



Ministry of Foreign Affairs

The Vegetable and Potato sector Nigeria

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Preface

The embassy of the Kingdom of the Netherlands is proud to present you with this overview of the vegetable and potato sector in Nigeria. Nigeria is a priority for the Dutch government. This has been underlined by the 2018 policy note 'Investing in global prospects'. But also the Dutch private sector has an increased interest in Nigeria. VNO-NCW in its 2019 Africa strategy mentions the biggest economy on the continent as one of its 3 prime target countries in on the continent.

Within Nigeria, agriculture and food & nutrition security are priority sectors for Dutch interventions. For any real impact you have to be very precise on where and how you want to spend your money and time. The embassy aims to work in sectors where we have an added value based. For example through the expertise of our companies and knowledge institutes. Horticulture (especially vegetables), potato and seeds are some of the subsectors where we see this role for ourselves.

This report has helped us, and will help us, in defining our activities and interventions. We try to work based on thorough analyses and this is a key document for that. Obviously it is not possible capture all the complexities of a sector in one report. Especially not in a country as big and complex as Nigeria. In this sense I would also like to draw your attention to the seed sector review that will be published soon and that will give even more details on that specific sector in Nigeria.

Hopefully this report will be useful for you to get a better understanding of the current situation and obviously we are available for follow up. Together we could discuss more specific studies and activities based on the insights from this report.

Please enjoy the report and contact us through LAG-LNV@minbuza.nl for any questions, feedback or request!

The vegetable and potato sector Nigeria



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Summary

Agricultural cooperation between Nigeria and the Netherlands is increasing. The development of the vegetable, potato and seed sectors has high priority as they are key sources of income and nutrition. Feeding the increasing population and becoming less dependent on oil revenues are key challenges for Nigeria. The agricultural cooperation and development between the Netherlands and Nigeria is increasing and the Netherlands Ministry of Foreign Affairs (MoFA) aspires to enhance its trade and investment programme in support of the agri-food sector of Nigeria. Lack of good quality seeds is a key focus of this increased cooperation as it is considered a constraint to agricultural development in Nigeria. The Dutch Ministry of Foreign Affairs and the Dutch Ministry of Agriculture, Nature and Food Quality intend to develop a four-year integrated programme on vegetable, potato and seed sector development, concentrating in the first instance on Kaduna, Kano and Plateau States. These sectors are considered a high priority to the development of vegetable and potato cultivation and value chain development, both for improving earning and employment opportunities of farmer families and improving nutrition.

This report provides an overview of the vegetable (including seed) and potato sectors in Nigeria to inform the discussion on the design of the programme to support the horticultural sector in Nigeria. The overview is based on a combination of desk research, stakeholder interviews and a field visit. The first findings were discussed and validated during a two-week mission in Nigeria in September 2019. The report has been updated with the information and insights of this mission. Also SWOT analyses were conducted on the potato and vegetable sectors and actual seed prices of various suppliers and retail prices of the main vegetables were collected.

Kaduna, Kano and Plateau States produce over 50% of the key crops with much potential to increase yields. The key crops in terms of volume produced are tomatoes, potatoes, okra and onion. Most tomatoes (43%), peppers (36%) and onions (50%) are produced in Kaduna and Kano States and at least 45% of potatoes production comes from Plateau State.¹ The production area for vegetables was relatively stable over the last decade, but has increased for roots and tubers. The yield of most crops in Nigeria is at or below the average of Western Africa and hardly increased over the past 10 years.

Production estimates are far below potential. Potato and vegetable production perform far below their potential. Average potato yields are 3.7 tonnes per hectare per year of which 1-2 tonnes are used for seed. Sweet potato production yields approximately 2.5 tonnes per hectare. Two-thirds of the population in Kano and Kaduna is involved in agriculture and the majority is small-scale farmer with approximately 2-3 ha. Current crop indicative yields per hectare in Kaduna and Kano are low (according to FAO and FMARD 2015):

- Onion : 2 tonnes
- Tomato : 7-10 tonnes with other estimates up to 15 tonnes per ha
- Pepper : 7.6 tonnes
- Okra : 6 tonnes

There is a high demand for good agricultural practices (GAP). Agriculture in Nigeria is characterised by many challenges leading to very low productivity. The main challenges at production level are: i) low knowledge of good agricultural practices among producers, knowledge deficiency in extension staff and agro-dealers; ii) land pressure and competition (pastoralists/herdsmen); iii) limited access to good quality seeds (e.g. pest and disease resistant or suitability for both seasons, wet and dry, dominance of the seed sector by informal and unregistered seed supply, and farmers reliance on farm saved seeds of low quality; iv) ineffective seed distribution system; v) poor seed

¹ Some informal estimates indicate that even 95% of all potato produce is produced at Plateau State.

quality control system and monitoring/traceability in place and fake inputs (seed, fertiliser, pesticides) and vi) high pest and diseases occurrence.

Agronomic conditions in Nigeria are favourable to agricultural development; although water availability for irrigation systems is a serious challenge. Nationally, Nigeria has two main seasons: the wet season from May to September and the dry season from October to April. Both seasons are not comparable in terms of temperature and rainfall and farmers adjust their farming activities to the season. Regionally, Nigeria has four important types of climate. Kano, in Northern Nigeria, is characterised by a dry semi-arid climate. Kaduna, in Central Nigeria, is characterised a tropical steppe climate. The South is characterised by a tropical wet climate. Finally, the Jos Plateau is characterised by a colder temperate climate. This diversity in climate makes Nigeria favourable for larger scale and mechanised agriculture. Although Kano and Kaduna have access to dams, the water availability and quality are two challenges to the development of the agricultural sector. Infrastructure for irrigation is not in place or in very bad condition. Climate change has a strong impact on the agricultural development of Nigeria. Climate-smart agriculture or resilient strategies are not developed.

The vegetable and potato value chains are highly organised but agreements and arrangements between value chain actors are almost always informal. Most food is sold in informal markets (95-99%). The main open markets are in the southern parts of the country. Lagos alone has more than 30 informal markets with Mile 12 being the leading wholesale market of the country, Ibadan having the Sasha and Bodija wholesale markets and in Plateau State the Bokkos market is leading for the national trade in potatoes. According to unofficial estimates, 80% of production in the dry season (using irrigation farming system or riverbed production) of the northern parts of the country are marketed and consumed in the South, whereas in the wet season, mainly the southern states (using rain-fed farming systems) supply the market. Wholesale traders have a dominant position in linking producers to consumers (e.g., the trader association in Mile 12 in Lagos is very organised and influential). The retailers purchase produce from the wholesalers. They sort the tomatoes into different quality classes and sell them in smaller plastic cups at smaller markets, along the road or other informal spots. On average the weight of a plastic cup is around 0.3-0.5kg. At this point, the tomatoes are sold 4-5 days after harvest. The Nigerian food system is complex given its enormous size and frail institutional setting. Exploitative behaviour and high levels of informality are challenges. The formal retail channels serve only a very small share of the market (1-5% of national vegetable supply) with few shops and direct delivery is just emerging as an innovative new segment. Farm gate and retail prices vary per season and state. An average Irish potato price at farm gate is N140 per kg and N160 per kg at retail price on the road side close to production hub in Jos and can be as much as N400 per kg at a modern open market in Abuja. Farmgate prices for tomato vary according to the season, location and type but an average indication is N130 per kg in the dry season and N400 per kg in the wet season. Premium tomato prices vary between N350 and N800 per kg at retail level (whether exotic or local). During the Nigerian wet season, it is more difficult for farmers in the North to produce good quality produce due to a significant higher pest and disease pressure. This means that the volume is lower in this season and prices are accordingly higher. During the wet season, vegetables are often supplied from the South where the production is mainly rainfed.

Processing of vegetables as well as potatoes is very limited. For potato, the main processing actors are Fruit and Veggies Ltd., Feikop (Flour and Starch) and Lovely Potato Chips (artisanal crisps). For tomato main players are Dangote Tomato Processing Factory (Kano, GB tomato processing factory (Kaduna) and Tomato Jos factory (Kaduna). The main challenge is a stable supply of quality tomato meeting the required standards and supplying at the right price. As a result, many processed food is imported.

Access to quality seeds of improved varieties is a key challenge. Most farmers use old Open Pollinated Varieties (OPV). Farmers use seed from the informal system that is produced by other farmers, without any quality guarantee. Hybrid seeds are still uncommon with approximately 2% market share. NASC has 314 seed entrepreneurs registered at different categories ranging from large scale, medium scale, producer seller, seed dealer, and small scale companies. The Access to Seed Index benchmarked 24 key seed companies in Nigeria; but outreach in terms of extension seems

limited of the selected companies. Although good quality seed in combination with good agricultural practices leads to higher production, generally farmers are reluctant to invest in quality seed, for a variety of reasons.

Vegetable intake is insufficient in terms of quantity and variety but production cannot meet demand. Daily consumption of vegetables in Nigeria, as in most countries, is below recommendation even though vegetables are considered a standard element of meals in Nigeria. An important crop to the Nigerian diet is tomatoes, accounting for almost one-fifth of vegetable consumption. Tomatoes are often consumed in combination with onion and pepper. Currently, national production cannot meet demand. According to FMARD (2015), the demand gap for tomato is 2.3 million tonnes, for onion 0.8 million tonnes and for okra 10 million tonnes. The expectation is that demand will only further increase as a result of population growth, increasing income and the increased focus of government policies and awareness raising activities on food nutrition. One of the activities is the school feeding programmes **where all students have a weekly 'Fruit and Vegetable day'**.

The enabling environment for agriculture development in Nigeria is improving, but still very challenging. The Agriculture transformation policy agenda in Nigeria is, and has been, key to agricultural development. Food security, import substitution, job creation and economic diversification are priorities of the new agricultural promotion policy. The formal vegetable seed sector is weak and poorly accessible; improving access to good quality seeds requires improved import facilitation in both the vegetables and potato sector. The potato sector has recently gained importance in public policy. A new potato value chain development programme is a sign of this improved importance. However, the potato sector is not formally represented and lacks an effective national lobby even though a State level union has been initiated. Another key challenge is the lack of land titles which strongly decreases investments by farmers. The fact that Nigeria ranks 146 out of 190 in the World Bank Doing Business and 144 out of 180 in the Transparency International Corruption is illustrative for the challenging enabling environment.

The value chain actors are very aware of the challenges they face in the potato and vegetable sectors. The participants of the validation workshops in Nigeria summarised the main challenges they face. They unanimously listed the following challenges.

Summary of challenges in the Irish potato sector, Jos September 12, 2019:

- Low knowledge of good agricultural practices among farmers, extension staff and agro-dealers (especially bacterial wilt and late blight management).
- No access to water and if irrigation exists in bad condition.
- Pest and diseases occurrence.
- Land pressure and competition (pastoralists/herdsmen).
- Bad quality of seed potato and no local breeding.
- Poor access to finance for farmers.
- Poor quality of road infrastructures.
- Volatile market prices.
- Hardly value addition, lack of performing large-scale processors.
- No seed quality control system in place.

Summary of challenges in the vegetable sector, Kano and Kaduna September 16 and 17, 2019:

- Low knowledge of good agricultural practices and post-harvest (farmers, extension, dealers).
- Land pressure and competition (pastoralists/herdsmen).
- Limited access good quality seeds. Sector dominated by an informal seed supply and relies on saved seeds. Incomplete and not functioning seed supply chain.
- No seed quality control system and monitoring/tracing in place.
- Fake inputs (seed, fertiliser, pesticides).
- Pest and diseases occurrence (especially in the wet season).
- Long distances between production and consumer. Faced with poor quality of the road infrastructure, tax and bribe flash points, lack of storage and cold chain.
- Volatile market prices/glut (sometimes not even harvest of produce).

- Dominated marketing system, dominated by powerful middle men/traders faced with high post-harvest losses: 30% up to 60%.
- Lack of successful operating processors and added value. Challenge to have effective and all year round facilities in place due to lack of continuous quality supply.
- Poor performing and strong producer organisations in place with one voice and power.

The Strengths, Weaknesses, Opportunities and Threats (SWOT)-analyses for the potato and vegetable sectors give an informative and holistic overview for practitioners and policy-makers. Table 1 and Table 2 summarise the SWOT analyses compiled in Nigeria. The participants of the validation workshops were organised in small groups according to their background (i.e. producers, traders, private sector, government, knowledge institutes) and made a SWOT for the sector from the perspective of their position in the value chain.

Table 1 SWOT analysis potato sector (source: participants potato workshop, Jos September 12, 2019)

Potato sector	
Strengths	Weaknesses
<ul style="list-style-type: none"> • Established and effective support/models by NGOs • Well-established product in the national diet • Favourable climate conditions • Well-working trading system 	<ul style="list-style-type: none"> • Poor agricultural practices • Poor quality potato seed • Conducive enabling environment • The unfavourable land tenure system • Bad infrastructure: roads to rural areas, storage of potato
Opportunities	Threats
<ul style="list-style-type: none"> • Availability of resources to expand production • Introducing quality seed potatoes to increase yields • Substitution of seed imports by local production • Substitution of processed products by local production • Increase in demand (an increase of population) • The development of farmer cooperative/associations • Access to the internet and ICT solutions 	<ul style="list-style-type: none"> • Insecurity and conflicts (herdsmen versus pastoralists) • Corruption and stringent measures by regulation agencies • Pest and disease outbreak • Natural disasters/climate change consequences • Lack of adoption and willingness to invest at farmer level

Table 2 SWOT analysis vegetable and seed sector (source: participants workshops Kano and Kaduna September 16 and 17, 2019)

Vegetable sector	
Strengths	Weaknesses
<ul style="list-style-type: none"> • Favourable climate and production of vegetables possible in the dry and wet season • Culture of farming and expertise in farming • Seed companies active on the ground • Profitable business to produce vegetables 	<ul style="list-style-type: none"> • Low yields • Lack of adoption and willingness to invest at farmer level • The sector is not organized • Weak marketing system (and poor post-harvest handling with high losses) • Lack of a cold chain • Constraints/lack of credit facilities • Lack of a conducive environment
Opportunities	Threats
<ul style="list-style-type: none"> • Workforce available • Available of suitable and water access • High potential for increased yields • High demand for vegetables, attracting investors • Entrepreneurial spirit Nigeria • Increasing attention international + government (local and federal) • Development of a national processing industry: import ban processed products in place • Progress in the draft Plant Variety Protection bill • Food and Nutrition security programme and attention • Access to the internet and ICT solutions • Farmers groups/clusters in place 	<ul style="list-style-type: none"> • Insecurity and conflicts (herdsmen versus pastoralists) • High corruption and change of rules and policies + lack of law enforcement • Climate change • Land use (land tenure system) and land rights issue • Smuggling of vegetable seed/fake seed/inputs • No effective quality and monitoring system in place for inputs • Disease and pest outbreaks • No off-take of produce (in case of higher production) • Aging population of producers/migration youth

The high and increasing demand and purchasing power at the producer and consumer level, the availability of suitable land, manpower, existing experience in agriculture and increasing political attention offer great opportunities. However, the number of threats and weaknesses indicate that it is not easy to improve the sector, for example, high corruption, moral hazards, changing and volatile policies, insecurity and land conflicts, lack of transparency and quality control, and power imbalances. A long-term time horizon of business actors is required as well as political will, investments at all stages of the value chains, mutual trust between actors and cooperation of all stakeholders. The SWOT analysis clearly shows the opportunities and areas of potential investments.

The following priority areas are defined based on this study and the field visit:

1. Seed:
 - a. Potato seed: building of a well-functioning seed system through 1) import of larger volumes of early generation potato seed and 2) local potato seed production development.
 - b. Vegetable seed: supporting the development of a seed system. Including a favourable enabling environment to ensure quality seed availability and affordability; building an effective quality seed quality assurance system and establishing a stakeholder platform.
2. Regulation and policy: ensure quality seed availability and affordability; build an effective quality seed quality assurance system and establish stakeholder platform as an instrument to lobby and link national and state level.
3. Knowledge: build knowledge of extension workers, producers and agro-chemical dealers (e.g. how to handle seed); sensitisation on the use of quality seed/hybrids.
4. Demand: Increased demand for horticultural produce is attracting investors from other sectors that have the financial means to establish large-scale farms and to source high-quality inputs need to develop modern horticultural projects.
5. Marketing and processing of vegetables and potatoes: parallel to priority areas # 1-4: supporting the development of a strong local processing sector *mainly for potatoes* with added value, outgrower/contracting system and improved transportation.

1 Introduction

Feeding the increasing population and becoming less dependent on oil revenues are key challenges for Nigeria. Nigeria is the largest economy of Africa and one of the fastest growing countries in the world, with a population of almost 200 million and rising to an estimated 400 million in 2050.² This creates challenges in terms of food and nutrition insecurity, urbanisation and unemployment. In total, 82 out of 92.4 million hectares of Nigeria's land is arable with suitable agro-climatic conditions (PWC, 2017). Smallholder farmers are the backbone of the agricultural production, accounting for the majority of all food produced in Nigeria. However, Nigeria still relies heavily on import to feed its population as only 50% of arable land is under cultivation and yields are generally low. Another incentive for promoting the agricultural sector is the drive for economic diversification by the government away from (only) oil revenue, which currently represents 25% of GDP.

The agricultural cooperation and development between the Netherlands and Nigeria is increasing. Nigeria is a new priority country for both the Dutch Ministry of Foreign Affairs (MoFA) and the Dutch Ministry of Agriculture (MoA). The MoFA has recently signed a Memorandum of Understanding (MoU) with the Nigerian government in which agricultural development, cooperation and trade are central themes. Lack of access to quality seeds is a focus of increased cooperation as it is considered a key constraint to agricultural development in Nigeria. Therefore, the seed sector is identified as one of the focus sectors in the Multi Annual Country Strategy of the Embassy of the Kingdom of the Netherlands (EKN) in Nigeria.

A four-year programme is foreseen focused on vegetable, potato and seed sector development to improve income and nutrition. Aside from a focus on the quality seeds, the SeedNL scoping mission clarified there is a high priority to the development of vegetable and potato cultivation and value chain development, both for improving 'earning and employment opportunities' of farmer families and improving nutrition. MoFA and the Dutch MoA intend to develop a four-year integrated programme on vegetable, potato and seed sector development, concentrating in first instance on Kaduna, Kano and Plateau States. Seed sector interventions in the programme will be coordinated and implemented in close collaboration with SeedNL, which is a public private partnership of Plantum, MoFA and the MoA, with involvement of knowledge institutes and NGOs.

A comprehensive overview of the vegetable, potato and seed sector is needed to enable an informed discussion on the design of the programme. There is not yet a comprehensive overview with basic data of the vegetable and potato sector, which makes it difficult to organise more informed discussions on the opportunities and challenges of investing in Nigeria, both at the level of SeedNL and at company level. The overall objective of this draft report is to provide an overview of the vegetable and potato sector to support an informed discussion on the development of the envisaged vegetable, potato and seed sector development programme in Nigeria.

The overview of the sector is based on a combination of desk research, stakeholder interviews. The report is based on a desk study, with a number of additional interviews with Nigerian and Dutch industry stakeholders (see Appendix 3 for an overview of the interviewed stakeholders). The draft findings were validated, adjusted and sharpened during a field visit to Nigeria. Three validation workshops were organised in Jos, Kano and Kaduna. A broad range of stakeholders participated reflecting the Dutch Diamond Approach. In addition to discussion on and validation of the first findings of the study, SWOT analyses were done. A summary of the analyses are presented in the report. For the programme, the complete SWOT analyses and list of participants see Appendices 5-7. The report focusses on Nigeria as whole (Chapter 2) with special attention to the major producing States of vegetables and potatoes, Kaduna, Plateau and Kano (Chapter 3).

² UN DESA/Population division: <https://population.un.org/wpp/Graphs/Probabilistic/POP/TOT/566>

2 Material and methods

A mixed method approach is used to validate and triangulate findings. The study is based on a combination of methods and tools: desk research, stakeholder interviews and a field visit with validation workshops. Both quantitative and qualitative information has been used to triangulate insights and to check for discrepancies or paradoxes. The main sources for quantitative data are the Ministry of Agriculture of Nigeria, National Survey Statistics of Nigeria, FAO, KIT, the private sector and NGOs active in production areas. Quantitative up to date and reliable facts and figures are scarce in Nigeria which highlights one of the challenges and especially in agriculture: the lack of an effective and efficient monitoring system, lack of data and accurate analyses, lack of financial resources (or no political will to allocated resources to data collection), no farm record keeping. The lack of evidence based policies is consequence.

Interviews conducted give a good and complete picture, support correct interpretation of information from other data sources and aggregated analysis reveal the common sector challenges and priority areas. Interviews were done with Dutch and Nigerian actors involved in the seed, vegetable and potato sector in Nigeria. Interviewees represent the Dutch Diamond approach, i.e. government, private sector, civil society and research and development.

Three validation workshops were organised in Jos, Kano and Kaduna State. The first findings from the desk research and stakeholder interviews were discussed and validated during a two-week mission of one of the WUR researchers and a national consultant in Nigeria in September 2019. The main objective of the mission was to conduct three workshops in Jos, Kano and Kaduna with participants representing the government, private sector (seed suppliers, processors and producers), civil society and knowledge institutes. Also additional in-depth interviews were conducted with relevant stakeholders, SWOT analyses were done and actual seed prices and consumer retail prices were collected. See Chapter 6 for a summary of the SWOT analyses and the four priority areas identified by the attendees. Appendices 5 and 6 present the programmes of the workshops in Jos, Kano and Kaduna State, the SWOT-analyses per group (e.g. a SWOT analysis from governmental perspective, from the private sector and from producers). The SWOT analyses provide rich insights in the differences and commonalities between the different parties in how they experience and perceive the sector providing a holistic overview with crucial information for the Dutch Diamond sector approach. The lists of workshop participants can be found in Appendix 7.

Alignment and information sharing were done as much as possible between WUR researchers and other actors involved in comparable activities in the sectors under study. Where possible and adding value WUR-researchers communicated, aligned and synchronized the research process, the validation workshops and findings with other initiatives and activities between Nigeria and the Netherlands. For example: S4C-NABC, KIT (potato), IFDC (2SCALE), WUR (Seed Road Map), ICRA, SNV and Agriterria (HortInlude).

3 Nigerian vegetable and potato sector

3.1 Production and productivity

The production area for vegetables was relatively stable since 2014 and has increased for potato in the last decade. Nigeria is an important producer of vegetables and potatoes in Africa. The produced volume of vegetables and potatoes has increased due to an increasing production area. But figure 3.1 also shows that in some years the area harvested increased while production remained or decreased. See figure 3.1.

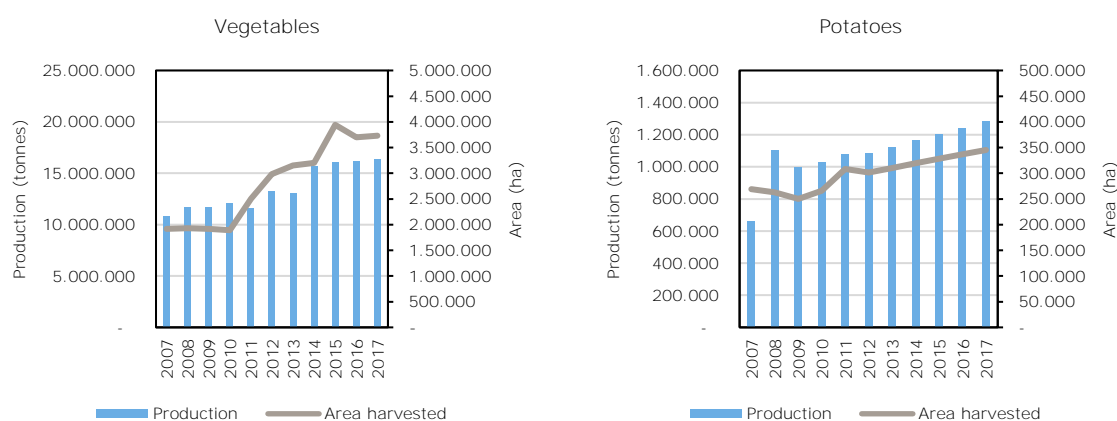


Figure 3.1 Production (tonnes) and area (ha) in Nigeria of vegetables and potatoes

Source: FAOSTAT

The key crops in terms of volume produced are tomatoes, (sweet and Irish) potatoes, okra and onion. Table 3.1 gives an overview of the most important crops. Nigeria produces almost 4.1 million tonnes of tomatoes which is almost 2.4 times more than in 2007. Pepper and onion one of the most important ingredients used in making most Nigerian meals. The total annual potato production area in Nigeria is estimated to be almost 1.3 million tonnes (see the table 3.1).

Table 3.1 Production of different vegetables and potatoes in Nigeria, tonnes

	2011	2012	2013	2014	2015	2016	2017
Tomatoes	1,491,319	2,060,300	1,925,120	4,083,500	4,229,330	4,128,995	4,100,000
Sweet potatoes	3,516,653	3,592,440	3,676,709	3,760,978	3,845,248	3,929,517	4,013,786
Potatoes (Irish)	1,077,058	1,085,139	1,124,985	1,164,831	1,204,676	1,244,522	1,284,368
Onions, dry	1,238,090	899,700	802,340	985,400	997,900	1,031,014	996,519
Okra	843,500	1,999,200	1,886,200	2,039,500	2,067,900	2,005,254	2,060,280
Chillies and peppers, green	733,207	735,765	738,324	740,883	743,442	746,001	748,559
Onions, shallots, green	236,000	240,000	235,000	235,000	235,383	248,807	248,072
Carrots and turnips	217,848	227,128	227,694	229,313	226,222	222,166	220,855
Vegetables, freshness	6,136,054	6,309,068	6,499,588	6,679,634	6,865,947	7,048,510	7,233,317

Source: FAOSTAT

Together, the States of Kaduna, Kano and Jos Plateau produce over half of the tomatoes, onions and potatoes in Nigeria. Figure 3.2 presents the share of production of selected crops for each State (in % of total tonnes produced). Data was collected by the National Agricultural Statistics Service in 2011 but it is very likely that the relative differences observed between is still

representative. Appendix 1 gives an overview of the production areas and volumes in all Nigerian States of the crop data available.

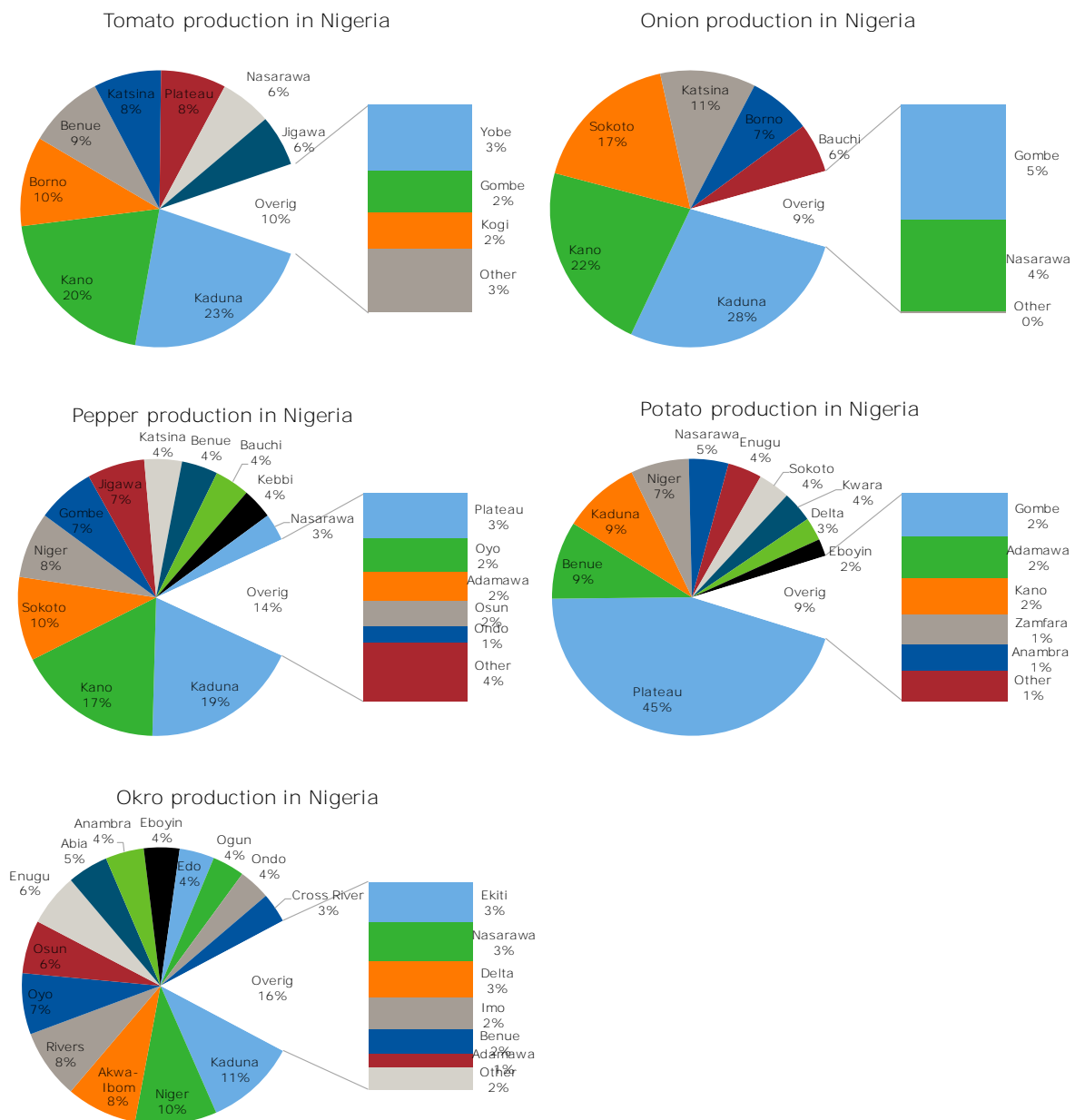


Figure 3.2 Division of different crops produced per State, in % of total tonnes
Source: NASS (2011)

Tomatoes are commonly grown, but over 50% comes from Kano and Kaduna States. Tomatoes are commonly produced in 24 out of the 40 states in Nigeria – but mainly in the States of Kaduna and Kano. According to data from the NASS (2011) those States produce jointly more than 50% of all tomatoes in the country. Tomatoes are grown in the south-western part of the country on small plots under rain-fed conditions and in the northern regions under irrigation systems (Ayandiji and Adeniyi Omidiji, 2011). Larger and advanced greenhouse projects are being realised in various parts of Nigeria with mostly Israeli and Spanish constructors.

Most peppers (36%) and onions (50%) are produced in Kaduna and Kano. The two major pepper species grown in Nigeria are *capsicum annuum* (bell pepper, cayenne, chili) and *capsicum frutescens* (elongated chili or bird chili). The types of pepper suitable for commercial production in the country are the large fruited sweet pepper, the medium corrugated fruited hot pepper, and the small-fruited chilli/red pepper (Ado, 1990). Most production of peppers and onions is done by smallholders

(MoA, 2010). Onion production is limited to the northern part of Nigeria. Onions are only produced in the northern states of Nigeria. The dominant States involved in the production of onions are Kaduna, Kano and Sokoto.

45% of the potato production is in Plateau State. According to official data from the NASS (2011) the most important potato production area (excluding sweet potato) in Nigeria is the Jos Plateau, Plateau State, where 45% of the national production takes place. Other qualitative estimates indicate an even higher share for this State in the national production going up to 95% (Gildemacher and Belt, 2019a). Within Plateau State potatoes are mainly produced in the LGAs (Local Government Areas) located at higher altitude. Other areas for potato production are Kaduna State and Benue State. The potato production season is divided between a wet season from April until August to September, and a dry season from September till March when potatoes are irrigated. In addition, there is some limited production in Kano state, in the northern part of the country. Here potatoes are produced during the dry colder period, from October till January. Potatoes are typically grown by smallholder farmers; in Nigeria there is now large-scale potato farming. Ayuba (2012) estimates a total of 300,000 potato-producing households, which means that the average yearly cultivated area per household is around 1 hectare.

The yield of most key crops in Nigeria is at or below the average of Western Africa. Table 3.2 presents Nigeria compared to the average for western Africa. Yields for hot pepper, okra and tomatoes are somewhat in line with the yields observed in other western African countries. The yields for onions and potatoes are however much lower due to various challenges. Interviewed experts indicate that the knowledge level of farmers is low, contributing to low yields. The data also shows clearly that the vast majority of the vegetable and potato area can be found in Nigeria.

Table 3.2 Area harvested in Nigeria compared to Western Africa for selected crops (2017)

	Nigeria		Western Africa	
	Area (ha)	Yield (kg per ha)	Area (ha)	Yield (kg per ha)
Tomatoes	589,254	6,958	714,339	7,653
Onions, dry	556,466	1,791	620,471	4,585
Onions, shallots, green	15,412	16,096	54,207	23,315
Chillies and peppers, green	97,770	7,656	164,132	7,353
Okra	1,480,386	1,392	1,767,003	1,541
Carrots and turnips	24,971	8,845	30,208	9,894
Irish potatoes	345,246	3,720	375,035	5,031
Sweet potatoes	1,619,876	2,478	1,929,600	3,115

Source: FAOSTAT

Most vegetables are still sold through traditional informal markets. The traditional informal markets are still the major source of vegetable and potato distribution. Although the food retail is growing during recent years. This is mainly due to the economic growth and increase in the middle-class income group (Van der Waal, 2015).

3.2 Agronomic conditions

Nigeria has four key types of climate: dry semi-arid climate, a tropical steppe climate, a tropical wet climate and a temperate climate. Nigeria has the following climates: the Sahelian climate in the northern part of the country, a tropical savannah/steppe climate in the centre and a tropical wet climate in the South. The mountainous areas of Jos and Adamawa, close to the Cameroon border, have a more temperate climate. Figure 3.3 shows the different states and agro-ecological zones in Nigeria.

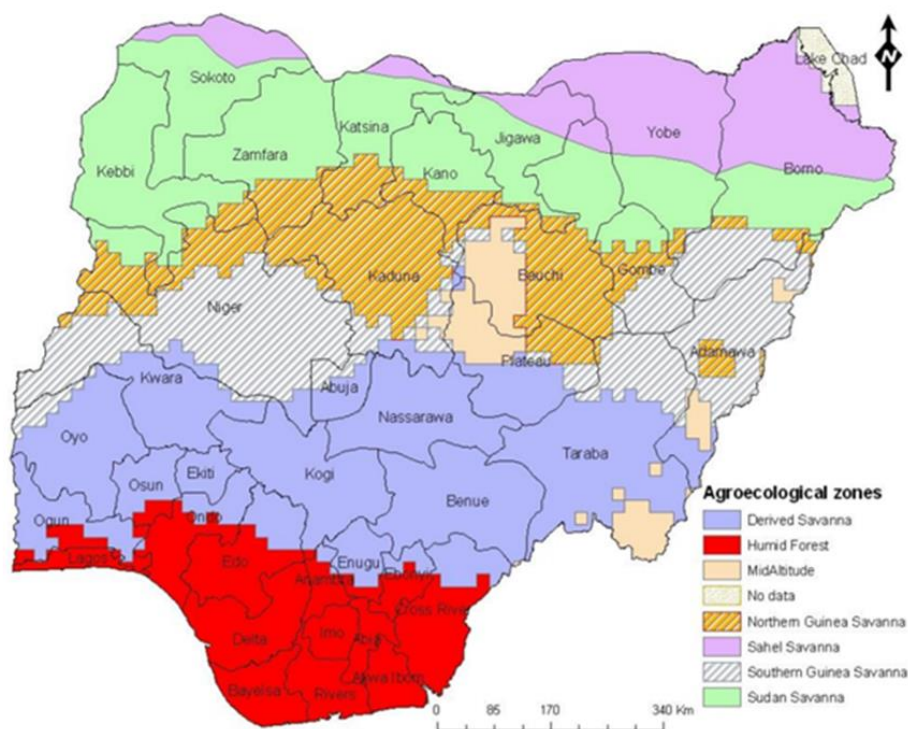


Figure 3.3 Map of Nigeria showing different States and agroecological zones
Source: Alamu et al. (2013)

Kano, in Northern Nigeria, is characterised by a dry semi-arid climate suitable for agriculture. The Sahelian climate, defined as subtropical dry semi-arid, is characterised by high temperatures leading to an important evaporation exceeding rainfall. The regional landscape is defined by semi-arid plains. The region is crossed by several rivers, the most important being the Kaduna river flowing from the Jos plateau to the Lake Chad. Kano State is located at the merge between the central area and the northern area and has a Sahelian climate (Van der Waal, 2015).

Kaduna, in Central Nigeria, is characterised by a tropical steppe climate. The central area of the country is an interface between the dry and arid North and the tropical rainforest of the North. The climate is considered as tropical wet and dry because a dry (in winter) and a wet season are distinguishable. Vegetation is divided between a variety of forests, steppe and savannahs: a tropical savannah or steppe, the Guinean savannah (large expanse of land between Guinea on the west coast of west Africa and Nigeria) and the Sudan savannah. Kaduna is located within this climatic area (Van der Waal, 2015).

The South is characterised by a tropical wet climate. In the South, the tropical wet climate is characterised by important rainfall all year round and relatively high temperatures. Vegetation is abundant as the region is divided between a tropical rainforest and a mangrove swamp (Akinyele, 2009; Van der Waal, 2015). The southern part of the country is a delta region crossed by two important rivers: the Benue river flowing from east to west to meet the Niger river which, eventually, flows into the Atlantic Ocean in the Gulf of Guinea. The heavy rainfall, a typical rainfall pattern of tropical forests, come from the evaporation of water of the Atlantic Ocean in the Gulf of Guinea which

then move north and face dry and hot air coming from the north of the country. The meeting of the two air masses, one dry and hot, the other charged in moist, results in important rainfall (Van der Waal, 2015).

The Jos Plateau is characterised by a colder temperate climate. Lastly, a temperate climate is observed in the Jos plateau at an altitude of 1,520m above sea level and in the Adamawa plateau. The Jos plateau is defined by highlands at an average altitude of 1,200m above sea level (Van der Waal, 2015).

The uniformity of the land makes Nigeria favourable for larger scale and mechanised agriculture. Because Nigeria is relatively flat, the country enjoys favourable conditions for mechanisation and larger-scale agriculture. Nonetheless, the poor access to machines and equipment, a low capital power and an underdeveloped market, mechanisation has not met its potential (FMARD, 2016).

Water availability and quality is a challenge to the development of the agricultural sector. Although the northern parts of the country (Kano and Kaduna) have access to water via dams, water is a relatively scarce resource in Nigeria. Agricultural intensification will require good irrigation and water conservation methods to ensure its sustainability. The current water system is not able to deliver water all year round in the country or guarantee its quality. Investments must be done to improve the water system (FMARD, 2016). In 2015, only half of the fertile land was used for farming activities and only 7% is grown under irrigation (Van der Waal, 2015). In addition, poor fertilisation practices and wastewater systems are lowering the water quality (FMARD, 2016).

Climate change has a strong impact on the agricultural development of Nigeria. Climate change has a big impact on Nigeria's climate; the weather has become more unpredictable and decreased rainfall is leading to a drier climate. This decreased rain fall is threatening rain fed agricultural systems (Van der Waal, 2015). There are no climate-smart practices or effective resilience policies developed.

3.3 The value chain

3.3.1 The vegetable value chain

Most food is sold in informal markets. The Nigerian food retail sector is divided into two main market channels: the formal and informal market. Based on interviews with industry experts we estimate that informal market comprises most of the food sales (est. 95-99%). The formal supermarket is estimated to comprise 1-5% of the total market share. Two different types of urban market segments can be distinguished; urban high income and urban low income. Figure 3.4 gives an overview of the entire vegetable sector and the different value chains (VCs). There is a VC serving the urban high-income consumers through supermarkets and a VC serving the urban poor through corners shops.

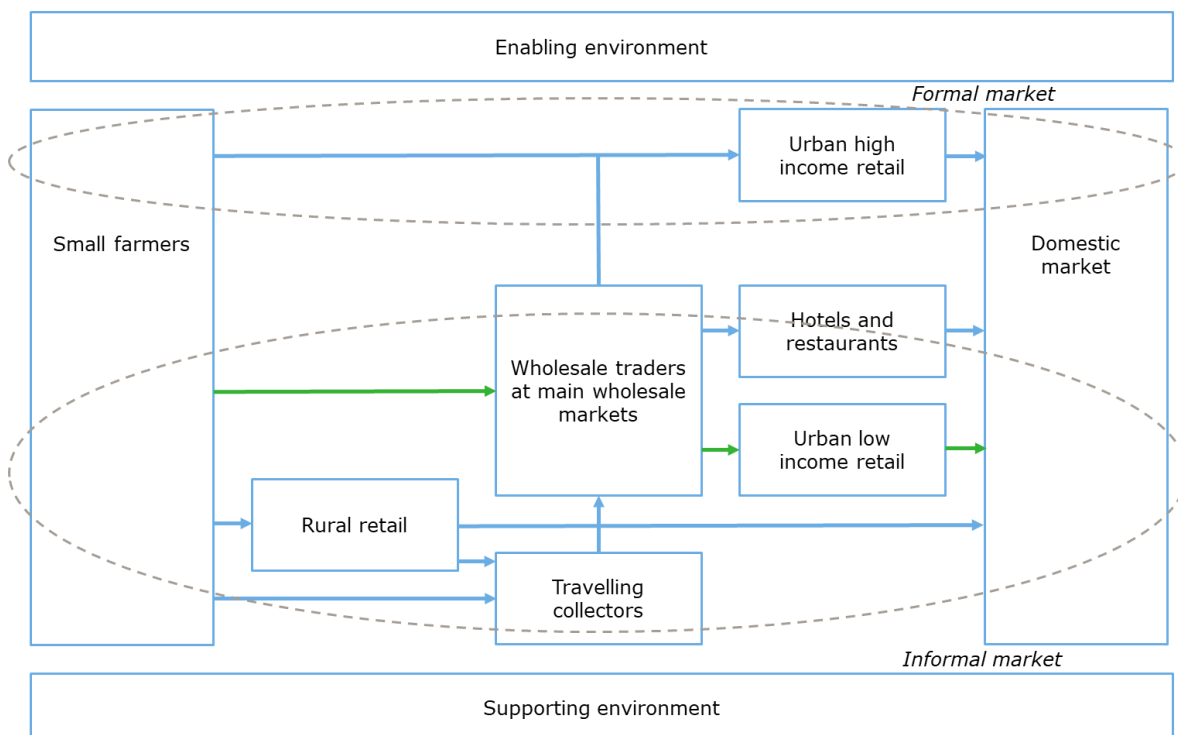


Figure 3.4 The vegetable value chain distinguishing the formal and informal chain

Wholesale traders have a dominant position in linking producers to consumers. In both the formal and informal value chain, wholesale traders have a dominant position in connecting farmers to consumers. Only a minority of the farmers is taking their own produce to the market (Coffey, 2013). Traders provide an important intermediary service for both farmers and consumers, since they transport vegetables like tomatoes, peppers and onions over large distances from the main production fields in the northern states to the consumption regions in the South (Kok et al., 2019).

The Nigerian food system is complex given its enormous size and frail institutional setting. Lyon and Porter (2007) describe the Nigerian domestic food system in a study published in 2007 as a fascinating case:

'In which debates concerning the moral economy are played out with huge implications for the wellbeing of millions of people in poverty. Considering the difficult business conditions with no recourse to legal systems, a corrupt and ineffective police force, minimal banking infrastructure, poor communications and a highly degraded transport infrastructure, the movement of food from over 70 million food producers to over 60 million urban consumers is a feat of ingenuity [nowadays this has increased to 95 million].'

Exploitative behaviour, and high level of informality are challenges in the value chain. However, there are also reports of exploitative behaviour and even the formation of cartels in the markets. According to an older study by Ajani (2007):

'The majority of the trader's lack basic formal education. This hinders marketing efficiency, because they do not keep records of day to day financial activities. This also prevents them from obtaining loans from financial institutions. Traders mainly got their initial start-up capital from personal savings, friends and local lending agents. Capital is not readily available for further expansion. The lack of good and cheap means of transportation has posed a serious threat to the traders. This is due to frequent fuel scarcity, long distances from the point of production, poor roads and the dilapidated condition of existing roads.'

In addition traders also heavily influence and decide what is happening in the market. They seem also to be prescribers on the varieties that you have to use, what the farmer is using. Farmers are often not aware of the differences between hybrid seed and other type of seed.

Wholesale traders and retailers meet in informal markets. After arrival at the wholesale the produce is sold to retailers, usually women. In Lagos alone - the largest city in Africa with a population of over 21 million people - there are more than 30 informal markets. Every neighbourhood has its own fresh produce market. Most of the resellers are women (93%) and are aged between 31 and 40 (58%). They completed primary education (79%) and 50% of them have 6 to 10 years of retail experience (Adeoye et al., 2009). This market channels includes the convenience stores and small groceries (e.g. corner shops). With a population of over 3 million, Ibadan has Shasha and Bodija as the main informal (wholesale) markets.

The leading wholesale market, Mile 12, is highly organised and has an important role in organising the sector. Mile 12 market is the leading wholesale market. It is by far the biggest in southwest Nigeria and is in business for over 40 years. The market is located along Ikorodu Road and serves as the main distribution centre for vegetables arriving in Lagos. At this market all traders are united in an official association per crop that control trade. The Mile 12 market has a specific area for each crop. Every product is under control of a dedicated trading association that has an office at the market. This association is an important body and is governing the north-south trade in terms of supplied volume and access to the market.

The formal retail channels serve only a very small share of the market. Like in many African Countries supermarkets in formal market channel are emerging (Van Berkum et al., 2017). The formal supermarket serves the higher income classes and the top tiers of the middle class. The requirements placed on quality, assortment and presentation of the fresh fruit and vegetable category are higher. In that sense, they provide an important incentive for upgrading the VC. Lagos, and to a far lesser degree Ibadan, has different supermarket chains that serve the higher income classes and the top tiers of the middle class. The leading supermarket is ShopRite from South Africa with over 20 stores; other chains are Spar International with 10 stores, Huebmarket and Massmart.

Direct delivery is merging in Nigeria as an innovative segment. Aside from retailers and supermarkets, various examples of direct delivery are emerging in Nigeria. For example, Fresh Direct is an upcoming door to door delivery start up. They only serve consumers in Abuja now. They focus on introducing new technologies to improve current farming methods (e.g. drip irrigation, cooling). They also work without growers and supply consumers directly.

Most farmers use OPV seed; hybrid varieties are still uncommon. Popular tomato OPVs are Roma and UC82 for tomato, as data collected in a study by Kok et al. (2019) shows. Farmers appreciate the firmness of these varieties so that they can endure the long transportation distance. Interviewed experts in the seed sector estimate that less than 2% of the farmers are using hybrid varieties. Farmers use seed from the informal seed system. They use their own seed or they buy at the market, which is seed produced by other farmers, without any quality guarantee. In general, farmers are reluctant to adapt to good quality seed for a variety of reasons (RVO, 2019). A reason mentioned by interviewed experts indicated that there have been problems with seed quality in

governmental procurement programmes that have affected the perception of farmers on seed. See Appendix 8 for an overview of the released varieties (NASC, 2019).

Unlike in many other West African countries, the role of the private sector has been vital to the transition and growth of Nigeria's seed sector. Private sector participation in breeding and variety release has led to an increase in its share of variety release in the country, which the public sector dominated until 2000. According to the National Agricultural Seeds Council (NASC), there are 157 registered seed companies in Nigeria, with the majority producing fewer than 1,000 tonnes of seeds annually. The Seed Entrepreneurs Association of Nigeria is the country's main private seed trading body, with approximately 67 registered members.

Agricultural research institutes are present in Nigeria. The national agricultural research institutes (NARIs) should play a significant role in the sector but are not very active in the vegetable and potato sector. However NARIs, among others, do produce foundation seed. Moreover, the Consultative Group on International Agricultural Research (CGIAR) is an important player in Nigeria, with ongoing activities through the International Institute of Tropical Agriculture (IITA), The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and AfricaRice.

The Seed Index benchmarked 24 seed companies in Nigeria. Four have breeding activities in the country, and 10 have testing locations. Six companies have seed production activities in Nigeria, of which 4 involve smallholder farmers, while five companies have processing facilities in the country. Of the 24 companies, only 9 accompany their sales activities with extension services. Appendix 2 gives an overview of the companies listed for the Access to Seed Index. According to NASC figures, there are about 314 seed entrepreneurs registered at different categories ranging from large scale, medium scale, producer seller, seed dealer, and small scale companies.

Access to quality varieties is limited. The seed sector is largely dominated by an informal seed supply and relies on farmer saved seeds even though there is a demand for quality seeds of varieties with high-yield and market needs characteristics (Daniel and Adetumbi, 2004). The seed chain is characterised by ineffective and inefficient distribution. This results in higher prices compared to seeds from the informal system. In addition, there is reluctance among farmers to purchase quality seed varieties, if available. The recent **RVO 'Seed Sector Review Nigeria'** (2019) provides more information on the adoption of quality varieties.

The vegetable sector is covering large distances between production and consumption areas. The distance to the market is around 1,000 kilometres from north to south. In the case of tomatoes, for example, baskets are used that carry volumes of 45-100kg. Figure 3.5 gives an overview of the current loading and transportation practice. The price for transport over this distance is estimated at around N500 per basket. This has increased in recent years due to inflation and increasing costs for fuel.



Figure 3.5 Picture of the current loading and transportation practices: on the left loading of tomatoes in Kaduna State. On the right arrival of tomatoes in Ibadan stored on top of a tanker after a 1,000+ kilometres journey (photos taken by Wageningen Economic Research)

Post-harvest losses in vegetable chains between 30% up to 60% ; partly caused by transportation. Various studies conducted on post-harvest losses (PHL) in vegetable chains in **Nigeria revealed some of the losses 'guesstimates', typically showing a wide range between 30 to 60%** (Bolarin and Bosa, 2015). The policy and strategy document of Nigeria's Federal Ministry of Agriculture and Rural Development (FMARD) reported post-harvest losses up to 60% for perishable crops (FMARD, 2016). Ugonna et al. (2015) estimated the annual losses of tomatoes in Nigeria at 45% of the total production. Generally, rough handling during unloading causes the most damage. It was reported that 14% of the produce was spoilt during the transport (Idah et al., 2007) and the study by Kok et al (2018) shows losses in weight between 7 and 12% as well as losses in quality. Stacking of baskets holding tomatoes, high temperatures and exposure to sunlight are important damaging factors.

Processing of vegetables is very limited. Processing of vegetables is done mainly at small scale. However, there are a few exceptions like Dangote Tomato Processing Factory and the Tomato Jos factory. They are among the most important tomato processors in the country. According to NASC and FMARD (2019) processing of tomatoes is increasing lately and they report that 8 tomato processing plants are installed across the country with capacity ranging from small scale (7 tonnes per day) to large scale (1,200 tonnes daily) From time to time the processing company face serious sourcing challenges due to the scarcity of tomatoes and continuous supply of quality meeting the requirements.³ As a result, Nigeria imports large volumes of processed tomatoes.

3.3.2 The potato value chain

Several institutional actors are involved in the Nigerian potato value chain. Besides the main actors such as input suppliers, farmers, traders, processors and retailers involved in the production and trade along the value chain various institutional players are currently involved in the Nigerian potato value chain. The most important actors are shown in figure 3.6 in the boxes surrounded with a dotted line:

³ <https://www.bloomberg.com/news/articles/2019-03-19/dangote-s-nigeria-tomato-plant-resumes-after-years-idling>

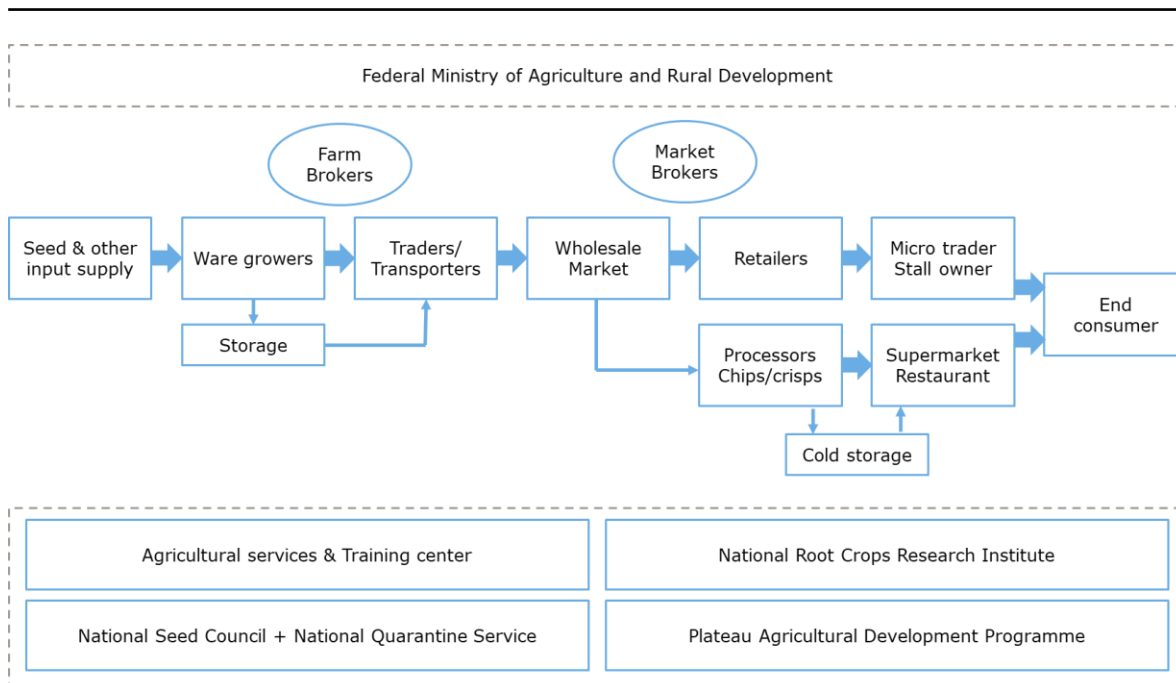


Figure 3.6 The potato value chain

Source: GIZ-SEDIN, 2015

Trade in potatoes is organised in specific potato wholesale markets. Collection of potatoes is done at specific potato wholesale markets, across the potato producing areas. Farmers transport their potatoes to these markets, where traders come to buy. The buying usually takes place through market brokers, who connect producers to traders.

Packaging is well organised, but sub-optimal for quality and preventing loss. The Bocos market, the largest market, has specific branded bags for potatoes produced in the Bocos area (Gildemacher and Belt, 2019a). Informal quality grades are recognised, based on size and skin firmness. Packaging was reported by Gildemacher and Belt (2019a) to be sub-optimal:

'Rather than using jute-bags or net-bags which allow the potatoes to be aerated during transport, they are packaged in the (cheaper) woven polythene bags, which do not allow ventilation, and will result in heat build-up and high moisture content, which stimulates rotting.'

In addition, the bags are piled up high in the trucks, and it is even a regular practice to jump on the bags to be able to load more.

Lack of short-term storage facilities is a constraint. Gildemacher and Belt (2019a) describe the current potato marketing system as highly dynamic and well-functioning. It effectively takes the produce from the farm to the customers. A constraint in the system is the lack of short-term storage facilities for unsold potatoes. This makes farmers sell unsold stocks at the end of the market day at lower prices; this poses a serious risk to local traders who remain with unsold stocks that cannot be stored properly.

Good quality seeds are not available in the market and no policies or enabling environment for seed import. There is a strong demand for seed potatoes by potato farmers and clearly a willingness to buy them at a higher price compared that what they pay now, but supply is absent (Gildemacher and Belt, 2019a). The only seed available is through ad-hoc importation from European seed potato suppliers and there is a lack of capacity to further multiply imported seed. There are no sources of reliable quality seed potatoes, making that farmers continuous recycle their own seed, or buy similar recycled seed in the market. Nigerian policy-makers have the tendency to shield off imports of seed potatoes. On an annual base, only 300 tonnes of seed potato is imported in Nigeria, according to UNCOMTRADE. Because of seed borne diseases, viruses, yield potential is reduced

significantly. See Appendix 8 with a list of the released potato varieties (NASC, 2019). For sweet potato, **Nigeria's National Root Crops Research Institute (NRCRI)** – Umudike and the International Potato Center (CIP) have released a new orange-fleshed sweet potato (OFSP) variety in 2018, bringing the total number of OFSP varieties in Nigeria to three.⁴

Production practices and crop protection management by the ware potato producers are poor. Farmers nor extension staff or agro-chemical dealers have the required basic knowledge on virus disease management, bacterial wilt management and late blight management. According to Gildemacher and Belt (2019a), a large number of potato farmers abandoned wet season production since the late blight pressure has increased significantly over the past 5 years. With appropriate crop protection measures, however, it would have been possible to grow potatoes during the wet season. Not only smallholder farmers lack the required knowledge; the entire sector seems to be isolated from the international body of knowledge on efficient potato production. As a result, the return on land, labour, water, capital and nutrients is very poor. Gildemacher and Belt (2019a) conclude: 'The important and highly potential natural resource of the Plateau highlands is currently used very inefficiently.'

The development of a properly functioning seed potato supply system is required and need long-term investment. Gildemacher and Belt (2019a) recommend to simultaneously develop different pathways for seed production and marketing. Rather than choosing between a seed potato system that is based on imports or a domestic production system, it is better to develop them both. What is required is a targeted effort to facilitate the emergence of both large- and medium-sized for-profit seed potato multipliers. Specific attention is required for developing access to Early Generation Seed (EGS). Local production of EGS can, for instance, compete with the importation of potato seed from Europe, to be multiplied locally for another season, before it is sold. Currently there is no seed potato quality assurance system. Once for-profit seed potato production starts to take off, also quality assurance regulation and routines need to be developed by the National Agricultural Seed Council (NASC).

Potato processing is limited to restaurants and a few small-scale processors. The main type of potato processing takes place in restaurants, where fresh potatoes are made into chips. Other than that, there is virtually no potato processing in Nigeria (Gildemacher and Belt, 2019a). Fruit and Veggies Ltd. is one processor in Jos that is working on a semi-industrial scale, making packed potato wedges and cubes by peeling, blanching and vacuum packaging. Feikop is local processors of potato flour and starch and Lovely Potato Chips is active in artisanal processing making crisps for the local market, but volumes are very low. One challenge is to organise a constant supply of potatoes of the right quality and of a particular size. The only other kind of artisanal processing (Lovely Potato Chips) in Jos is making of crisps for the local market, in very low volumes (Gildemacher and Belt, 2019a). It is quite exemplary that French fries and almost all chips are for example not produced in the country but imported. Another challenge mentioned at the Jos workshop was a lack of knowledge and experience in adding value.

3.4 Import and export

As food production could not keep pace with its increasing population, Nigeria began to import food as a quick fix. It also lost its status as a net exporter of such cash crops as cocoa, palm oil, and groundnuts. Due to the under-investment and resulting low productivity, Nigeria is a food-deficit country. The high urban demand is met through cheap food imports. Food imports have more than quadrupled in the past decades, from a value of USD964 million in 1995 to 4,566 million USD in 2016 (FAO, 2019), resulting in a substantial trade deficit for the agri-food sector (Figure 3.7). Nigeria is relatively weakly integrated into regional value chains (ECOWAS, 2019): its export to the ECOWAS region, which averaged about 7% of its total exports between 2001 and 2006, dropped to 2% in 2010 (Chete, 2010).

⁴ Referred to as Solo Gold— UMUSPO4, 'Mothers Delight', and UMUSPO1, which is known as 'King J'.

For potato, total import (ware, seeds and processed potatoes) are between 40,000 and 60,000 tonnes according to FAO (2008) and the National Root Crop Research Institute (NRCRI, 2010). Imports are minor and mainly take place in off-season due to a lack of storage capacities. Both export and import data collected by FAO and NRCRI do not match official figures circulated by the Nigerian Customs Service (NCS). FAO and NRCRI calculated their figures based on estimations received from brokers and traders in local markets. This procedure allows for integration of cross border trade with neighbouring countries that is often not recorded by NCS. For 2013 NCS counted 3,700 tons of imported potatoes which seems to be far below actual trade volumes. Fresh and frozen potatoes, as well as seeds, are mainly imported from Belgium, the Netherlands, United Kingdom and South Africa (Abuya et al., 2014).

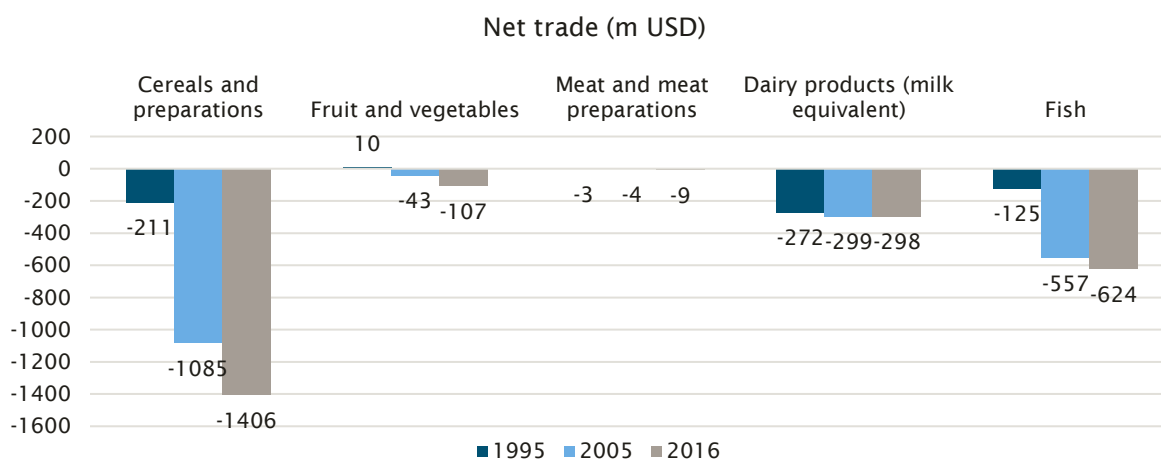


Figure 3.7 Trade deficit for agricultural sectors in Nigeria in 1995, 2005, 2016 (FAOSTAT, 2019)

In table 3.3 the top 10 product groups are shown with the highest dollar value in Nigerian global shipments during 2017 (ITC, 2017). Also shown is the percentage share each export category represents in terms of overall exports from Nigeria. From this figure, it becomes clear that agricultural exports are only a marginal part of the total exports of Nigeria, which are dominated by oil exports. Most important agricultural exports are cocoa, oil seeds (mainly palm oil), tobacco, fruits & nuts, leather and rubber. For potato exports, according to the NRCRI 30,000 tonnes potato were exported (2010).

Table 3.3 Export product groups with highest dollar value in 2017 (ITC 2017)

#	Product group	In amounts	of total exports
1	Mineral fuels including oil	\$39.1 billion	96%
2	Ships, boats	\$253.5 million	0.6%
3	Cocoa	\$238.1 million	0.6%
4	Oil seeds	\$180.9 million	0.4%
5	Fertilizers	\$149.8 million	0.4%
6	Tobacco, manufactured substitutes	\$102.4 million	0.3%
7	Plastics, plastic articles	\$78.1 million	0.2%
8	Fruits, nuts	\$76.1 million	0.2%
9	Raw hides, skins, leather	\$67.9 million	0.2%
10	Rubber, rubber articles	\$55.4 million	0.1%

3.5 Consumption

Nigeria ranks 38 with 100 being the highest score and 58 the average of 113 countries the Economist’s Global Food Security Index. This Index considers the core issues of affordability, availability, and quality across a set of 113 countries.⁵ Among households in rural areas, 71 per cent of the population is food insecure (Matemilola and Elegbede, 2017). Nigerian Food Consumption and Nutrition Survey data (2001-2003) on nutritional status showed that at national level, 36 per cent of the children under five were stunted and 25 per cent underweight. Meanwhile, obesity among adults (18+) has more than doubled from 3.4 per cent in 2000 to 7.8 per cent in 2016 (Maziya-Dixon, 2004). Globally but also in Nigeria, food security has long been associated with a vision of an abundance of grains, roots, and tubers – the staple crops that provide affordable sources of dietary energy. But this picture is changing as the concept of nutrition security has become embedded in that of food security and the importance of dietary diversity for good health has moved to the fore. Fruits and vegetables are essential sources for the micronutrients needed for healthier diets and this is increasingly being recognised by the government and higher social-economic classes. Policy and awareness raising activities focus on the importance of nutritious meals. Many schools have awareness-raising programmes now and have introduced a weekly ‘Fruit and Vegetable day’.

Average food consumption has increased over the past decades. On average, the share of total income spent on food is 41 percent. The data on food budget shares show that the average Nigerian consumer spends 73 percent of his/her earnings on food products (Nigeria Data Portal, 2010). Table 3.4 shows the distribution of these expenditures over different food categories. Fruits and vegetables make up 15% of total expenditures, while cereals take up over one third of total expenditures. In addition to educational background, income, region and an urban or rural setting influence consumer behaviour and food expenditures of total expenditures are the highest in the rural areas. Also composition of diets vary considerable between the Nigerian states with a more generic conclusion that the main difference is between urban and rural settings. For example, Kano State consumers spend 70% on food where the majority of food expenditures is spent on cereals (26%) followed by vegetables (14%), beans and peas (10%) and rice (9%).

Table 3.4 Food expenditures, by category (&)

Beverage, tobacco	Breads, cereals	Meat	Fish	Dairy	Fat, oils	Fruits, vegetables	Other foods	Total food expenditures
Percent of total food expenditures								% of total expenditures
2.73	34.08	12.88	15.22	5.61	5.15	15.44	8.89	72.97

Source: Nigeria Data Portal (2010)

Daily consumption of vegetables is insufficient in Nigeria. Reliable data on food intake in developing countries (including Nigeria) are scarce and limited, meaning that the mentioned numbers may deviate from actual consumption. A recent study by Raaijmakers et al. (2018) showed that on average, the total urban consumption of vegetables was 2.55 portions per day whereas it is recommended to eat at least 4 portions (200 g). Vegetables were considered a standard element of meals, but a limited variety of vegetables was commonly consumed, both in terms of types of vegetables eaten, degree of processing (i.e., mostly fresh), and outlets (i.e., mostly traditional informal markets). Consumers in higher economic classes consumed a greater variety of vegetables, especially the ones that are considered exotic (e.g., broccoli, cauliflower) and they also ate more raw vegetables. Regarding the drivers of vegetable consumption, the researchers found that higher consumption of vegetables relates to higher knowledge of vegetables and belief in ones’ own ability to prepare the vegetables. Health was considered the most important driver by the respondents. Although vegetable consumption is insufficient in Nigeria, current national production levels cannot

⁵ The index is only available at national level so regional figures cannot be extracted. <https://foodsecurityindex.eiu.com/>

meet demand. According to the Ministry of Agriculture (2015) the demand gaps are huge for tomato (2.3 tonnes), okra (10.1 tonnes) and onion (0.8 tonnes) as a result of underperformance in agriculture, high post-harvest waste and increasing demand (FMARD, 2015).

Tomatoes are key to the Nigerian diet; accounting for almost one fifth of vegetable consumption. Many different vegetables are consumed in Nigeria, but tomato is a major food component which is consumed in every household. It accounts for about 18% of the average consumption of vegetables in Nigerian daily diets. Figure 3.7 gives an overview of average prices of tomato in the various States in Nigeria. It shows the fluctuations over the year (N100-N595) and the differences between states. It is clear that the prices in Lagos are higher compared to the main production States. According to FMARD, demand of tomatoes exceeds supply and they refer to a gap of more than 2.3 tonnes (2015).

Consumer preference for fresh produce. A study conducted in Ibadan (2016) showed that 93.3% of 150 consumers interviewed purchase tomatoes on the urban market and they mostly prefer the fresh tomato varieties UC82 (62% of respondents) and Roma (32%), as well as large tomatoes (56%) and medium-sized tomatoes (42%). Tomatoes were bought in all seasons, but the expenditure on tomatoes was higher during low season as supply is less (Adeoye et al. 2016). Also at festivals and ceremonies consumption is higher and prices increase (e.g. Christmas and Eastern at the more Protestant oriented states). Farmgate prices for tomato vary according to season, location and type but an average indication is N130 per kg in the dry season and N400 per kg in the wet season. Premium tomato prices vary between N350 and N800 per kg premium tomato at retail level. During the Nigerian wet season it is more difficult for farmers in the North to produce good quality produce due to a significant higher pest and disease pressure. This means that the volume is lower in this season and prices are accordingly higher. During the wet season vegetables are often supplied from the South where the production is mainly rainfed.

For potato, the Irish and the sweet potato are consumed but Irish consumption is higher with approximately 7kg per person per year. Farmgate and retail prices vary per season and state. An average Irish potato price at farm gate is N140 per kg and N160 per kg at the road up to N400 per kg at a modern open market in Abuja. See table 3.5 for an overview of some consumer prices of different vegetables and potatoes at different locations gathered during the field visit in Nigeria in September 2019. The following pages present a few pictures of vegetables and potatoes sold in a supermarket (Spar) in Abuja and in open markets.

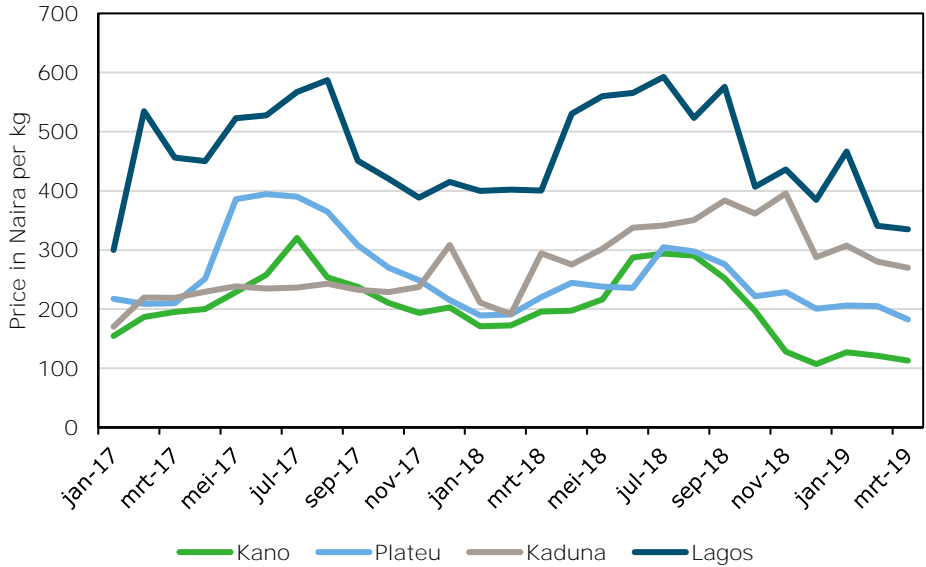


Figure 3.8 Average prices of tomato at different States in Nigeria (National Bureau of Statistics, Nigeria)

Orange-fleshed sweet potato (OFSP) is introduced by CIP and CGIAR as biofortified crop to address nutritional challenges. CIP is collaborating with a consortium of CGIAR research centres; Governments of Nigeria and Tanzania and national partners on an initiative called Building Nutritious Food Baskets Project (BNFB), which is testing a scaling-up model through a multi-crop (food basket) approach to address hidden hunger by catalysing sustainable investments for the production and utilization of biofortified crops that are ready for scaling up including orange-fleshed sweet potato (OFSP). An OFSP platform for Nigeria has been established to catalyse OFSP scaling up efforts (CIP, 2017).

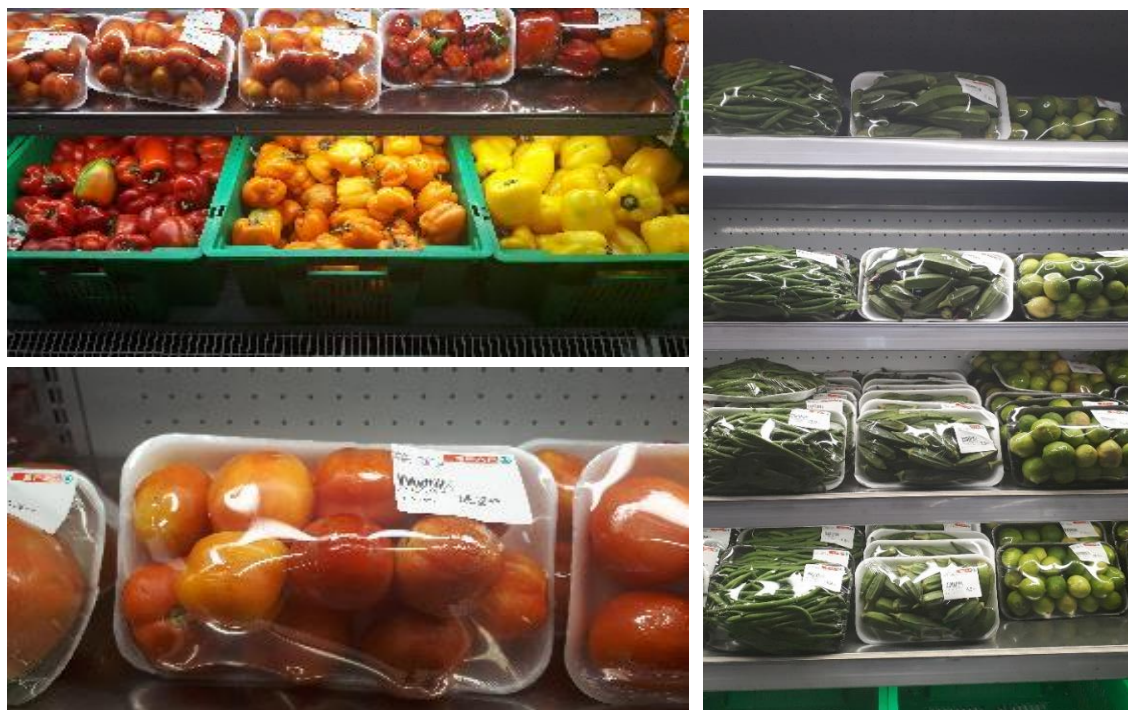


Figure 3.9 Vegetable sales formal outlet, Spar Abuja (photos taken by Wageningen Economic Research)



Figure 3.10 Left: potato and Onion, Spar Abuja, Right: awareness raising activity on nutritional aspects (photos taken by Wageningen Economic Research)



Figure 3.11 Processed food items, majority imported - Spar Abuja (photos taken by Wageningen Economic Research)



Figure 3.12 Potato and onion retail, just outside Abuja (photos taken by Wageningen Economic Research)



Figure 3.13 Tomato and pepper retail, open market Abuja (photos taken by Wageningen Economic Research)





Figure 3.14 Vegetable retail, open market Abuja (photos taken by Wageningen Economic Research)



Figure 3.15 Irish potato sales point, entrance of Jos (photos taken by Wageningen Economic Research)

Some retail price indications and ranges as per September 2019, a snapshot from Abuja, Lagos, Ibadan and Kaduna, are presented in the table below. In the Netherlands an average tomato price per kg for loose tomatoes is around N1,000 (EUR 2.40) per kg.

Table 3.5 Retail prices of vegetables at different locations in Nigeria (observed during field mission Nigeria September 2019)

Vegetable	Price in naira/kg	Location
Tomato	cherry 560	Spar Abuja
	premium 845	Spar Abuja
	Regular (exotic) 345	Spar Abuja
	Regular (exotic) 500	Ultra-Modern Market Abuja
	premium 800	Maitama Fruit Market Abuja
	Regular (local) 156	Ibadan open market
Onion	Regular (local) 167	baki Dogu market Kaduna
	315	Spar Abuja
	416	Ultra-Modern market Abuja
	225	Road outside Abuja
	147	Ibadan open markets
Hot Pepper	285	baki Dogu market Kaduna
	975	Spar Abuja
	1330	Ultra-Modern Market Abuja
	357-256	Ibadan open markets
Irish potato	500	baki Dogu market Kaduna
	440	Spar Abuja
	400	Ultra-Modern Market Abuja
	147	Road outside Abuja
	160	Road entrance Jos
Sweet potato	300	baki Dogu market Kaduna
	260	Spar Abuja
Okra	225	Spar Abuja
	300	Ultra-Modern Market Abuja
	263	Lagos//Ibadan open markets
	243	baki Dogu market Kaduna
Green Pepper	550	Spar Abuja
Yellow Pepper	1,950	Spar Abuja

3.6 The enabling environment

3.6.1 Agriculture transformation policy

The Agriculture Transformation policy Agenda is key to agricultural development. The Agricultural Transformation policy Agenda (ATA) has had a great role in enhancing the role of agriculture as an engine of inclusive growth leading to rural employment, wealth creation, and diversification of the economy.⁶ A policy accomplishment in the sector is the liberation of seed and fertiliser supply, which had previously been controlled by the Federal Government, undermined the private sector and did not deliver the inputs to farmers. Since 2011, fertilisers and seeds are being sold by the companies directly to farmers. Lending commitments from commercial banks has been leveraged using guarantees issued by the Ministry of Finance (MoF) to finance the seed and fertiliser supply. The specific objective is to increase, on a sustainable basis, the income of smallholder farmers and rural entrepreneurs that are engaged in the production, processing, storage and marketing of the selected commodity value chains.

3.6.2 Green alternative policy

Food security, import substitution, job creation and economic diversification are priorities of the new agricultural promotion policy. The Agriculture Promotion Policy 2016-2020 document, 'The Green Alternative', is the outcome of an intensive consultative process started in November 2015

⁶ <https://fmard.gov.ng/ata-nigeria/>

through April 2016. The federal priorities (in partnership with State Governments) are: food security, import substitution, job creation and economic diversification.

Several guiding principles have been established in the new agricultural promotion policy to help meet these priorities. The new policy regime, the Agriculture Promotion Policy (APP), is founded on the following guiding principles, a number of which are carryovers from the ATA:⁷

- Agriculture as a business – focusing the policy instruments on a government-enabled, private sector-led engagement as the key driver of the sector. This essential principle was established in the ATA and will remain a cardinal design of Nigeria’s agriculture policies going forward.
- Agriculture as key to long-term economic growth and security—focusing on policy instruments to ensure that the commercialisation of agriculture includes technologies, financial services, inputs supply chains, and market linkages that directly engage the rural poor because rural economic growth will play a critical role in the country’s successful job creation, economic diversity, improved security and sustainable economic growth.
- Food as a human right – focusing the policy instruments for agricultural development on the social responsibility of government with respect to food security, social security and equity in the Nigerian society; and compelling the government to recognise, protect and fulfil the irreducible minimum degree of freedom of the people from hunger and malnutrition.
- Value chain approach – focusing the policy instruments for enterprise development across successive stages of the commodity value chains for the development of crop, livestock and fisheries sub-sectors, namely input supply, production, storage, processing/utilisation, marketing and consumption.
- Prioritising crops – focusing policy on achieving improved domestic food security and boosting export earnings requires a measure of prioritisation. Therefore, for domestic crops, the initial focus in 2016 – 2018 will expand to production of rice, wheat, maize, soya beans and tomatoes. For export crops, the initial focus was on cocoa, cassava, oil palm, sesame and gum Arabic. From 2018 onwards, the export focus has been on bananas, avocado, mango, fish and cashew nuts.
- Market orientation – focusing policy instruments on stimulating agricultural production on a sustainable basis, and stimulating supply and demand for agricultural produce by facilitating linkages between producers and off takers, while reducing price volatility for agricultural produce through market-led price stabilisation mechanisms
- Factoring climate change and environmental sustainability – focusing policy instruments on the sustainability of the use of natural resources (land and soil, water and ecosystems) with the future generation in mind while increasing agricultural production, marketing and other human activities in the agricultural sector.
- Participation and inclusiveness – focusing instruments on measures to maximise the full participation of stakeholders including farmer’s associations, cooperatives and other groups, as well as Non-Governmental Organisations (NGOs), Community Based Organisations (CBOs), Civil Society Organisations (CSOs), development partners and the private sector. This places a premium on the role of these organisations as agents of change, drawing benefits from their policy advocacy roles as partners to and watchdog of government.
- Policy integrity – focusing policy instruments on measures for sanitising the business environment for agriculture, in terms of accountability, transparency and due process of law, ensuring efficient allocation and use of public funding and fighting corruption on all programmes involving public resources. This also applies to compliance with international commitments, protocols and conventions that Nigeria is a signatory to.
- Nutrition sensitive agriculture – focusing policy instruments on addressing the issues of stunting, wasting, underweight and other manifestations of hunger and malnutrition with particular reference to the vulnerable groups, which include children under 5, nursing mothers and persons with chronic illness and disabilities
- Agriculture’s linkages with other sectors – focusing policy instruments on the connected relationship between agriculture and other sectors at federal and state levels, particularly industry, environment, power, energy, works and water sectors.

⁷ <https://fmard.gov.ng/the-green-alternative/>

The Federal Government concentrates on supporting the development of a conducive enabling environment. Within this overall set of policy principles, the Federal Government concentrates on providing an enabling environment for stakeholders at federal and state level to play their distinctive roles. The policy emphasis will be on providing a conducive legislative and agricultural knowledge framework, macro policies, security enhancing physical infrastructure and institutional mechanisms for coordination and enhancing access to adequate inputs, finance, information on innovation, agricultural services and markets.

3.6.3 Vegetable seed policies

The formal vegetable seed sector is weak and poorly accessible. The formal seed sector has been depicted as inefficient due to its bureaucracy, its centralised functioning and the weak link between research organisations and farmers despite that today both the private and public organisations are actively involved. Hybrid seed varieties are scarce (Oyekale, 2014). Seeds from private companies are distributed through traders and dealers, but the remoteness of rural areas, poor quality of the road network and high prices further decrease uptake (Oyekale, 2014). Another reason is that the federal government is supplying cheap OPVs to farmers, free of costs.

The public sector has a key role in the seed sector. The public seed sector is run by FMARD, the NASC, which works under the FMARD, and which is a member of the Crop Varieties Registration and Release Committee (CVRRC). The CVRRC is responsible for varietal evaluation, release and registration in the national catalogue of registered and released varieties. NASC is a statutory agency of Government with the responsibility of coordinating and regulating the seed industry. It advises government on seed related programmes and is responsible for quality control through certification procedures and enforcement of quality standards. Before varieties are officially released, NASC forms part of the committee that evaluates the technical procedures and parameters before the varieties are released. The committee is an interagency committee.

A Plant Variety Protection bill has been domesticated in Nigeria and the bill has moved to the National assembly per September 2019. The country is a signatory to various treaties of the Food and Agriculture Organization and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). Work is ongoing to develop a model plant variety law that will be in line with the UPOV 1991 convention.

3.6.4 Potato sector policies

The potato sector has recently gained importance in public policy. The potato sector has not been at the forefront of federal agricultural policy, due to its limited economic importance. More recently however, the potential of potato as a cash crop has led to an increasing interest at the federal level. After efforts by the National Root Crops Research Institute (NRCRI), a federal subsidy was approved for the construction of an in-vitro laboratory and associated facilities to produce potato mini-tubers. Despite these efforts in the public arena, the actors in the potato chain do not experience political will or see resources released. One missed opportunity to uplift the potato sector is that NRCRI does not have the mandate for lobby and advocacy. According to the potato value chain actors, the potato sector needs a formal potato stakeholder platform as an instrument to lobby and link national and state level.

In the Plateau State investment in the potato sector have been implemented. At state level (Plateau State) there has been a long recognition of the importance of the potato sector, for the economic development. The Plateau state has invested in the set-up of mechanisation services (the Agricultural Services and Training Centre - ASTC), through a joint venture with an Israeli service provider. The programme delivered affordable tractor services, which were appreciated by farmers. At the same time the programme was running its own horticultural production farm. With political changes at state government however, the programme lost its subsidy, and the service provider had to stop its operations. This has resulted in lack of maintenance of the machine park and the farm, and the discontinuation of the service provision to farmers. Recently a similar new state initiative has been

launched with the importation of tractors. The business model behind the new agricultural mechanisation effort was not immediately clear.

A new potato value chain development programme is a sign of the renewed importance. The state agricultural department is responsible for the public agricultural extension services. The state department has initiated a potato value chain development programme, with support by the African Development Bank. The focus of the programme is the development of small irrigation infrastructure, it does not focus on capacity building for productivity increase or seed potato sector development. In 2019 the department has strengthened its workforce with 150 new young graduates, to increase its presence in the field.

The potato sector is not formally represented; but a State level union has been initiated. The potato sector does not have a specific representing body, not at state, nor at federal level. Thanks to the efforts of SEDIN-GIZ a potato producers union has been initiated in Plateau state, bringing together potato producers' cooperatives, according to Gildemacher and Belt, 2019a).

Improving access to good quality seeds requires improved import facilitation. There is no significant domestic seed potato production. The fastest and most effective way to increase access to quality seed potato is to facilitate the import and retail of seed potatoes produced in other countries. In Germany, France and The Netherlands there are specialised international companies with the expertise to supply the Nigerian market with high quality seed potatoes, supplying varieties that perform well under Nigerian conditions. However, the current regulation and practices do not facilitate the import of seed potatoes, which results in erratic supply, limited availability, high prices and reluctant trade partners (exporters and importers). The import of seed potatoes is restricted to few traders who have acquired approval to import a specific quota. However, even with these quotas the clearance procedure to get the seed potatoes out of the harbour is very complicated and inefficient⁸.

3.6.5 Landownership

Lack of land titles is an important barrier to investment by farmers. Land allocation and management is chaotic and therefore does not empower most of the farmers with a land title. Therefore, Nigerian farmers cannot propose their lands as collateral to buy these inputs which limits already the access to technologies and higher quality inputs (Federal Ministry of Agriculture Nigeria, 2016). Farmers must pay for these costs upfront either through savings or other financial sources such as cooperatives, financial groups, etc. Land is sometimes taken as a collateral for farmers to buy inputs on credit to agro-dealers. Nonetheless, in Nigeria, 95% of the land is not registered.

3.6.6 Doing business

Nigeria ranks 146 out of 190 in the World Bank Doing Business ranking. On the ranking of doing business prepared by the World Bank (2019), Nigeria is ranked 146th out of the 190. Other large economies in the region are Democratic Republic of Congo (184), Ethiopia (159), Tanzania (144), Sudan (162), and Uganda (127). In Nigeria various business reforms were observed by the World Bank in 2019:⁹

- Starting a business became faster: Nigeria made starting a business easier by reducing the time needed to register a company at the corporate affairs commission and introducing an online platform to pay stamp duty. This reform applies to both Kano and Lagos. Currently it takes 7 days to register a company.
- Getting electricity became easier: Nigeria made getting electricity easier by requiring that the distribution companies obtain the right of way on behalf of the customers and by turning on the electricity once the meter is installed. This reform applies to both Kano and Lagos.
- Trading across borders became faster: Nigeria reduced the time needed to export and import by implementing joint inspections, the NICIS2 electronic system and around-the-clock operations at

⁸ The Nigerian Agricultural Quarantine Services (NAQS), National Drug Law Enforcement Agency (NDLEA) and the National Agency for Food and Drug Administration and Control (NAFDAC) are among the controlling agencies where licences need to be obtained and payments made. All this is in addition to customs clearance.

⁹ <http://www.doingbusiness.org/en/data/exploreconomies/nigeria>

Apapa Port (Lagos). At the moment it costs USD1,077 (border compliance) and USD564 (document compliance) to import a 15-tonne container. On average this remains twice as much compared to other Sub-Sahara African countries.

- Enforcing Contracts became easier: Nigeria (Lagos State) made enforcing contracts easier by issuing new rules of civil procedure for small claims courts which limit adjournments to unforeseen and exceptional circumstances.

Nigeria ranks 144 out of 180 in the Transparency International Corruption index. This obviously indicates that the level of corruption in the country is relatively high compared to other nations.

4 Regional vegetable and potato sector Kaduna, Kano and Plateau

In this chapter we provide a description of the climate, the production system in these States, area under cultivation for vegetables and potatoes, and the different farming systems.

4.1 Agronomic conditions

As became clear in Chapter 2, the main areas of the vegetable and potato production in Nigeria are the States of Kaduna, Jos and Kano. Figure 4.1 gives an overview of the dominant soil types.

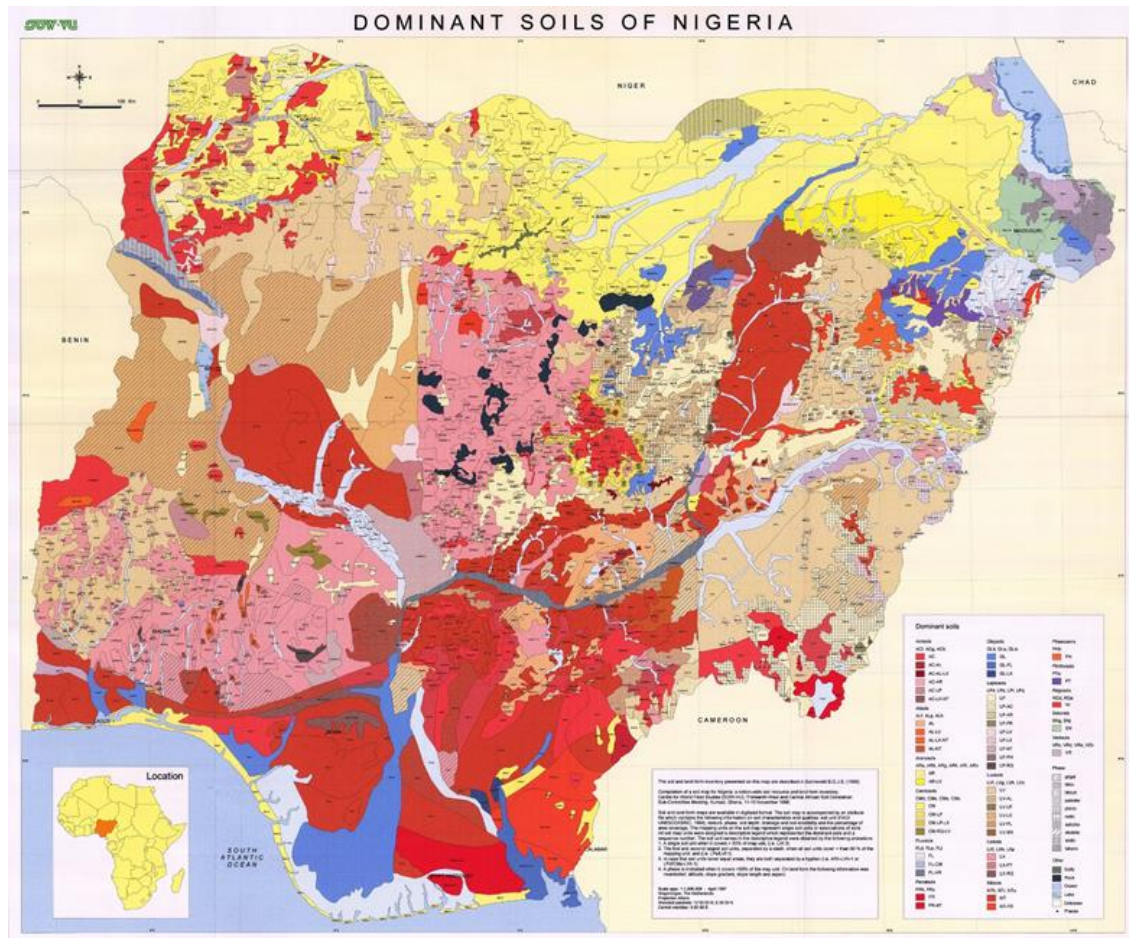


Figure 4.1 Map of dominant soil types of Nigeria (European Digital Archive of Soil Maps, 1997)

4.1.1 Kaduna State

Kaduna state is important to the agricultural development agenda. Kaduna State is important for the success of implementation of the national Green Alternative policy. While it has a political significance as the former administrative headquarters of the North, agriculture is the mainstay of Kaduna State's economy. About 80% of the 6.3 million people of the State are actively engaged in farming. Cash and food crops cultivated include grains, legumes, cotton, and in the vegetable sector – tomatoes and pepper. In Kaduna, maize is the most grown crop. The bulk of tomatoes produced in Nigeria comes from Kaduna State. This is similar for onions (the second most important vegetable in

Nigeria), where Kaduna State is the largest producer, with outputs destined for consumption in the southern states where over 90 million people of Nigeria reside.

Recent outbreaks of violence pose serious risks. Recently, south Kaduna has become a hotspot for violence between farmers and pastoralists. Kaduna State is a key junction in the over 1,000 km supply corridor for neighbouring states that are sources agricultural produce being moved to the markets in southern Nigeria.

The climate is tropical in Kaduna. About 1,211 mm of precipitation falls annually. Compared with winter, the summers have much more rainfall (going up to 280 mm in July). The average annual temperature in Kaduna is 25.2 °C. Appendix 4 gives detailed information on the climate in Kaduna State.

The predominant soil type is Lixisols; characterised by strongly weathered soils and low nutrient content. In Kaduna region, the predominant soil type is Lixisols with scattered Luvisols, Regosols and Acrisols soil. Lixisols are defined as strongly weathered soils. If Lixisols have the same clay and organic matter content than Acrisols, their moisture retention capacity is higher. Lixisols are still subject to slaking and erosion, restraining their agrarian potential. They have a low nutrient content and a low Cation Exchange Capacity (CEC).¹⁰ Usually used for grazing or perennial crops, they can also be used for arable farming if fertilisers are applied frequently (ISRIC, 2015d).

Loss of soil fertility due to deforestation and poor agricultural practices is a clear challenge. Deforestation has caused a loss of soil fertility due to desertification (Federal Ministry of Agriculture Nigeria, 2016). The clear cut of forests leaves the topsoil unprotected which is blown or washed away by wind or rain. This topsoil contains essential nutrients for the crop growth. With the loss of a rich soil, vegetation growth is limited. In wet conditions, mechanised agriculture might cause soil compaction. Terracing and the use of plastic mulch are considered as good techniques to maintain soil quality while poor agricultural practices can deplete the soil of its nutrients.

4.1.2 Kano State

Kano State is the most extensively irrigated state in Nigeria. Kano State has been a commercial and agricultural State. Kano is largely Muslim. The majority of Kano Muslims are Sunni. Christians and followers of other non-Muslim religions form a small part of the population.

Subsistence and commercial agriculture is mostly practiced in the remote districts of Kano. Some of the food crops cultivated are millet, cowpeas, sorghum, maize and rice for local consumption while groundnuts and cotton are produced for export and industrial purposes. During the colonial period and several years after the country's independence, the groundnuts produced in the state constituted one of the major sources of revenue for the country.

Kano State is **famous for its tomatoes and onion production but its's also the first producer** of hides and skins, sesame, soybean, cotton, garlic, gum arabic and chili pepper. The bulk of tomatoes are produced in Kaduna State, with Kano being second. The production has been estimated at 3,600,000 tonnes per year (Van der Waal, 2015). The centres of consumption being the large urban centres in the South. The production of onions, the second most important vegetable in Nigeria, is also concentrated in the north of the country. Kaduna State is the largest producer, followed by Kano. The total Nigerian production was almost 18,000,000 tonnes in 2011 (NASS, 2012; National Bureau of Statistics, 2012).

Kano is influenced by the local steppe climate. During the year there is little rainfall. The driest month is January, with 0 mm of rainfall. Most of the rain falls in August, averaging 257 mm. The temperature averages 26.1 °C. More detail climate info can be found in Appendix 4.

¹⁰ 'Cation-exchange capacity (CEC) is the maximum quantity of total cations that a soil is capable of holding, at a given pH value, available for exchange with the soil solution. CEC is used as a measure of fertility, nutrient retention capacity, and the capacity to protect groundwater from cation contamination.' (source: FAO source Portal)

The predominant soil types are arenosols and cambisols which are challenging for crop production. In Kano region arenosols and cambisols are predominant. Often used for grazing, these soils could also be used for crops if irrigation is available. Arenosols are soils with a sandy to loamy sand texture frequently found in arid regions. Low in organic matter, arenosols are susceptible to erosion and wind. Due to their coarse texture, they are permeable soils but might be subject to variations in terms of water retention and susceptible to leaching (loss of water-soluble plant nutrients). The CEC is low except in the topsoil. Nonetheless, it is considered that in dry regions, Arenosols are richer than in temperate areas but still susceptible to leaching. The poor soil structure, low water and nutrient storage capacity and its susceptibility to erosion are important barriers to crop cultivation. In this region, fertilisation, irrigation and soil conservation techniques are crucial for moderate-costs and sustainable crop productions (ISRIC, 2015c) and increasing yield to its potential.

4.1.3 Plateau State

The Plateau State also offers favourable conditions for the cultivation of temperate vegetable such as tomatoes but still focus is on potato production. In addition, a growing consumer market demand because of a more numerous middle class living in cities, pushed inhabitants to shift from their previous activities to vegetable farming which has shown a positive impact on smallholder farmers' livelihoods.

Occurrence of pest and diseases and the lack of access to water are serious challenges. Situated in higher altitudes, farmers, in the Plateau, tend to look for plots close to the roads to facilitate transportation. However, an even more important driver is presence of a water. Access to water remains weak; some sources dry up before the end of the season causing pests, diseases and low yields. Water access is also threatened by underperforming and inefficient irrigation practices. Moreover, over-cultivation combined with soils that hardly retain enrichers have led to soil nutrient depletion. Another challenge is that pest and disease pressure is high while farmers' knowledge to implement efficient solutions is low. The use of collective irrigation system is also contributing to the spread of pests and diseases. Extension services nor pesticide dealers, pushing farmers to inefficiently and overuse pesticides, have been able to provide solutions.

Land pressure and competition is causing tensions in trade in the region. Vegetable farming has brought tensions in the region especially due to land pressure for agricultural purposes. Competition for buyers and traders is also increasing tensions between farmers. Relying mostly on personal networks some farmers are able to sell their production to traders from their community (Hausa communities), while farmers from other communities with less power must turn to markets farther away. In addition, there are conflicts between pastoralists, bringing their cattle in mountains during the hot season, and vegetable growers about the land use and location where cattle could graze freely.

Access to credit, volatile market prices and high transportation costs are challenges identified. Growth of the agricultural sector is constrained by poor access to credits and volatile market prices which limits purchase of higher quality inputs or irrigation systems. Due to a poor quality of the road infrastructures, transportation costs are relatively high given low production volume.

Jos has a more temperate climate than the rest of Nigeria. Average monthly temperatures range from 21–25 °C, and from mid-November to late January, minimum temperatures drop as low as 11 °C. Appendix 4 gives a detailed overview of the climate data.

The first predominant soil types is arenosols which require careful management. The Plateau State, acrisols are predominant (European Digital Archive of Soil Maps, 1997). Acrisols are typical soils found in the tropic and sub-tropic areas. They are assimilated to highly weathered soils (degraded clay particles) with an argic horizon (higher content of low activity clay in the sub-soil horizon) with a low base saturation (acid soils). The CEC is usually low and soils are characterised by a poor nutrient content, a high phosphorus sorption, a high aluminium content which can become toxic to plants and, eventually, a high susceptibility to erosion which leads to the phenomenon of

crusting (limiting oxygen flow into and out of the oil). Often cultivated for subsistent agriculture, Acrisols are poor, acidic and not very productive: they require a careful management to increase production which is currently far below its potential (ISRIC, 2015a; Allaby, 2006).

Cambisols are predominant around mountainous areas which are considered suitable for agricultural production. Cambisols are defined as weakly to moderately developed soils where the beginning of soil horizons differentiation is observable. Cambisols usually have a loamy to clayey texture, contain weatherable minerals, have a stable and good soil structure, a high porosity, a good CEC and drainage and of a weakly acidic to neutral pH. These soils are interesting for farming explaining that worldwide they are intensively used for agricultural productions. Nonetheless, in humid areas such as the tropics, Cambisols usually offer a poor nutrient content but still higher than in Acrisols for example. Cambisols in the tropics are found at a moderate altitude often downstream of more mountainous areas which are characterised by Acrisols or Ferralsols. This might be the case in Jos region, as nutrients are eroded or washed away from higher plateau (where Acrisols are found) and then deposited downstream (ISRIC, 2015b).

4.2 Area under cultivation and productivity

4.2.1 Vegetable production

The tables below show the production of different crops divided by the production share of the studied States (in hectares and tonnes). Data was collected by the National Agricultural Statistics Service in 2011 but it is very likely that the production volumes per State observed in these data is still representative.

Most tomatoes, onions and peppers are grown in Kano, Kaduna and Sokoto states. Tomatoes are mainly produced in the States of Kaduna and Kano. According to data from the NASS (2011) those States produce jointly more than 50% of all tomatoes in the country. However, tomatoes are commonly produced almost all States (24 out of the 40 States of Nigeria). Tomatoes are grown in the south-western part of the country on small plots under rain-fed conditions and in the northern regions under irrigation systems (Ayandiji and Adeniyi Omidiji, 2011). Onion are only produced in the northern states of Nigeria. The dominant States involved in the production of onions are Kaduna, Kano and Sokoto. Peppers are produced in more than 80% of the Nigerian States. Important production States are again Kaduna and Kano.

Table 4.1 Area and production of vegetables (2011)

		Kaduna	Kano	Plateau	Other states	Total	Share
Tomato	Area (ha)	47,100	44,020	18,490	163,340	272,950	40%
	Production (tonnes)	405,760	363,330	136,660	894,210	1,799,960	50%
Onion	Area (ha)	146,880	144,000	-	269,810	560,690	52%
	Production (tonnes)	2,470,490	1,993,990	-	4,510,310	8,974,790	50%
Pepper	Area (ha)	151,670	106,740	18,020	475,810	752,240	37%
	Production (tonnes)	214,470	198,240	34,220	708,990	1,155,920	39%
Okro or okra	Area (ha)	44,700	1,590	-	351,000	397,290	12%
	Production (tonnes)	115,360	3,730	-	964,530	1,083,620	11%

Source: NASS (2011)

4.2.2 Potato production

The potato sector is of major economic importance to Plateau State. With an estimated 293,240 hectares of production it is one of the largest potato production areas of the African continent. According to official data from the NASS (2011) The most important potato production areas (excluding sweet potato) are the Jos Plateau, Plateau State, where 45% of the national production takes place. However more qualitative estimates indicate a more important share for this State in the national production going up to 95% (Gildemacher and Belt, 2019a). Within Plateau State potatoes are mainly produced in the LGAs (Local Government Areas) located at higher altitude. The distribution and marketing is done through spot markets, but function well. The production system and production support systems, however, are very poorly developed. Average yields are below 4 tonnes per hectare which is very low, particularly considering that 1-2 tonnes of seed are used to obtain this.

Table 4.2 Area and production of potato, 2011

	Kaduna	Kano	Plateau	Other states	Total	Share
Area (ha)	19,430	12,850	113,870	147,090	293,240	50%
Production (tonnes)	194,580	36,580	975,640	961,380	2,168,180	56%

Source: NASS (2011)

4.3 Types of farming systems

4.3.1 Vegetable farming systems

Traditional mixed vegetable farming systems are most common. Onions, tomatoes and other vegetables are often produced in mixed systems. They are grown to a large extent in fadama lands (seasonally irrigated flood plains in the Northern savannah) (Hussaini and Abayomi 2010). The tomato production in the North is mainly done during the dry season as described by van der Waal (2015). According to the same study, during the wet season, the disease pressure is too high and the land is often used for grain production, which is necessary to supply the staple crops. To ensure a higher yield, farmers using irrigation.

High potential to improve yield with modern farming information and techniques. Modern farming information and techniques will provide farmers and the vegetables sector with opportunities for greater yield and access to markets. The irrigation system is deficient but offer farmers a better income compared to farmers working with rain-fed systems. The same situation has been observed by Usman and Bakari with extension services: farmers with an access to extension services are financially better off than farmers without access to such service. As land tenure is unclear due to the absence of land titles, the purchase of higher quality inputs is limited. As land cannot be used as a collateral to buy inputs on credit, farmers must pay for these inputs with their savings which are limited. This is a risk that farmers are not eager to take, explaining the low use of higher-quality inputs and the dominance of low external input system (Ayoola, 2014). Pest and diseases infestation is a major problem that farmers are hardly coping with, resulting in an over- and inefficient use of pesticides and residues in final products (Van der Waal, 2015).

Experimental plots show potential for more profitable vegetable farming systems. Table 4.3 gives an overview of a tomato crop budget for a 200m² demo farm in Kaduna with conventional OPV seed and hybrid seed. It is obvious that costs for the hybrid seeds are higher but that the yield from the plot is also much higher, resulting in a positive profit margin. However, given the challenges mentioned before, uptake of such seeds is limited.

Table 4.3 Tomato crop budget for a 200m² demo farm in Kaduna

		Conventional OPV	Hybrid
Inputs	Seed	0	1,000
	Crop protection	3,350	3,350
	Fertiliser	1,950	1,950
	Staking	1,200	1,200
Labour		5,000	5,000
Total costs		11,500	12,500
Production	Kg	28	615
Farm gate sales price	250 per kg	7,000	153,750
Gros margin	Naira	-4,500	141,250
	USD	-4	130

Source: East West Seeds (2019)

4.3.2 Potato farming systems

Potato production practices are limited yields. Gildemacher and Belt (2019a) describe that the current potato production practices are clearly a major factor contributing to the very low yields in the country. Based on interviews with farmers, the study team noticed a lack of understanding of the basic production practices. In addition, there is a lack of professional seed multipliers. This makes that potato producers rely on recycling their own seed and buying recycled seed from the market. In the rural potato markets, there is a specific corner where small sprouted tubers are being sold as seed.

Access to input, but knowledge on their application is limited. The same authors describe that fertiliser and agro-chemicals are readily available in the larger towns in Nigeria. Fake inputs are mentioned by farmers and potato experts as a main problems. At the same time there are more reputable agro-dealers running shops, who are known to (usually) retail genuine products. They argue that the knowledge level of the agro-chemical dealers is low. Their understanding of potato diseases, the appropriate chemicals to use, and the best treatment schedules, was at such a level that they could not advise farmers.

Potato production is usually rain-fed. Virtually all potato production occurs under rain-fed conditions. The crop is generally planted during the wet season that lasts from April to August. On average the harvesting is done 3 months later and can drag on until November for the last potatoes that were planted in late August. Planting of potatoes under irrigation, which can be done at any time, normally takes place from October through January with harvest in February, March and April. Nigeria is endowed with favourable physical and natural resources for agricultural production.

Improved potato seeds and irrigation can strongly improve yield. In a presentation Gildemacher and Belt (2019b) calculated the current conventional crop budget versus the improved crop budget for 1 hectare of potatoes production. It is clear there is room for improvement to increase the yield from 8 tonnes to 18 tonnes with improved potato seed and irrigation, as can be seen from Table 4.4. Farm gate price could increase from N140 per kg to N250 per kg.

Table 4.4 Potato crop budget

		Conventional			Improved		
		Quantity	Price NR	Costs	Quantity	Price NR	Costs
Inputs	Seed potatoes (kg)	-		-	3,000	450	1,350,000
	Fuel for irrigation (l)	-		-	650	200	130,000
	Other inputs	-		130,000			140,000
Labour	Land preparation (days)	20	1,500	30,000	-		-
	Irrigation (days)				30	1,500	45,000
	Other (days)			80,000			103,000
Service	Tractor for land prep (contract)			-	1	86,500	86,500
	Transport to market (bag)	160	200	32,000.00	360	200	72,000
Total costs				272,000.00			1,926,500
Revenues		8,000	140	1,120,000	18,000	250	4,500,000
Gros margin	Naira			848,000			2,573,500
	USD			7,169			2,362

Source: Gildemacher and Belt (2019a)

5 Seed prices

The seed sector is characterised by many challenges. First, there is lack of availability of good quality seed and if available the distribution system is underperforming. The seed chain is not transparent, there is no quality control, good quality seed is dominated by the private sector and unofficial figures report seed import of more than 70% of total quality vegetable seed availability (OPV and hybrid). Imported seeds are distributed by various distributors. Progress has been made on the Plant Variety Protection bill (NASC, 2019) but currently there is no effective quality, control and monitoring system in place. Farmers mostly use outdated varieties and farm saved seed and there is a lack of adoption among farmers: hybrids are more expensive but farmers are not very willing to pay even if there yield will increase. They are very hesitant to invest as a result of distrust, traditional practices and fake seed sales. For potato seed, the lack of available good quality seed is a serious challenge. Farmers continuously recycle own seed but the current regulation does not facilitate import of seed potatoes and there is no seed potato quality assurance system in place.

OPV seeds are mostly used in the north of Nigeria by over 80% of vegetable farmers in Nigeria. Pepper farmers and Okra farmers predominantly recycle seeds but tomato farmers often buy OPV seeds which is the reason why you hardly find packaged seeds on the shelves. Hybrid tomatoes seeds are predominantly used in the South by farmers because OPV hardly survive due to bacterial wilt infestation present in the soil. There are many hybrid seeds varieties suppliers gaining market share such as Technisem, East-West, Pop Vriend, Bakkers Brothers and the smaller ones: Enza Zaden, Syngenta and Continental seeds. Table 5.1 provides with some seed prices ranges of different crops for OPV and Hybrids.

Table 5.1 Examples of selected OPV and Hybrid retail seed prices, see for a full list Appendix 9

Vegetable	Type of seed	Retail Price range per 1,000 seeds
Tomato	OPV	N96-114
	Hybrid	N1,200-19,000
Okra	OPV	N38-72
	Hybrid	N165-270
Cucumber	OPV	N54-75
	Hybrid	N390-32,000

In figure 5.1 photos are presented of seed retail outlets in the northern part of Nigeria. A full price list is attached in Appendix 9) and a selection of released varieties of the NASC Catalogue (NASC, 2019) in Appendix 8.



Figure 5.1 Shop agro-dealer, Kaduna (Photos taken by J. Talabi, September 2019)

6 SWOT analyses and conclusion

There are many business opportunities and potential for growth, but an insecure enabling environment requires a long-term perspective. The following two tables synthesize the SWOT analyses done during the validation workshops with industry stakeholders in Nigeria. All participants were organised in small groups according to their background (i.e. producers, traders, private sector, government, knowledge institutes) and made a SWOT analysis for the sector from the perspective of their position in the value chain. They presented their analyses in a plenary session. Tables 6.1 for the potato sector and 6.2 for the vegetable sector give an overview of the highlights of all the SWOT analyses after careful restructuring and analysing, done by the research team. Appendix 6 contains the complete SWOT analysis provided by the stakeholder groups.

6.1 Potato sector

6.1.1 Strengths

An important strength of the Nigeran potato sector is the well-established and effective support models developed by NGOs. Current activities of NGOs are focussed on training farmers on GAP and sensitise on good quality seed use. Relevant networks are established and an infrastructure to reach out to farmers is in place.

Another strength is the embeddedness of potato consumption in the Nigerian diet. Everybody in Nigeria consumes potato. This makes the potato farming a profitable business. It is likely that the demand for potato will increase in the further due to an increasing population and an increase in purchasing power.

Plateau State is the main potato producing State in Nigerian and has a favourable climate to produce potatoes. However, potato is easily affected by diseases. The most serious diseases affecting varieties planted in the Plateau State include late and early blight. Prevailing climate conditions are favourable especially for the development of late blight that particularly occurs during the rainy season.

In Nigeria, there is a well-established potato marketing and distribution system. Despite that almost all potatoes are trade trough informal markets, the markets function well.

6.1.2 Weaknesses

It was often mentioned that poor agricultural practices are the key bottleneck in the Nigerian potato sector. This includes disease control, post-harvest and seed handling. Farmers have a lack of understanding of the basic potato production practices. In addition to agronomic practices, farmer knowledge of crop protection seems to be absent. This contributes to low yields. Due to poor agricultural practices, excessive use of chemicals is mentioned resulting in land devastation.

Another constraint is the lack of quality seed available in the market that results in low yields. There is no significant domestic quality seed potato production and a lot of starting material contains seed borne diseases. The fastest way to increase access to quality seed potato is to facilitate the import of seed potatoes. However, policies for importing good quality Early Generation Seed are unfavourable. Specialised international companies could be able to supply the Nigerian market. This requires a conducive environment with import rules and procedures, which need to be regulated and enforced. The current regulation and practices do not facilitate or control the import of seed potatoes at all, which results in unreliable supply, limited availability, high prices and reluctant trade partners. Under the current regulation, the import of seed potatoes is restricted to a few traders who have acquired

approval to import a specific quota. However, even with these quotas, the clearance procedure to get the seed potatoes out of the harbour proves to be complicated, and often unclear. Both exporter and importer need to invest considerable time and money to get the shipment into Nigeria.

Overall the enabling environment in Nigeria for the potato sector is not conducive. At government level, a clear development pathway is missing. An important aspect of the policy should be targeted towards the training of farmers on good agricultural practice, regular potato seed inspection, facilitate the import of seed potatoes and supporting the potato processing industry. In addition, a potato sector lobby platform at a national level can be initiated to lobby at the federal government level for favourable policies.

The current land tenure system in Nigeria is often mentioned by the industry stakeholders a weakness. As land tenure is unclear due to the absence of land titles, farming is often limited to short term thinking and quality inputs like fertilisers needed to enrich the soil are not applied. Also expansion of land for potato production is limited, also due to the fact that a lot of land is infested with diseases.

Finally, in Nigeria, there is a very weak infrastructure of roads that make it difficult to source from rural areas. Parts of the roads, even major routes, are in such bad condition that because of loss of time, high maintenance and repair costs for the trucks the transport costs are increased by up to 20% in comparison to the situation with good road conditions. Also, in the case of imported seed potatoes that need to be transported from Lagos to the rural areas in the North, this is taking a lot of time and is adding costs. Also, storage facilities for potatoes are missing.

6.1.3 Opportunities

During the validation workshops, it was stated that Nigeria has serious resources in terms of manpower and land availability. This makes it possible to extend the production area of potatoes.

Since there is only very limited seed potato multiplication in Nigeria and farmers often recycle their own potatoes, a serious opportunity would, therefore, be the access to quality seed potatoes. The facilitation of importing seed potatoes from abroad is key. Also, the support for local seed potato production is needed.

Potato consumption in Nigeria is on the rise and it is likely to increase in the future due to an increasing interest in the consumption of potatoes. Also, the consumption of processed potatoes is increasing. Consumer demand is shifting from fresh tubers to processed products and ever greater quantities of potatoes are being processed to meet the rising demand for convenience food and snacks. The major drivers behind this trend include expanding urban populations, rising incomes, diversification of diets, and lifestyles that leave less time for preparing the fresh product for consumption.

In Nigeria, there is a lack of potato processing facilities. Therefore, large volumes of French fries are imported in Nigeria. Substitution of imported by locally processed products is, therefore, a serious opportunity. Support from the government to further develop this sector is required (e.g. favourable tax regimes for the importation of processing machinery, preventing imported French fries to enter the country, etc).

The development of farmer cooperative/associations is on the rise. Bringing farmers together so that they can interact with processors or buyers as a group and negotiate better conditions. They could also consider producing their own seed potatoes.

In general, the upcoming ICT sector in Nigeria is providing great opportunities, as mentioned by the industry stakeholders. Also, farmers in Plateau State do have increasing access to the internet. ICT solutions can contribute to transparency and can improve trust among the key players.

6.1.4 Threats

As stated before, Nigeria is poorly ranked at the Corruption Index. This was confirmed during the industry stakeholder workshop, also by government representatives. Corruption is present at all layers and levels of the government and throughout society. This makes it difficult for European companies to do business in a transparent way without adjusting company operations to the corrupt system. In addition, stringent measures by regulation agencies were mentioned by the stakeholders as a threat. It is a challenge to obtain a certificate for the seeds.

Pest and disease outbreaks are frequent. Since farmers have only limited knowledge of applying the appropriate pesticides and practices for controlling pest and diseases and only have pest and disease prone seed, it can often happen that complete plots of potatoes are lost.

Climate change and natural disasters are often mentioned as a serious threat. Therefore, climate-smart innovations should be considered (e.g. quality seed varieties that withstand climate change).

In Nigeria (and as in many other countries) small-scale potato farmers are not willing to adapt to new practise at their farms easily. Therefor change will take time and require long-term investments. Also, farmers miss the financial resources and lack access to credit to invest and to make changes at their farm.

Table 6.1 SWOT analysis potato sector (source: participants potato workshop, Jos September 12, 2019)

Potato sector	
Strengths	Weaknesses
<ul style="list-style-type: none"> Established and effective support/models by NGOs Well established product in the national diet Favourable climate conditions Well working trading system 	<ul style="list-style-type: none"> Poor agricultural practices Poor quality potato seed Conducive enabling environment The unfavourable land tenure system Bad infrastructure: roads to rural areas, storage of potato
Opportunities	Threats
<ul style="list-style-type: none"> Availability of resources to expand production Introducing quality seed potatoes to increase yields Substitution of seed imports by local production Substitution of processed products by local production Increase in demand (an increase of population) The development of farmer cooperative/associations Access to the internet and ICT solutions 	<ul style="list-style-type: none"> Insecurity and conflicts (herdsmen versus pastoralists) Corruption and stringent measures by regulation agencies Pest and disease outbreak Natural disasters/climate change consequences Lack of adoption and willingness to invest at farmer level

6.2 Vegetable sector

6.2.1 Strengths

It was often mentioned by the stakeholders that Nigeria has a favourable climate to produce vegetables. It is possible to produce nationwide in the dry and wet season. As stated before the southern part of Nigeria produces vegetables in the wet season and the North in the dry season, just before it becomes humid and the crop is likely to be affected by diseases.

Nigeria has a long tradition of vegetable farming and this is practised generation after generation. In addition, the vegetable sector has a well-working value chain that can transport fresh produce over long distances from the North (the bulk of production) all the way to the South (main markets).

Many local and international seed companies are active. They have developed specific vegetable seeds suitable for the local conditions, however, stable and timely access to the good quality seed for rural farmers and in some cases affordability remains sometimes challenging; also the lack of a quality control and monitoring system create challenges (see 6.2.2. weaknesses).

Vegetable farming is regarded as profitable. Especially if the market is not flooded with products in terms of glut. This mainly due to the high and increasing demand for vegetables and the importance of it in the national diet. Especially tomato, sweet pepper and onion are important ingredients of the Nigerian diet.

6.2.2 Weaknesses

Vegetables in Nigeria provide low yields. This is mainly due to limited access to good quality seeds available, weak seed distribution system, widespread presence fake inputs (seeds, fertilisers), poor or inadequate access to fertiliser (even if there if money, it is scarcely available), lack of knowledge on good agricultural practises, lack of irrigation facilities in the South. Finally, also the lack of adoption of advanced production technologies like protected cultivation remains very scarce.

Vegetable small scale farmers are not willing to easily adapt to new practices and new varieties. Therefore change will take time and requires long-term investments. Also, farmers miss the financial resources to invest and lack access to credit facilities to make changes at their farm. Stakeholders firmly stated that there is some level of distrust among farmers for new varieties and improved agricultural practices.

The sector is not very well organized. There is a lack of cohesion (formal inputs, producers and marketing cooperatives or effective farmer groups are missing). The few cooperatives are not formed based on intrinsic motivation to act collectively, but they are more used as a means to apply for grants and subsidies. Cooperatives could be used to develop a unified voice of producers and to develop the power imbalances in the section namely between farmers and the middle-men/traders to regain some negotiation power.

In Nigeria, the market system itself is well developed, and the products go easily from north to south mainly because of established traders associations. However, the system has several serious shortcomings:

- No information/transparency in VC vegetable;
- The marketing system is dominated by only a few players; and
- In a time of oversupply: low prices, no harvest, produce rotten in the field since dominant traders do not want to take them or the revenue does not outweigh the costs for harvesting and transportation;

In Nigeria, there is no cold chain and the post-harvest techniques and storages are very poor. Stacking of raffia baskets in large open trucks or tied on top of empty fuel tankers returning South. The infrastructure with roads is poor, lack of storage, many stops on the way to the South. It is taking a long time before the produce is reaching the markets.

Another serious constraint is the lack of credit facilities. For farmers in Nigeria, it is impossible to get access to credit at acceptable rates. For the development and progress of the sector, it is important that actors in the value chain can finance investments.

Often mentioned by the stakeholders in Nigeria is the lack of a conducive political environment because of:

- Lack of continuity in policies and focus of government;
- **Lack of political will: "It is easy to see what they should do but they don't do it";**
- Lack of focus in political priorities/lack of vision and SMART-strategy;
- Lack of transparency, so that the system cannot hold them accountable/conflicting information until you are completely lost;

-
- Disconnection and lack of coherence (between ministries/divisions and institutions (e.g. research institutes and government));
 - Bureaucracy and corruption are considered too big issues;
 - Lack of adequate extension workers in the field; and
 - Lack of reliable national and regional up to date data provided by the government on production, productivity and pricing.

6.2.3 Opportunities

During the validation workshops, it was stated that Nigeria has serious resources in terms of manpower, land availability and water. This makes it possible to extend the expand the production area of vegetables.

There is a high potential to increase yields by improving the knowledge of the farmers on good agricultural practices. Also, access to and the adoption of good quality seed of improved varieties and other necessary quality inputs is a great opportunity.

Demand for vegetables is increasing due to a strong increase in population, increase awareness about food nutrition and the importance of vegetables and an increasing purchasing power. Also, the potential export to neighbouring countries (high demand) is an opportunity. The demand increase is also luring investors in the sector that are willing to make serious investments.

The vegetable sector is receiving increasing attention from international actors and the local and federal government since it is an important sector for rural development, food and nutrition production for the cities and vegetables. Vegetables are globally considered to be a healthy food item that fits perfectly in food and nutrition security programs and Nigeria is increasing paying attention to the nutrition component of food security.

Local processing of vegetables is very limited, due to issues with a constant supply meeting the specific requirements and cheap imports. Currently, there is an import ban on some processed products in place that should enable local processors to step up and grasp the opportunity. There are varieties in place that meet the requirements of processed vegetables and small-scale outgrower models between processors and farmer groups are established. These models offer possibilities for upscaling if enough attention is paid to the current challenges in the processing industry of vegetables.

Another opportunity recently showed up by the fact that a Plant Variety Protection draft bill has been domesticated in Nigeria and the bill has moved to the National assembly per September 2019. The country is a signatory to various treaties of the Food and Agriculture Organization and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). Work is still ongoing to develop a model plant variety law that will be in line with the UPOV 1991 convention.

In general, the upcoming ICT sector in Nigeria is providing great opportunities, also for vegetable farmers. ICT solutions can contribute to transparency and can improve trust among the key players. There is increasing attention from the ICT sector for the potential of the agricultural sector and there are successful models in place which can be further studied for upscaling and application to the vegetable sector.

Some informal farmers groups/clusters are in place, often at the village level. It would be a great opportunity to build their capacity, to strengthen their management and to make the step to formal cooperatives to jointly work on the marketing of their products.

6.2.4 Threats

Insecurity and conflicts over land use are a serious risk and treat in agriculture and business investments in the sector (for example the herdsmen versus pastoralists conflicts). Many violent

outbreaks have occurred between Muslim Fulani herdsmen and Christian farmers in the Nigerian Middle Belt States like Kaduna, Benue, Taraba and Plateau State.

Nigeria is poorly ranked at the Corruption Index. This was confirmed during the industry stakeholder workshops and all interviewees. Corruption is present at all layers and levels of the government and throughout society. This makes it difficult for European companies to do business if they do not want to align and adjust their operations to the locally applied rules of law

Climate change is affecting vegetable production in Nigeria seriously. Climate-smart innovations and resilience strategies should be considered (e.g. quality seed varieties that withstand climate change) but are not in place.

Pest and disease outbreaks are frequent. Since farmers have only limited knowledge of applying the appropriate pesticides and practices for controlling pest and diseases, it can often happen that complete vegetables plots are lost. Also, and especially in the wet season, there is a lack of varieties that are pest and disease resistant.

In Nigeria, there is hardly any off-take of produce in the peak seasons due to the absence of a strong local processing industry that is able to source produce for processing. However, it should be noted that processing of certain vegetables (e.g. tomato) require the right varieties and that specific arrangements need to be made between farmer and processors and that local processing, in general, is not adding a lot of value for the farmers. There are small-scale outgrower models in place between processors and farmers but it requires some time to have evidence whether these models are successful and financially viable business models.

Another threat mentioned by the industry stakeholders is the ageing population of farmers and the migration of youth to the cities of Nigeria. This leaves a serious challenge to sustain vegetable production in rural areas.

Table 6.2 SWOT analysis vegetable sector (source: participants workshops Kano and Kaduna September 16 and 17, 2019)

Vegetable sector	
Strengths	Weaknesses
<ul style="list-style-type: none"> • Favourable climate and production of vegetables possible in the dry and wet season • Culture of farming and expertise in farming • Seed companies active on the ground • Profitable business to produce vegetables 	<ul style="list-style-type: none"> • Low yields • Lack of adoption and willingness to invest at farmer level • The sector is not organised • Dominated marketing system (and poor post-harvest handling) • Lack of a cold chain • Constraints/lack of credit facilities • Lack of a conducive environment
Opportunities	Threats
<ul style="list-style-type: none"> • Workforce available • Available of suitable and water access • High potential for increased yields • High demand for vegetables, attracting investors • Entrepreneurial spirit Nigeria • Increasing attention international + government (local and federal) • Development of a national processing industry: import ban processed products in place • Progress in the draft Plant Variety Protection bill • Food and Nutrition security programme and attention • Access to the internet and ICT solutions • Farmers groups/clusters in place 	<ul style="list-style-type: none"> • Insecurity and conflicts (herdsmen versus pastoralists) • High corruption and change of rules and policies + lack of law enforcement • Climate change • Land use (land tenure system) and land rights issue • Smuggling of vegetable seed/fake seed/inputs • No effective quality and monitoring system in place for inputs • Disease and pest outbreaks • No off-take of produce (in case of higher production) • Aging population of producers/migration youth

6.3 Conclusions and recommendations

Potato and vegetable production is far below potential and there is a strong need to develop good agricultural practices. Agriculture in Nigeria is characterised by many challenges leading to very low yields.

The high and increasing demand and purchasing power at the producer and consumer level, the availability of suitable land, manpower, existing experience in agriculture and increasing political attention offer great opportunities. However, the number of threats and weaknesses indicate that it is not easy to improve the sector, for example, high corruption, moral hazards, changing and volatile policies, insecurity and land conflicts, lack of transparency and quality control, and power imbalances. A long-term time horizon of business actors is required as well as political will, investments at all stages of the value chains, mutual trust between actors and cooperation of all stakeholders. The SWOT analysis clearly shows the opportunities and areas of potential investments.

The following priority areas are defined based on this study and the field visit:

1. Seed:
 - a. Potato seed: building of a well-functioning seed system through 1) import of larger volumes of early generation potato seed and 2) local potato seed production development.
 - b. Vegetable seed: supporting the development of a seed system. Including a favourable enabling environment to ensure quality seed availability and affordability; building an effective quality seed quality assurance system and establishing a stakeholder platform.
2. Regulation and policy: ensuring quality seed availability and affordability; building an effective quality seed quality assurance system and establishing a stakeholder platform as an instrument to lobby and link national and state level.
3. Knowledge: building knowledge of extension workers, producers and agro-chemical dealers (e.g. how to handle seed); sensitisation on the use of quality seed/hybrids.
4. Demand: Increased demand for horticultural produce is attracting investors from other sectors that have the financial means to establish large scale farms and to source high-quality inputs need to develop modern horticultural projects.
5. Marketing and processing of vegetables and potatoes: parallel to priority areas # 1-4: supporting the development of a strong local processing sector *mainly for potatoes* with added value, outgrower/contracting system and improved transportation.

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Appendix 1 Production of vegetables and potatoes in Nigeria

	Tomato		Onion		Pepper		Okra		Potato	
	Area (ha)	Prod (ton)	Area (ha)	Prod (ton)	Area (ha)	Prod (ton)	Area (ha)	Prod (ton)	Area (ha)	Prod (ton)
Abia	-	-	-	-	1,570	2,230	19,780	51,630	-	-
Adamawa	-	-	-	-	16,190	22,060	4,580	10,530	7,830	42,350
Akwa-Ibom	-	-	-	-	-	-	34,490	89,350	-	-
Anambra	460	2,840	-	-	800	980	16,080	48,670	4,700	26,350
Bauchi	-	-	27,470	517,070	27,020	47,300	-	-	-	-
Bayelsa	-	-	-	-	1,960	2,940	600	6,830	590	2,500
Benue	28,760	158,850	-	-	23,410	48,930	5,220	19,690	24,620	197,180
Borno	34,960	188,860	32,930	653,160	-	-	1,810	5,270	-	-
Cross River	-	-	-	-	1,370	2,260	13,070	37,720	-	-
Delta	1,740	9,670	-	-	1,340	1,800	14,060	29,310	8,370	58,260
Ebonyi	180	940	-	-	1,580	2,220	21,570	45,010	5,290	43,810
Edo	1,350	6,230	-	-	2,120	4,110	19,440	44,060	-	-
Ekiti	1,010	5,120	-	-	2,560	4,300	11,250	32,480	-	-
Enugu	1,660	7,630	-	-	2,610	3,230	13,730	66,430	12,630	85,510
Gombe	7,180	37,700	22,140	435,600	59,300	78,760	-	-	7,800	43,170
Imo	680	3,410	620	920	1,590	2,130	10,770	25,680	2,020	12,240
Jigawa	24,590	107,210	-	-	52,400	77,620	-	-	-	-
Kaduna	47,100	405,760	146,880	2,470,490	151,670	214,470	44,700	115,360	19,430	194,580
Kano	44,020	363,330	144,000	1,993,990	106,740	198,240	1,590	3,730	12,850	36,580
Katsina	21,620	141,770	62,540	987,770	28,100	50,870	-	-	-	-
Kebbi	-	-	-	-	22,320	41,490	-	-	920	4,870
Kogi	4,370	33,160	-	-	1,720	1,890	-	-	-	-
Kwara	-	-	-	-	-	-	-	-	9,190	77,960
Lagos	440	1,990	-	-	-	-	-	-	-	-
Nasarawa	16,330	108,120	23,520	353,640	27,380	36,840	14,340	32,400	14,680	99,280
Niger	-	-	-	-	55,450	89,060	32,910	103,320	33,430	145,900
Ogun	820	4,220	-	-	3,630	7,340	18,520	40,750	-	-
Ondo	1,170	4,970	230	2,110	6,040	12,610	8,150	40,090	-	-
Osun	1,050	5,010	-	-	11,120	19,420	29,080	67,350	1,390	11,040
Oyo	1,340	6,210	-	-	15,960	25,730	30,050	77,330	-	-
Plateau	18,490	136,660	-	-	18,020	34,220	-	-	113,870	975,640
Rivers	-	-	-	-	5,150	6,730	30,280	88,020	-	-
Sokoto	-	-	100,360	1,560,050	101,450	113,250	-	-	8,020	80,140
Taraba	-	-	-	-	-	-	-	-	-	-
Yobe	13,630	60,280	-	-	-	-	-	-	-	-
Zamfara	-	-	-	-	-	-	-	-	5,610	30,810
Fct Abuja	-	-	-	-	1,690	2,870	1,220	2,610	-	-
Total	272,950	1,799,960	560,690	8,974,790	752,240	1,155,920	397,290	1,083,620	293,240	2,168,180

Source: NASS 2011

Appendix 2 Seed companies in Nigeria

Companies	Crops in portfolio				Company activities in country			
	Field crops	Vegetables	Breeding location	Testing location	Seed production	Processing location	Sales	Extension
Bayer	x	x					x	x
Bejo		x					x	
Charoen Pokphand	x	x					x	
Corteva Agriscience	x						x	
Da-Allgreen Seeds **	x	x		x	x	x	x	x
East African Seed	x	x					x	
East-West Seed		x		x			x	x
Enza Zaden		x					x	
GAWAL	x				x		x	
Maslaha Seeds **	x		x	X	x	x	x	x
Monsanto	x	x		X			x	
NAFASO	x						x	
Nongwoo Bio		x					x	
Pop Vriend Seeds		x		X			x	
Premier Seed **	x	x	x	X	x	x	x	x
Rijk Zwaan		x					x	
Sakata		x					x	
Seed Co	x	x		X	x	x	x	x
Soprosa		x					x	
Syngenta ***	x	x	x				x	
Technisem		x		X			x	
Value Seeds **	x	x	x	X	x	x	x	x

Source: Access to Seed 2019

Appendix 3 Climate data

Climate data for Kaduna

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (C)	23.6	25	27.4	28.6	27	25.4	24.2	23.3	24.4	25.4	24.4	23.4
Min. Temperature (C)	15.4	16.6	19.7	22.2	22.2	20.6	20.1	19.5	19.5	19	16.1	14.5
Max. Temperature (C)	31.9	33.4	35.1	35.1	31.9	30.2	28.4	27.2	29.4	31.8	32.7	32.3
Precipitation/Rainfall (mm)	0	2	9	61	130	166	219	284	256	80	4	0

Source: Climatedata.org

Climate data for Kano

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (C)	21.5	24	27.9	30.9	30.3	28.4	26.4	24.9	25.9	26.4	24.5	22
Min. Temperature (C)	13	15	19	23.6	24	22.8	21.8	20.9	20.9	18.9	15.8	13
Max. Temperature (C)	30.1	33.1	36.9	38.2	36.7	34	31	29	31	34	33.2	31.1
Precipitation/Rainfall (mm)	0	0	1	10	52	113	193	257	113	13	0	0

Source: Climatedata.org

Climate data for Plateau

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (C)	21.3	22.9	24.9	25.7	24.5	22.7	21.4	20.9	21.9	22.9	22.7	21.5
Min. Temperature (C)	13.9	15.4	17.9	19.7	19.2	17.9	17.4	17.2	17.1	16.9	15.7	14.1
Max. Temperature (C)	28.8	30.5	31.9	31.8	29.8	27.6	25.4	24.7	26.8	29	29.8	28.9
Precipitation/Rainfall (mm)	0	1	17	77	180	194	298	280	218	53	4	2

Source: Climatedata.org

Appendix 4 List of interviewed stakeholders

- Bakker Brothers
- East West Seed Nigeria
- FAMRD Nigeria, Horticulture Department
- Federal ministry of Agriculture (National Program for Food security (NPFS))
- HZPC
- IFDC/2SCALE Nigeria
- KIT
- Limagrain
- NABC Netherlands and Nigeria
- NASC Nigeria
- PT East West Seed Indonesia
- Syngenta
- WorldVeg Nigeria – Cameroon

Appendix 5 Programme of validation workshop

	September 12, 2019	September 16, 2019	September 17, 2019
Place	Jos	Kano	Kaduna
Venue	The Crest Hotel	IITA Kano Station	Asaa Pyramid Hotel
Directions	Old Airport Road, Jos	Sabo Bakin Zuwo (Wudil) road, Kano,	#13, Lafia Road, Off Independence way, Kaduna
Time	10.00 – 17.00	10.00 – 17.00	11.00 – 18.00

Programme

09.30	Meeting hall ready (beamer tested)
10.00	Welcome and Opening and background
10.15	Introduction participants and expectations
10.30	Coffee and tea break and bottles of water
10.45	Objectives of the study and the workshop
11.00	First presentation (production, seed and value chain)
11.30	Questions and Discussion
12.00	Second presentation (marketing and dynamics)
12.30	Questions and Discussion
13.00	Lunch
14.00	Start afternoon programme
14.15	Assignment 1: in small groups SWOT analysis
14.30	Group work Assignment 1
15.00	Plenary presentations group work
15.30	Group work Assignment 2: in small groups needs and risk assessment
16.15	Plenary presentations group work
16.45	Conclusions and closure
17.00	Closing prayer

Appendix 6 SWOT analyses per group

Jos, September 12, focus: potato

Potato Producers		Private sector: processors		Private sector: seed		Private sector: ICT	
Strengths	Weaknesses	Strengths	Weaknesses	Strengths	Weaknesses	Strengths	Weaknesses
Land available Climate conditions favourable Experience in potato manpower available	Lack of high quality seed Lack of disease control management Lack of storage Low technology Bad agricultural practices Lack of knowledge Bad road infrastructure	Large market: domestic and external Availability of raw materials (potato) Availability of research institutes Product is highly acceptable in the market, everyone eats it, very nutritious	Poor technology of processing equipment: government wants them to use local machinery but it's not working, a lot of issues Inconsistencies of supply of raw materials Lack of capacity building at processing level Lack of traceability: the farmers cannot trace their inputs, they are not grouped together to trace back to the source Lack of focus on the sector of processing by the government (parallel development of production and marketing/processing) Low yield of produce and bad quality	Multiplication: high volumes of multiplication Conducive weather and climate to produce especially on the Plateau to breed foundation seed Available arable land, good soil but some have become very bad (see weaknesses) High demand of potato + potato seed	Degradation of land, of soil (high use of chemical fertiliser) Difficult to access rural areas Pest and disease Research A lot of talking, no action, especially of research institutes Lack of storage facilities and poor handling of seed Lack of technical knowhow	Innovative products and services Competent support workforce Affordable prices and accessible products/services Big data analytics and precision	Inadequate finance Inadequate modern equipment (e.g., farmers don't have a smartphone/I-phone) with GPS which is not precise even if there is no network
Opportunity	Threat	Opportunity	Threat	Opportunity	Threat	Opportunity	Threat
Land available Climate conditions Experience in potato Workforce Source of income (potato farming) by increased productivity Huge population market (demand)	Insecurity and conflicts Lack of good infrastructure No dam infrastructure for irrigation (only for mining) Lack of processing facilities Pest and diseases Weak to no supportive government policies Natural disasters/climate change	Product is highly acceptable in the market, everyone eats it, very nutritious Availability of labour Intervention programmes going on, new policies of government Availability of farmer cooperative/associations to interact with as processors and work together Wide potential use of potato products (the flour, the starch, and many other products) huge potential for added value	Substitute problems (yam, cassava, sweet potato), they also fry yam, cassava into chips for example, so they copy what they are doing in the potato added value processes Government policies are not very favourable for the processing industry (e.g., machinery, tax, importation of seed) Insecurity Stringent measures by regulation agencies: NAFDAC, the requirement to obtain certification is very stringent, very difficult Excessive use of chemicals on the farm (affects the quality of the produce, high content of chemicals)	High demand of potato + potato seed Favourable weather and climate Employment: workforce and seed breeding sector provides employment Income generation as a result of higher yields and higher sales of seed	Mining activities Theft Price fluctuations Government policies, long processes, changing policies, bureaucracy Wrong application of agro-chemicals, overapplication of chemicals by farmers, agro-dealers just motivate to apply (BAP)	Increased accessibility of farmers to potential global buyer (e.g. via the E-commerce platform) Increase in sales volume + more income ICT --> transparency can improve trust among the key players (real time MandE) or e.g., for the finance sector/banks to use the ICT system for monitoring Create massive employment, especially youth (ICT attractive to remain)	Insecurity Poor internet and skills among farmers to use the required software/apps Political instability

Government		NGOs		Knowledge and research		Finance	
Strengths	Weaknesses	Strengths	Weaknesses	Strengths	Weaknesses	Strengths	Weaknesses
<p>Farmers training: extension staff who train farmers and extension services</p> <p>Demonstrations of farming techniques</p> <p>Counterparts at other ministries (alignment)</p>	<p>Inadequate manpower and lack of manpower</p> <p>Lack of research materials from the research institute</p> <p>Government policies: not favourable or adequate</p> <p>Poor storage facilities</p> <p>Inadequate processing plants</p>	<p>We have business models which can be replicated which can be adopted by other programmes/actors</p> <p>Recognition and partnership (e.g., Oxfam and GIZ are internationally recognised)</p> <p>Linkages: able to link partners to different stakeholders at different levels (e.g., potato farmers in Plateau looking for alternative markets and GIZ could arrange and meet with Shoprite to mediate and facilitate outlet at Shoprite)</p> <p>Knowledge, skills and materials available</p>	<p>Bureaucracy and bottlenecks (the relationship as a development organisation and the government): sometimes long processes and change of government and stakeholders sometimes do not understand (e.g. GZI imported a container of potato seed for 10 ha, but it's very limited, only 10 ha)</p> <p>Poor adoption of GAP and lack of attitude: difficult to make people adopt and change. People don't want to change.</p> <p>Conflict of interest: good practices and believing capacity, the farmers tell: we want money and do not want knowledge. So sometimes conflict of interest.</p> <p>Sustainability and duplication: to sustain activities and impact, sometimes partners only interested in the next program.</p>	<p>How can potato lead to increase in GDP</p> <p>Employment creation</p> <p>Plateau hub for potato</p> <p>High yield potential</p> <p>Higher income as a result</p>	<p>Land tenure system not favourable for growth and development/access to land</p> <p>Poor research capacities</p> <p>Poor implementation of research findings (adoption), also by government, evidence is there</p> <p>Policy inconsistencies government level and bureaucracy; and when PPPs are established, government has her own interests or does not want to meet the conditions/requirements for funds to be released</p> <p>Poor agricultural practices at farm level</p> <p>Land devastation especially through mining activities</p> <p>Lack of record keeping at farm level</p>	<p>Availability of funds (the money is there, it's available)</p> <p>Established institutions</p> <p>Low interest rate (lower than the commercial bank)</p> <p>Wide branch network</p> <p>Minimal collateral required (compared than commercial bank)</p>	<p>Low literacy at farmer level (and financial literacy)</p> <p>Bureaucracy in accessing finance/difficult procedures for farmers to understand and follow (especially low literate farmers) and long duration of processes and procedures</p> <p>Instability in government policies</p> <p>Lack of infrastructure (sometimes no roads to visit the farmers)</p> <p>Low information and dissemination activities among farmers/low level of understanding and knowledge among farmers about available funds</p> <p>Mismatch procedures and application of funds and reality of potato farming</p>
Opportunity	Threat	Opportunity	Threat	Opportunity	Threat	Opportunity	Threat
<p>Increase in GDP, empowered population</p> <p>Job creation</p> <p>Policies of other ministries (Food Security)</p>	<p>Insecurity</p> <p>Disease outbreaks (e.g., potato blight)</p> <p>No new and quality seed</p> <p>Land tenure system that is not effective</p>	<p>Upscaling and duplication is possible.</p> <p>The good examples</p> <p>Opportunities in investors (either in the seed sector, storage facilities, processing and solar)</p>	<p>Potato value chain policies lack</p> <p>Political agenda and will: each have their own agenda and sometimes does not fit with what is needed or what the NGOs want</p> <p>Policies: the models offered are not applicable (e.g., loan schemes: available in time, at the moment of planting and not afterwards)</p> <p>Insecurity hampering development and investors entering the sector and region</p>	<p>Work force and direct and indirect employment</p> <p>Access to markets through this partnership and produce market-consumer based</p> <p>Increased access to finance/income increase if produce can be higher and marketed</p> <p>Attention for potato and energy in potato sector</p>	<p>Lack of negotiations skills (especially among farmers)</p> <p>Comparative advantage potato (eggs in one basket), threat to be highly dependent on potato and neglect other crops</p> <p>Land devastation</p> <p>Poor agricultural practices at farm level</p>	<p>Availability of suitable land</p> <p>Favourable climate</p> <p>Some favourable government policies</p>	<p>Moral hazards/corruption</p> <p>Attitude of farmers and staff (e.g., false names)</p> <p>Loan defaulting, diversion of funds</p> <p>Natural hazards/climate change (and lack of insurance of loans, but diseases are not insured)</p> <p>Low/no reliable crop budgets available</p>

Kano, Swot Analysis, September 16, 2019

Vegetable Producers		Private sector: processors		Private sector: seed	
Strengths	Weaknesses	Strengths	Weaknesses	Strengths	Weaknesses
Can be able to cultivate 2-5 ha Employ 7-9 person per season (job creation) Production of vegetables for dry and wet season Profit if there is no market glut Tomato farmer groups are organised	Lack of hybrid seeds Lack of irrigation facilities Poor or inadequate access to fertiliser; even it there if money, it is scarce available Scarcity of raffia basket: plastic crates can be expensive Lack of adequate extension workers Inadequate information (regarding production, processing)	Large produce by farmers Large market (high demand) Price determination	Lack of cold chain Lack of market infrastructures Reduced no of processors Instability of price No full adaptation/adoption of returnable plastic crates	Good reputation of the private sector Business oriented Close relationship with agribusiness and farmers Result oriented (outputs)	Limited investment in agricultural production by the private sector Uncontrolled market Value chain farmers -market huge distances Price challenges Low farmer knowledge
Opportunity	Threat	Opportunity	Threat	Opportunity	Threat
Availability of labour High profit if glut is controlled for Federal government took tomato as national crop Potential yield could be as 60 ton/ha	Fluctuation of the price Tuta absoluta and other diseases outbreaks Climate change Weed management (high costs of herbicides) Lack of continuous supply of good seed Lack of knowledge on GAP	increased governmental support in the chain Potential in export market Increased awareness leading to more youth involvement	Smuggling of processed product Government policy, market relocation (tax)	Donor agencies interest to work with the private sector (output and ROI) Interest increasing by actors in the chain	Limited accountability and quality control Uncontrolled market Unfair monopoly (e.g., the big four which are in fertiliser) Unavailability of plant variety protection (IP no protected) Fluctuation in seed demand

Government		NGOs		Knowledge and research	
Strengths	Weaknesses	Strengths	Weaknesses	Strengths	Weaknesses
Extension Agents Irrigation Facilities Government	Low skill extension agents Poor inputs distribution system And incentives Ability to charge and collect fees from actors for government services Knowledge	Favourable climate Large number of producers	Poor irrigation facilities Fake inputs in the market (e.g., poor pesticides and herbicides) Farmers struggling with GAP Poor extension service delivery Inadequate processors Poor infrastructure High cost of production (risk for import) Crude production method (not fully mechanised) Poor funding of research institutes	very good/suitable weather Labour availability Land and water resources (18 dams out of 23 in Kano) Expertise, institutional expertise (Nat. research and knowledge institutes) Market	Inadequate inputs (quality and availability) Weak extension officers Financial constraints/lack of credit facilities Poor farm mechanisation (e.g., greenhouses, still very scarce, especially in the dry season) Low accessibility of land: current land tenure system Low yields Lack of reliable and up to date statistics Inadequate market information
Opportunity	Threat	Opportunity	Threat	Opportunity	Threat
Large consumers PHL Actors with industries (high) High food prices	Poor transparency and trust in the sector Land use and land rights issue Environmental challenges	Large population (consumption capacity) Arable land available Government policies going towards and angle that favours agriculture Importation ban Interest from international agencies/NGOs	Price volatility in the market Direct result of the poor market structure (power imbalances) Pest and diseases Insecurity Aging population of producers Climate change issues	Labour availability There is a market To train (youth) Opportunity to open seed companies Demand, increasing awareness on Food Nutrition To export Processing industries (e.g., Dangote) Increase incomes	Poor infrastructure Poor power balance Poor power balance Pest and diseases (e.g., Tuta) Farmers/pastoralists conflict Insecurity Corruption

Kaduna, September 17

Vegetable Producers		Private sector: processors		Private sector: seed	
Strengths	Weaknesses	Strengths	Weaknesses	Strengths	Weaknesses
<p>Availability of labour</p> <p>Farmers groups/clusters</p> <p>Culture of farming</p> <p>Experts in farming</p>	<p>Lack of capital/finance</p> <p>Knowledge (gap)</p> <p>Lack of cohesion (cooperatives) (intrinsic motivation to be a clusters, only access to grant/subsidy)</p> <p>No negotiation power</p> <p>Poor storage facilities</p> <p>Lack of farm inputs</p> <p>Weak marketing system</p> <p>Poor accessible roads</p> <p>Poor processing facilities/no</p>	<p>Knowle able workforce</p> <p>Good production systems/strategy to gain experience (own assessment and trials)</p> <p>Capacity of 50-70 ha of irrigation (drip irrigation)</p> <p>Good relationship with the locals/community (relationship management, trust building)</p> <p>The capacity to model farmers and to develop outgrowers farmers (now 98) (as a result of relation building in the community)</p>	<p>Inability to purchase fertilisers required for the land under cultivation</p> <p>Logistics issues around sales/acceptance (sending processed tomato to the southern market, there is preference for import)</p>	<p>Available vegetable seed/hybrids</p> <p>Knowledge on how to cultivate with these seeds</p> <p>Respond to market demand of producers (e.g., which variety requirements)</p> <p>Capability of knowledge transfer</p>	<p>Poor development of horticulture sector</p> <p>Knowledge gap on value chain, especially inputs</p> <p>Pricing system and seed supply chain (distribution)</p> <p>Inadequate facility to monitor seed handling system (what will happen with the seed from the middle men to the farmer), unknown and not monitored</p>
Opportunity	Threat	Opportunity	Threat	Opportunity	Threat
<p>Loan facilities/grants if you are a farmer cluster</p> <p>With higher produce: your income will increase as a farmer</p> <p>Increase in processing because farmers can supply more</p> <p>Job creation</p> <p>Food and Nutrition security programmes</p> <p>Land and water availability</p>	<p>No continuous supply of good quality seed (or in time)</p> <p>Poor pricing/fluctuation in price</p> <p>Disease and pest outbreaks</p> <p>Change of government policies market if production increases</p> <p>No off take of produce (in case of higher production)</p> <p>Insecurity</p>	<p>35 tonnes (300 ha)</p> <p>Availability of market for paste</p> <p>Proximity to production areas</p> <p>Availability of water source</p> <p>Conducive business environment created by Kaduna state gvt</p>	<p>That the supply and the mechanisation is not working continuously</p> <p>Insecurity</p> <p>Low water volume at certain time of the production period (drainage too soon)</p> <p>Pest and diseases</p> <p>Change in government policies</p> <p>Unpredictable weather conditions/climate change</p>	<p>Growing population</p> <p>Focus on Food Nutrition</p> <p>Increasing Middle Class</p> <p>Wide range of climate conditions for growing vegetable</p> <p>Availability of dams (Water access)</p>	<p>National insecurity</p> <p>Climate change</p> <p>Fake and seed in the vegetable market</p> <p>Smuggling of vegetable seed</p> <p>Subsidies</p>

Government		NGOs and Finance		Private sector BSS	
Strengths	Weaknesses	Strengths	Weaknesses	Strengths	Weaknesses
<p>Is able to make policies</p> <p>Can make regulations</p> <p>Is able to reinforce</p> <p>Can provide security</p> <p>Can provide the enabling environment</p>	<p>There is a knowledge gap (technical knowledge e.g.), most people in civil service do not have an objective of achievement/performance, there remuneration is not target based, always promotion, no incentive to have success.</p> <p>Bureaucracy, big issue</p> <p>Lack of continuity and focus (high staff turnover, high changes)</p> <p>Lack of political will: it is easy to see what they should do but they don't.</p> <p>Lack of transparency, so that the system cannot hold them accountable/conflicting information until you are completely lost</p> <p>Disconnection (between ministries/divisions and institutions (e.g., research institutes and government))</p>	<p>Expert in fruit and vegetables</p> <p>Many years of experience</p> <p>Not limited to one place</p> <p>Global reach</p> <p>Can influence (government) policies</p> <p>Experts across other value chains</p> <p>Ability to link farmers to link to inputs/access/services</p> <p>Ability to organise farmers into groups and build capacities</p>	<p>Financial dependency</p> <p>Projects are no short-term basis</p> <p>Locations and themes of projects are predetermined</p>	<p>Use of ICT (modern techniques)</p> <p>Grassroots outreach</p> <p>Agribusiness network</p> <p>Certified agribusiness coaches</p> <p>Technical experts (staff)</p>	<p>Difficult to meet the requirements of the funders</p> <p>Lack of business model/outdated models</p> <p>No umbrella body (BSS)</p>
Opportunity	Threat	Opportunity	Threat	Opportunity	Threat
<p>Partnerships (the kind of today, PPP, Dutch Diamond) but transparency conditional</p> <p>Capacity building: currently they do not have up to 10% of the required knowledge (e.g., agronomists/extensions)</p> <p>Continuous education and development (most civil societies do not improve themselves or continue their knowledge and development)</p> <p>Focus on priorities (too many ambitions, wants everything), make realistic business opportunities (e.g., ginger, the main profitable crop of Kaduna)</p>	<p>They feel easily threatened</p> <p>Feel they don't owe anything</p> <p>Not open to new ideas (perceived as a threat or not interested (e.g., Global GAP certification))</p> <p>Conflict of interest between the actors, difficult to align</p>	<p>Wide network reach</p> <p>Ability to attract experts</p> <p>Partnerships with research institutions, government and the private sector</p> <p>Good in knowledge transfer</p>	<p>Insecurity</p> <p>Limited funds/non-continuous funds</p> <p>Time constraints to finish projects</p>	<p>Extension services (demand for knowledge)</p> <p>Potential local partner to provide services and to access farmers</p>	<p>Financial dependency</p> <p>Difficulties in accessing up to date training and out roll</p> <p>Lack of partnerships: to meet, to interact, to understand each other: So misunderstanding</p> <p>Clients not willing to pay: so sustainability is at risk</p>

Appendix 7 List of participants workshops

Attendance sheet Validation workshop potato, Jos - September 12, 2019.

For privacy reasons we only present names of organisations.

#	Organisation	Email
1	Feikop Appropriate Business Ventures Ltd Jos	
2	Fruits and Vagies Nig Ltd Jos	
3	German International Corporation – GIZ	
4	Feikop Fadama Users Cooperative Society Ltd Kwatas Bokkos LGA	
5	Lamingo Farmers Cluster	
6	Plateau Agricultural Development Programme (P.A.D.P)	
7	Bank of Agricultural (BOA) Jos	
8	Wedurat Agro Interbiz Nigeria Limited	
9	Aweng Potato Farmers Jos	
10	Lamingo Potato Farmers	
11	Potatoe Farmers Association of Nigeria	
12	Oxfam Nigeria	
13	NIRSAL	
14	Solanium Potato Enterprise	
15	ICRA	
16	SEEDAN	
17	Jos Climate Smart Agric Hub	
18	Salvation Mrs Gyel (Potato)	
19	Oxam Nigeria	
20	GIAE/GIZ	
21	Potato Farmers Group	
22	Wedurat Agro Interbiz Nigeria Limited	
23	Harvest Time Multipurpose Cooperative Society Ltd	
24	Wedurat Agro Interbiz Nigeria Limited	
25	Potato Retailer	
26	Wedurat Agro Interbiz Nigeria Limited	
27	Vom cooperative	
28	Salvation MPCS Tanchol	
29	Rihilad Farms	
30	Rihilad Farms	
31	Caru Dep	
32	Fruits and Veggies	
33	Ephod Comm. Ltd	
34	Bokkos Cluster	
35	Pathway Organic Solution	
36	Caru Dep	
37	Pathway Organic Solution	
38	Bum Ti Hai Cooperative	
39	MARD Jos	
40	Ephod Comm. Ltd	
41	Ephod Comm. Ltd	
42	Plateau State Potato Value Chain Support Project	
43	Plateau State Potato Value Chain Support Project	
44	CCC	
45	Ephod Comm. Ltd	
46	Potato Farmer	
47	Farm Radio Intl	
48	All Farmers Association of Nigeria	

Attendance sheet Validation workshop potato, Kano - September 16, 2019

#	Organisation	Email
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1	ICRA Nigeria
2	NIHORT Ibadan
3	NIHORT Kano
4	Agricultural Research Council of Nigeria
5	Pyxera Global
6	Pyxera Global
7	Harvestfield Nig. Ltd
8	JR Farms
9	Afri Agri Products Ltd
10	S4C
11	Afri Agri Products Ltd
12	2SCALE
13	2SCALE
14	WUR
15	Sahel Consulting
16	NIHORT Kano
17	KNARD
18	TechnoServe
19	TechnoServe
20	Mile 12
21	Dangote Farms and Processing
22	Dan marke Tomato
23	bayero University
24	Tomato seller
25	Dan marke Tomato

Invited and confirmed, but no show:

- Federal Ministry of Agriculture (National Program for Food Security, NPFS)
- Direct Project Coordination Unit Federal Ministry of Agriculture
- Kano State Commissioner for Agriculture
- Syngenta/BU Vegetables
- Bakker Brothers
- NATPAN
- Jubaili Agrotec
- Woolcot
- Potato Farmers Association of Nigeria
- Tomas Laberia Tomatoes and Pepper Sellers
- NEXIM
- GIAE/GIZ

For privacy reasons we only present names of organisations.

#	Organisation	Email
1	Palm Valley	
2	Nigeria Agribusiness Group (Formal Commisioner of Agric/Kaduan)	
3	barakphils Agro.Allied venture	
4	Solidaridard	
5	TomatoJos	
6	TomatoJos	
7	Dakau Magairi tomato dealer	
8	Savannah Agribusiness	
9	Gamji Dankwari Market	
10	AFC- NICOP	
11	AFC- NICOP	
12	Sani Gari Farmer Coop.	
13	Sani Gari Farmer Coop.	
14	Dannycoolseed ltd	
15	Afri Agri Product ltd	
16	EastWest Seeds International	

Invited and confirmed, but no show:

- NASC (National Agricultural Seeds Council)
- Palm Valley Nig. Ltd
- Savvah Agribusiness
- Sabo Gari Nasarawa Farmers' Cooperative Society
- Dokan Maigari Farmers' Cooperative Union Ltd
- World Vegetable Centre
- SEEDAN SEED ENTREPRENEURS ASSOCIATION OF NIGERIA
- Premiere seeds
- SeedCo
- Value Seed
- IFAD
- Amadu Bello University Zaria
- BarakphilsAgro-Allied Venture
- Agricultural Fresh Produce Growers and Exporters Association of Nigeria
- Nigerian Investment promotion Council
- GIAE/GIZ

Appendix 8 National Variety Catalogue

S/N	Crop Name	Variety Name	Original Name	National Code	Origin/Source	Developing Institute	Breeder/ Collaborating Scientists	Outstanding Characteristics/ Potential Yields	Agro-Ecological Zones	Year of Release	Year of Registry
484	Tomato	SAMTOM -1	CIRIO -56	NGLE -91-1	Introduction from stezione Agraria Sperimentale, Bari, Italy	IAR, Samaru Zaria	J.G. Quinn	High yielding, good paste qualities, field tolerance to leaf diseases and moderately resistant to Fusarium race 1. (47.5-55.3/ha)		1980	1991
485	Tomato	SAMTOM - 2	MARZANINO	NGLE -91-2	Stazioine Sperimentale Parma, Italy	IAR, Samaru Zaria	J.G. Quinn	High yielding, good paste qualities, field tolerance to leaf diseases and moderately resistant to Fusarium race 1. (51.7-64.1/ha)		1980	1991
486	Tomato	SAMTOM -3	Piacenza 0164	NGLE -91-3	Institute Nazionale Gertica Rome Italy	IAR, Samaru Zaria	J.G. Quinn	High yield under heavy leaf spot disease pressure, good paste qualities		1980	1991
487	Tomato	SAMTOM -4	Harvester	NGLE -91-4	FMG Corp, California U.S.A. Peto, Italian, parwa, Italy USDA, Beltsville, Maruland, U.S.A.	IAR, Samaru Zaria	J.G. Quinn	High yield and good paste qualities. (49.5-59.1/ha)		1980	1991
488	Tomato	SAMTOM -5	Chico	NGLE -91-5	Texas-A&M Weslaco, U.S.A	IAR, Samaru Zaria	J.G. Quinn	High yield and some heat tolerance. Good paste qualities		1980	1991
489	Tomato	SAMTOM -6	La Bonita	NGLE -91-6	Texas-A&M Weslaco, U.S.A	IAR, Samaru Zaria	J.G. Quinn	Uniform size, round and attractive fruit with skin suitable for salad		1980	1991
490	Tomato	SAMTOM -7	Roma -VF	NGLE -91-7	Royal Sluis, Enkhuizen, Holland	IAR, Samaru Zaria	J.G. Quinn	Combines high yield with good paste qualities, good processing tomato		1980	1991
499	Tomato	Chibli	Chibli	NGLE -15 -16	Syngenta Nig. Ltd.	Syngenta Nig. Ltd.	Sylvain Bontems, Tairu, F.M., Chikaleke, V.A., Olufolaji, A.O., Akintoye, H.A., Ajayi, E.O., Afolayan, S.O., Usman, N., Oyediji, E.O., Arogundade, O., Umeh, V.C., Babalola, S.O., Adeoye, I.B., Egbekunle, K.O., Abdul-Rafiu, A.M., Orkeh, U., Aminu-Taiwo, R.B. and Bala, I.A.	High yielding, tolerant to fusarium wilt, late blight, with firm fruits and high brix good for processing. (56.7/ha)	Adapted to Derived, Southern guinea, Northern guinea and Sudan savannah.	2015	2015
500	Tomato	Tylka	Tylka	NGLE -15 -17	Syngenta Nig. Ltd.	Syngenta Nig. Ltd.	Luis Ortega, Tairu, F.M., Chikaleke, V.A., Olufolaji, A.O., Akintoye, H.A., Ajayi, E.O., Afolayan, S.O., Usman, N., Oyediji, E.O., Arogundade, O., Umeh, V.C., Babalola, S.O., Adeoye, I.B., Egbekunle, K.O., Abdul-Rafiu, A.M., Orkeh, U., Aminu-Taiwo, R.B. and Bala, I.A.	High yielding, tolerant to Verticillium and fusarium wilt, Grey leaf spot, with firm fruits. (53.5/ha)	Adapted to Derived, Southern guinea, Northern guinea and Sudan savannah.	2015	2015

S/N	Crop Name	Variety Name	Original Name	National Code	Origin/Source	Developing Institute	Breeder/ Collaborating Scientists	Outstanding Characteristics/ Potential Yields	Agro-Ecological Zones	Year of Release	Year of Registry
537	Amaranthus	Tete (Green)	NHAC 49	NGAC-00-1	Ote (Kwara State)	NIHORT	Dr.Denton, Olufolaji and Badra	Late maturing, adaptable to several cuttings, high yielding and nematode resistant.		1985	2000
538	Amaranthus		NHAC 84/445-2	NGAC-00-2	IPGRI	NIHORT	Dr.Denton, Olufolaji and Badra	Uniform green, vegetable colour with edible leaves and seeds.		1987	2000
539	Amaranthus		ED82/1019B	NGAC-00-3	Zaria	NIHORT	Dr.Denton, Mr. Edema and Miss Dinakin	Early flowering with broad green leaves.		1987	2000
540	Amaranthus		NHAC/84/452	NGAC-00-4	IPGRI	NIHORT	Dr. O.A. Denton, Olufolaji and Badra	Tall deep purple stem with edible leaves and seeds		1987	2000
541	Amaranthus	Tete (Opopo)	NHAD 35	NGAC-00-5	Ibadan	NIHORT	Dr.O.A. Denton & Dr. Prem Nath	Tall soft green leaves with profuse branching habit, suitable for repeated cuttings.		1984	2000
542	Amaranthus		NH84/457-E	NGAC-00-6	IPGRI	NIHORT	NIHORT	Uniform green colour with edible leaves and seeds.		1987	2000
543	Amaranthus	NHAMAR1	NHAMOLA5	NGAC-16-7	NIHORT	NIHORT	Olagorite Adetula, Mary Adeyemi, Olatunbosun Bolaji, Olabode Isaac and Usman Nasiru	Early maturity, good stay green, tolerance to <i>Choanephora cucurbitarum</i> and lodging (25/ha)	Rainforest up to Sudan Savanna	2016	2016
544	Amaranthus	NHOKRA1	NHOLAK7	NGAC-16-8	NIHORT	NIHORT	Olagorite Adetula, Folashade Omotajo, Usman Nasiru and Olatunbosun Bolaji	High yield, spineless, early maturity (23.96/ha)	Rainforest up to Sudan Savanna	2016	2016

S/N	Crop Name	Variety Name	Original Name	National Code	Origin/Source	Developing Institute	Breeder/ Collaborating Scientists	Outstanding Characteristics/ Potential Yields	Agro-Ecological Zones	Year of Release	Year of Registry
550	Corchorus	NHC 09	Oniyaya	NGCO-00-3	Abeokuta	NIHORT	Dr. O.A. Denton and Miss Dinakin	Shining deeply serrated leaves. Suitable for uprooting and cutting.		1982	2000
551	Okra	V ₂	V ₂	NGAE-96-1	IAR&T Ibadan	IAR&T Ibadan	Dr. A.O. Ojomo	Fruit slender, smooth, bell-shaped, high yielding.		1973	1996
552	Okra	V ₃₅	V ₃₅	NGAE-96-2	IAR&T Ibadan	IAR&T Ibadan	Dr. A.O. Ojomo	High yielding, bigger fruits.		1973	1996
553	Okra	NHAR 47-4	NHAR 47-4	NGAE-00-3	Ilorin	NIHORT	Dr. O.A. Denton and Prem Nath	Early maturing, good draw property		1985	2000
554	Solanum	Osungba 1	Osungba 1	NGSM-96-1	IAR&T Ibadan	IAR&T Ibadan	Dr. M.O. Omidiji	Both leaves and fruits edible		1977	1996
555	Solanum	Osungba 2	Osungba 2	NGSM-96-2	IAR&T Ibadan	IAR&T Ibadan	Dr. M.O. Omidiji	Both leaves and fruits edible		1977	1996
556	Solanum	Osungba 3	Osungba 3	NGSM-96-3	IAR&T Ibadan	IAR&T Ibadan	Dr. M.O. Omidiji	Both leaves and fruits edible		1977	1996
557	Solanum	Ogudu	Ogudu	NGSM-96-4	IAR&T Ibadan	IAR&T Ibadan	Dr. M.O. Omidiji	High yielding leaf vegetable with acceptable non-bitter taste		1977	1996
558	Pepper	Ata Sombo	NHCf 371	NGCF-00-1	Ogbomoso	NIHORT	Drs. Denton and Nath, Miss Dinakin	Upright fruit bearing profile.		1982	2000
559	Pepper	Ata Sombo	NHCf 387	NGCF-00-2	Kano	NIHORT	Drs. Denton and Badra, Miss Dinakin	Profuse fruit setting with an upright plants shape.		1981	2000
560	Pepper	Ata Wewe	NHCf 378	NGCF-00-3	Zaria	NIHORT	Dr. Denton and Miss Dinakin	Erect with profuse fruiting and an upright fruit carriage.		1983	2000
561	Pepper	Ata Rodo	NACa(R) 142B	NGCF-00-4	Oyo	NIHORT	Drs. Denton and Badra, Miss Dinakin	Erect, green stem colour, fruit declining, low pungency.		1984	2000
562	Pepper	Ata Rodo	NACa(R) 429	NGCF-00-5	Ibadan	NIHORT	Drs. Denton and Nath, Miss Dinakin	Prolific flowering and fruiting, disease tolerant.		1982	2000
563	Pepper	Lafayette	Lafayette	NGCF-16-6	Syngenta Holland	Syngenta Holland	Chikaleke, V.A., Tairu, F.M., Ajayi, E.O., Olufolaji, A.O., Akintoye, H.A., Afolayan, S.O., Usman, N., Adeleke, O., Babalola, O.S., Oyedeji, E. O., Arogundade, O., Adeoye, I.B., Orkpeh, U., Oduntan, A.O., Umeh, V.C. And Bala, I. A.	High yield; large, firm, blocky and smooth-skinned fruits. (26t/ha)	Derived, Southern Guinea, Northern Guinea and Sudan Savannah	2016	2016

S/N	Crop Name	Variety Name	Original Name	National Code	Origin/Source	Developing Institute	Breeder/ Collaborating Scientists	Outstanding Characteristics/ Potential Yields	Agro-Ecological Zones	Year of Release	Year of Registry
564	Pepper	Jupiter	Jupiter	NGCF-16-7	Syngenta Holland	Syngenta Holland	Chikaleke, V.A., Tairu, F.M., Ajayi, E.O., Olufolaji, A.O., Akintoye, H.A., Afolayan, S.O., Usman, N., Adeleke, O., Babalola, O.S., Oyedeji, E. O., Arogundade, O., Adeoye, I.B., Orkpeh, U., Oduntan, A.O., Umeh, V.C. And Bala, I. A.	High yield; resistance to TMV, CMV and PVY. (32t/ha)	Derived, Southern Guinea, Northern Guinea and Sudan Savannah	2016	2016

S/N	Crop Name	Variety Name	Original Name	National Code	Origin/Source	Developing Institute	Breeder/ Collaborating Scientists	Outstanding Characteristics/ Potential Yields	Agro-Ecological Zones	Year of Release	Year of Registry
593	Sweet Potato	TIS-87/0087	TIS-87/0087	NGIB-01-1	IITA, Ibadan	IITA, Ibadan	Dr. S.K. Hahn	Widely adapted, highly dependable as under any adverse condition produces economic yield. Good for fries and chips, high tolerance to sweet potato weevil.		1992	2001
594	Sweet Potato	TIS-87/0087	TIS-8164	NGIB-01-2	IITA, Ibadan	IITA, Ibadan	Dr. S.K. Hahn	Very high root yields. The top is highly cherished by livestock and fishes.		1992	2001
595	Sweet Potato	TIS2532.OP.1.13	TIS2532.OP.1.13	NGIB-01-3	IITA, Ibadan	IITA, Ibadan	Dr. S.K. Hahn	Tuberous roots are very large with white flesh.		1992	2001
596	Sweet Potato	TIS-8164	TIS-8164	NGIB-01-4	IITA, Ibadan	IITA, Ibadan	Dr. S.K. Hahn	Very high root yields. The top is highly cherished by livestock and fishes. Good for starch production.		1992	2001
597	Sweet Potato	TIS-2532 OP.1.13	TIS 8164	NGIB-01-5	IITA, Ibadan	IITA, Ibadan	Dr. S.K. Hahn	Tuberous roots are very large with white flesh.		1993	2001
598	Sweet Potato	UMUSP 1	NRSP/05/022	NGIB-12-6	NRCRI, Umudike	NRCRI, Umudike	Solomon O. Afuape, Innocent I.M. Nwankwo, Ted Carey, Chiedozi N. Egesi, Jude Njoku, Thankgod N. C. Echendu and Jan Low	High beta carotene, high dry matter, high root yield and resistant to SPVD. (63.63t/ha)	Rainforest and Northern Guinea Savanna	2012	2012

Appendix 9 Pricing seed various suppliers

Vegetable	Variety	Name	Price per 1000 seeds
Tomato	hybrid	Gem Pride	n1200
		Lady Nema F1	n2100
		Nirvana F1	n2400
		Chibli F1	n2800
		Inlay F1	n3600
		Padma F1/Platinum	n5000
		Tina	n6000
		Larisa	n10,000
	OPV	Commandando F1	n19,000
		Rio Grande	n96-114
		UC82B	n96-114
		Roma Savanna	n96-114
		Buffalo	n102
Okra	hybrid	Basanti	n270
		Maha F1	n165
	OPV	Okra Clemson	n72
		Okra Spineless	n38
Cucumber	hybrid	Saira F1	n390
		Darina Mix Hybrid	n510
		Monalisa F1	n4400
		Greengo F1	n6000
		Basimah F1 (seedless)	n29,000
	OPV	Cucumber Marketmoor	n75
Watermelon		Watermelon Kaolak	n54
Cabbage	hybrid	Oxylus F1	n504
		Indica F1/Gloria F1	N660
		Attila F1	n720
		Pakse F1/Nuzaka F1	n1300
		OPV	Copenhagen Market
	Hot pepper	hybrid	Demon F1
Annuum Nikly F1			N2400
Annuum Bandai			N2400
Avenir F1			n2100
OPV		Antillais	n420
		Big sun	n480
		Efia	n540
Green pepper	hybrid	Mekong F1 (sweet)	n3000
	OPV	Ganga	n360
Onion	OPV	Onion Super	n84
		Prema/Dayo	n96

Examples of selected OPV and Hybrid retail seed price, see for a full list Appendix 9.

Product variety and price list (October 2018)

Company 1: Independent Retail Outlet - anonymous

Crop	Variety	Size	Price
Tomato	Tina f1 (indeterminate)	500 seeds	
	Nirvana f1	5g	4,000
	Padma f1	100 seeds	500
		5g	3,000
	Platinum f1	50g	
		100 seeds	500
		5g	3,500
	Inlay f1 (indeterminate)	50g	
5g		6,000	
Cucumber	Greengo f1	500 seeds/sachet	3,500
	Greengo f1	1000 seeds/sachet	7000
	Monalisa f1	1000 seeds/sachet	5,000
	Monalisa f1	500 seeds/sachet	2,500
	Nandini f1	10g	2,000
	Saira f1	10g	2,000
Watermelon	Erato f1	10g	2,500
	Sweat sangria f1	10g	2,500
Chili Pepper	Demon f1	5g	5,000
	Nikly f1	5g	4,500
Green Pepper (Bell sweet pepper)	Mekong f1	5g	5,000
	Ganga	5g	600
Tatashe	Marvel f1	1000 seeds	7,000
Habanero pepper (Rodo)	Efia	5g	900
Cabbage	Nuzaka f1	1000 seeds	2,000
	Indica f1	10g	2,500
Red Cabbage	Kifaru f1	1000 seeds	2,000
Papaya Seedlings	Red Royal f1		
	Vega f1		
Cauliflower	Atria f1	10g	2,500
Broccoli	Madiba f1	5g	2,500
Melon	Neptune	10g	3,000
	Jupiter f1	10g	3,500
	Uranus f1	10g	3,000
Long Beans	Gita/Ayoka	10g	500
Carrot	Fortado	250g	5,500
	Thema	250g	6,000
		100g	2,500
Lettuce	Marulli	50g	5,500
	Rapido	50g	5,000
Eggplant	Merdian f1	1000 seeds	3,500
Sweat corn	Superking f1	250g	5,000
	Golden cob f1	250g	5,000
Okra	Maha f1	100g	6,000
	Basanti f1	100g	5,500
Beetroot	Jhelum	10g	500
Onions	Prema	250g	8,000
	Dayo	250g	8,000
Coriander	Ramses	500g	12,000
Celery	Sedano	10g	2,500
Zucchini	Lusor f1	500 seeds	8,000

Product variety and price list (August 2018)

Company 2: Independent Retail Outlet - anonymous

Crop	Variety	Size	Price (N)
Tomato	Chibli f1	1000 seeds	2,800
Bell Pepper	Commandant f1	1000 seeds	19,000

Product variety and price list (August 2018)

Company 3: Independent Retail Outlet - anonymous

Crop	Variety	Size	Price (N)
Cucumber	Darina Mix Hybrid	10g	1,700
Cabbage	Gloria f1	25g	5,500

Product variety and price list (Dec. 2018)

Company 4: Importers' Prices - anonymous

Crops	Varieties	Packsize	Wholesale Price (N)	Retail Price (N)
Tomato	Padma F1	100 Seeds	350	400
		5g	3,000	3,500
	Platinum	100 Seeds	350	400
		5g	3,500	4,000
	Nirvana F1	5g	3,500	4,000
	Larisa	500 Seeds	5,000	5,500
Tina	1000 Seeds	6,000	6,500	
Hot Pepper	Demon F1	5g	4,000	4,500
	Efia	5g	600	700
	Annuum Nikly F1	5g	4,000	4,500
	Annuum Bandai	5g	4,000	4,500
Okra	Basanti	20g	900	1,000
		100g	4,000	4,500
	Maha F1	100g	5,500	6,000
Cabbage	Pakse F1	1,000 Seeds	1,300	1,500
	Nuzaka F1	1,000 Seeds	1,300	1,500
	Indica F1	10g	2,200	2,500
Lettuce	Marulli	10g	700	750
	Rapido	50g	3,200	3,500
Egg Plant	Merdan F1	1,000 Seeds	3,200	3,500
	African Kibibi	500 Seeds	950	1,000
Broccoli	Madiba F1	1,000 Seeds	1,300	1,500
Coriander	Ramses IT	500g	11,000	12,000
Cauliflower	Atira 153 IT	10g	2,500	3,000
	Poomima F1	1,000 Seeds	1,200	1,500
Onion	Onion Prema	250g	7,000	7,500
	Onion Dayo	250g	7,000	7,500
	Onion Super	250g	7,000	7,500
Basil Sweet	Chang	250g	23,000	25,000
Papaya	Vega IT TS	1,000 Seeds	35,000	40,000
	Red Royale	500 Seeds	14,000	15,000
Zucchini	Luxor TS	500 Seeds	7,500	8,000
Celery	Sedano	10g	1,800	2,000
Pakchoy	Mayleen	10g	550	600
Shallot	Charlotte	10g	350	400
Pumpkin	Moschata	10g	950	1,000
Red Cabbage	Kifaru	1,000 Seeds	1,300	1,500
Sweet Corn	Sugar King F1	250g	5,000	5,500
	Golden Cob F1	250g	5,000	5,500
	Sugar King F1	1000g	18,500	20,000
Cucumber	Saira F1	10g	1,300	1,500
	Nandini F1	10g	1,300	1,500
	Monalisa F1	500 Seeds	2,200	2,500
	Greengo F1	500 Seeds	3,200	3,500
	Greengo F1	1,000 Seeds	6,000	6,500
	Basimah F1	1,000 Seeds	29,000	30,000
	Kayin F1	10g	1,300	1,500
Monalisa F1	1000 Seeds	3,500	4,000	
Watermelon	Sayda F1	10g	2,700	3,000
	Sweet Sangria F1	10g	1,800	2,000
	Erato F1	10g	2,000	2,500

Crops	Varieties	Packsize	Wholesale Price (N)	Retail Price (N)
Melon	Jupiter F1	10g	2,500	3,000
	Neptune F1	10g	2,500	3,000
	Uranus F1	10g	2,500	3,000
Beetroot	Jhelum	10g	350	400
Yard Long Bean	Ayoka/Gita	10g	350	400
	Ayoka/Gita F1	100g	2,000	2,500
Sweet Pepper	Mekong F1	5g	4,000	4,500
	Kaveri F1	1,000 Seeds	5,500	6,000
	Ganga	5g	250	300
	Marvel F1	1,000 Seeds	6,000	6,500
	Nirmada	1000 Seeds	6,000	6,500
Carrot	Fortado	250g	4,000	4,500
	Thema	250g	4,500	5,000
	Thema	100g	2,000	2,200
	Marulli	50g	4,500	5,000

Product variety and price list (April 2018)

Company 5: Importers' Price - anonymous

Species	Variety	Pack	Packing Unit	Wholesaler	Reseller	Retail
AFRICAN EGGPLANT	ALIONA F1	PTS	5 G	600	700	800
AFRICAN EGGPLANT	BELLO	BM	50 G	3700	3800	3900
AFRICAN EGGPLANT	BELLO	PTS	5 G	450	500	600
AFRICAN EGGPLANT	DJAMBA F1	BM	50 G	4800	4900	5000
AFRICAN EGGPLANT	DJAMBA F1	PTS	1 G	200	300	400
AFRICAN EGGPLANT	DJAMBA F1	PTS	5 G	550	600	700
AFRICAN EGGPLANT	KOTOBI	BM	50 G	3000	3100	3200
AFRICAN EGGPLANT	KOTOBI	PTS	1 G	200	300	400
AFRICAN EGGPLANT	KOTOBI	PTS	5 G	450	500	600
AFRICAN EGGPLANT	MEKETAN	PTS	5 G	460	500	600
AFRICAN EGGPLANT	YALO	BM	50 G	3000	3100	3200
AFRICAN EGGPLANT	YALO	PTS	5 G	450	500	600
AMARANTH	FOTETE	GTS	10 G	300	400	500
BAHIA GRASS	PASPALUM Not.	SAC	1 KG	5800	5900	6000
BASIL	BIG GREEN	PTS	1 G	300	400	500
BEAN	CONTENDER	SAC	1 KG	4000	4200	4300
BEAN	CORA	GTS	30 G	400	500	600
BEAN	CORA	SAC	1 KG	4000	4100	4200
BEAN	MONEL	SAC	1 KG	5600	5900	6000
BEET	CRIMSON GLOBE	BM	100 G	1400	1500	1600
BEET	CRIMSON GLOBE	BM	250 G	2800	2900	3100
BEET	CRIMSON GLOBE	GTS	10 G	350	400	500
BERMUDA GRASS	CYNODON DACTYLON	SAC	1 KG	6800	7000	7300
BITTER GOURD	PAROKANA F1	SM	5 G	1200	1300	1500
BROCCOLI	ISABELA F1	BM	50 G	19000	19200	19300
BROCCOLI	ISABELA F1	GTS	10 G	4800	4900	5000
BROCCOLI	ISABELA F1	PTS	1 G	550	600	700
BROCCOLI	ISABELA F1	PTS	5 G	2200	2300	2400
CABBAGE	ATTILA F1	PTS	1 G	350	400	500
CABBAGE	ATTILA F1	PTS	5 G	1200	1300	1400
CABBAGE	COPENHAGEN MARKET	BM	100 G	1800	1900	2000
CABBAGE	COPENHAGEN MARKET	GTS	10 G	300	350	400
CABBAGE	EMIR F1	PTS	5 G	700	800	900
CABBAGE	FORTUNE F1	PTS	1 G	300	400	500
CABBAGE	FORTUNE F1	PTS	5 G	1000	1100	1200
CABBAGE	GLORIA F1	BM	50 G	9100	9200	9300
CABBAGE	GLORIA F1	GTS	10 G	1300	1400	1500
CABBAGE	LEADER -CROSS F1	BM	50 G	9000	9100	9200
CABBAGE	LEADER CROSS F1	PTS	1 G	350	400	500
CABBAGE	MAJESTY F1	PTS	5 G	700	800	900
CABBAGE	MINOTAUR 2- F1	SM	5 G	1000	1100	1200
CABBAGE	MINOTAUR - F1	BM	50 G	9000	9100	9200

Species	Variety	Pack	Packing Unit	Wholesaler	Reseller	Retail
CABBAGE	MINOTAUR - F1	PTS	5 G	1000	1100	1200
CABBAGE	SULTANA F1	PTS	5 G	450	500	600
CABBAGE	SUPER COMET F1	BM	50 G	9000	9100	9200
CABBAGE	SUPER COMET F1	PTS	5 G	1200	1300	1400
CARROT	AMAZONIA	PTS	5 G	300	400	500
CARROT	BAHIA	GTS	10 G	400	500	600
CARROT	MADONA	BM	100 G	1500	1600	1700
CARROT	MADONA	PTS	5 G	300	400	500
CARROT	NANTAISE IMPROVED	BM	100 G	1600	1700	1800
CARROT	NANTAISE IMPROVED	BM	500 G	5300	5400	5500
CARROT	SHAKIRA F1	BM	50 G	2700	2800	2900
CARROT	SHAKIRA F1	PTS	5 G	650	700	750
CARROT	TOUCHON	BM	100 G	1500	1600	1700
CARROT	TOUCHON	BM	500 G	5300	5400	5500
CARROT	TOUCHON	GTS	10 G	400	550	600
CARROT	TOUCHON	PTS	5 G	300	400	500
CARROT	TOUCHON MEGA	BM	100 G	1500	1600	1700
CARROT	TOUCHON MEGA	BM	500 G	5300	5400	5500
CARROT	TOUCHON MEGA	GTS	10 G	400	550	600
CAULIFLOWER	MONT PERLE 2 F1	PTS	5 G	2400	2500	2600
CAULIFLOWER	MONT PERLE - F1	PTS	5 G	2400	2500	2600
CELERY	ELNE	BM	100 G	2900	3000	3100
CELERY	ELNE	GTS	10 G	500	600	700
CELERY	ELNE	GTS	25 G	1200	1300	1400
CHEMICAL	FIGHTER	LTR	1	3600	3700	3800
CHEMICAL	FIGHTER	ML	250	1000	1100	1200
CHEMICAL	FIGHTER	ML	500	1900	2000	2100
CHEMICAL	TSUKILL		15 G	1500	1600	1700
CHEMICAL	TSUKILL- BLOCK		15 G	2800	2900	3000
CHINESE CABBAGE	MICHIHILI	GTS	10 G	500	600	700
CHINESE CABBAGE	PAK CHOI - GREEN	BM	100 G	2700	2800	2900
CHINESE CABBAGE	PAK CHOI - WHITE	BM	100 G	2700	2800	2900
CHINESE CABBAGE	PAK CHOI - WHITE	PTS	5 G	300	350	400
CHINESE CABBAGE	TSOI SIM	GTS	10 G	550	650	700
CHINESE CABBAGE	VICTORY F1	BM	50 G	11000	11100	11200
CHINESE CABBAGE	VICTORY F1	PTS	1 G	300	350	400
CHINESE CABBAGE	VICTORY F1	PTS	5 G	1100	1200	1300
CHINESE RADISH	SUPER - LONGO 2000	BM	100 G	1700	1800	1900
CHINESE RADISH	SUPER - LONGO 2000	GTS	10 G	450	500	550
CHINESE TURNIP	MAXIMUS	PTS	5 G	300	400	500
CHINESE TURNIP	SUPER - LONGO 2000	BM	KG	15000	15200	15300
CHINESE TURNIP	SUPER - LONGO 2000	BM	100 G	1700	1800	1900
CORIANDER	CULTIVATED	BM	100 G	1700	1800	1900
CORIANDER	CULTIVATED	PTS	5 G	350	450	500
CUCUMBER	AKITO F1	BM	50 G	10500	10600	10700
CUCUMBER	AKITO F1	PTS	5 G	1400	1500	1600
CUCUMBER	ANTILLA F1	BM	50 G	4300	4400	4500
CUCUMBER	ANTILLA F1	PTS	5 G	900	950	1000
CUCUMBER	FAKKOUS	SM	5 G	400	500	600
CUCUMBER	KENZO 2 F1	BM	50 G	6500	6600	6700
CUCUMBER	KENZO F1	BM	50 G	6500	6600	6700
CUCUMBER	KENZO F1	PTS	5 G	1000	1100	1200
CUCUMBER	MARKETER	BM	2 KG	28000	28100	28200
CUCUMBER	MARKETER	BM	100 G	2400	2500	2600
CUCUMBER	MARKETER	GTS	10 G	500	600	700
CUCUMBER	MARKETMO- E	BM	100 G	3100	3200	3300
CUCUMBER	MURANO 2 F1	BM	50 G	10500	10600	10700
CUCUMBER	MURANO 2 - F1	PTS	5 G	1400	1500	1600
CUCUMBER	POINSETT	BM	2 KG	28000	28100	28200
CUCUMBER	POINSETT	BM	100 G	2400	2500	2600
CUCUMBER	POINSETT	BM	500 G	9500	9600	9700
CUCUMBER	POINSETT	GTS	10 G	400	500	600
CUCUMBER	TOKYO F1	BM	50 G	10500	10600	10700
CUCUMBER	TOKYO F1	PTS	5 G	1400	1500	1600

Species	Variety	Pack	Packing Unit	Wholesaler	Reseller	Retail
CUCUMBER	NAGANO F1	BM	50 G	3500	3600	3700
CUCUMBER	NAGANO F1	PTS	5 G	450	500	550
CURLY ENDIVE	GROSSE POMMANT	PTS	5 G	350	400	500
EGGPLANT	AFRICAN - BEAUTY F1	PTS	5 G	500	550	600
EGGPLANT	KALENDA F1	PTS	1 G	300	350	400
EGGPLANT	MELINA F1	PTS	1 G	300	350	400
FEATHER COCKSCO	MHEMERA	GTS	10 G	300	400	500
GBOMA EGGPLANT	KOMBARA	GTS	10 G	300	400	500
HOT PEPPER	ANGEL F1	PTS	5 G	1600	1700	1800
HOT PEPPER	ANTILLAIS	BM	50 G	6400	6500	6600
HOT PEPPER	ANTILLAIS	PTS	1 G	300	400	500
HOT PEPPER	ANTILLAIS	PTS	5 G	700	800	900
HOT PEPPER	AVENIR F1	BM	50 G	29000	29100	29200
HOT PEPPER	AVENIR F1	PTS	1 G	850	950	1000
HOT PEPPER	AVENIR F1	PTS	5 G	3500	3600	3700
HOT PEPPER	BALTHAZAR -F1	PTS	1 G	500	600	700
HOT PEPPER	BALTHAZAR - F1	PTS	5 G	1800	1900	2000
HOT PEPPER	BIG SUN	BM	50 G	6600	6700	6800
HOT PEPPER	BIG SUN	PTS	5 G	800	900	1000
HOT PEPPER	BOMBARDIER	PTS	5 G	800	900	1000
HOT PEPPER	CAYENNE	BM	50 G	2800	2900	3000
HOT PEPPER	CAYENNE	GTS	10 G	750	850	900
HOT PEPPER	FIRE KISS F1	PTS	1 G	840	900	1000
HOT PEPPER	FIRE KISS F1	PTS	5 G	3600	3700	3800
HOT PEPPER	FOREVER F1	BM	50 G	14000	14100	14200
HOT PEPPER	FOREVER F1	PTS	1 G	400	500	600
HOT PEPPER	FOREVER F1	PTS	G	1600	1700	1800
HOT PEPPER	JAUNE DU BURKINA	PTS	5 G	800	900	1000
HOT PEPPER	SAFI	BM	50 G	6600	6700	6800
HOT PEPPER	SAFI	PTS	5 G	800	900	1000
HOT PEPPER	SHAMSI	GTS	10 G	700	800	900
HOT PEPPER	SHERIF	PTS	1 G	250	350	450
HOT PEPPER	SUNNY F1	BM	50 G	14500	14600	14700
HOT PEPPER	SUNNY F1	PTS	1 G	400	500	600
HOT PEPPER	SUNNY F1	PTS	5 G	1600	1700	1800
HOT PEPPER	TORO F1	PTS	1 G	400	500	600
INSECTICIDE	TETRAKILL	LTR	1	3600	3700	3800
INSECTICIDE	TETRAKILL	ML	250	1000	1100	1200
INSECTICIDE	TETRAKILL	ML	500	1900	2000	2100
LEEK	LARGE LONG SUMMER	BM	100 G	2500	2600	2700
LEEK	LARGE LONG SUMMER	GTS	10 G	450	500	550
LEEK	LARGE LONG SUMMER	PTS	5 G	250	350	400
LEEK	LARGE LONG TROPIC	GTS	10 G	450	500	550
LETTUCE	BLONDE DE PARIS	GTS	10 G	550	650	750
LETTUCE	EDEN	BM	100 G	4200	4300	4400
LETTUCE	EDEN	GTS	10 G	600	700	800
LETTUCE	EDEN	PTS	5 G	350	450	550
LETTUCE	GINA	GTS	10 G	670	700	800
LETTUCE	GREAT LAKES - 659	BM	100 G	4000	4100	4200
LETTUCE	GREAT LAKES - 659	GTS	10 G	600	700	800
LETTUCE	IMPACT	PTS	5 G	350	450	550
LETTUCE	MINDELO	BM	100 G	4200	4300	4400
LETTUCE	MINDELO	GTS	10 G	600	700	800
LETTUCE	MINETTO	BM	100 G	4000	4100	4200
LETTUCE	MINETTO	GTS	10 G	650	750	850
LETTUCE	OPTIMA	PTS	5 G	350	450	550
LETTUCE	TAHOMA	PTS	5 G	350	450	550
LETTUCE	TRINITY	GTS	10 G	650	750	850
MELON	CAPORAL	PTS	1 G	300	400	500
MELON	CHARENTAIS	BM	100 G	3100	3200	3300
MELON	CHARENTAIS	GTS	10 G	450	550	650
MELON	EPSILON F1	BM	50 G	4100	4200	4300
MELON	EPSILON F1	PTS	1 G	250	350	400
MELON	OMEGA F1	BM	50 G	4100	4200	4300

Species	Variety	Pack	Packing Unit	Wholesaler	Reseller	Retail
MELON	OMEGA F1	PTS	1 G	250	350	450
MORINGA	INCAMA	BM	50 G	1000	1100	1200
OKRA	CLEMSON SPINELESS	BM	100 G	1300	1400	1500
OKRA	CLEMSON SPINELESS	GTS	10 G	350	450	550
OKRA	HIRE	BM	100 G	1300	1400	1500
OKRA	HIRE	BM	500 G	4000	4100	4200
OKRA	KIRENE F1	BM	50 G	1500	1600	1700
OKRA	KIRIKOU F1	BM	50 G	1500	1600	1700
OKRA	KIRIKOU F1	GTS	10 G	500	600	700
OKRA	KOUSKO	GTS	10 G	400	500	600
OKRA	LIMA F1	BM	50 G	1500	1600	1700
OKRA	MADISON F1	BM	50 G	1500	1600	1700
OKRA	MADISON F1	BM	100 G	2400	2500	2600
OKRA	PAYSAN	BM	100 G	1400	1500	1600
OKRA	PAYSAN	BM	500 G	3800	3900	4000
OKRA	PAYSAN	PTS	5 G	250	350	450
OKRA	SAHARI F1	BM	50 G	1500	1600	1700
OKRA	SAHARI F1	BM	100 G	2500	2600	2700
OKRA	YELEEN	BM	100 G	1400	1500	1600
OKRA	YELEEN	BM	500 G	4000	4100	4200
OKRA	YELEEN	GTS	10 G	400	500	600
OKRA	YODANA F1	GTS	10 G	500	600	700
ONION	ARES	BM	100 G	3500	3600	3700
ONION	ARES	PTS	5 G	300	400	500
ONION	BELAMI (TYPE GOUDAMI)	BM	100 G	3500	3600	3700
ONION	GANDIOL +	BM	100 G	3500	3600	3700
ONION	GANDIOL +	GTS	10 G	600	700	800
ONION	JULIO	BM	100 G	3500	3600	3700
ONION	KARIBOU	GTS	10 G	600	700	800
ONION	NATANGUf	PTS	5 G	300	400	500
ONION	RED TANA	BM	100 G	3500	3600	3700
ONION	ROUGE DE TANA	GTS	10 G	600	700	800
ONION	SAFARI	BM	100 G	3500	3600	3700
ONION	SAFARI	PTS	5 G	300	400	500
ONION	DAMANI (Galmi type)	BM	500 G	13500	13600	13700
ONION	VIOLET DE GALMI	BM	500 G	13500	13600	13700
PAPAYA	RANA	BM	50 G	24000	24100	24200
PAPAYA	RANA	PTS	1 G	700	800	900
PAPAYA	RANA	ST	10 G	5800	5900	6000
PAPAYA	SOLO N ₁ 8	GTS	10 G	6000	6100	6200
PAPAYA	SUNSHINE F1	PTS	1 G	2100	2200	2300
PARSLEY	COMMON	BM	100 G	1400	1500	1600
PARSLEY	COMMON	PTS	5 G	300	400	500
PARSLEY	CURLED	BM	100 G	1400	1500	1600
PARSLEY	CURLED	PTS	5 G	300	400	500
PEPPER	TATSE	PTS	5 G	2000	2100	2200
PUMPKIN	BAROUTI F1	PTS	5 G	400	500	600
PUMPKIN	GLADIATOR F1	PTS	5 G	400	500	600
PUMPKIN	MARTINICA + F1	PTS	5 G	400	500	600
RADISH	CHERRY BELLE	GTS	10 G	300	400	500
RADISH	FRENCH BREAKFAST	GTS	10 G	300	400	500
RED CABBAGE	RED BALL 2 F1	BM	50 G	18000	18100	18200
RED CABBAGE	RED BALL F1	BM	50 G	18000	18100	18200
RED CABBAGE	RED BALL F1	PTS	5 G	2000	2100	2200
SPINACH	ORIENTAL KING F1	BM	100 G	1300	1400	1500
SPINACH	VIROFLAY	BM	100 G	1200	1300	1400
SQUASH	LUNA F1	BM	100 G	4000	4100	4200
SQUASH	PRECOCE MARAICHERE	GTS	10 G	500	600	700
SQUASH	ROSINA + F1	GTS	10 G	700	800	900
SQUASH	SAMIRA F1	GTS	10 G	700	800	900
SQUASH	TENOR F1	GTS	10 G	700	800	900
SQUASH	TENOR F1	PTS	5 G	450	550	600
SWEET CORN	JAVA	BM	100 G	1200	1300	1400
SWEET PEPPER	GOLIATH F1	BM	50 G	16000	16100	16200

Species	Variety	Pack	Packing Unit	Wholesaler	Reseller	Retail
SWEET PEPPER	GOLIATH F1	PTS	1 G	530	650	700
SWEET PEPPER	GOLIATH F1	PTS	5 G	1900	2000	2100
SWEET PEPPER	GRANADA F1	PTS	1 G	530	650	700
SWEET PEPPER	GRANADA F1	PTS	5 G	1900	2000	2100
SWEET PEPPER	MAGELLAN F1	PTS	1 G	530	650	700
SWEET PEPPER	MERLIN F1	PTS	1 G	530	650	700
SWEET PEPPER	NIKITA F1	BM	50 G	16000	16100	16200
SWEET PEPPER	NIKITA F1	PTS	5 G	1900	2000	2100
SWEET PEPPER	NOBILI F1	PTS	1 G	530	650	700
SWEET PEPPER	NOBILI F1	PTS	5 G	1900	2000	2100
SWEET PEPPER	PIZARRO F1	PTS	5 G	1900	2000	2100
SWEET PEPPER	SIMBAD F1	BM	50 G	16000	16100	16200
SWEET PEPPER	SIMBAD F1	PTS	1 G	530	650	700
SWEET PEPPER	TIBESTI BW F1	PTS	5 G	1900	2000	2100
SWEET PEPPER	ULYSSE F1	PTS	1 G	530	650	700
SWEET PEPPER	ULYSSE F1	PTS	5 G	1900	2000	2100
SWEET PEPPER	YOLO WONDER	BM	100 G	4100	4200	4300
SWEET PEPPER	YOLO WONDER	GTS	10 G	650	700	750
SWEET PEPPER	YOLO WONDER +	BM	100 G	4100	4200	4300
SWEET PEPPER	YOLO WONDR +	GTS	10 G	650	700	750

Overview of seeds of tomato, cucumber and watermelon mostly cultivated in the North (source J. Talabi, Kaduna, Baki Dogu Market), September 2019

Predominant seeds, seed companies and distributors in North Nigeria

Seed company	Origin	Distributor	Crop	Var	Type	Quantity	Price (n)
Jubaili Seeds		Jubaili	Watermelon	Kaolack	OP	100g	1800
			Tomato	UC82B	OP	100g	3200-3800
			Tomato	Rio Grande	OP	100g	3200-3800
Griffaton		Isah Agro Seed and Chemical/	Cucumber	Marketmoor	OP	100g	2500
			Tomato	Rio Grande	OP	100g	3200-3800
Semetes Veg Seeds	Italy	Musty Agro-Allied Nig. Ltd	Tomato	Rio Grande	OP	100g	3200-3800
			Tomato	UC82B	OP	100g	3200-3800
Stark Ares	South Africa	Value Seeds Ltd	Okra	Clemson	OP	100g	2400
				Spineless			10g
Graffass		Apical Agro Science ltd	Tomato	Rio Grande	OP	100g	3200-3800
Seminis	USA		Tomato	Gem Pride	Hybrid	1000 seeds	1,200
			Cabbage	Oxylus F1	Hybrid	25g	4200
Technisem Seeds	France	AgroTropic	Tomato	Roma Savanna	OP	100g	3200-3800
Graffter		Arid Agro Science Nig. Ltd		Rio Grande	OP	100g	3200-3800
				UC82B	OP	100g	

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The mission of Wageningen University & Research is 'To explore the potential of nature to improve the quality of life'. Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 5,000 employees and 10,000 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.



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