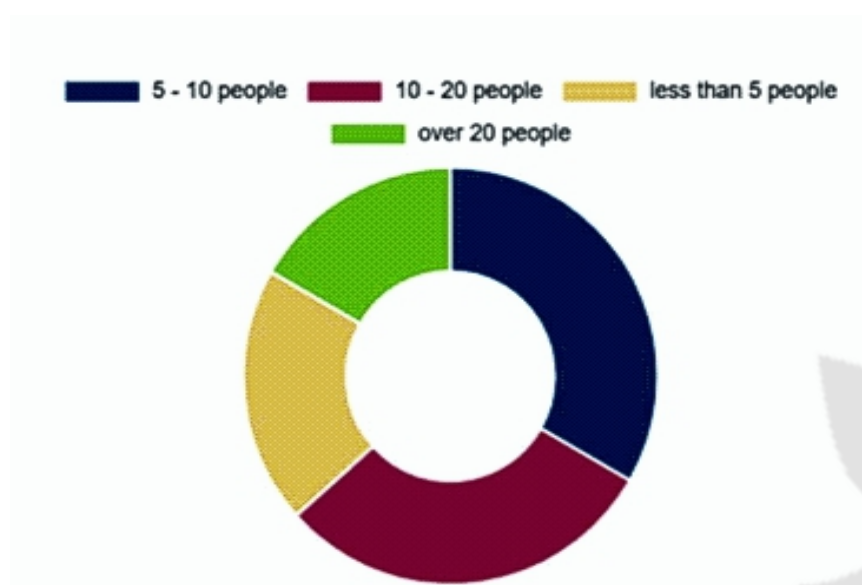
The Socio-Economic profile in this rapid survey refers to the nature and characteristics of key stakeholders who directly employ protected cultivation in their farming practices. This section seeks to identify and profile the stakeholders for easy identification, intervention, and communication planning.

In terms of academic status, although 92% of our respondents attained tertiary level of education, it was observed that the Greenhouse vegetable farming in Nigeria is mainly driven by mid-level professionals who mostly did not major in Agriculture in their academic degrees but wholly depend on informal and online trainings for their knowledge development. Only a mere 1% had gone through any form of vocational or practical skilled based training

In the age parameter, 45% of the respondents were between the ages of 35 – 50 years while the gender indices showed female representation in the sector to be very low (26% of rapid assessment respondents) as majority of the greenhouse farms had average staff sizes of ten individuals with seven of those being male.



Years of experience in greenhouse farming



Number of farm workers

Socio-Economic Profile

The protected cultivation sub-sector seems to be at an early stage of economic expansion and relevance in the Nigerian agribusiness space. The majority of the respondents had been in the sector just about five years (31%) while the next largest group were those that had spent over 10 years in the business (28%). The ecosystem seems to be at a point where rapid expansion and scaling up of what has worked and pruning down on those that have failed in the last decade is about to occur. Overall, the socio-economic profile of the sector seems primed for increased investments in the country.

The sample consisted of six hundred (600) individuals in total, out of which 444 were male (74%) and 156 were female (26%).

Table of frequency for gender

Gender	Frequency	Percent
Male	444	74
Female	156	26

YEARS OF EXPERIENCE	Frequency	Percent
Over 5 years	184	30.67
10 years+	176	29.33
3 - 5 years	166	27.67
1 - 2 years	74	12.33

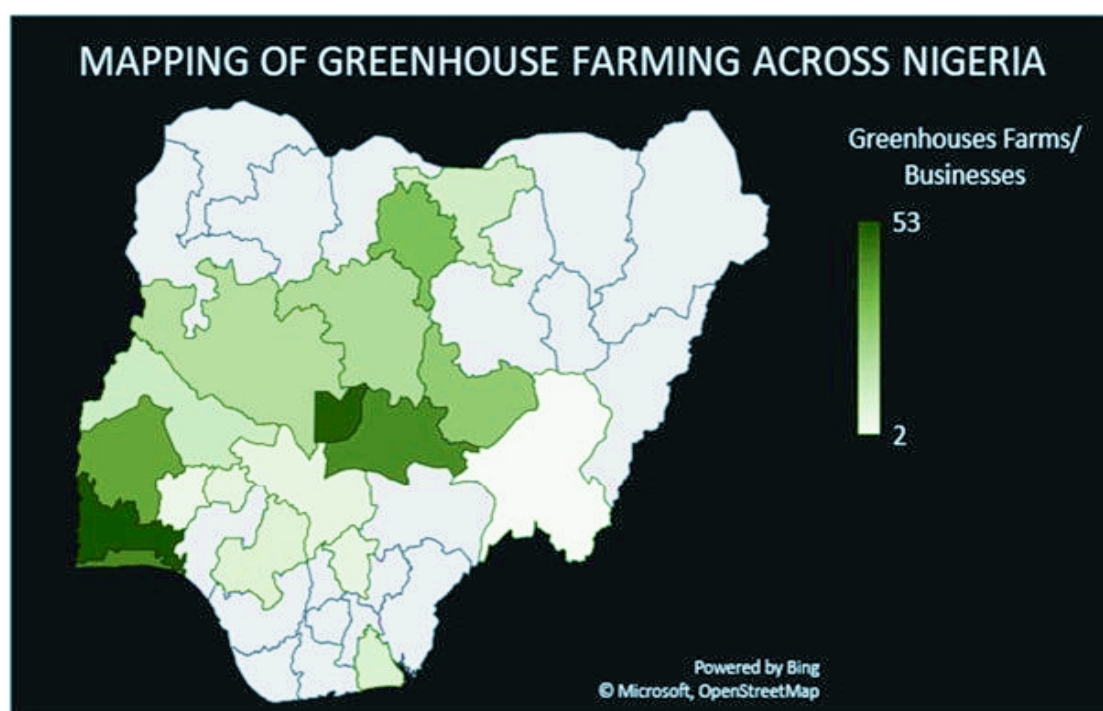
Years of experience in green house value chain



Role in the greenhouse value chain

Biophysical and infrastructure.

The Biophysical and infrastructure section of the rapid assessment sought to identify the nature of protected cultivation materials majorly used in Nigeria and any identified challenges these materials pose to the users. In this section, Protected cultivation adoption trends were also considered with areas most favourable to the method of cultivation. The data generated from this section include.



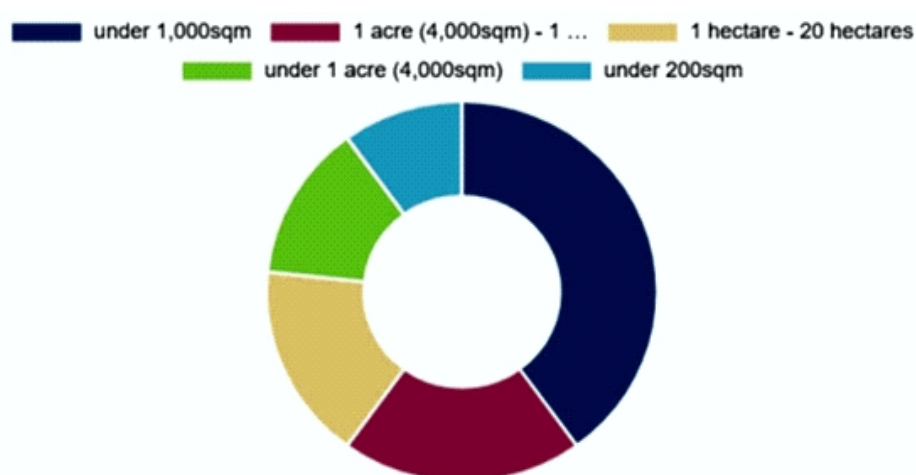
States	Greenhouses Farms/Businesses
Federal Capital Territory	51
Kaduna	21
Kano	32
Plateau	28
Nasarawa	43
Ogun	53
<u>Oyo</u>	38
<u>Lagos</u>	44
Edo	9
<u>Kwara</u>	13
Niger	20
Jigawa	12
Ekiti	7
Taraba	2
Enugu	6
Kogi	6
Osun	5
Akwa Ibom	10
Total	400

Sizes & Types of Greenhouses

About 50% of the respondent greenhouse/protected cultivation farmers are producing in areas less than 1000msq. On average most greenhouse farms have installations that are about 1000 square metres in size. Greenhouse farm sizes were observed to be mainly below 1 acre while some large-scale installations done by 13.25% of the respondents were between one acre and 1 hectare under cultivation. There are some key flagship greenhouse farms across the country with over a hectare of protected cultivation installations. Companies like DobiAgro (4Ha Abuja), Blaid Farms (2Ha Abuja), SCL Farms(1Ha), and Mallam Aloo Farms (2.5Ha Jigawa) have large-scale installations. Wells Hosea (12Ha) farms in Edo state currently have the largest protected cultivation set-up in one location. Eupepsia Farms in Ogun state are currently at the construction and installation phase of a large cluster of greenhouses that would span over 30 ha.

If we are to classify the farmers according to sizes and refer to the farmers with less than a hectare as smallholder greenhouse farmer. From the survey we have 83.25% of our respondents as smallholder greenhouse farmers (SGF)

The percentage of farmers who have a hectare and above under protected cultivation is 16.75% of the respondents. These farmers we have classified as medium-sized greenhouse farmers (MGF)



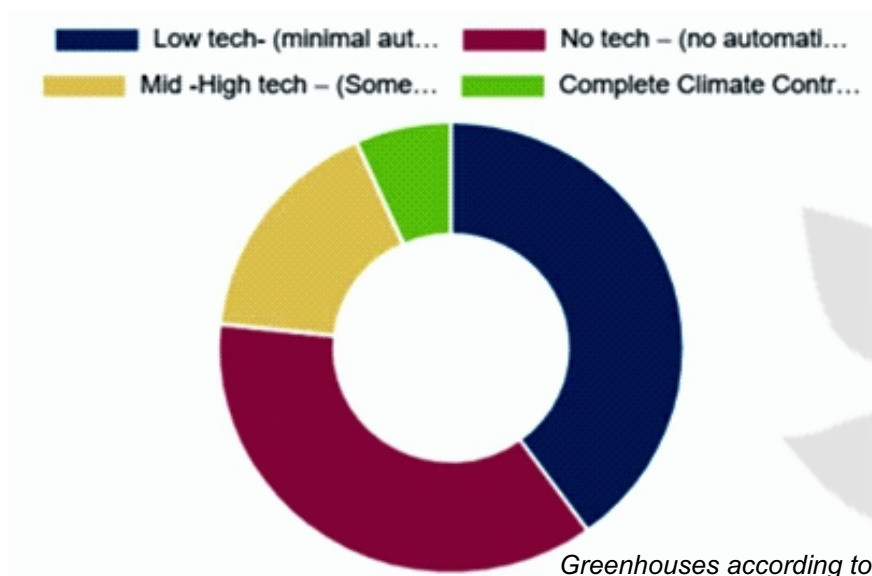
Greenhouses according to sizes

Average size of greenhouses	Frequency	Percent
under 1,000sqm	160	40
1 acre (4,000sqm) - 1 hectare (10,000sqm)	80	20
1 hectare - 20 hectares	67	16.75
under 1 acre (4,000sqm)	53	13.25
under 200sqm	40	10

Classification of greenhouses	Frequency	Percent
No tech – (no automation, protected covering with manual operations)	187	36.67
Low tech- (minimal automation with protected (covered) cultivated)	204	40
Mid -High tech – (Some automation and partial climate control)	85	16.66
Complete Climate Control Advance tech - (full automation with comprehensive climate control)	34	6.67

Average Size of Greenhouses (sqm)	Number of greenhouses	Size (Sqm)	Size (Ha)	Extrapolated Size of Greenhouse using result from survey (Ha)
1000	160	160000	16	96
7000	80	560000	56	336
110,000	67	7370000	737	4422
4000	53	212000	21.2	127.2
200	40	8000	0.8	4.8
Total	400	8,310,000	831	4,986 Hectares

The survey shows an estimated 2,400 greenhouses in study area covering an estimated 4,986 hectares of protected cultivation land across the study areas.



Technology Adoption

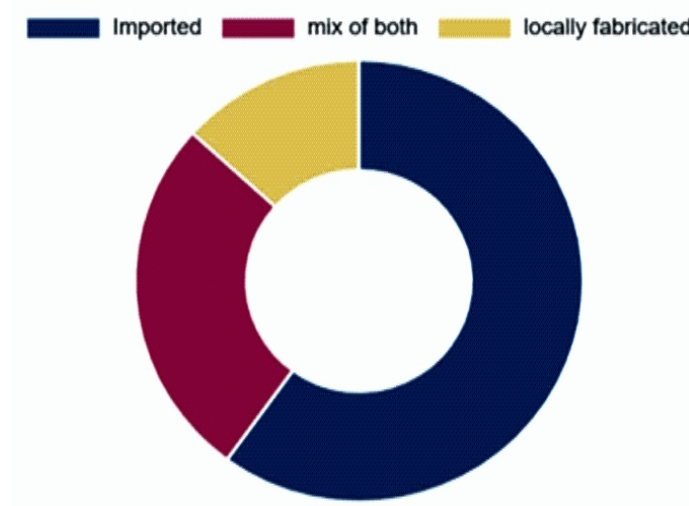
For efficient production under protected cultivation, there is the need for adoption of some level of automation and technology to provide optimum growth conditions for crops. The greenhouses were classified based on the level of automation used in the set-up of the greenhouse. The greenhouses in the country were classified into; (i) No tech (ii) Low Tech (iii) Mid Tech (iv) Complete Climate Control. The assessment shows that 36.7% of the respondents conduct their operation with manual operation (No Tech). These were exceedingly popular in clusters outside Epe local government area on the outskirts of Lagos as well as in Jos, Plateau state. These types of greenhouses are typically fabricated by local professionals and companies using bamboo, wood, galvanized pipes, and some shade materials (nets, plastic and woven greenhouse covers). Forty percent of the greenhouse farmers employed Low tech greenhouses which are supplied by companies like Dizengoff, Jubaili Agro and Saro sciences. The Mid - High Tech greenhouses were 16.7 %. Greenhouses with complete climate control and automation are still rare across the country with only 6.7% of the respondents having greenhouses with those features. These are the main larger greenhouses with over one hectare of protected cultivation facility on their farms.

Considering that over 83.25% of the growers in protected cultivation have less than a hectare under cultivation (SGF), based on the earlier size classification, the tendency of having small holder farmers adopting more technology focused on automation and climate control for production might be low because it involves an additional investment cost which leads to higher production cost for the farmer. There are innovative approaches adopted by farmers to manage the climatic aspects e.g., semi-automated shade nettings, cooling pads with phase change material that require low energy for cooling, especially in greenhouses in the arid North. The greenhouses at the Centre for Dryland Agriculture in Kano developed a pilot tunnel using this technique to drop the temperature of their tunnels and achieve production at the peak of the hot season. Other technologies typically adopted by greenhouse farmers are mechanized hand tools (tillers, ridge makers), Temperature alarms and feedback systems, precision irrigation tools (timers, water metres, sensors etc) foggers and sprinkler systems and insect traps.

Also, feedback from the FGD listed access to affordable electricity as one of the major challenges faced by farmers who grow under protected cultivation. There is a need for electricity to be used in the irrigation of the systems and for climate control systems. As most farms are not located in areas where a constant electricity supply is available, steps need to be taken to provide substitutes sources of electricity.

Source of Greenhouses

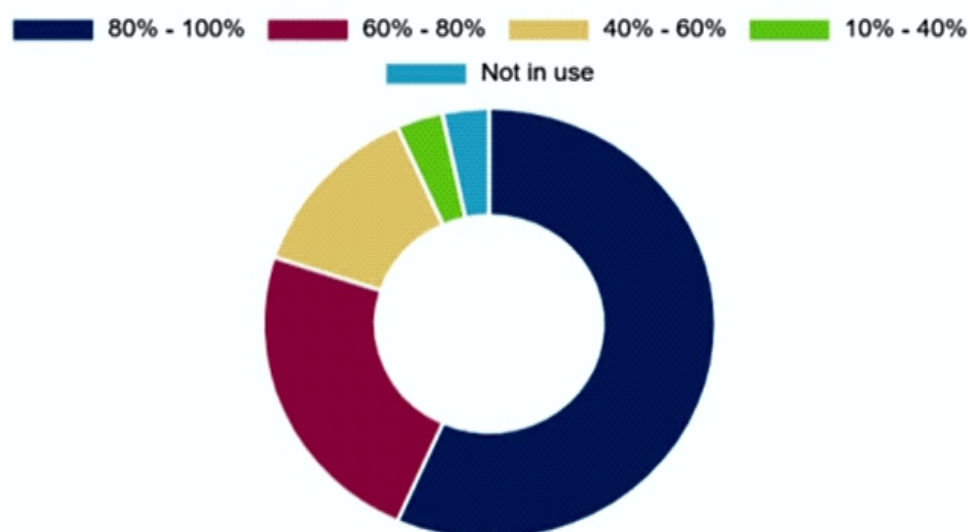
From the survey, most of the greenhouses owned by farmers were imported into the country. This trend is expected as the idea of producing crops under protected cultivation is not a farming system locally developed in Nigeria. From the focus group discussions, the countries where the greenhouses are sourced from are countries like Spain, China, and Israel. Although as the adoption of the greenhouse is growing in the country, there are now more locally available local fabricators of green houses.



Source of greenhouses

Utilization & Trends in Greenhouse Adoption

Majority of the participants in the survey are actively utilizing greenhouses across the year. When also asked if there is a willingness to expand their growing facilities, most of them indicated an interest in the expansion of their activities. This response indicates that despite the difficulties faced by farmers, they recognize the advantages of protected cultivation and see a path towards profitability.



Percentage of greenhouse in utilization

The popularity of greenhouse vegetable farming is on an upward trajectory when looking at the data for the installation of green houses. From the survey conducted, there has been a steady increase in the establishment of greenhouses in Nigeria aside from a drop in the year 2017. After that decline, there has also been a steady increase in the interest and adoption of protected cultivation, even the pandemic period did not deter this trend. The effect of the government policy on removing import duties and tariffs on

Protected Cultivation Size & Fertilizer Utilization Data	
Description	Quantity
Number of Greenhouses study conducted	400 Greenhouses
The average number of Neighboring Greenhouses	6 farms/greenhouses
Estimated Number of Greenhouses in Study Area	2400 greenhouses
Average Weekly Soluble Fertilizer Usage /Greenhouse (kg)	100 kg
Estimated Weekly Soluble Fertilizer Usage for Greenhouses in Study Area (kg)	240,000 kg
Estimated Utilization of Soluble Fertilizer Annually in Study Area (kg)	12,480,000kg (12,480tons)
Average cost of Soluble Fertilizer/Ton	\$842.00 (₦387,320)
Estimated Cost of Annual Fertilizer Usage	\$10,508,160.00 (₦4,833,753,600)

Cost of maintenance and replacement of equipment

There is a high capital cost required to own or operate greenhouse infrastructure and this is not just for the set-up costs but also in maintenance. The parts needed have no local substitutes, hence the need to be imported. 27.9% of the respondents said that the cost of these maintenance parts and equipment was a great concern to them. Currently, Soilless Farmlab is training over one thousand people in the protected cultivation value chain. Their training covers various aspects of greenhouse management from installations to operation, and post-harvest handling, sales, and marketing. There is a clear gap for locally fabricated spare parts and inputs to support the protected cultivation space. There is also a need for technical vocational training that emphasize the practical aspects of installations, fabrications, and repairs of parts.

Climatic conditions

The climatic conditions are very varied within the country and therefore lead to a variation in the kind of structures designed for the various locations across the country. From the FGDs, the extreme heat in the northern regions of the country makes growing difficult while in the southern part of the country, the high humidity increases disease pressure. There is a strong need for proper environmental feasibility studies before installations. There is growing discontent amongst farmers at the structures sold to them not matching their climatic conditions or needs. This was also noticed in some of our field visits where wind damage laid low some tunnels while some avoided growing in their greenhouses as the plastics were the wrong fit for a tropical region making the heat within the structures unbearable to work in (over 45 degrees Celsius) and not ideal for crops to thrive.

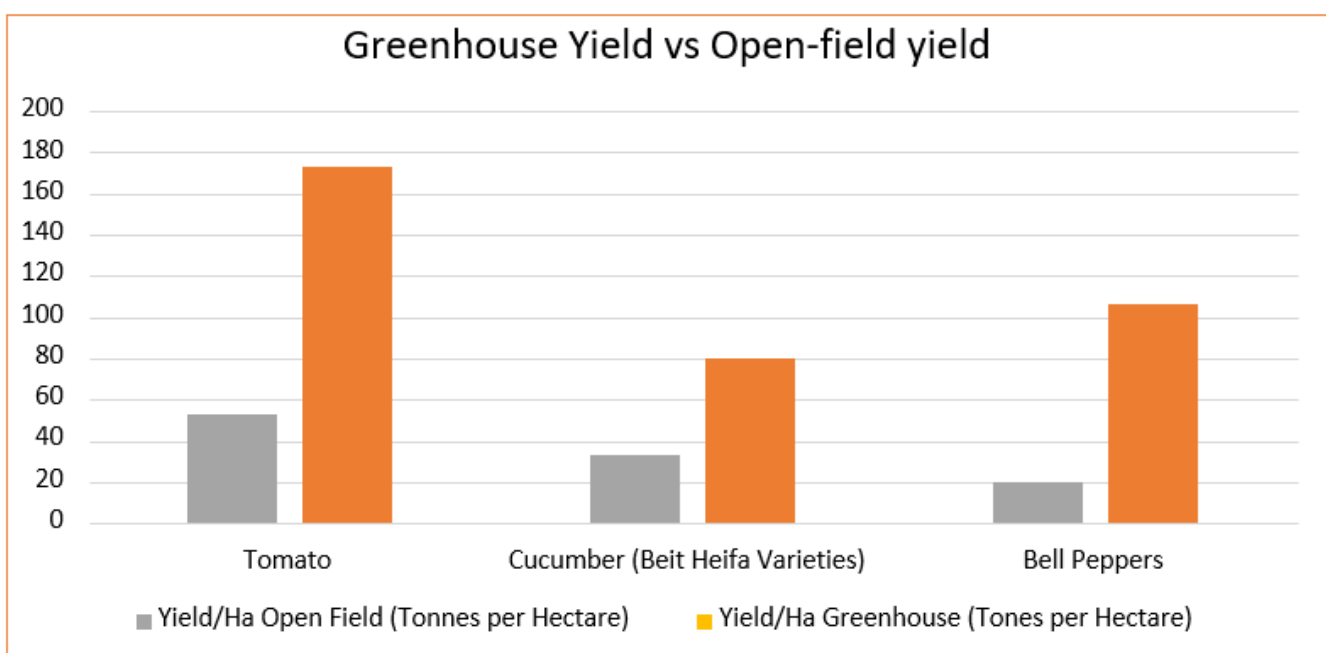
Production Systems

The Rapid assessment tool also went a step further to gather data on the mode and methods of production adopted in greenhouse cultivation, taking into consideration the cost, inputs, methodologies, and every factor that comes to play in having a productive protected cultivation system.

Based on the survey respondents, there is a strong belief that production yields in greenhouses are higher in comparison to open field with 90% of the respondents agreeing that greenhouses are more productive. The main crops grown in the greenhouses are tomatoes, bell peppers, hot peppers, and cucumbers (a strong focus on Beit Haifa varieties). This result is also in line with what was seen during the physical surveys and farm visits that were conducted.

Cultivation of ornamental plants like flowers was almost non-existent as only one farm was seen to be at the preparatory phase of growing flowers in Ogun state. The target of the farm is the export market. Although there is a small market that values and appreciates flowers in Nigeria, the utilization and acceptance of flowers in Nigeria is extremely low when compared to the western cultures and thus reflects in the low interest to grow them by greenhouse farmers and investors. As a direct response to the available local market, there is a general alignment of the protected cultivation towards the production of vegetables instead of ornamental plants.

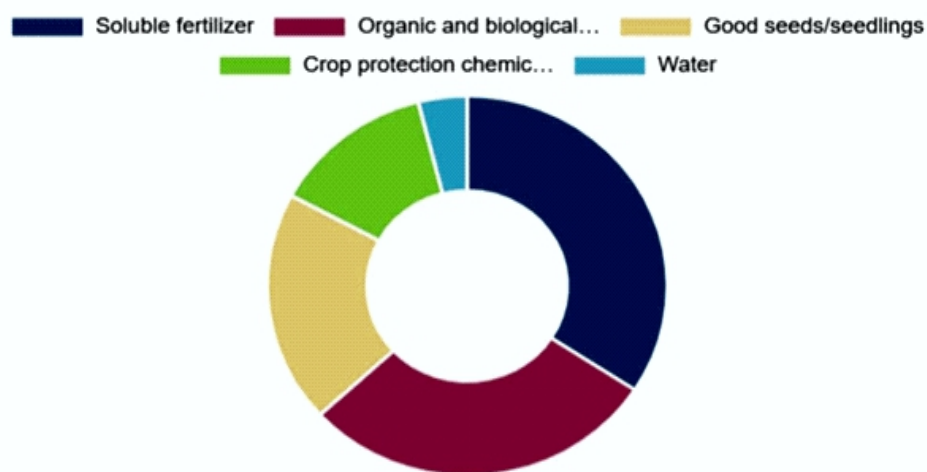
	Avg. Yield/Plant Open Field (kg)	Avg. Yield/Plant Greenhouse (kg)	Yield/Ha Open Field (Tons per Hectare)	Yield/Ha Greenhouse (Tons per Hectare)
Tomato	2	6.5	53.2	172.9
Cucumber (Beit Alpha Varieties)	1.25	3	33.25	79.8
Bell Peppers	0.75	4	19.95	106.4



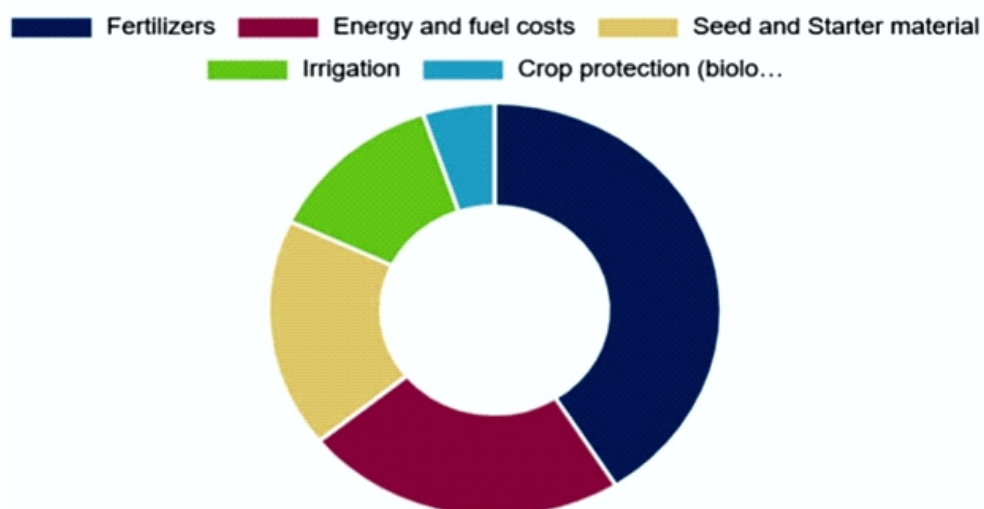
Access to inputs

Protected cultivation is new in Nigeria, and because of it, most of the support industries and businesses are also at a development stage. 44.62% of the respondents selected access to inputs as a key challenge they face. Some of the reason for this is that most of the inputs are imported as there are no local substitutes available yet. Also, when the inputs are available, there is no standardized check for the quality of the products to guarantee that they are fit for purpose. When these inputs are available to buy, the costs keep rising. The unavailability or scarcity of inputs leads to habits like hoarding to be able to take advantage when prices skyrocket.

This problem was further highlighted during the FGD. The complexity of sourcing quality inputs for greenhouse farms remains a limiting factor in developing profitable production systems. Enhanced performance fertilizers (soluble horticultural grade fertilizers) are the hardest to get while biological crop protection and organic-based inputs were also extremely hard to source and when available they were extremely expensive.



Most difficult items to source (scarce item)

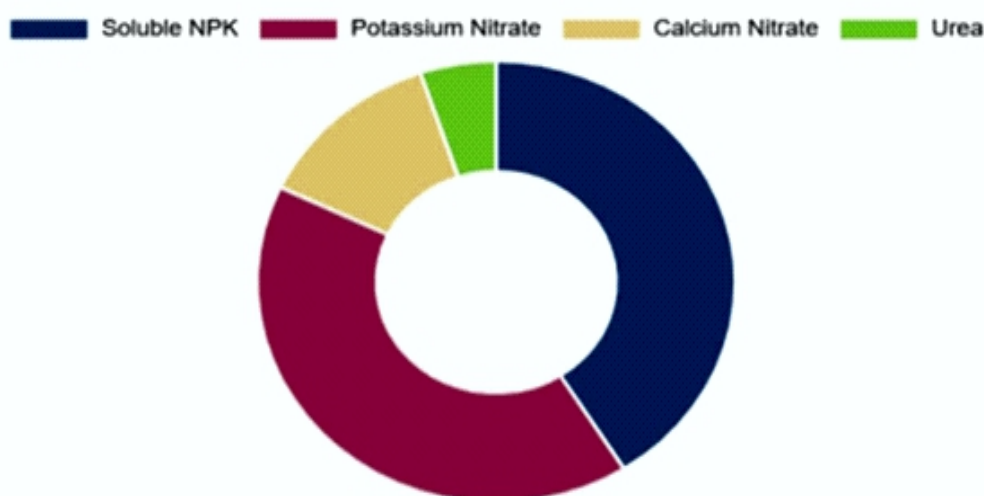
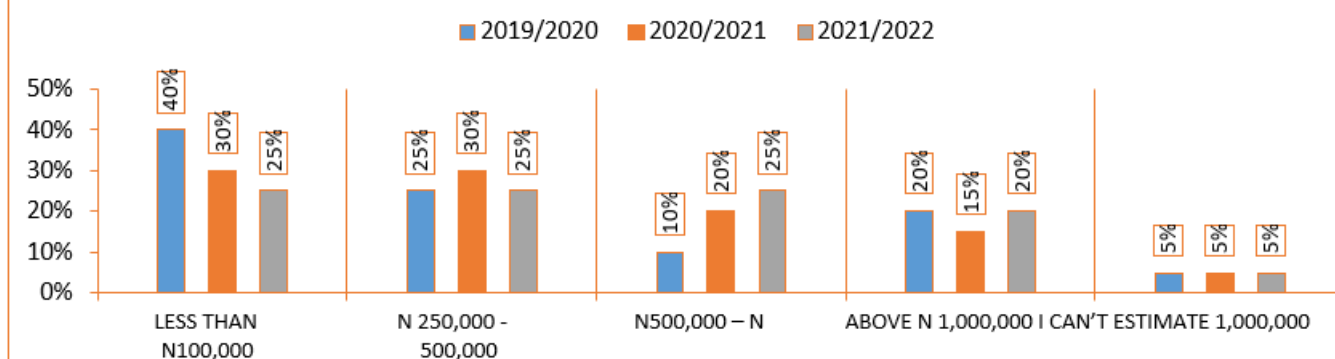


Most expensive input to source

Fertilizers

In 2018, the Federal Government of Nigeria placed a ban on the importation of NPK fertilizers, this was intended to encourage and improve the capacity of local fertilizer production. This ban translated to a total ban on fertilizer imports in the country. This led to a scarcity of quality fertilizers because there were no local producers of soluble fertilizers. In the year 2018 alone, the ban resulted in a price increase of 100 percent in price of fertilizer. When compared to the price in February 2023 there has been a further 310% increase in the cost of fertilizers. This increase in price in a major input cost for greenhouse farmer was not transferred to the selling price of produce as there has been just a marginal increase in the farm gate selling prices of produce between 2018 and 2023 with an increase from N500/kg to N600/kg (20% increase) in tomatoes and while for bell peppers it was an increase from 1200 to 1500 Naira (25% increase). This means a reduction in the profit margins that farmers have been making over the years. Fertilizers represent a major limiting factor for yield in protected cultivation system with over 20% of the respondents using over a 100kg of soluble fertilizers in a week.

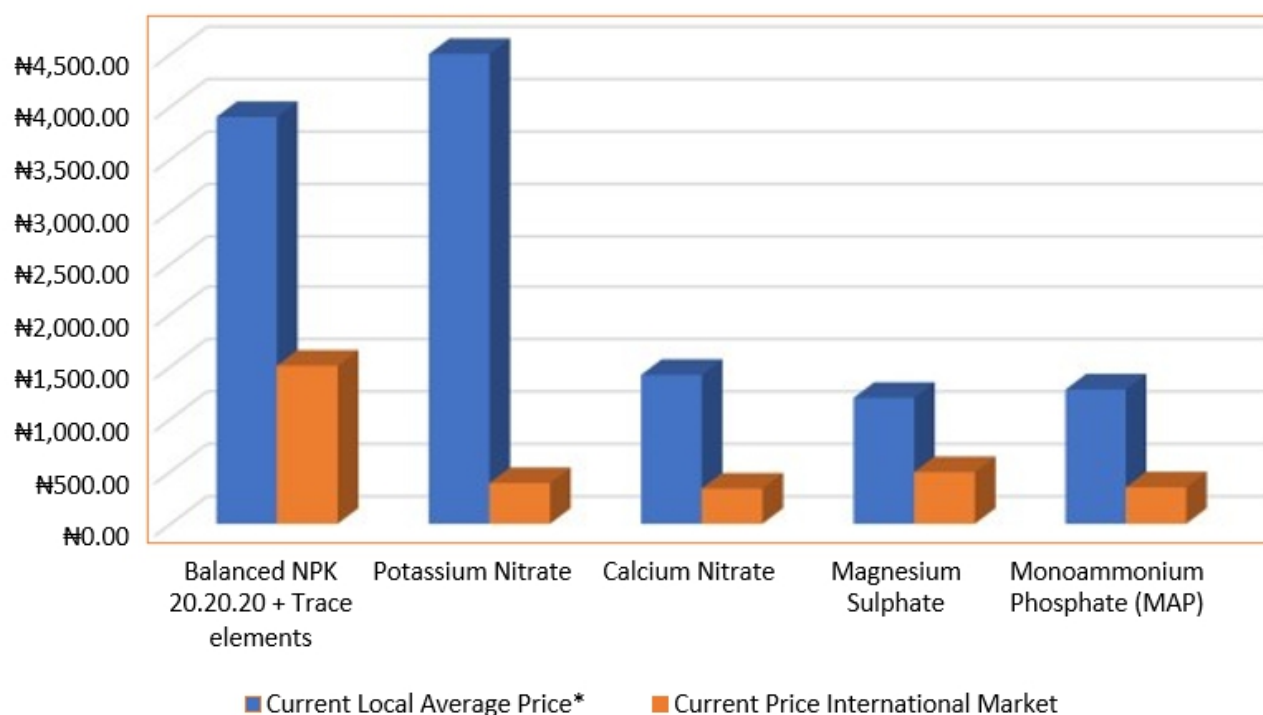
HOW MUCH DID YOU SPEND ON FERTILIZER BETWEEN 2019-2022 ON YOUR GREENHOUSE FARM



Most Important fertilizers for production

Enhanced Performance Fertilizers	Current Local Average Price*	Current Price International Market
Balanced NPK 20.20.20 + Trace elements	N 3,900	N 1,506.78
Potassium Nitrate	N 4,500	N 387.32
Calcium Nitrate	N 1,420	N 335.71
Magnesium Sulphate	N 1,200	N492.20
Monoammonium Phosphate (MAP)	N 1,280	N 347.30

Comparison of Local Price of Soluble Fertilizers vs International Market





44.6% of greenhouse farmers identified access to quality inputs as a key challenge they face



Seeds and seedlings

Getting a consistently reliable source of seeds is one of the great concerns of producers in the protected cultivation sector. Some of the seeds readily available in the market are imports with minimal extension support and agronomic advice on suitability for the growing environment and season. Farmers are not able to get the variety selection correctly and rely on trial and error. When they do get the right varieties, they have little support to get the potential of that seed's genetics. This means time and money are spent and sometimes lost while experimenting on finding seeds best suited for their production.

Commercial production of seedlings for protected cultivation is not yet widespread in the country. Syngenta Foundation for Sustainable Agriculture has invested in setting up some seedling production greenhouses (36) where smallholder farmers are able to use the greenhouses as nursery tunnels, but their target market are for open field vegetable farmers. Dansa Farms and Centre for Dryland Agriculture in Kano also operate similar greenhouse nurseries but all report low patronage from greenhouse farmers and get patronage from small scale open-field farmers. Seeds for protected cultivation are a lot more expensive than indoor varieties and it was noted from the farms visited and farmers interviewed, all the greenhouse farmers had their own nursery facilities for raising seedlings.

“Last year we lost a lot of money to non-germinating seeds” –
Mrs Zakari CEO Numo Farms

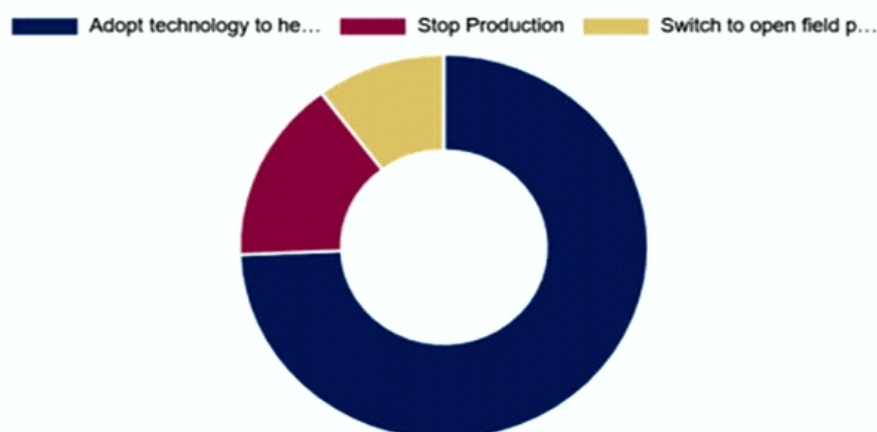


Location-based Production

The climatic conditions affecting greenhouse farming were simplified into the North and South based around the prevailing weather conditions. The southern part of the country characterized with high temperature, and annual rainfall of about 2000mm with humidity of about 70-90% during the wet season and goes slightly lower during the dry season. While the northern part of Nigeria has an arid to semi-arid climate with lower rainfalls of less than 1000mm per year, sometimes as low as 500mm per year. The humidity during the wet season could be as high as 60% and as low as 10 percent during the dry season. Greenhouse farmers in the South of the country target filling in the gap for fresh produce markets in the Lagos, Rivers, Delta, and Anambra states. The farmers in the North service the major vegetable markets in Abuja, Plateau, Kano, and Kaduna with small pockets of supplies going to the Northeast regions (Yobe & Borno).

This distinction in climatic conditions reflects in the differences in the type of greenhouses used for these locations. Also, while growing the crops in the two regions the pest pressure and diseases experienced by farmers in the regions vary as well as seasonality in planning their productions. For example, during the dry season, the low humidity means farmers in the northern part of the country can grow tomatoes in protected cultivation areas successfully while

avoiding the hottest months of February -March. In comparison, to those in the southern part of the country during the on-set of the dry season (December – March), the warm weather and high humidity make farmers in the protected cultivation struggle to grow tomatoes successfully. Farmers in the South typically focus on starting tomatoes from March. The high level of pests and diseases especially white flies affect their production so badly that most farmers totally avoid growing tomatoes during the dry season in the southern part of the country. The ability to grow vegetables all year round is cited as a key factor in investing into greenhouse farming, these gaps in production requires farmers to therefore adapt. The survey reveals that 44% of the respondent were willing to invest in technology to mitigate these challenges. Field visits showed farmers using manually placed shade nets to reduce sunlight intensity, low tech fans and incorporating vents into their structures to allow for better air circulation.



Diseases and soil Challenges

Protected cultivation in theory is meant to give a farmer a better chance at reducing, if not eliminating pests and diseases. Yet 24.62% of respondents pointed towards management of pests and diseases as factors limiting their yields and potential financial returns. Some of them pointed towards soil borne pathogens while some highlighted pest-transmitted diseases (particularly white flies). The pressure and prevalence of these pest and diseases varied across the country and according to season. Soil borne diseases like nematodes and bacterial wilt ranked high amongst the worst culprit for loss of income in greenhouse farms. Few farmers have adopted soilless media and using resistant or tolerant seeds varieties while the majority of the greenhouses which are low-tech structures rely on heavy use of nematicides, soil sterilization, solarization and using growbags to avoid this challenge. The latter options are extremely time-consuming and tedious while the former requires significant investment in soil-less media and fertilizers to provide the needed crop nutrition. Chemical crop protection are the prevalent options for controlling pest with limited availability of biological and organic-based inputs as well as limited knowledge on integrated pest management.

Competencies and Expertise of Personnel

The infancy of the greenhouse industry is one of the reasons why there is insufficient quality and skilled workforce. Workers and managers need to be trained in the processes for growing under protected cultivation. Most of the capacity developed so far in the industry can be linked to private extension and consultancy companies. There is a lack of standardized qualification for greenhouse managers and competency levels are usually widely varied. Farmers usually get their production protocols from personal research and peer-to-peer knowledge sharing via social media platforms.

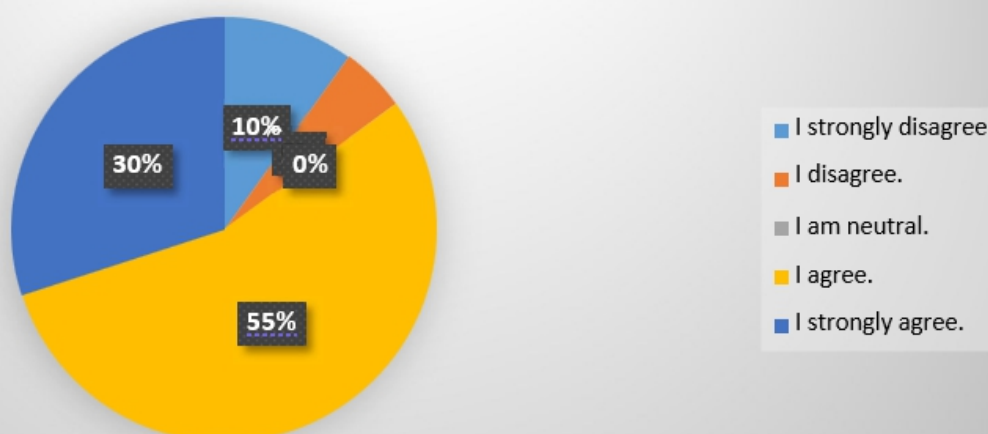
Low tech tunnel supply companies like Dizengoff have been able to train workers and agronomists to support their customers. These agronomists are usually provided in a bundled deal with the procurement of a one thousand sqm of greenhouse low tunnels. Soilless farmlab in Ogun State is another company that offers a 360 extension and support service to their clients with a focus on low tech greenhouses to high-end soilless cultivation systems. There is a project by Greenport Nigeria aimed at improving the quality of skills that greenhouse operators possess.

Most respondents to the survey and focus group discussions mentioned the huge gap in training on the practical aspects of greenhouse management. There is also a need to developing standardized knowledge and competencies focused on protected cultivation in tertiary institutions.

Energy Utilization and Climate Aspects of Production

Greenhouse farmers in Nigeria rely heavily on fossil fuel (diesel and petrol) generators to power their farm activities. This reflects the large energy deficit in the country due to a struggling national power grid. Also, another factor is farm locations, because greenhouse farms are typically located in the rural areas and outskirts of the major cities which are off grid or under served. 44 % of farmers relied solely on these generators while 23.1% used a mix of generators and national grid. The use of solar photo voltaic or other forms of renewable energy was extremely low amongst the protected cultivation space. Currently less than 10% of greenhouse farming ventures have invested into renewable energy sources. The main energy requirements are for irrigation - pumping water from ground wells to suspended reservoirs and running the fertigation pumps and climate control systems in more high-tech greenhouses. On the average, farmers are spending N25,000 per month for small green houses on energy cost to run their farm activities. Energy is also considered the second highest cost driver in protected cultivation production. Efficient water utilization is seen as a positive and attractive feature of growing vegetables in greenhouses. 85% felt they improved their water use efficiency since moving from open field production to greenhouse farming.

I am using less water in my greenhouse compared to the open field vegetable farming

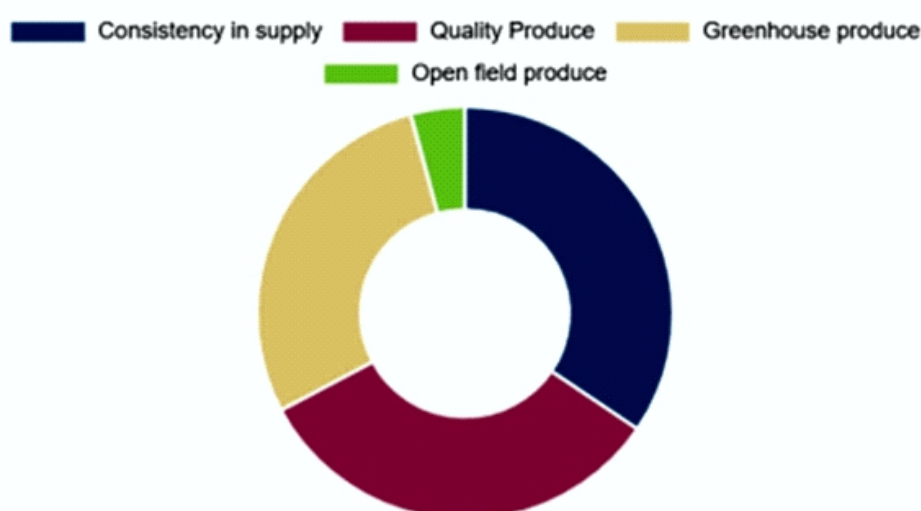


Value-chain, Consumption and Services

Access to market

The market for greenhouse vegetables in Nigeria is mainly formal supermarkets. The demand for high quality and exotic vegetables produced in greenhouses are usually from this market segment. Hotels, restaurants, and hospitality-based businesses account for the next highest demand for greenhouse produce. Access to market is ranked as the least of worries for greenhouse farmers. Only a small fraction of the respondents (9.23%) mentioned this as a source of concern to them. The socio-economic profile of greenhouse farmers explains the entrepreneurial approach by these farmers in assuring their market channels before production. Farmers typically establish direct contact with these outlets and negotiate prices and terms of supply. Currently, there is a lack of standardization for these produces in terms of quality grading, traceability, and safety certifications. A few aggregators and traders are currently in the ecosystem and play a very vital role in the growth of the sector.

During the FGDs and farm visits, greenhouse farmers clearly felt they were taking on too much risk and responsibilities. Managing the greenhouses and coordinating their sales agreement with multiple hotels and supermarkets as clients was taking a toll on their business. It becomes hard to manage primary production and handle sales. This is the niche the aggregators occupy. Twenty-four percent of these farmers use these intermediaries/marketers/aggregators. Some of the extension service providers offer a 360 deal where they support with training, technical support and off take of produce. These aggregating businesses are at early stages just like the overall protected cultivation space and already show commitment to working closely with greenhouse farmers. 63% of these aggregators pointed towards consistency in supply of fresh produce as their main challenge. As they are filling in a market demand that supermarkets traditionally sourced through import from countries like South Africa, they needed to show consistency in supply to build more trust in their capacity. Companies like Mafil Veggies, Larde-Brass all highlighted the needs for greenhouse farmers to keep consistency in quality of supply and in availability to avoid stock out.



Factors important to produce buyers.

The major crops of focus are tomatoes, bell peppers, cucumbers, and leafy greens like lettuces. There are an estimated 1200 tonnes of greenhouse tomatoes harvested weekly, with peppers and cucumbers are estimated at about half that volume (700 tonnes/week) across the major greenhouse farms in the country. In addition to the supermarkets that purchase these products, the aggregating businesses are expanding the market using innovative methods like web-shops, semi-formal vegetable outlets in open local markets. Pop up farmer's market events are also innovative ideas greenhouse farms use to reach their client bases directly. Dedicated vegetable farmer's market in the urban cities is very interesting opportunity to boost this subsector of horticultural produce. This model was piloted with continued success at the Abuja Farmer's market which take a large volume of greenhouse farm produce grown around Abuja, Nasarawa and other North Central states.

In terms of crop choices, 54 percent of our survey respondents signified interest in producing more tomatoes while 31 percent indicated for more peppers and 15 percent indicated interest in producing more lettuces and leafy greens due to the demand. The survey shows a weekly demand with over 53 percent of these open market actors selling a minimum of 1000kg of tomatoes weekly, while 46 percent sold below 2000kg being the highest weekly tomatoes demand cap. Results for pepper showed 69.2 percent of respondents selling approximately 1000kg and 15 percent sold less than 2000kg, cucumbers also reflected 69 percent to meet a 1000kg weekly demand and 23 percent less than 2000kg demand. Lettuces and leafy green were sold at less than 1000kg weekly demand by 92 percent of the respondents and less than 2000kg weekly sales by 7.7 percent. This clearly shows a steady trend in the demand rate of greenhouse produce as majority of the market actors achieved at least one tonne in each vegetable assortment from the greenhouse space. This position was also supported in the responses gotten from the question "what greenhouse products are highest selling in the market" where tomatoes got a 61 percent market share of greenhouse produces and pepper got a 39 percent share, going further to buttress the point of tomatoes being the highest crop to be sold.

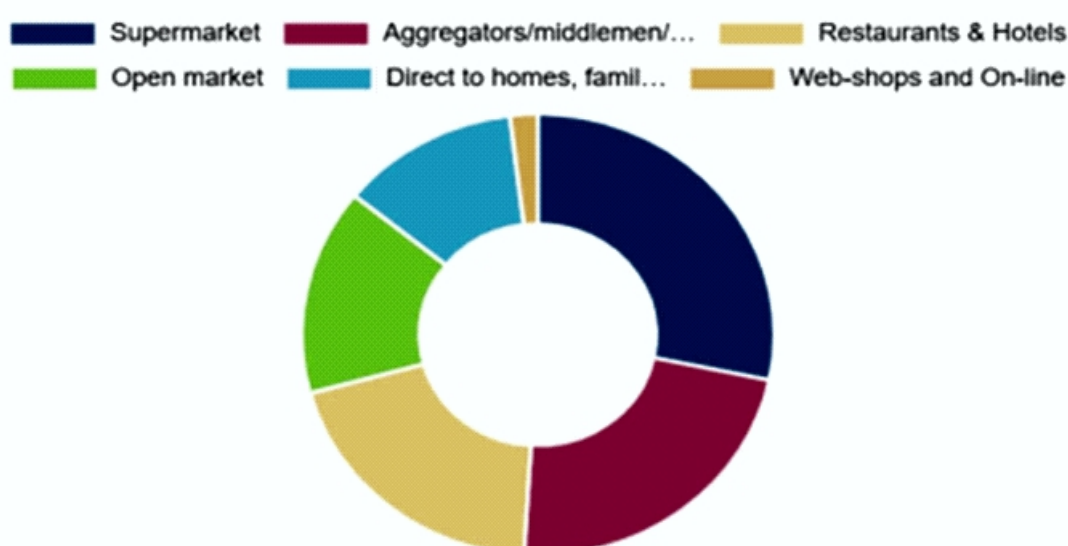


Chart of produce off-takers.

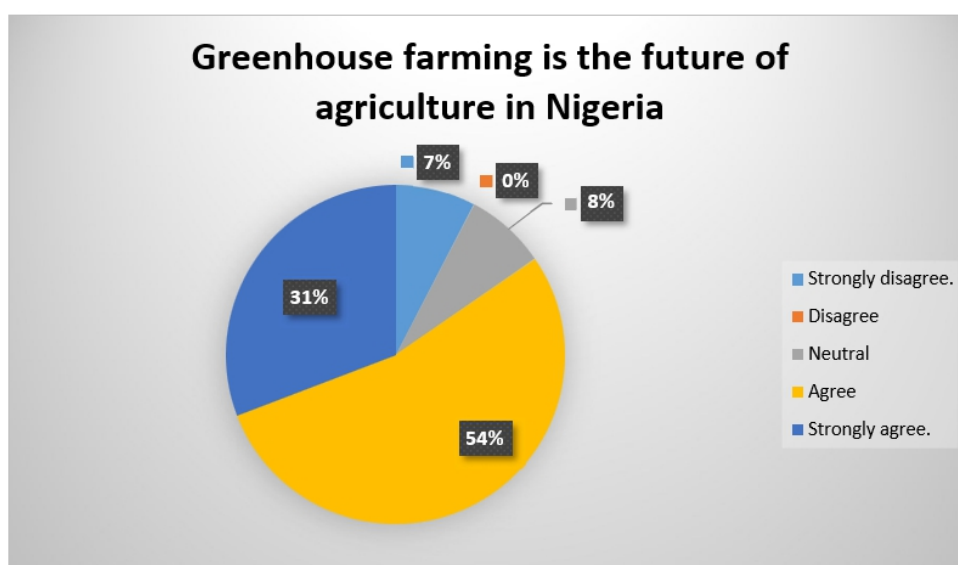
Based on analysis from the survey questionnaire, the value-chain is rapidly growing in the Southwest than any other region in the country. Thirty-eight percent of the value-chain actors were from that region followed by the north central with 31% and northwest 23%, while the other three regions shared the remaining 8%. Key cities for greenhouses in Nigeria are Ogun, Lagos, Abuja, Nasarawa, Kano and Plateau state. Majority of those found in Kano were focused on seedling production for openfield farmers.

Post Harvest Handling

Post-harvest management in the greenhouse space is more developed than the open field vegetable farmers. Over 90% of the farms visited during the field visits and personal interviews had adopted the use of plastic crates for handling and transporting their produce. Most of these plastic crates were owned by the farms and not leased. Other aspects of post-harvest management are still underdeveloped. Very few farms had standard designated pack-house facilities for cleaning and package of produce after harvest. Most produce are supplied in loose forms after harvest, cleaning and weighing on crates. Cucumbers (Beit Alpha variety) was the only crop that most of the farmers did some level of post-harvest packaging using plastic bags to pack them in 1kg units. The bigger high-tech farms all had post-harvest spaces while the smaller farms pushed those responsibilities unto the intermediaries and indeed the supermarkets. The aggregators and service providers all saw the need for cold-chain storage facilities and agro-logistic solutions but currently exceedingly rare to find. From the FGD discussion, aggregators believe that investment into modern pack-house facilities is too high for their businesses but willing to use shared facilities provided by government or lease commercial packhouses for their activities if available. This is shown in more detail in table of this document where feedback from FGD is discussed.

Investment Trends in Greenhouse Vegetable Value-chain

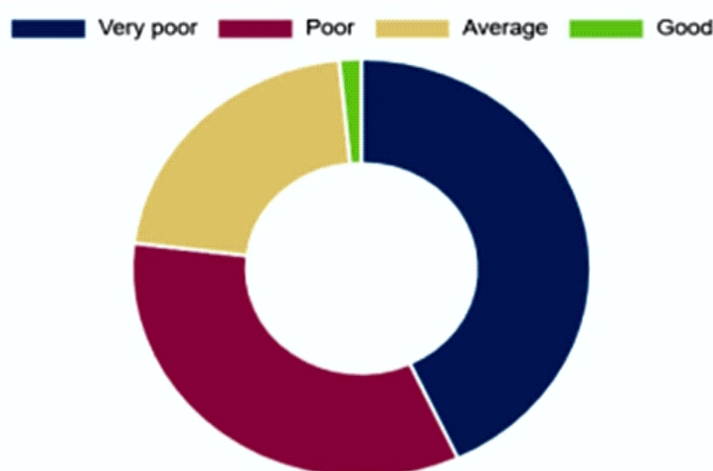
There is a clear increased interest in the greenhouse farming sector for Nigeria. There has been a consistent increase in the number of greenhouse tunnels installed in the country. Eighty-five percent of those interviewed in the rapid assessment see greenhouse farming as having a great future in Nigeria. There is still a slight reservation in possibility of the sectors growth though as 31% of our respondents agreed that the increase in price of fertilizer made greenhouse business model a bad investment. 31% also agreed that due to high cost of greenhouse inputs and lack of increased value in the produce, the market has become unfavorable, leaving the farmers with very slim margins. These sentiments were clearly echoed during the focus group discussions (FGD).



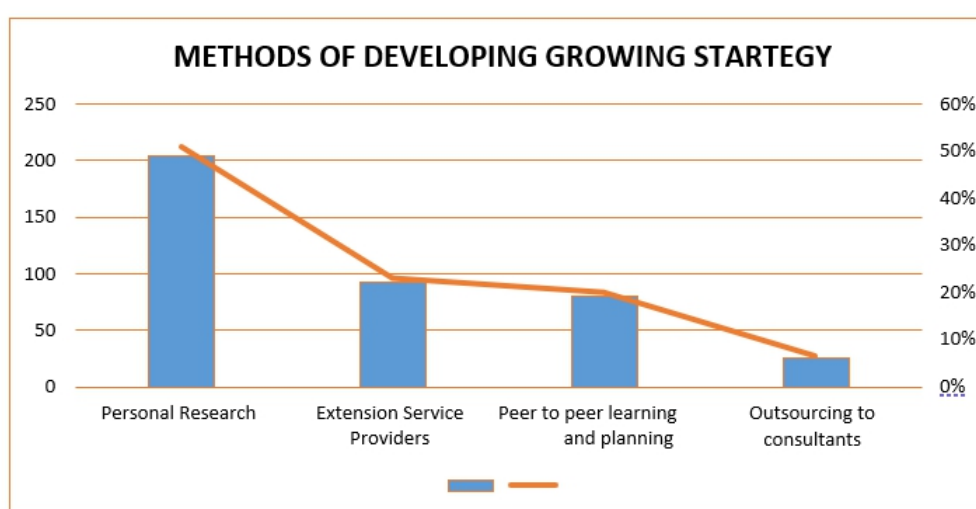
The removal of import duties on greenhouse equipment by the government and the clear evidence of its productivity and ability to fill a niche market in the vegetable sector still makes it an attractive area for investment. Private funds and personal savings are the key sources of investment in the sector currently with little financial support from financial institutions or government-based subsidies to support protected cultivation investors. There is a clear need to regulate the sector and protect investors from un-certified and unscrupulous input salespersons who supply the inappropriate forms of protected cultivation technologies. On the average, it cost €32/sqm to purchase a low-tech greenhouse tunnel with irrigation. This could rise to as high as €75/sqm for high-tech climate-controlled installations. Based on average yield of ninety-one tons per hectare obtained in greenhouses across Nigeria, a gross return of €18-20/sqm per cycle can be expected. The annex of this document contains estimates of productions (EOP) for the three main crops of interest as well as detailed capex and opex indicators.

Policy, Coordination and Regulation Subsidies, Support, and Extension Services

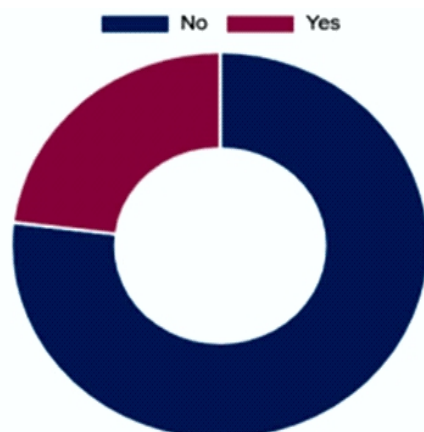
The quality of extension services offered to greenhouse farmers is rated incredibly low. An estimated 78% of greenhouse farmers interviewed felt the extension support they received was poor or extremely poor. This has a highly negative impact on the sector as most (51%) of the players in the space resort to personal research and personal effort to get the needed knowledge and information required to manage their productions. Acquiring knowledge in silos like this leads to a wide variation of production methods employed. The tendency to pick un-validated methodologies or growing strategies that do not align with the climatic needs of their locality is common.



Support from Government and extension agents



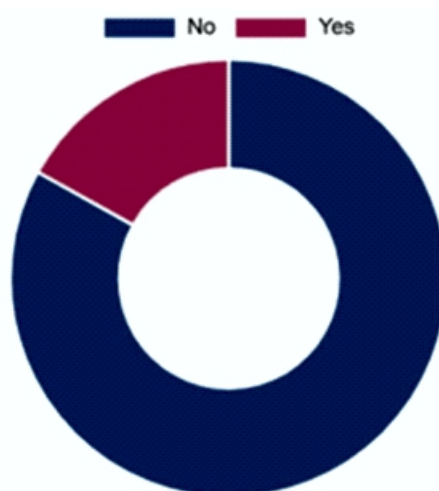
Government subsidies targeted towards protected cultivation are currently non-existent as, much of the effort in the sector is seen to be coordinated by the players in the eco-system. The support from development partners, NGOs and donors are also very low with only 15% of the respondents receiving any form of technical support.



Technical or financial support from NGO

Farmer Groups, Coordination & Organizations

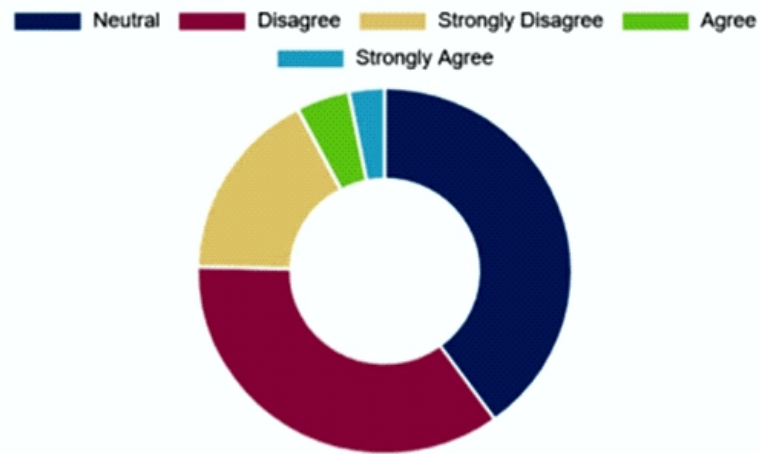
Protected cultivation associations are still at a very early stage of development in Nigeria, and this is evident with how weakly structured farmer groups are. Most of players in the sector rely on social media groups like WhatsApp platforms to keep connected. Eighty-three percent of the farmers in this sector are not members of any form of cooperative or farmer groups but at least 4 in 10 greenhouse farmers are part of a dedicated protected cultivation group on social media. There are little business networking events focused on greenhouses or general horticulture. This leads to farmers in this sector not having the needed numbers to influence policies or develop proper advocacy activities. During the FGD, majority of the farmers identified a lack of coordination in the sector and poor flow of information within the sector as having serious negative impact on their ambitions to address the biggest systemic challenges facing them.



Member of a greenhouse association or cooperative

Regulatory Framework

There is currently no legal framework for registering greenhouse equipment and input sellers or for the service providers in this sector particularly the training consultants. Over half the respondents believe the regulation of the sector is poor.



Need for Regulation in the sector

Government Policies

Government policies have been deemed as counter productive and inhibiting the growth of the sector. The ban on fertilizer importation is seen as a big hindrance to developing the sector. Field visits showed correlation with this data as farmers are struggling to keep up with the rising cost of fertilizers for their production. On a positive note, the removal of import duty by the Federal Government of Nigeria on greenhouses through the National Tomato policy developed in 2017 has really helped the promotion of the sector.





Closing Discussion & Recommendations

The key findings from this study have been devolved into five sector alerts that highlights the state of protected cultivation in Nigeria and the recommended mitigation in the context of the HortiNigeria program. The various alerts are inter-linked and create an eco-system of interdependent problems that feed into each other to create a snapshot of the sector. These alerts as well as suggested mitigations are compiled in the table below.

Greenhouse cultivation has the potential to play a significant role in Nigeria's agriculture sector, providing increased food security, higher yields, and improved quality of crops. Despite the challenges, investment in the development of the greenhouse sector in Nigeria has the potential to provide significant benefits to farmers, the agriculture sector, and the country when the identified challenges around infrastructure for post-harvest management, agro-logistics, technical knowledge/capacity development, enabling policies that help easy access to the correct inputs are addressed.



Overview of Rapid Assessment of Protected Cultivation; Sector Alerts

Sector	Key challenges and alerts	Proposed mitigations
Socio-Economic	Protected cultivation investments are carried out without proper market research and information. This creates an unrealistic expectation for Return on investment (ROI) and poor match of investor and the appropriate protected cultivation technology.	<p>Profile of investors need to be put into consideration before investments are made to manage expectations properly.</p> <p>There is a need to develop a starter toolkit based on proper technical recommendations and guidelines for matching solutions/innovations with the right investors.</p>
	Greenhouse vegetable farming is championed by young entrepreneurs and rearing professionals lacking a matured and tested business model as well as sufficient knowledge base in farming production systems.	<p>Existing businesses in the protected cultivation space need to be supported to develop optimized working models that can be used as templates for new investors.</p> <p>Cost benefit analysis of greenhouse farming to prevent high expectations and validated market potentials and ROIs to attract more investments.</p>
Bio-physical & Infrastructure	Poor design and selection of greenhouses. Not all PC structures are the same as there are different levels and need to be very clear when using terminologies - shaded cultivations are different from greenhouses, low tunnels etc.	Due to the wide divergence of environmental challenges within the country, a region-specific tailored approach is required in greenhouse construction and installation.

	Lack of proper feasibility studies -climatic conditions are not properly emphasized when procuring greenhouses in Nigeria.	Feasibility studies need to be properly undertaken before PC investments. Meteorological data collection before construction and installations
	High cost of spare parts and repair of greenhouse structures.	Research on how to produce local substitutes for spare parts. Better enforcement of the tariff waivers for greenhouse parts at the ports.
	Power, energy, and road access are key challenges facing the sector	Government interventions needed – consider public-private enterprise models to develop infrastructure to support protected cultivation. Offer tax breaks and investment incentives for investors creating large infrastructural solutions for the greenhouse sector
Production Systems	Production cost for greenhouse farming is getting higher due to the high cost of inputs – (<i>fertilizer, energy, maintenance</i>) and the market size is still small, as the traditional open market doesn't place much value on the quality but low prices.	Review of policies by relevant agencies to include certain inputs that are not available locally or research on local alternatives
	Low skills proficiency in agronomic knowledge and technical know-how on the field level especially amongst field staff and farm managers leading to low yield returns.	Promote capacity building training through TVET (Technical and Vocational Education and Training) and school curriculum adaptation. Training/development of formalized crop specific modules on PC management Build business models that would include SMH farmers in PC value-chain.



	Supply of poor inputs or inappropriate inputs leading to exploitation of the poor knowledge of investors in greenhouse farming is very common leading to failure and closures of farms.	Use starter materials and seeds from certified Seed distributors. Research and technology verification trials with greenhouse growers
	Seed quality for PC cultivation is very low and poor selection of varieties among growers.	Support in the selection of the right varieties is needed. Growers are recommended to engage in crop consultation business model. Recommend PC investors to join associations that have Crop consultants on retainer or
Value-chain /Consumption/Services	Lack of storage facilities to improve shelf life coupled with poor transport network and logistics leads to increased post-harvest losses.	periodic trainings on PC SOP Pooling of resources through processing centers and shared clusters for facilities like pack-houses are much more important than focusing on cold chain logistics alone.
	Limited market segment for greenhouse vegetables. Purchase power of the open markets <u>are</u> very limited. Low consumers awareness of vegetable consumption Inconsistency in supply of greenhouse products	Stimulate investment in development of retail chains and standardized market outlet. Build more business linkages with premium markets. Understanding the seasonality of demands and keeping the standards consistently high is key in reducing losses for marketers and keeping the value chain growing. Value chain actors need to invest in other players of the chain rather than try to take on new roles leading to system
Coordination, Policy & Regulation	Regulation for protected cultivation seeds is very low, typically PC seeds are hybrid and high costing. The fertilizer ban is detrimental to the business - as the law is misinterpreted or poorly formulated.	inefficiencies in the value chain The formation of greenhouse associations is key for engaging productively with the policy makers. NGOs can only stimulate the conversation. Training of policy makers and increasing the awareness of

	Lack of strong associations and farmer groups in the greenhouse sector	<p>policy makers on PC investment potentialities.</p> <p>Build stronger network and networking events to increase engagement.</p> <p>Protected cultivation is a very competitive market and needs stronger focus on collaboration and information sharing.</p> <p>Proper certification is needed for actors in this eco-system. particularly greenhouse suppliers and training service providers & consultants.</p> <p>Need for more networking events and private investor forums to steer the sector development and engagement of policy makers.</p>
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Fertilizer Ban and Effects on Protected Cultivation

The sector is struggling to cope and face an existential problem with the challenge of the fertilizer policy of the government. Nigeria's recently imposed ban on certain types of fertilizers that are believed to be harmful to the environment has dire consequence on the sector. This ban has had a significant impact on greenhouse cultivation in Nigeria, as these types of fertilizers are commonly used in the greenhouse industry.

Impact on Crop Yields: The ban on certain types of fertilizers has led to reduced yields for greenhouse farmers. These fertilizers play an important role in providing essential nutrients to crops, and the ban has resulted in a shortage of effective and safe fertilizers for greenhouse use. This has led to reduced growth and lower yields for greenhouse crops, which has had a negative impact on the profitability of greenhouse farming.

Costs: The ban on fertilizers has also resulted in increased costs for greenhouse farmers. Many farmers have been forced to switch to more expensive and less effective fertilizers, which has increased the cost of production and reduced profitability.

Challenges for Small Farmers: The impact of the fertilizer ban has been particularly challenging for small farmers. These farmers often have limited resources and are unable to absorb the increased costs associated with the ban. This has led to a reduction in the number of small farmers engaged in greenhouse cultivation, which has had a negative impact on the overall industry. The ban on certain types of fertilizers has had a significant impact on greenhouse cultivation in Nigeria. The ban has resulted in reduced yields, increased costs, and challenges for small farmers. The government needs to reconsider the ban and find alternative solutions that will protect the environment and support the growth of the greenhouse industry in Nigeria.

Impact on Yields: A direct consequence of the ban is reduced yields and low-quality crops, which can negatively impact the profitability of greenhouse farmers. This can result in decreased investment in greenhouse cultivation, leading to reduced production and food security.

Increased Costs: In the absence of fertilizers, farmers may have to rely on alternative, often more expensive, methods to meet the nutrient needs of their crops. This has increased the cost of production and reduced profitability, making greenhouse farming less attractive to farmers.

Lack of Innovations: Fertilizer research and development play an important role in the agriculture sector, and a ban on their use can limit the potential for innovation and the adoption of new technologies. This can be a barrier to the growth and development of greenhouse farming in Nigeria. A concerted effort towards boosting local blending and manufacturing of enhanced performance fertilizer is required. FEBSAN the flagship association for fertilizer blenders in Nigeria need to be stimulated through research and innovation towards filling this gap for horticultural grade fertilizers.

Impact on Soil Health: The overuse of fertilizers can lead to soil degradation, but without their use, soil fertility may decline, resulting in reduced crop productivity overtime. This highlights the importance of balanced and sustainable fertilizer use, which can support both soil health and crop productivity.

The ban on fertilizer use can have a significant impact on greenhouse cultivation in Nigeria, affecting yields, costs, and soil health. It is important for the government and stakeholders to consider the implications of such a ban, and to find alternative solutions that support sustainable and productive greenhouse farming. This may include measures to regulate the use of fertilizers, promote balanced and sustainable use, and provide alternative sources of nutrients for crops.

Renewable Energy and Protected Cultivation

The energy costs for running greenhouse farms in Nigeria are significant. This is the third most important cost driver for the production cost of vegetable farmers in protected cultivation. Investment in renewable sources of energy particularly solar is of great importance towards ensuring continued sustainability of the sector in the country. A combination of solar/photovoltaic solutions with protected cultivation would provide an environmentally friendly and economical approach towards solving the energy crisis bound to affect the sector with the expected increase in prices of fossil fuel in Nigeria with the planned removal of subsidies for petrol and diesel. Solar energy solutions would not just play a key role in helping greenhouses get energy for pumping water for irrigation and running the climate control systems, but also energy to store and run affordable cold storage facilities.

Biological Crop Protection

The need for increased investment and research into biological crop protection inputs is clear from this study. Majority of the agro-dealerships interviewed are interested in stocking bio-based and organic inputs but do not have the right linkages to companies and manufacturers of inputs with proven efficacy on the field. Understanding the various types of modern biological-based crop protection available globally would be important for the agro-dealers and input providers as well as re-training on usage of these inputs. Vegetable farmers in general have struggled with various diseases and pests that are showing stronger tolerance and resistance to conventional pest control inputs. Pests like Tuta Absoluta, while not a major worry for greenhouse farmers have proven to be high on the challenges faced by farmers in various parts of the country. Thrips and soil-borne pathogens have also been highlighted by farmers and these all require novel approaches that are safe for the farmer and in line with the expectations of a growing demand for healthy locally made vegetables.

Protected Cultivation's Role in Transforming Nigeria's Horticultural Sector:

- **Enhanced Crop Yield:** Greenhouses provide a controlled environment that allows for optimal growth conditions, leading to higher yields. This results in increased productivity and profitability for farmers.
- **Increased Food Security:** Greenhouse cultivation helps address Nigeria's food security challenges, by providing a steady and reliable source of fresh produce throughout the year.
- **Reduced food systems Losses:** The enclosed nature of greenhouses reduces crop losses due to pests, diseases, and environmental stress.
- **Creates job opportunities for youths:** Protected cultivation offers great employment opportunities for the young populations particularly graduates from tertiary institutions taking their first steps into agribusiness.
- **Makes agriculture attractive for the younger generation.**

Recommendations

1. Intensified and sustained advocacy effort should be made on policy makers to ensure a review of the ban on fertilizers and consider providing alternative solutions that will protect the environment while also supporting the growth of the greenhouse industry.
2. Investment into research and development should be increased to find locally manufactured alternative, safe, and effective fertilizers for greenhouse use.
3. HortiNigeria should provide dedicated support in practical aspects of greenhouse production competencies as well as agribusiness training for the greenhouse industry in Nigeria.
4. Liaise with tertiary institutions to develop a protected cultivation curriculum for students and intensify research into locally suitable systems that can be adopted in the country
5. HortiNigeria should work with the private sector to improve access to financing for greenhouse farmers due to the peculiar nature and large amount of capital required for setup and operations in the sector. Consider stimulating venture capital investment in the sector.
6. Support the formation of greenhouse farmer groups, cooperatives and Increase business-to-business networking opportunities for them and information sharing platforms.
7. Incubate and support fresh produce aggregation and marketing businesses that would create more pull and demand for greenhouse produce.
8. Develop a clear roadmap towards combining climate smart innovations, particularly in linking renewable energy sector to greenhouse farming, this can be achieved by investing into market-building activities e.g. developing a digital platform for B2B matchmaking of companies in the horticultural sector with companies in the renewable energy space to create interesting solutions for greenhouse farmers.
9. Develop a clear strategy towards increasing female inclusion in protected cultivation eco-system in Nigeria
10. Stimulate and support input providers/agro-dealers in expanding biological crop protection products by building partnerships with producers globally and supporting research into local production.



Greenhouse cultivation has the potential to play a significant role in Nigeria's agriculture sector, providing increased food security, higher yields, and improved quality of crops with the right investment into safer inputs, agro-logistic and post-harvest technologies as well as enabling environments to support investors in the sector.



ANNEX

Estimates of Production for Key Crops in Greenhouse EOP & GROSS MARGINS FOR GREENHOUSE TOMATO PRODUCTION

GROSS MARGIN BREAKDOWN

COSTS	ITEM	DIESEL/LTS	QUANTITY	UNIT	UNIT COST	SUB TOTALS	TOTALS
Water requirement	60000ltrs/day						
SEED	Seed EVA		11000		N 32.00	N 352,000.00	N 352,000.00
	Seed Belfort		11000		N 65.00	N 715,000.00	N 715,000.00
FERTILIZER						N -	
	NPK 20:20:20+ TE		75	kg/Ha	N 1,240.00	N 93,000.00	
	KNO3		960	kg/Ha	N 1,280.00	N 1,228,800.00	
	Magnesium Sulphate		500	kg/Ha	N 410.00	N 205,000.00	
	Calcium Nitrate		800	kg/Ha	N 1,040.00	N 832,000.00	
	Mono Ammonium PHOSPHATE (MAP)		200	kg/Ha	N 1,040.00	N 208,000.00	
	SSP		256	kg/Ha	N 240.00	N 61,440.00	
	NPK 20:10:10		512	kg/Ha	N 210.00	N 107,520.00	
	Nitric acid		240	kg/Ha	N 771.00	N 185,040.00	
CHEMICALS						N -	
	Mectin		1,500.00	mls/ha	N 6.00	N 9,000.00	
	ACTARA		400.00	g/ha	N 100.00	N 40,000.00	
	RIDOMIL GOLD		6,000.00	g/ha	N 8.00	N 48,000.00	
	Ridmil MZ		6,000.00	Mls/Ha	N 9.00	N 54,000.00	
	Champ Dp		6,000.00	g/ha	N 8.00	N 48,000.00	
	Neem oil		12,000.00	ml/ha	N 5.00	N 60,000.00	
	Abamectin		6,000.00	ml/ha	N 3.00	N 18,000.00	
	Ampligo		160.00	sachet/ha	N 750.00	N 120,000.00	
	Ortiva - Azoxystrobin		2,000.00	ml/ha	N 20.00	N 40,000.00	
	Fruit setting solution		500.00	ml/tunnel	N 170.00	N 85,000.00	N 3,442,800.00
PLANTING MEDIA	CHICKEN MANURE		20.00	Trailer	N 15,000.00	N 300,000.00	
SOIL STERILIZATION	SOIL STERILIZATION LABOUR		30	day	N 6,000.00	N 180,000.00	N 480,000.00
	Trellising rope		20	Bag	N 9,500.00	N 190,000.00	
	Planting bag		25,000	Count	N 41.00	N 1,025,000.00	N 1,215,000.00
FIREWOOD			72	cord/ha	N 10,000.00	N 720,000.00	N 720,000.00
Sharp sand			54	Trailer	N 3,500.00	N 189,000.00	N 189,000.00
LABOUR COST/ ha							N 1,000,000.00
DIESEL COST/ha							N 950,000.00
OTHER TFARM OPERATING COST/							N 500,000.00
TOTAL COST OF PRODUCTION:						N -	N 10,447,800.00

Gross Yield (kg/T)	60,000
Life Cycle	5month
Average Pack out (%)	90%
Net Yield (kg/ha)	54,000
Variable Costs of Production per T	N 10,447,800.00
Variable Costs of Production per Net Kg	N 193.48
Farm Gate Price	N 450.00
Gross Return	N 24,300,000.00
Gross Profit/Loss	N 13,852,200.00

EOP & GROSS MARGINS FOR GREENHOUSE BELL PEPPER PRODUCTION

GROSS MARGIN BREAKDOWN

COSTS	ITEM	DIESEL/LTS	QUANTITY	UNIT	UNIT COST	SUB TOTALS	TOTALS
Irrigation/fertigation	Irrigation/Fertigation		10000	M3/HA	# 190.00	# 1,900,000.00	
	Miscellaneous Irrigation/fertigation Costs @ 1% of Total Costs						# 1,900,000.00
Water requirement	60,000lts/ha/day					# -	
SEED	Seed Clair. Evans, Gulpina, ergon		22000		# 50.00	# 1,100,000.00	# 1,100,000.00
SEED	Seedling cost			seedlings		# -	
FERTILIZER						# -	
	NPK 20:20:20+ TE		75	kg/ha	# 1,240.00	# 93,000.00	
	KNO3		960	kg/ha	# 1,280.00	# 1,228,800.00	
	Magnesium Sulphate		500	kg/ha	# 410.00	# 205,000.00	
	Calcium Nitrate		952	kg/ha	# 1,040.00	# 990,080.00	
	Mono Ammonium PHOSPHATE (MAP)		200	kg/ha	# 1,040.00	# 208,000.00	
	SSP		256	kg/ha	# 210.00	# 53,760.00	
	NPK 20:10:10		512	kg/ha	# 240.00	# 122,880.00	
	Nitric acid		240	kg/ha	# 771.00	# 185,040.00	
CHEMICALS							
	Mectin		3,000.00	mls/ha	# 6.00	# 18,000.00	
	ACTARA		40.00	g/ha	# 100.00	# 4,000.00	
	Lancer gold		2,000.00	g/ha	# 8.00	# 16,000.00	
	Ridmil MZ		2,000.00	MLS/HA	# 9.00	# 18,000.00	
	Champ Dp		2,000.00	g/ha	# 8.00	# 16,000.00	
	Dimetoate		200.00	ml/ha	# 3.00	# 600.00	
	Belt Expert		300.00	mls/ha	# 30.00	# 9,000.00	
	Cypermethrin		1,500.00	mls/ha	# 3.00	# 4,500.00	
	Neem oil		3,000.00	ml/ha	# 6.00	# 18,000.00	
	Insecticidal soap		3,000.00	mls/ha	# 2.00	# 6,000.00	
	Emamectin benzoate		2,000.00	mls/ha	# 6.00	# 12,000.00	
PLANTING MEDIA	CHICKEN MANURE		20.00	Trailer	# 15,000.00	# 300,000.00	
	Miscellaneous Labour @ 1% of Total Labour		-	lab/days	# -	# 80,000.00	# 3,778,660.00
TRELLISING	Bailing twine		20.0	rolls	# 9,500.00	# 190,000.00	# -
	Repairs & Maintenance			10%		# -	# 800,000.00
LABOUR COST/ha							# 1,000,000.00
OTHER TFARM OPERATING COST/5% of Operating cost							# 410,000.00
TOTAL COST OF PRODUCTION:						# -	# 8,988,660.00

Gross Yield (kg/T)	40,000 kg
Life Cycle	6month
Average Pack out (%)	90%
Net Yield (kg/ha)	36,000
Variable Costs of Production per T	# 8,988,660.00
Variable Costs of Production per Net Kg	# 249.69
Farm Gate Price	# 750.00
Gross Return	# 27,000,000.00
Gross Profit/Loss	# 18,011,340.00

EOP & GROSS MARGINS FOR GREENHOUSE CUCUMBER PRODUCTION

COSTS	ITEM	DIESEL/LTS	QUANTITY	UNIT	UNIT COST	SUB TOTALS	TOTALS
Irrigation/fertigation	Irrigation/Fertigation		2000	M3/HA	N 190.00	N 380,000.00	
	Miscellaneous irrigation/fertigation Costs @ 1% of Total Costs						N 380,000.00
Water requirement	60,000lts/ha/day					N -	
SEED	Cucumber		48000		N 28.00	N 1,344,000.00	N 1,344,000.00
SEED	Seedling cost			seedlings		N -	
FERTILIZER						N -	
	NPK 20:20:20+ TE		38	kg/ha	N 1,240.00	N 46,500.00	
	KNO3		240	kg/ha	N 1,280.00	N 307,200.00	
	Magnesium Sulphate		125	kg/ha	N 410.00	N 51,250.00	
	Calcium Nitrate		119	kg/ha	N 1,040.00	N 123,760.00	
	Mono Ammonium PHOSPHATE (MAP)		60	kg/ha	N 1,040.00	N 62,400.00	
	SSP		256	kg/ha	N 210.00	N 53,760.00	
	NPK 20:10:10		512	kg/ha	N 240.00	N 122,880.00	
CHEMICALS	Nitric acid		60	kg/ha	N 771.00	N 46,260.00	
	Mectin		1,500.00	mls/ha	N 6.00	N 9,000.00	
	ACTARA		20.00	g/ha	N 100.00	N 2,000.00	
	Lancer gold		1,000.00	g/ha	N 8.00	N 8,000.00	
	Ridmil MZ		1,000.00	MLS/HA	N 9.00	N 9,000.00	
	Champ Dp		750.00	g/ha	N 8.00	N 6,000.00	
	Belt Expert		150.00	mls/ha	N 30.00	N 4,500.00	
	Cypermethrin		750.00	mls/ha	N 3.00	N 2,250.00	
	Neem oil		1,500.00	ml/ha	N 6.00	N 9,000.00	
	Insecticidal soap		1,500.00	mls/ha	N 2.00	N 3,000.00	
	Emamectin benzoate		750.00	mls/ha	N 6.00	N 4,500.00	
PLANTING MEDIA	CHICKEN MANURE		10.00	Trailer	N 15,000.00	N 150,000.00	
	Miscellaneous Labour @ 1% of Total Labour		-	lab/days	N -	N 25,000.00	N 1,236,260.00
TRELLISING	Bailing twine		20.0	rolls	N 9,500.00	N 190,000.00	N -
	Repairs & Mantanance		10%			N -	N 800,000.00
LABOUR COST/ ha							N 250,000.00
OTHER TFARM OPERATING COST/ 5% of Operating cost							N 150,000.00
TOTAL COST OF PRODUCTION: N						-	N 4,160,260.00

Gross Yield (kg/T)	30,000
Life Cycle	2.2 months
Average Pack out (%)	90%
Net Yield (kg/ha)	27,000
Variable Costs of Production per T	N 4,160,260.00
Variable Costs of Production per Net Kg	N 154.08
Farm Gate Price	N 250.00
Gross Return	N 6,750,000.00
Gross Profit/Loss	N 2,589,740.00

SAMPLE COST OF GREENHOUSE INSTALLATION

S/N	Level of Tech	Price per sqm
1	Low Tech with startup kits and seeds	₦20,833.33
2	Low tech with startup kits and seeds	₦18,229.17
3	Mid Tech with startup kits and seed	₦29,500.00
4	Mid tech with startup kits and seeds	₦26,666.00

STAKEHOLDER MAPPING OF PROTECTED CULTIVATION IN STUDY AREA

ABUJA		
NAME (COMPANY OR INDIVIDUAL)	CONTACT (ADDRESS, EMAIL OR PHONE NUMBER)	CATEGORY
Colour Capital Farms	Gaube Village, Kuje	Greenhouse
Isabel Farm	Kaura	Greenhouse
Blald Farms	Gaube Village – Kuje	Greenhouse
National Biotech Agency Farm	Lugbe, Airport Road	Greenhouse
Innov8 Hub	Gosa Village Airport Road, Municipal Abuja	Greenhouse
SCC farms	Bwari, Abuja	Greenhouse
Etema Farms	Gwagwalada	Greenhouse
Almat Farms	Almat Drive, Chibiri – Kuje	Greenhouse
Onitech global		Greenhouse
LATC/DobiAgro	Dobi, Gwagwalada	Greenhouse
Ajima Farms	Chibiri village Kuje	Greenhouse
DRS Farms	Check Point, Pasali, Kuje	Greenhouse
CCL Farms	Gaube Village, Kuje	Greenhouse
Ismaila Farms	Kaduna Road, Madalla Abuja	Greenhouse
Golden Finger Farms	Zuba Junction, Abuja	Greenhouse
Jebyaw Farm	Extension AA, Near Holy Family, Kuje	Greenhouse
Shebah Farms	Kiyi Village, Kuje	Greenhouse
Numo Farms	Chibiri Village Kuje	Greenhouse
Agrohortiponics	Garki Abuja	Agrodealership
Gwani Agro Inputs	Jabi Motor Park, Abuja	Agrodealership
Verde Stratum	Km8, Chibiri Village Kuje -	Agrodealership
Onida Global	Jabi Abuja	Agrodealership
Contec Global	Maitama	Agrodealership
Jubaili Agrotech	Idu Industrial Estate, Abuja	Agrodealership
Jubaili Agrotech seeds	Idu Industrial Estate, Abuja	Seeds supplier
Afri-Agri	Jabi Park, Abuja operations@afri-agri.com	Agrodealership
Afri Fruits	Rukaya Plaza, Abuja Central	Greenhouse Supplier
Dizengoff WA	Business Area, Abuja dizengoff@dizengoff.com	Greenhouse Supplier
Jubaili Agrotech Mafwil	Idu Industrial Estate, Abuja	Greenhouse Supplier
Natural Veggies Mama	bulusmandong7@gmail.com ,	Fresh Produce Seller
Papa Veggies	Dei-Dei Market	Fresh Produce Seller
Abdulrahman Aliyu	Maitama Farmers Market, abdulrahmanaaliyu48@gmail.com	Fresh Produce Seller
Yakubu Yallo	Kuje Market - 08038976543	Fresh Produce Seller

STAKEHOLDER MAPPING OF PROTECTED CULTIVATION IN STUDY AREA

OGUN		
NAME (COMPANY OR INDIVIDUAL)	CONTACT (ADDRESS, EMAIL OR PHONE NUMBER)	CATEGORY
Adu Farms		Greenhouse
Veggies city Farm		Greenhouse
Odeda Farm		Greenhouse
Rade Agro farms ltd		Greenhouse
All specs Farm		Greenhouse
Riparian Farm Ltd		Greenhouse
Agro Blue star Farms ltd		Greenhouse
BA Ameen N Ltd		Greenhouse
Celplas Farms		Greenhouse
Faika Farms		Greenhouse
Gessort Agro		Greenhouse
Jenny josh Enterprise		Greenhouse
Veggie tulips Agro		Greenhouse
Seedforth Agro		Greenhouse
BIC farms		Greenhouse
Obasanjo farms		Greenhouse
Soilless Farmlab		Greenhouse
Grace Edge Agro		Greenhouse
San Carlos Marke ng		Greenhouse
Ibid Farm Nigeria Limited	Ibido Ogbo, Ijebu Ode – Ogun	Greenhouse
Fourlas Foods		Greenhouse
LWMS Farm Limited		Greenhouse
Seedforth Agro		Agrodealership
Jubaili Agrotec		Agrodealership
Agro mart		Agrodealership
Ceda Agro		Agrodealership
Adia Doa Ltd		Agrodealership
Fab Ayoka Agro		Agrodealership
Baba Cabster		Agrologistics Transporter
Light Trucker	08062654435	Agrologistics Transporter
Fresh Green Transporter		Agrologistics Transporter
Farm2city Agro Consult		Technical Manager
Chicclar farms Consult		Technical Manager
Hinents		Technical Manager
Adia Doa Ltd		Technical Manager
Uche farm tech		Technical Manager
Kaspharyn solutions		Greenhouse Supplier
Farm Afrik		Greenhouse Supplier
Agromart		Greenhouse Supplier

STAKEHOLDER MAPPING OF PROTECTED CULTIVATION IN STUDY AREA

LAGOS		
NAME (COMPANY OR INDIVIDUAL)	CONTACT (ADDRESS, EMAIL OR PHONE NUMBER)	CATEGORY
Aingeal Farms	Epe – Lagos	Greenhouse
Enviroagro farms		Greenhouse
Treasure Farms	Igbodu Epe, Lagos	Greenhouse
Levi Farms Grace	Igbodu Epe, Lagos	Greenhouse
Bay Farms	Malojoye, Epe -Lagos	Greenhouse
Blooming Garden	Igbodu Epe, Lagos	Greenhouse
Lapa Farm	Igbodu Epe, Lagos	Greenhouse
Amaccen Farm	Igbodu Epe, Lagos	Greenhouse
Jedusa Farm Agro Limited	Igbodu Epe, Lagos	Greenhouse
Accent Integrated Farm	Igbodu Epe, Lagos	Greenhouse
Best foods Farm	Igbodu Epe, Lagos	Greenhouse
Nature's Valley Agro Farm	Ejirin Epe, Lagos	Greenhouse
Zi o & Rose Farm	Ipakere Epe Lagos	Greenhouse
Kalase Farm Limited	Ipakere, Epe – Lagos	Greenhouse
Okeowo Farm	Majoda Epe, Epe Lagos	Greenhouse
Dassah Farm	Ilara Epe, Epe Lagos	Greenhouse
Eweko Concept		Technical Manager
Greencity Farmers		Greenhouse
Rofa Farms		Greenhouse
Rade Agro farms ltd		Greenhouse
Q6 Ltd		Greenhouse
Fumman		Greenhouse
Oak Tree Farm		Greenhouse
Li le Greens Farm		Greenhouse
Krish Agro		Greenhouse
NV Square Express		Greenhouse
EAT Agro Farm		Greenhouse
Cosmos Farms		Greenhouse
Ms Chris ana Akinwunmi		Greenhouse
Chadi Kunda ltd		Greenhouse
Mr Prakash K Rennie		Greenhouse
Greens Farm		Greenhouse
Dibbles Farm		Greenhouse
Fadil Farms		Greenhouse
VD&S Farmers shop		Agrodealership
Afri Agric Products		Agrodealership
Agrohortiponics		Agrodealership
Saro Sciences	saroagrosiences@saroafrica.com	Agrodealership
Dizengoff WA		Agrodealership
VeggieGrows		Fresh Produce Trader
Bunkasa Agro Tech	info@mile12market.org	Fresh Produce Trader
RODABAS TRANSPORTERS		Agrologis cs Transporter
Greenhouses.ng		Greenhouse Supplier
Greenspan agro		Greenhouse Supplier
Spar Nigeria Freshmarket	scmfrsh05@sparnigeria.com	Fresh Produce Trader
(Shoprite)	Shoprite Lekki - 08034824617	Fresh Produce Trader

STAKEHOLDER MAPPING OF PROTECTED CULTIVATION IN STUDY AREA

OYO		
NAME (COMPANY OR INDIVIDUAL)	CONTACT (ADDRESS, EMAIL OR PHONE NUMBER)	CATEGORY
Feed the west		Greenhouse
Farm Help		Greenhouse
Kofo Agro Farms	Iseyin,	Greenhouse
Wells Hosa GH farm		Greenhouse
Green World	akinlabiae@yahoo.com	Greenhouse
Saro Agrosience Limited		Greenhouse
Toc Noc Agro	uchaynancy@gmail.com	Agrodealership/Input Provider
MOAFK Agro		Agrodealership/Input Provider
UPL	adenideb@gmail.com	Agrodealership/Input Provider
Kartlos Farms		Greenhouse
The International Institute of Tropical Agriculture (IITA)		Greenhouse
BA Ameen N Ltd	ceo@baameenfarms.com	Greenhouse
Solokad Mul ventures		Agrodealership/Input Provider
KANO, JIGAWA & KADUNA		
NAME (COMPANY OR INDIVIDUAL)	CONTACT (ADDRESS, EMAIL OR PHONE NUMBER)	CATEGORY
DE ROCK LANDMARK INTERNATIONAL	Onoche- 08080318502 Dutse, Jigawa	Agrodealers & Input Providers
Mallam Aloo	CDA, New Campus BUK	Greenhouse
Centre For Dryland Agriculture	Kwana Dawaki, Kano	Greenhouse
Belmari Farms	Bagauda, Kano	Greenhouse
SFSA HUB	Bagwai, Kano	Greenhouse
SFSA HUB	Makoda, Kano	Greenhouse
SFSA HUB	Kwana Dawaki, Kano	Greenhouse
SFSA HUB	Bichi, Kano	Greenhouse
SFSA HUB	Minjibir, Kano	Greenhouse
SFSA HUB	Dan Hassan, Kano	Greenhouse
SFSA HUB	Damba a, Kano	Greenhouse
Damba a College of Agriculture	Maidugri Road, Kano	Greenhouse
Royal Blue Contractors	Singa Market, Kano	Agrodealership & Input Provider
Kafin Kafi	Kadawa, Kano Kwana	Agrodealership & Input Provider
Dansa Food Greenhouse	Dawaki, Kano	Greenhouse
Afri-Agri Products	Tarauni, Nassarawa LGA, Kano	Agrodealership & Input Provider
Vertical Farms	Fagge Market, Kano	Technical Manager
Alheri Global Implus	Tarauni, Kano	Agrodealership & Input Provider
Jay Tech & Allied Resources	jaytechresources@gmail.com 7A, TUKUR ROAD, NASSARAWA	Greenhouse
Jubaili Agro Tech	GRA, KANO, KANO STATE	Greenhouse
Fresh Produce Trader	Sokoto Road, Nassarawa LGA,	
A. Howeidy Enterprises	Kano	Agrologis cs Transporter

STAKEHOLDER MAPPING OF PROTECTED CULTIVATION IN STUDY AREA

PLATEAU, NASSARAWA & TARABA		
NAME (COMPANY OR INDIVIDUAL)	CONTACT (ADDRESS, EMAIL OR PHONE NUMBER)	CATEGORY
CSS Group	Gora, Nasarawa State morrisindiana39@gmail.com	Greenhouse
Mrs. Grace	Wukari, Taraba	Greenhouse
Ten Greens Farms	Jos - Plateau state georgedapel@gmail.com	Greenhouse
Solarum Potatoes	Jos - Plateau state	Greenhouse
Rayuwa Farms	Gora, Nassarawa State	Greenhouse
Kamjay farms	Nassarawa State	Greenhouse
SFSA Hub	Koffi, Nassarawa	Greenhouse
Vicampro	Jos - Plateau state	Greenhouse
Derby Farm		Greenhouse
Camiolla Garden		Greenhouse
Blessed Agro		Greenhouse
Thap Veg-Pro		Greenhouse
Plant Alive		Greenhouse
Lamingo Chinese Farm		Greenhouse
Bitrus Pwajock		Greenhouse
Engr. Linus Farm		Greenhouse
Taraba vegetables	Jalingo, Taraba	Greenhouse
Corban Agro	Rayfield, Jos Plateau	Agrodealership & Input Provider
Ace Green Foods	Rayfield, Jos Plateau	Agrologis cs Transporter

EKITI, ONDO, OSUN, EDO		
NAME (COMPANY OR INDIVIDUAL)	CONTACT (ADDRESS, EMAIL OR PHONE NUMBER)	CATEGORY
Bethel farms	Ondo	Greenhouse
Beck Fol Veggies		Greenhouse
Fanjund Farm		Greenhouse
Crown Mul dynamic business Ent.		Greenhouse
Affluenza Group		Greenhouse
Mr Ebenezer Komolafe		Greenhouse
Mr Ro mi		Greenhouse
Mr Michael Olasco		Greenhouse
Mr Abiodun Ademola Afolabi		Greenhouse
FMS Farms Ltd	Eki	Greenhouse
Farmaville Consult Ltd	Imo	Greenhouse
Wells Hosa Farms	Edo	Greenhouse
Emperor Farms	Kogi	Greenhouse
Bayer crop science	Osun	Agrodealership & Input Provider
Omo Iya	Osun	Technical Manager
Pete Consults	Edo	Technical Manager

FEEDBACK FROM THE PUBLIC PRESENTATION HELD ON THE 12TH OF FEBRUARY 2023 IN ABEOKUTA OGUN STATE

Below is feedback from panelists and participants at the public presentation of the report on protected cultivation:

1. The Director of Horticulture at the Federal Ministry of Agriculture and Rural Development committed to supporting the development of a protected cultivation policy document. He also emphasized that they will be needing technical inputs and support in developing the strategy document, exposure, and more information about the sector, especially the pain points of the actors along the value chain. He also suggested fact-finding missions to and discussing trade missions to Morocco and Netherlands
2. Currently, the support given by the Ministry of Agriculture is mainly input supply to farmers, but these inputs are suited for open-field farmers and not relevant to farmers working in protected cultivation
3. To enhance interaction between protected cultivation actors, the government, and other policymakers, there is a need for the establishment of a protected cultivation association not “cooperatives”. The association will serve as a means of interaction between the government and operators of the protected cultivation value chain. In addition, the association will encourage more collaboration and knowledge sharing among actors in the value chain.
4. The protected cultivation actors noted that there is a disconnect between the performances of the people in the protected cultivation sector and other actors in the sector like academia and policymakers. More synergy and interaction are encouraged between them.
5. While sourcing for funding, it might be a better option to get funds from the Bank of Industry than sourcing for funds abroad considering the exposure to foreign exchange fluctuation ached to foreign-sourced funding
6. Considering that the climatic conditions in the country vary, it is essential that seeds and inputs developed by the academia and other research institutes should be tested around the country in the different climatic conditions to ascertain the performance and viability of the seeds under various weather conditions
7. It was noted that the government has reimposed a 20% duty on greenhouses. Local substitutes are recommended especially for the steel components of greenhouses
8. Campaign and lobby for duty waivers for greenhouse components and replacements parts
9. Continuous publicity and glamorizing of protected cultivation to attract participation from the youth









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