

RESILIENCE

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SCOPING STUDY HORTICULTURE NIGERIA

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EXECUTIVE SUMMARY

Horticultural production largely takes place in Northern Nigeria, and in particular in the states of Kano, Kaduna and Sokoto. Farmers cultivate tomato, onion, peppers and cabbages often with irrigation in open field production systems. Yields are relatively low at on average 5 t/ha for tomato.

Medium to high-tech production systems are being introduced on a limited scale in the South-West and around larger metropolitan areas across Nigeria. In these settings, yields are higher, ranging between 10 and 50 t/ha with use of specialty inputs, planting in beds and irrigation. In professional greenhouses higher yields are achieved which go up to 15 kg/m² per production cycle. Due to the higher costs for land, inputs and labour, competitiveness remains a challenge.

The North mainly produces during the dry season, with the rainy season reserved for cereals and legumes. As such, the main vegetable production season runs from October till March. Combined with the highly perishable nature of most of the vegetables prices are volatile, reaching peaks in December, followed by very low prices during a glut in January and February. Good opportunities exist to grow outside this main season, using better seeds with increased resistances and some form of protection against the rain. However, this type of production is still limited and requires higher upfront investment.

Given the high price volatility combined with outbreaks of pests and diseases like *tuta absoluta*, vegetables can be seen as a gambling crop. This is further compounded by the high cost of logistics and food losses along the way. Farmers do not have the means nor incentives to invest in productivity improvements with current revenues and volatility. At the same time, good opportunities exist for increasing productivity and spreading production more evenly throughout the year. Pilot projects show that doubling productivity *and* income is feasible when using good agricultural practices and better inputs.

A singular and almost monopolized trade channel is possibly hindering quality and price improvement through absence of market dynamics. Current markets do not value quality and are unwilling to pay premiums for better quality produce. Innovations for aggregation, support services and logistics exist but SMEs struggle to reach scale without access to finance.

At a national level, dependency on one main production region brings a high risk of crop failure in case of a pest or disease outbreak. Diversification of production regions, production systems and market channels allows to spread risk, balance supply and demand, and create new market segments. Local processing could further reduce food losses and reduce influences of seasonality, if cost competitiveness can be achieved.

Several development programmes and projects are focusing on horticulture. Many of the recent initiatives concentrate on tomato in Kano, while other regions and crops offer good opportunities as well. There appears to be a lack of coordination in initiatives leading to overlap in activities. Several projects struggle with continuity after subsidized period ends.

Opportunities for Embassy involvement include:

1. Increasing productivity and income for a large number of smallholder farmers in Northern Nigeria and bringing this to scale
2. Piloting production systems innovation and regional diversification in South-West Nigeria

3. Increasing access to finance for SME companies that invest in solving value chain bottlenecks at regional and national level
4. Enhancing sector coordination and business-to-business linkages

Measuring impact will be important to learn about the (relative) success of approaches and interventions, as well as to accurately account for public funding. Professional and independent impact measurement is recommended to monitor and evaluate programme activities.

1. BACKGROUND AND OBJECTIVES

1.1 PROGRAMME CONTEXT

The Netherlands Embassy in Abuja as part of the Dutch Ministry of Foreign Affairs wants to further explore support to Nigeria's horticulture sector. The ambition is part of the broader intensification of bilateral relations between Nigeria and The Netherlands as laid out in a Memorandum of Understanding (MoU) that was signed in 2018. The MoU specifically highlights the organisation of regular bilateral dialogue and puts focus on economic cooperation and agriculture development.

In its Multi-Annual Country Strategy Nigeria (MACS 2019-2022) the Netherlands government has further elaborated the objectives for its bilateral cooperation. An important pillar of the MACS is the one on food security and private sector development. As part of this chapter, five aspects for achieving food security are highlighted, these include:

- Increasing agricultural productivity and income of family farms;
- Improving the ecological sustainability of the horticulture farming systems (and related to this increasing resource use efficiency and adapting to climate change);
- Enhancing the functioning of horticultural value chains; decreasing post-harvest losses and improving agro-processing and agro-logistics (also increasing availability of quality inputs);
- Contributing to strengthened knowledge and innovation systems (including formal education);
- Improve the business climate for the private sector to operate.

Within the scope of food security, first priorities would be improved productivity and national resource management. Importantly, two cross-cutting issues are mentioned: youth and gender; focusing on increasing youth employment and accelerating female entrepreneurship.

For a horticulture programme the focus initially is on Kano, Kaduna and Sokoto, being the three states with the highest production of tomato, onion and pepper. As secondary focus, the study also considered Plateau (Jos). In addition, attention is paid to the South-West, peri-urban Lagos combined with Ogun and Oyo states.

Furthermore, the crop focus is on vegetables and potentially potato. Fruits and flowers are out of scope. The envisaged horticulture programme will focus on domestic markets not export.

1.2 OBJECTIVES

The overall objective of the scoping study was to develop an intervention strategy for a Dutch funded programme supporting the development of the horticulture sector in Nigeria, and to formulate necessary documentation for an international tender. The Dutch government has currently earmarked EUR 10 million for this programme.

This scoping includes a clear advice on the problem analysis, geographic focus, opportunities and implementation approach, a design of a number of programme components, each with a list of results indicators and targets. In addition, the scoping study delivered an internal report for the Embassy only, that included a list of (tentative) evaluation criteria on the basis of which project proposals can be assessed, as well as a ('shadow') budget for each of the components.

2. HORTICULTURE PRODUCTION IN TARGET REGIONS

2.1 NORTH-CENTRAL: KADUNA, KANO, SOKOTO AND PLATEAU

PRODUCTION CLUSTERS AND PRODUCTION SYSTEMS

Overall, Kaduna, Kano and Sokoto are the three most important states for the production of tomato, onion and pepper; which in turn are the three most important vegetables in Nigeria (see Figure 1 below). One other state stands out: Plateau (especially for potato). Together these four states produce more than 50% of all vegetables in Nigeria.

The three states of Kaduna, Kano and Sokoto each have quite distinct production systems. Whereas Kano is dominated by the centralized large-scale irrigation systems that were developed under the successive FADAMA projects of the World Bank, Kaduna State is characterized by more localized small-scale irrigation systems, often managed by small groups of farmers jointly operating a pump that draws water from adjacent rivers and streams. Sokoto has a mix of these two systems, with both large-scale and small-scale systems. Each three having ample availability of surface water, often dammed to allow for reservoir formation. Plateau region presents a case by itself with more limited water availability, often extracted from subsurface water sources through tube wells and boreholes. Temperatures in Plateau are also colder and benefit crops like strawberries, potato and specific species of the brassica family (e.g. cauliflower, broccoli).

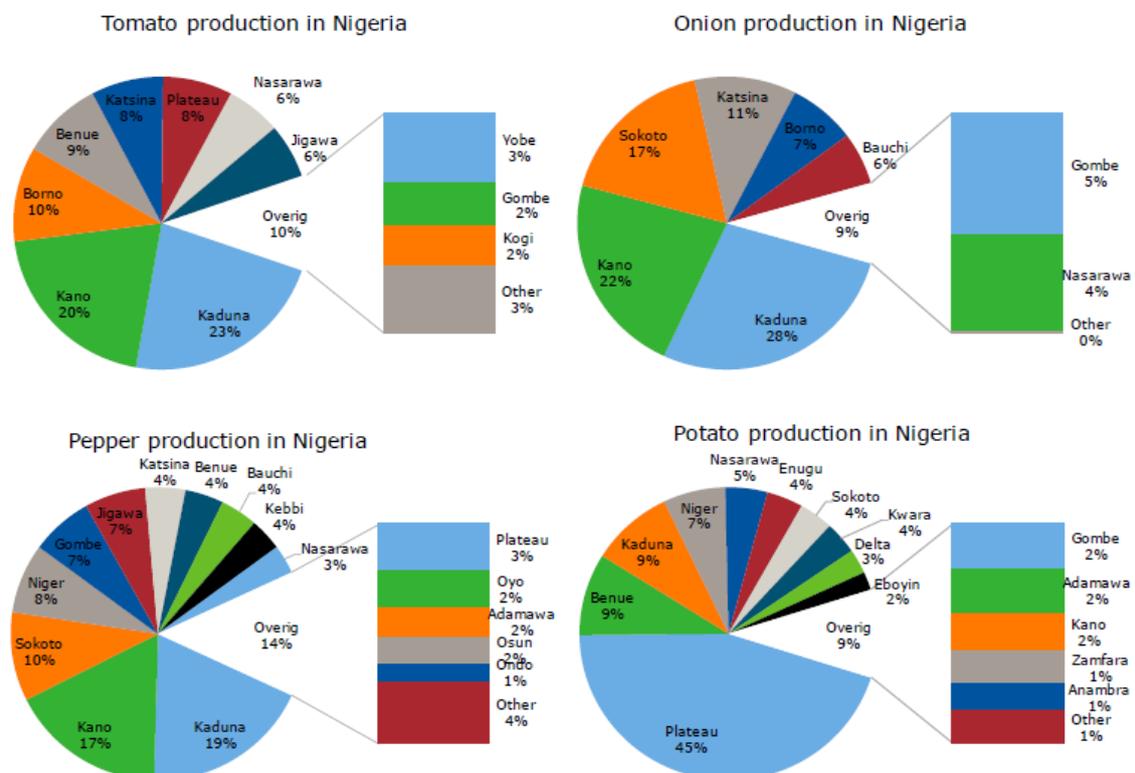


Figure 1: Relative share of Nigerian states in the production of tomato, onion, pepper and potato (Plaisier, 2020)

	Kaduna	Kano	Sokoto	Plateau
Tomato	23% (1)	20% (2)	1% (NA)	8% (6)
Onion	28% (1)	22% (2)	17% (3)	0% (NA)
Pepper	19% (1)	17% (2)	10% (3)	3% (12)
Potato	9% (3)	2% (13)	4% (7)	45% (1)

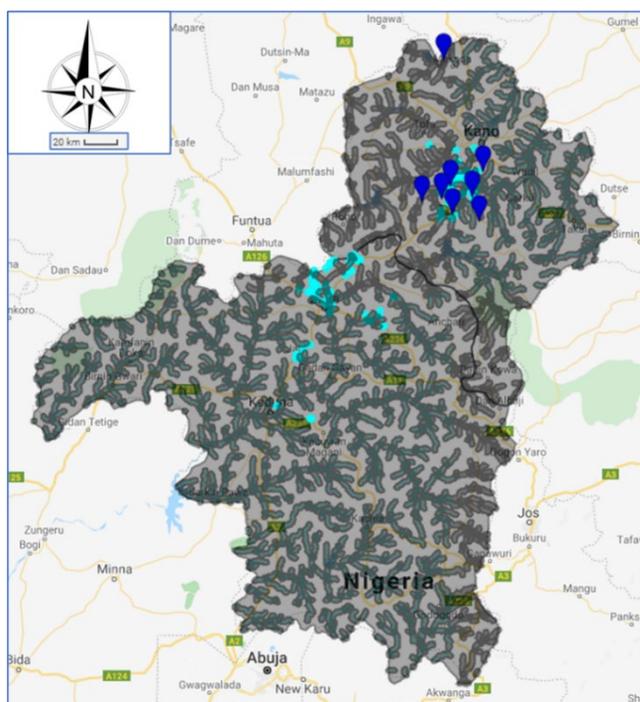
Table 1: Relative importance of four vegetables for the four selected regions, including ranking (deducted from: Plaisier, 2020)

The above characterisation makes it easier to define geographic vegetable hotspots in Kano than in the other two states. In Kano, there is one major irrigation scheme, the Kano River Irrigation Scheme, which will consist of an anticipated 22,000 ha. The scheme is organized in 50 sectors which vary in size, from the smallest of 28 ha to the largest of 2,343 ha (WB, 2019). Important locations include: Kura, Dawakin Kudu, Bebeji, Garum Mallam, Bunkure and Rano; all south of Kano city. The main source of water for the irrigation scheme is provided by the Tiga Dam, which blocks the Kano river from flowing further into the Hadejia river which in turn drains to Lake Chad. One other major dam is the Challawa Gorge Dam in the northwest of Kano state (close to Makoda), which irrigates an estimated 10,000 ha. In Sokoto, there are two main dams and related irrigation scheme, the Bakalori and Goronyo dams. The map below presents the larger irrigation schemes in Kano in dark blue and the irrigated demo sites of East West Seed (SDGP) in light blue. The map also shows the all available rivers and streams in both states, from which water can be drawn by pump and tube well (in dark grey).

Irrigated agriculture combined with climate change have led to the fact that Lake Chad is drying up. The current size of the lake is less than 90% of its original size in the 1960s. This in turn has further aggravated tensions between pastoralists and agriculturalists in the region.

The vast majority of farmers are smallholder farmers, each cultivating on average around 1 ha of vegetables (SDGP Baseline). Specific characteristics of vegetable farmers in Kaduna state include¹:

- For more than 50% of the farming families in Kaduna state the household head is in between 30 and 50 years old, with an average age of 44 (KASS, 2017).



¹ Availability of reliable data on horticulture in Kano, Kaduna and Sokoto states is limited. Data presented here largely stem from an extensive survey that was implemented in 2016, the Kaduna State Agricultural Survey

In the EWS baseline survey (2020), 30% of vegetable farmers were below the age of 35 and can be characterized as youth. For Kano, NABC (2020) arrived at a higher percentage, with around 60% of vegetable farmers being between 20 and 40 years of age. Respondents were predominantly male, either the husband or son of the household (in more than 90% of the cases).

- Family sizes are large with 42% having in between 6 and 10 family members and 21% having 11 or more members (with a mean household size of 7.9) (KASS, 2017).
- The main responsible for farming in the household was in 93% of the cases male and 7% female.
- Out of the 1,3 million farming households in Kaduna state 10% are involved in irrigated dry season production (136,189 households). Average land size of irrigated dry season production is 0,7 ha in Kaduna state.
- In Kaduna, around 10% of farmers are a member of a farmer cooperative of association (KASS, 2019), with farmer organisations mainly focusing on joint purchase of inputs for field crops (fertilizer, seeds) and less involved in joint output marketing and horticulture crops. For Kano state (NABC, 2020), around 30% of the farmers were a member of a cooperative, especially for tomato producers. Cooperatives assisted farmers with training, and access to credit and inputs.
- Apart from vegetable production vegetable farmers generate income from other activities as well, this includes both cereal and legume farming in the wet season, livestock keeping and casual labour/permanent employment; e.g. for tomato producers income from the crop constitutes 67% to 91% of total annual income (NABC, 2020). This allows for some income diversification during the year, not fully depending on the main production season for vegetables (November-March).
- In terms of land tenure and land rights: 63% of farm households had inherited their land, 21% had purchased the land and 10% had rented it (KASS, 2017). Percentages of rented land for irrigated vegetable production are much higher. NABC (2020), for Kano region specific, found that around 40% of land used for irrigated vegetable production was either rented or borrowed.
- Male adults own the land in the majority of cases. Women have very little access to ownership of the land (EWS, 2020).
- Most farmers produce in a semi-mechanized manner using (an often rented) tractor for land preparation (NABC, 2020).

A few larger vegetable farms exist in Kaduna, Kano and Plateau, which serve the higher end market in Abuja, Kano and Lagos. These companies often have integrated production systems cultivating a wide variety of vegetables, under (drip) irrigation, with more professional nursery houses and cold chain facilities. For the analysis below we mainly focus on the smallholder vegetable segment, as this comprises more than 95% of the vegetable production area in the three selected states.

AGRONOMIC ANALYSIS

A quick-scan was made of the current state of vegetable production in both the small-scale and large-scale irrigation schemes of Kaduna and Kano States. The below overview is not comprehensive but touches on the main agronomic issues and challenges as observed during the dry season of 2020-2021:

(KASS). With more than 2,500 respondents this survey is one of the more representative ones available. In addition, we used baseline data from EWS (2020) and NABC (2020).

- *Production planning:* Most farmers start cultivating vegetables after the main rainy season has come to an end in October. Then it is a collective rush to hit the Christmas market window with sufficient supply as prices are relatively high then. After Christmas, production continues but markets are saturated and prices go down as low as NGN 600 per 60 kg basket (or USD 0,02 per kg), well below cost-price. As temperatures go up in March-May production decreases and prices go up again. During the rainy season, a second production cycle takes place and prices stabilize (average prices), while most farmers in Kaduna and Kano resort to cereal production (maize, rice and sorghum). The combination of most farmers sowing around the same time and limited vegetable processing leads to a glut in January-February (of about two months). As such, vegetable are living up to their name as a 'gambling crop'. Because of this (most) farmers underinvest in vegetable production in the dry season as revenues are uncertain.
- *Irrigation:* most irrigation is provided in a form of basin irrigation (*Kuomi* in Hausa); ridged blocks of roughly 4x4 meters cultivating tomatoes, onions, peppers and cabbages both inside the basin as well as on the border ridges. Basins are flooded 2 to 3 times per week, causing root systems to stress, soils to compact and leaves (of especially tomato and pepper) stuck to the surface. This in turn leads to limited oxygen in the soil and spread of water and soilborne diseases. Demonstrations with furrow irrigation show higher yields, lower disease presence, and higher water use efficiency. Farmers also claim furrow irrigation is less labour intensive. Changing from basin to furrow irrigation across schemes, can reduce labour requirements as furrows can be established using animal traction or tractor ploughing. As such, furrow systems can be more labour and cost effective, and efficient in terms of water productivity (litters water per kg of produce).
- *Pest and disease management:* Most pests and diseases present in the vegetable production systems of Kano and Kaduna are 'usual suspects': early and late blight (resp. caused by *Alternaria* and *Phytophthora*), white fly, and *Tuta absoluta*. Most pesticides required for addressing these pests and diseases seem available in the agrodealer shops. However, general knowledge on the selection and use of pesticides appears low, with farmers mixing different types of pesticides and applying them without protection. Pest and disease pressure seems on the increase due to continuous cropping and general absence of more biological ways of pest management (e.g. traps, baits, border crops). *Tuta absoluta* and soilborne diseases are becoming more common and will pose a serious threat to future crop production.
- *Soil fertility management:* Soils appear depleted of organic matter after decades of cropping without replenishment of plant- and/or animal based manure. Soils in general have a good texture of (sandy) clay loam, with sufficient drainage properties. Fertilizer use is restricted to urea and NPK with limited availability of more specialized K, Ca, Mg and micronutrient fertilizers. Experts indicate that because of this soils are acidifying and a combination of both organic and inorganic (Ca, Mg, Na) supplements are needed to improve the situation.
- *Seeds:* Though a number of projects are implemented to increase uptake of quality seed of improved varieties, actual use is still low; with most farmers residing to cheaper Open Pollinating Varieties (OPVs) and recycling of seeds. Traits that are important for tomatoes are: moisture content (hardness), yield and shape (Roma-type). Hybrid seed use varies per crop and is higher for crops like cabbage and onion, than for tomato and water melon. For the latter two OPVs are still dominant. For pepper most seed used is recycled seed from a local variety.

Because of a combination of above factors, yields are low; with average yields estimated at 5 t/ha for tomato, 2-3 t/ha for onion and 1 t/ha for chilli peppers (EWSKT baseline, 2020). It is generally accepted that yields can be doubled (on average) by introducing better quality inputs, better understanding of processes of crop growth and health, and new agronomic practices.

CHALLENGES AND OPPORTUNITIES

Vegetable production in North-Central has several key opportunities:

- **Potential for doubling productivity:** The vegetable production systems in Kaduna, Kano and Sokoto currently produce as low-input, low-output systems. Often seeds are recycled, only basic NPK fertilizers are used, and limited organic fertilizers are applied. Neither do farmers invest in better ridging, trellising and biological pest control. Pilot projects have shown that simultaneously improving input use and agronomic practices easily leads to doubling yields for a wide variety of crops (i.e. onion, tomato, pepper, cabbage). An integrated package approach using an intensive ‘seeing is believing’ (demo) type of training, seems to bear fruit in this regard. This approach can be complemented by digital tools that assist trainers and key or lead farmers with tailored advice on all steps in the production process. Given the low level of (smart) phone penetration in Northern Nigeria directly targeting smallholder farmers with digital tools (for improving agronomic practices) seems less feasible at the moment.
- **Price volatility and the glut:** The problem of glut is particularly strong for tomato, as it is the most perishable vegetable and largest in terms of production (acreage and volume). The issue of glut can be addressed at production and postharvest side (conservation, processing, etc.). In terms of production, farmers can be trained to grow more outside of the season; either by starting earlier (seedling production in August-September) or later (producing throughout April-May and in the rainy season). This requires a shift in production practices and investments in better varieties (heat resistant, more disease resistant), simple forms of protected cultivation (e.g. rain shelters/abris, agro-fleece) and practices (growing on ridges instead of in basins, trellising and use of traps/baits). On-farm diversification and rotation of crops can further stabilize farm income, and reduce pest and disease pressure, also introducing new crops to an increasingly monotonous cropping system (e.g. sweet corn, okra, leafy vegetables, melons).
- **Sustainability, doing more with less:** Large parts of the irrigated production system of Kaduna and Kano are part of the Lake Chad river basin (the Sokoto river drains to the Niger Delta). The dams and irrigation schemes in Kaduna and Kano are contributing to increased evapotranspiration and subsequent drying up of the end lake of the river basin, Lake Chad. Given increased impacts of climate change (rising temperatures and lower rainfall) this situation is bound to aggravate over the next decades. As such there is a strong urgency to do more with less (‘more crop per drop’). The same holds for nutrient use efficiency and pesticide use efficiency; with low levels of organic matter being able to hold limited nutrients and leaching of especially N and P into ground and surface waters. Drivers for increasing uptake are mainly knowledge driven; understanding the basics of crop nutrient deficiencies, and pest and disease symptoms – and relating these to interventions. Often, the available solutions are already profitable (and cost-price per kg of produce decreases with the right application of water, fertilizers and pesticides).

A number of projects are currently being implemented in or related to the large-scale public irrigation schemes in Northern Nigeria (especially in Kano state and to a lesser extent Sokoto). These projects include: TRIMMING (WB, USD 560m), and APPEALS (WB, USD 200m). The latter project focuses on agroprocessing and includes many activities for the tomato value-chain. In general, there is a tendency by both the Nigerian government and the WB to focus more on the large-scale (gravity, lined canal)

irrigation systems; instead of the smaller-scale (farmer-led, pumped) irrigation systems. While in terms of acreage, the small-scale, farmer-led systems comprise the larger area under cultivation.

PRELIMINARY CONCLUSIONS

The analysis of current horticulture production systems in North-Central Nigeria has the following implications for the Embassy's intervention strategy for a Dutch funded programme supporting the development of the horticulture sector in Nigeria:

- a. There is a substantial yield gap for production of tomato, pepper, onion and cabbages in the three states of Kaduna, Kano and Sokoto. Root causes for the yield gap are: limited knowledge/skills on agronomic production and production planning, and underinvestment in inputs and technology (partly related to high volatility in output market prices).
- b. Capacity building of smallholder farmers will need to take the following into account:
 - Productivity can be doubled using a combined intervention focusing on improving input use and agronomic practices (possibly including digital tools for agronomic advice).
 - Outreach of activities can go to scale, potentially reaching 10,000s of farmers using efficient extension approaches.
 - Production planning can reduce the impact of seasonality and price volatility. On-farm diversification and rotation of crops can further improve farmer resilience.
 - Efficient use of water and other inputs can be addressed through more knowledge-based training activities.
 - Entry points exist to put more focus on youth and female-headed households; typically targets of 30% and 10% appear feasible.
- c. Effort and funds are currently mainly invested in the large-scale irrigation schemes, of Kano and Sokoto, supported by the World Bank (FADAMA, TRIMMING). In order to avoid overlap between donor-funded programmes and reach maximum impact, we recommend the Embassy's interventions to focus on small-scale (farmer-led) irrigation systems in Kaduna and Kano. Given the large distance from place like Abuja and Kano to Sokoto, and lower vegetable production volumes in the state, we recommend to exclude Sokoto for now.

2.2 SOUTH-WEST: LAGOS, OGUN, OYO

PRODUCTION CLUSTERS AND PRODUCTION SYSTEMS

Vegetable production in the South-West is mainly driven by the presence of Nigeria's largest market: Lagos. While still limited in size in many respects, new production systems are emerging. Distinct production systems exist:

- *Clusters of smallholder farmers* growing a range of vegetables in open field, mainly around Badagry and Epe axis, and some in Ogun and Oyo state. Many of these farmers are young, well-educated and tech-savvy, and go into farming as an alternative to unemployment. Clusters are organized as a cooperative, around an aggregator or informally. The more formalized clusters often provide training and access to inputs to their members. Average land size is around 1 ha and irrigation is commonly used. Farmers report challenges in growing tomatoes in the open field, while they are successful with other vegetables like sweet corn, spinach and local leafy vegetables

(notably ugu). They promote their vegetables as naturally or organically grown, but are mostly not certified. Currently, they mainly sell to local aggregators who supply to open markets across Lagos state. They are able to connect with large processors, but have been unable to produce and supply the consistent volumes needed by these juice, spice and paste manufacturers. Lack of technical training and access to finance to invest in irrigation and protected cultivation are cited as a barrier to achieving further scale.

- *Mid to high-tech greenhouses* around urban areas (Lagos, but also other urban centres including Abuja, Port Harcourt and Ibadan) are set to produce vegetables in a controlled environment. Around Lagos, several of these are located along the Lekki peninsula, and in Ogun state along the Ibadan expressway. Many of these greenhouses were invested in by professionals originally starting in different industries who were attracted to agriculture by the size of the market and the desire to introduce better quality produce. Some of these greenhouses using advanced technologies (climate sensors, fertigation, cocopeat substrate, hydroponics) are indeed producing good quality vegetables. Some greenhouses are less successful, importing greenhouses modelled from other countries that were not designed for a hot and humid climate. These often struggle with lack of ventilation, and frequently battle with soilborne diseases like bacterial wilt for tomatoes. Several of these greenhouses have been abandoned and are not being used currently. Greenhouses mainly sell to formal retail who appreciates the quality of their produce, but in practice is not willing to pay a higher price for the better quality produce. This leaves greenhouse farmers with a low profit margin. Furthermore, greenhouse farmers are dependent on imported specialized inputs (seeds, fertilizer) of which availability and cost is not consistent.
- *Medium-sized diversified farms* traditionally growing crops including cocoa, cassava, oil palm and other cash crops, are now diversifying into vegetable production beyond subsistence farming. These farmers generally have 5-10ha of land in Oyo, Osun and Ondo states. Government and traditional leadership structures in the South-West are promoting regional self-sufficiency and are looking to boost vegetable production to reduce external dependencies. These farms are generally connected to organised networks of large commodity traders, and several of these traders are promoting diversification as a road to sustainability and living income. These vegetables are still grown in open field, and mainly intended for medium-sized cities across the South-West. Challenges of humidity and soil-borne diseases exist, but the target markets do not demand for high quality vegetables as most will be used for stews and soups.
- *Home gardening* is a very fast-growing segment in urban areas, with people producing in their compounds for their communities in schools or churches. While individual production volumes are very small, this indicates a trend in wanting to know the origin of produce.

AGRONOMIC ANALYSIS

Some agronomic factors impacting vegetable production in the South-West are summarized below:

- *Production planning:* Farmers in the South-West are less dependent on rain cycles and should be able to plan harvests outside of the glut in January and February. Depending on the production system and level of expertise, some farmers do succeed in this, while others experience delays in obtaining seeds and planting, sometimes missing the Christmas peak demand and ending up supplying during the glut.

- *Beds and staking:* In open field settings as well as (semi-)covered production, young farmers use beds and stake their plants allowing for higher yields.
- *Irrigation:* Irrigation is commonly used, mostly with boreholes, pumps and generators, and often with drip irrigation installed. Cost of investment and power makes irrigation expensive.
- *Pest and disease management:* Soilborne diseases form the main challenge for farmers in the South-West. While some crops are less vulnerable, several high demanding crops like tomato would benefit from a more controlled environment (using substrate).
- *Soil fertility management:* More technologically advanced production systems require specialty inputs including fertigation. Farmers experience challenges both in availability and cost of obtaining water soluble fertilizers.
- *Seeds:* Farmers are generally open to improved varieties, and distributors are available but seeds are expensive.

Simple planting systems in the open field in the South-West do not work because of climate and soilborne diseases, and there is a risk of complete crop failure.

The (mainly young and educated) farmers who are successful use medium to high-tech production systems as described above. Because of a combination of above factors (quality inputs, medium-tech production systems), yields are higher compared to North-Central; current estimates show a range from 10-50 t/ha for open field tomato production. Yields in greenhouses are higher and go up to 15 kg/m² per cycle.

Though yields are higher in the South-West, cost of production is also much higher, caused by the need to invest in infrastructure, improved seeds, specialized inputs and a higher cost of labour, and as a result price competitiveness remains a challenge.

CHALLENGES AND OPPORTUNITIES

Vegetable production in the South-West experiences a number challenges:

- *Climate:* the climate in the South-West is extreme with a combination of high temperatures and humidity, as a result disease pressure is high and more is demanded in terms of inputs and knowledge of farmers.
- *Cost of production:* cost of inputs, investments and labour are higher in the South-West due to the combination of the climate challenges as well as higher cost of land and cost of living. Vegetables produced in the South-West are often unable to compete with a lower cost-price of farmers in the North, especially during peak harvest time.
- *Land scarcity and urbanisation:* current agricultural land around urban centres (Lagos and Ibadan) is gaining value for real estate, and many farmlands in these areas are leased and not owned by farmers. This hinders long-term investments by farmers. Ogun state offers the opportunity to securely buy land and invest in long term farming.

Based on the above analysis we distinguish three opportunities for South-West Nigeria:

- **Medium-tech production systems:** combining the lower investment of open field production with the protection offered by a roof or greenhouses, a mixed model could be developed. A simple greenhouse providing shade and ventilation, using growing bags and irrigation to control pests

and diseases as well as growing cycles, has shown success in other African countries with similar climates.

- **Finance to scale:** clusters of young farmers have the motivation to grow business using smart solutions. These clusters are currently stuck in a vicious cycle of being unable to invest and reach the scale needed to be profitable.
- **Exotic vegetables:** in the mindset of most Nigerian farmers, any vegetable is a tomato. While tomato represents roughly 50% of vegetables consumed in Nigeria, several farmers and traders report a high and unfulfilled demand for exotic vegetables, including red and yellow bell peppers, cauliflower, herbs, spinach and a range of local vegetables. These markets are less sensitive to price and these crops are less sensitive to the climatic challenges in the South-West.

PRELIMINARY CONCLUSIONS

The analysis of current horticulture production systems in South-West Nigeria has the following implications for the Embassy's intervention strategy for a Dutch funded programme supporting the development of the horticulture sector in Nigeria:

- a. While the climate in the South-West is less suitable for open field cultivation, medium tech production systems are piloted and appear feasible, and there is an opportunity to include youth in agriculture, diversify national production regions and reduce impact of seasonality, while increasing food production for the population and specifically Lagos.
- b. Pilots for medium tech production systems should consider:
 - Product quality and production efficiency can be achieved with mid-tech greenhouses or a covered/fenced structure, planting bags with substrate, irrigation, improved inputs and professional management.
 - Growing outside of the main two production seasons can reduce volatility and increase profits for involved SMEs.
 - Production opportunities exist both in high-demand crops including tomato and capsicum, as well as exotic vegetables, including red and yellow bell peppers, cauliflower, herbs, spinach and a range of local vegetables.
 - Cost competitiveness of new production systems is critical, to be achieved through higher productivity, quality and efficiency. Pilot projects should include detailed analysis of both financial and agronomic indicators.
 - Younger farmers in South-West are more tech savvy and heavily focused on social media to access information, and tech-based access to information should be leveraged.
- c. Considering proximity to Lagos, but not competing with real estate for land inside Lagos, we recommend the Embassy intervention should focus on Ogun and Oyo.

3. VALUE CHAINS AND ACCESS TO FINANCE

3.1 ACCESS TO MARKETS

VALUE CHAIN MAPPING

The vegetables value chain largely starts from smallholder production in Northern Nigeria, and trade is heavily dominated by regional and urban markets, notably Mile 12 in Lagos. An overview is provided in Figure 2.

Rural consumers buy vegetables from local open markets. Urban consumers have a range of options, still mainly supplied from the central urban market through a network of street sellers, neighbourhood open markets and food service. We estimated that 80-90% of urban consumers buy vegetables from these channels. Mile 12 annually trades around 500,000 tonnes of tomatoes.

Formal retail, direct to consumer delivery and farmers markets offer higher quality produce but have small market shares of 2-5%. These segments do attract a price premium for quality, and a market channel for exotic vegetables.

Main challenges in the organisation of value chain actors include:

- **Market price volatility:** Prices are heavily influenced by production seasonality in North-Central combined with peak demand around Christian public holidays (Easter and Christmas). In practice, the majority of the crop is sold at very low rates in January and February, which implies farmers have a very low annual income and no opportunity or incentive to invest.
- **High reported food losses:** While hard data is not available, estimates range from 10-50% depending on crop and season. Better logistics would reduce direct food losses in transit, while reducing the impact of seasonality with better crop planning and extension of shelf life would also have an impact on balancing supply and demand and reduce food loss and waste during glut.
- **No premium for quality:** A very small percentage of the market values product quality (<5%) and an even smaller percentage of the market would be willing to pay extra for quality. Most demand for premium quality is mainly driven by expats and returning diaspora. In Abuja, located close to the main production areas and with less congested infrastructure, general quality available in the market is good and affordable and quality premiums are not paid. In Lagos, there is some traction in a premium segment because the general quality of produce in the market is very low and the added quality is therefore more valued.
- **High dominance of one market channel:** controlled by a small number of traders implies. Alternative market channels hardly exist. This can hinder competition that should improve quality and prices.

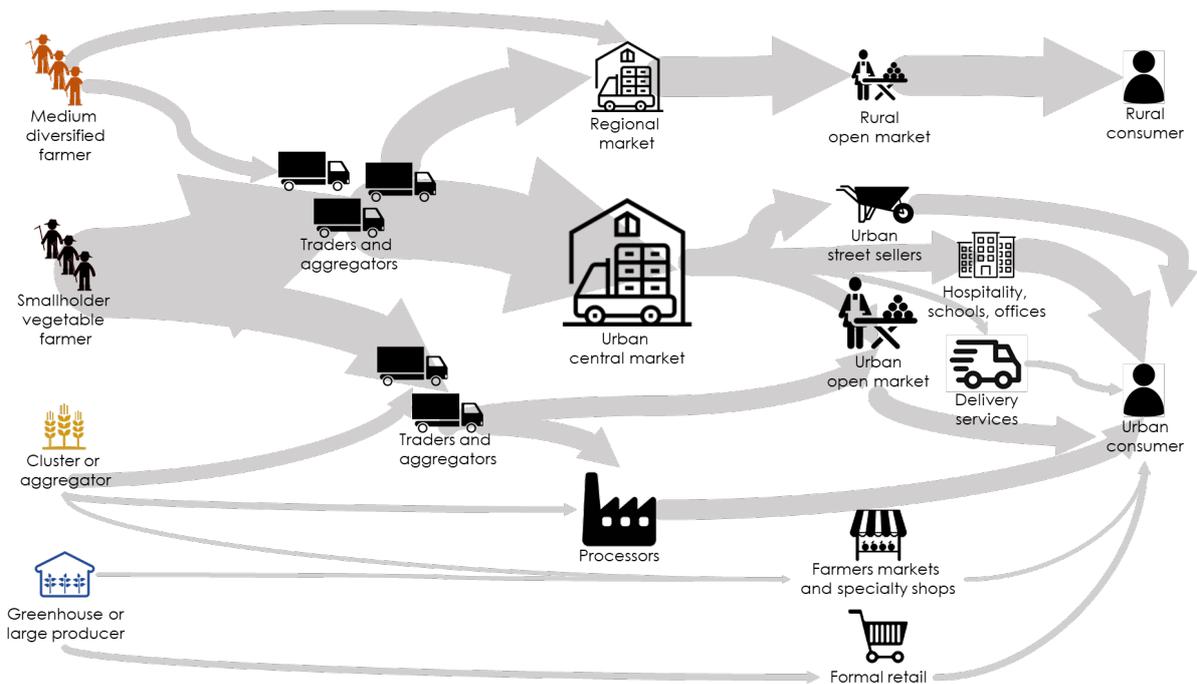


Figure 2: Value chain mapping vegetables in Nigeria (Agri-Logic)

LOGISTICS

Most vegetables move from North-Central to South-West, and local trucks are used. There are very few cold trucks in use, however if time of transit can be managed this is not an immediate need. The railway network offers a potentially cheaper alternative to road transport but it still remains under government control and relies on it for funding. This option is yet to be fully explored.

An insignificant number of aggregators are currently shipping by air, but at a higher price to pay per kg and very limited capacity in terms of quantity. This options exist for premium value produce which are delivered to high end urban customers.

Food losses are regularly caused by packaging and lack of storage.

Tomatoes are traditionally packaged in 50 kg baskets that are stacked on top of each other in large trucks. Several programmes have aimed to introduce 20 kg reusable crates to the market, and while all actors see a clear reduction of food losses in transit using crates, market uptake is still only around 50% of total tomatoes traded (depending per season). Main challenges for full uptake include:

- *Reverse logistics:* crates need to be returned to the North for re-use and especially in the glut turnaround time is insufficient. Returning empty crates also comes at a cost, and there are little products available that would be using the crates on their return journey.
- *Financing of the investment:* several traders and service providers are interested to rent out crates as a service, but struggle to raise the initial capital needed to purchase a large number of crates and secure storage for empty crates both in Lagos and the North.

Pepper is traditionally packaged in nylon sacks, which holds humidity and risks spoilage and mould. This crop could potentially also benefit from alternative packaging solutions. Onions, cabbage and

other less perishable crops are transported with open trailers and generally have much less food losses.

Packing houses and cold storage are currently not available. A number of SMEs aims to develop pragmatic packing houses for less-perishables like onions, and cold storage solutions using reefer containers that can be placed in local markets, to be used by farmers or traders against a fee per crate stored. Introducing cold storage could reduce time pressure for farmers and traders to sell immediately, and by spreading release to the market over a longer period of time could reduce food loss and improve prices for producers. Farmers and traders in other crops have shown a willingness to pay for storage as a service, and the model could be expanded to vegetable storage. While solutions exist, they require an up-front investment and access to finance is a challenge.

PROCESSING AND VALUE ADDITION

There are less than five large processors of tomato paste located in the main production regions in North Nigeria. Somewhat counterintuitively, these processors struggle with supply of fresh produce for processing, and there are a number of combined factors that explain this dilemma: Quality of available produce not always suitable for processing and price of tomatoes in Nigerian market is generally much higher than the international average. Seasonality of harvest implies that assets are only utilized part of the year, which has an impact on efficiency. Availability of power is unreliable, adding to additional cost for generating and storing power. Processors of tomato paste compete with imported paste, and need to maintain price competitiveness against international processors who are less affected by the before-mentioned cost price drivers.

In order to make processing commercially viable, the cost of fresh produce would need to be significantly decreased, for instance by introducing productivity measures on farm, potentially in partnership with these processors.

There are also rumours of Nigerian government introducing an import levy or import ban on tomato paste in order to protect the market for domestic processors. Historically, these protective schemes have however also had negative side effects incentivizing smuggling and increasing prices paid by consumers.

For other vegetables, better alternatives exist. Sun-drying of habanero pepper and other capsicum or even tomatoes and onions can be done small scale without significant investment and increases shelf life significantly.

PRELIMINARY CONCLUSIONS

The value chain analysis has the following implications for the Embassy's intervention strategy for a Dutch funded programme supporting the development of the horticulture sector in Nigeria:

- a. With a strong singular seasonality resulting in supply and demand and price volatility, combined with food losses in transport and a price sensitive market, value chain interventions are critical to ensure that increased production reaches markets and rewards farmers a fair price.
- b. Interventions need to focus on reduction of food losses and mitigating seasonality through innovations along the value-chain including mid-tech production systems, and improving shelf life via storage and processing. This can impact national food security as well as reduce price volatility for farmers and consumers.

- c. The premium market for higher quality at a higher price may be an entry point but is very small, and greatest impact of value chain interventions is expected from focusing on the main market channels.

3.2 ACCESS TO INFORMATION AND INPUTS

Generally, there is an information gap in the value chain structure and farmers lack adequate technical support to transit from old norms to embrace modern technology. Research institutes lack enough funds to sponsor publications of their findings. Government lack enough structure to manage farmer networks, transfer knowledge and to provide the right incentives timely.

Intervention programmes are vulnerable to sponsorship continuity and often disintegrates once subsidies are withdrawn. At best, government extension programmes related to production (trainers) are limited by inadequate experience relating to modern farming techniques, to enable them to transfer the right information to farmers at grassroots level. Despite active participation of government's Agricultural Development Programmes (ADP) and civil society in the focus regions, knowledge transfer will continue to be a challenge as long as access to qualified trainers still remains 10 trainers to 30,000 farmers. And for the privileged few that access these trainings programmes, proper transfer of knowledge is hardly reaching the farmers at the grassroots.

A number of agri-tech companies and start-ups has developed crowdfunding and aggregation platforms that often combine access to finance with capacity building and aggregation, but these companies are still small compared to the size of the market, and none focuses specifically on horticulture. Telecommunication and IT companies are currently not offering advisory services to horticulture farmers. Online communities mainly on Facebook and other social media are emerging as an information source for young farmers looking for advice. Several influencers are building their brands as experts, and young farmers appreciate their guidance.

Seed companies and agrodealers are the main source of inputs. Government provisions often arrive late and are only available to the few. Access to inputs is challenging, and the specific dynamics are dependent on the inputs category.

- *Seeds*: Improved varieties are available in the market, with several entrants importing a range of varieties. Currently farmers prefer local varieties or recycle own seed because of no or a lower upfront cash expense. Farmers usually resort to preservation of 'choice harvest' set aside for the next season production and cultivated until yield output drops. We expect that the ongoing demo projects and productivity programmes will set an example and prove the business case leading to further adoption of improved (hybrid) varieties.
- *Crop protection*: Pesticides and fungicides are widely available, but fake products are common and potentially harmful for soil, crop or people. Farmers lack knowledge on selecting appropriate products and appropriate use.
- *Fertiliser*: Nigerian government prioritizes the promotion of domestic fertilizer production, and has banned or regulated fertilizer imports. While generic NPK blends are produced and widely available, fertilizers specific to horticulture with required micronutrients are not locally produced and most former importers have not received their import certificates this year. In practice, this means that specific fertilizers are either unavailable, or smuggled in and very expensive. This

affects all vegetable farmers, although farmers using greenhouses and drip irrigation are more affected.

PRELIMINARY CONCLUSIONS

The access to information and inputs analysis has the following implications for the Embassy's intervention strategy for a Dutch funded programme supporting the development of the horticulture sector in Nigeria:

- a. Farmers in North-Central still largely depend on physical outreach structures for access to information.
- b. Younger farmers in South-West are more tech savvy and heavily focused on social media to access information. This is an opportunity, although quality of information shared needs to be considered and fake news and inappropriate guidance is a risk.
- c. Seeds and crop protection products are available in the market, but farmers willingness to invest in quality inputs and knowledge on application is limited. This should be addressed in any farmer outreach.
- d. Government policy affects availability and cost of fertilizer, and a representative sector platform could raise and resolve these issues on behalf of sector stakeholders.

3.3 ACCESS TO FINANCE

In the largely informal horticulture sector, there is very little to no access to finance. Actors from production to trade and markets are fragmented, often not formally registered and geographically dispersed. Registration and inclusion in formal banking would be a requirement to explore access to finance for these value chain actors.

Service providers, aggregators and processors are often SMEs who are formally registered and have scalable solutions. These SMEs have a need for financing of both working capital and investment capital to expand and innovate their business. However many of them do not yet qualify for commercial investment because they are start-ups, do not have collateral and/or have insufficient financial management skills. Access to finance for these SMEs would unlock solutions to value chain issues, including agricultural and inputs services, access to markets and logistics services.

Currently, banks and other commercial investors are hesitant to provide financing to horticulture based on risks as described.

If commercial banks invest in agriculture, this is often working capital to the grains sector through an aggregator. Horticulture is considered higher risk than less perishable crops. Aggregators and processors who do have a business case often do not have the required financial management capacity, and do not have a collateral. Longer term capital is almost never available. Banks do however have an ambition to grow their investment portfolio in agribusiness.

There is a large number of Micro Finance Banks licensed by the Central Bank of Nigeria (nearly one thousands MFBs in 2016), but World Bank concludes in 2017 that aspirations have only marginally been achieved. MFBs remain small and reach an estimated 1-10% of the target population. Furthermore, interest rates are high, and for farmers living in poverty debt at high interest rates is generally not a way out of poverty. As with commercial banks, MFBs often prefer urban areas, and if investing in rural areas it is more commonly in grains and staple crops and not in perishable crops.

A number of agri-tech companies and start-ups has developed crowdfunding and aggregation platforms that often combine access to finance with capacity building and aggregation, but these companies are still small compared to the size of the market, and none focuses specifically on horticulture.

Two access to finance schemes by Nigerian government need to be mentioned here:

Central Bank of Nigeria (CBN) through its Anchor Borrowing Programme, provides financial linkages to smallholder farmers through a processor or aggregator against favourable loan terms. To current date, most of these investments have been focused on staple crops (grains), but CBN has shown an increased interest to expand the scheme into the horticulture sector, starting from tomatoes.

NIRSAL provides risk-sharing mechanisms for commercial lending into agriculture.

Currently these initiatives are little used in horticulture. Furthermore, private sector and civil society stakeholders have expressed concerns about the feasibility of the training and compliance requirements for participation in these schemes, as well as the delivery on commitments if indeed risks covered by an agreement do occur.

PRELIMINARY CONCLUSIONS

The access to finance analysis has the following implications for the Embassy's intervention strategy for a Dutch funded programme supporting the development of the horticulture sector in Nigeria:

- a. Access to finance for smallholder farmers does not appear to be feasible in the short term. Farmers are not included in the formal banking system, and can't afford debt with high interest rates with their current productivity and profitability. Access to finance for farmers would only work through an aggregator, and by providing quality inputs in kind to be repaid in produce. This could be embedded in a farmer outreach component.
- b. Most SMEs are currently not bankable, but can achieve a required level of formalization and compliance, and with capacity building could develop financial management skills and bankable business plans. Access to finance for SMEs could open up youth involvement and resolve value chain bottlenecks through inputs provision, logistics services, aggregation and processing. Some medium to large farms using medium to high tech production systems fall into the SME category as well.
- c. Even with SME capacity building, there may be a need to provide a small seed grant (e.g. to address gaps in the company's technical capacity or operational management) and compensate for the lack of collateral. Banks would need some successful case studies in order to refine their own risk management procedures and open up further investment into the sector.
- d. The access to finance intervention should focus on SME capacity building combined with a blended finance approach to make risks manageable for banks and cost of capital affordable for SMEs. A combination of seed grants, technical assistance, and commercial finance within the project intervention could be appropriate.

4. STAKEHOLDERS, PROGRAMMES AND EXTENSION SERVICES

4.1 STAKEHOLDER ANALYSIS

GOVERNMENT ORGANISATIONS

The Nigerian government has several federal and state entities involved in agriculture.

Federal Ministry of Agriculture and Rural Development (FMARD) sets policy and enters into partnerships with international organisations and private sector. A current priority is creating models with less dependencies on aids and grants, and partnerships with research institutes to develop improved varieties. Equivalent State *Ministry of Agriculture and Rural Development* exists in each state.

Government has extension departments in each state, this includes for example *Kaduna Agricultural Development Agency (KADA)*. These agencies aim to provide extension services to farmers via training, phone hotlines and media, however are often understaffed and underfunded limiting the number of farmers that can be reached. Funding for training activities often is not available, and development partners team up with governments to leverage extension activities. However, programmes struggle with continuity once subsidized phase ends.

In addition to strengthening production capacity in the field, Federal Government develops import and export policies. In horticulture, import regulations for specialised fertilizers are currently hindering availability and increasing cost for medium to high-tech producers. The potential regulation of tomato paste imports would protect local processors, but also increase consumer prices of tomato paste.

South-West state governments are also promoting regional cooperation in agriculture, aiming to produce vegetables across the region for the Lagos market. *South-West Agricultural Investment Company (SWAgCo)* is actively pursuing these opportunities, both in production and by creating alternative market channels into Lagos.

NGOS AND INGOs

NGOs are less active in Nigeria compared to many other African countries, and main focus for agricultural projects are often on conflict areas in the North-East (gardening for income generation and food security) or in public private partnerships focused on cash crops in the South (economic development).

In the last 5-10 years, international organisations and international NGOs have increased their activity in agriculture. World Bank partnered with Nigerian government to realise irrigation in Northern Nigeria, projects funded by USAID and DFID have focused on reducing food loss with better logistics.

International NGOs are more and more focusing on training farmers and SMEs in productivity, food safety and business skills.

Traction is increasing, funds are becoming available, and civil society is building up extension capacity and technical expertise. Several implementers have experience outside Nigeria to leverage.

Civil society organizations report a lack of coordination. There are two main issues resulting from this lack of coordination:

- *Dependencies external to the project are not always addressed.* Some productivity programmes have failed to secure market access leading to an unwanted increase in food losses. Logistics improvement has led to the introduction of crates but the market has not been able to secure full uptake commercially due to lack of access to finance, and more capital intensive opportunities in storage and transport have been left unaddressed. New technologies introduced often depend on specialized inputs, that are sometimes unavailable in the market due to government policies.
- *Too many activities in certain states while others are left out.* Some implementers report risk of potential overlap between projects due to the large focus on outreach in Kano and to a lesser extent Kaduna. Opportunities in other areas are left unexplored.

PRIVATE SECTOR

Private sector for horticulture is largely informal. Producers are mainly small scale and not formally registered, with the exception of a few greenhouses and aggregator clusters. Producer associations exist for most crops, but some are better organised and more effective than others.

Trade and markets for fresh produce are also dominated by informal aggregators, varying in size depending on locality. Several large traders have a base in Mile 12 market in Lagos, and they control much of the supply chain especially for the Lagos market. A handful of processors of horticultural produce exist, large in size and located mainly in production areas.

Two private sector organizations are notable in the domains of agriculture and horticulture:

Agricultural Fresh Produce Growers & Exporters Association of Nigeria (AFGEAN) was started in 2011 and aims to be a network and membership organization of professional producers following quality standards, building formal businesses and serve the formal domestic and eventually export market. It currently has around 300 active members, and another 1000 dormant members. The organization has a strong focus on setting standards for quality and food safety.

Nigerian Agri Business Group (NABG) was formed by the Federal Government of Nigeria together with AfDB to serve as an umbrella for the private sector to raise and resolve common challenges and provide input to government policy. NABG membership consists of corporate members and representative associations.

Outside of production, trade and markets, there are a handful larger processors (mainly tomato paste producers located in the North). Other private sector activities are mainly in provision of inputs and finance.

PRELIMINARY CONCLUSIONS

The stakeholder analysis has the following implications for the Embassy's intervention strategy for a Dutch funded programme supporting the development of the horticulture sector in Nigeria:

- a. A number of development partners are teaming up with the government extension department (either through FMARD or NEARLs). However, programmes struggle with continuity once subsidized phase ends.

- b. Horticulture has only recently gained attention from stakeholders, and the sector does not have an appropriate public private platform for coordination and cooperation.

4.2 PROGRAMMES AND PROJECTS

CURRENT PROGRAMMES SUPPORTED BY THE NETHERLANDS IN NIGERIA

At the moment four vegetable sector related projects are supported by the Netherlands in northern Nigeria: (1) Nigeria-Netherlands Seed Partnership (WUR); (2) the SDGP project: Transforming Nigeria's vegetable markets (EWS); (3) Seeds4Change (NABC); and (4) 2SCALE -phase 2 (IFDC). Below a short summary of the projects' objectives and activities.

Nigeria-Netherlands Seed Partnership, 2020-2024 (WUR, FMARD, Plantum, NASC, Sahel Consultants and Naktuinbouw)

The NNSP falls under the umbrella of Seed-NL, a partnership of the Dutch Ministry of Agriculture, Nature and Food Quality, the Dutch Ministry of Foreign Affairs and Plantum. The project aims to contribute to improved sustainable food, income and nutrition security of rural households in Nigeria, by improving farmers' access to and use of quality seed of improved varieties. Supporting uptake of improved vegetable varieties forms an important part of the project. The project initially focusses on the following 8 topics: (i) decentralization of seed quality assurance; (ii) extension on seed and cultivation practices; (iii) seed company marketing and promotion; (iv) institutional markets; (v) sector governance and coordination; (iv) alignment of donor interventions; (vii) plant variety protection; and (viii) variety release.

SDGP - Transforming Nigeria's vegetable markets, 2019-2024 (East West Seed International, Solidaridad, ABU & MAF Kaduna)

The project aims at a significant productivity increase of the domestic vegetable sector by bringing knowledge and introducing new varieties and adapted technologies from the private sector and evidence based knowledge and skills from reputable Universities. The project demonstrates and disseminates sustainable and profitable farming practices to the vegetable farmers in Kaduna and Kano States in Nigeria. The project has four main components: (1) Training of trainers in sustainable vegetable production (high level professionals); (2) Development of input markets for farmers; (3) Farmer training and knowledge transfer; and (4) knowledge development, dissemination and sharing.

Seeds4Change 2019-2021 (NABC and 6 companies)

The overall objective of Seeds4Change is to development of the vegetable sector (five crops: tomato, onion, cabbage, watermelon and pepper) in the Kano region (Nigeria) by the provision of quality input materials (hybrid seeds, crop protection and fertilizers) adjusted to local circumstances. This will be supported through capacity building activities focused on crop management and good agricultural practices. Seeds4Change is implemented by a consortium of the Netherlands-African Business Council, five vegetable seed companies (Syngenta Seeds, East West, Rijk Zwaan, Bakker Brothers and Enza Zaden) as well as a supplier of biological crop protection products (Koppert Biological Systems).

2SCALE -phase 2, 2020-2024 (IFDC, BOP, SNV)

2SCALE is a project implemented in a number of African countries that offers a range of support services to private partners – companies and farmer groups – enabling them to produce, transform and supply quality food products to local, national and regional end-user markets, including Base of the Pyramid consumers. In Nigeria 2SCALE has lead company (business champions) partnerships with onion processors (sourcing from Sokoto) and is working on a system of returnable plastic crates for tomatoes for the Kaduna-Lagos chain. In addition they have worked on drying of tomatoes and processing of chillies.

CURRENT AND RECENT PROGRAMMES SUPPORTED BY OTHERS IN NIGERIA

GEMS4 - Growth and Employment in States 4 – Wholesale and Retail Trade

GEMS4 was a DfID funded project that ran between 2012 and 2017 with a total budget of £ 16.8 million, implemented across four states. i.e. Kano, Kaduna being production areas and, Lagos, Abuja as the urban markets. Its objective was to increase employment and income opportunities in the general markets by providing solutions to common constraints. The project further aimed at improving livelihoods of the poor and women in the wholesale and retail sector. In particular, the project focused on introducing plastic crates (instead of raffia baskets) and tried to introduce Good Handling Practices for farmers and aggregators.

WB-FMARD APPEAL Project: Agro-Processing, Agricultural Productivity Enhancement and Livelihood Improvement Support

The agro-processing, productivity enhancement and livelihood improvement support (APPEALS) project is a USD 200 million funded World Bank project that started in 2017 and is expected to run till 2023. Its objective is to enhance agricultural productivity of small- and medium-scale farmers and improve value addition along priority value chains in the participating states. The project is currently implemented through the Federal Ministry of Agriculture and Rural Development (FMARD) in six states, i.e. Kaduna, Kano, Kogi, Lagos, Enugu and Cross River state. Its objective targeted at 60,000 farmers within these states.

The project has 5 components:

1. Enhance production and productivity to increase efficiency in the value-chain for target products;
2. Empowering youth and women to support value-chain activities, facilitate cooperatives activities and SMEs within the value-chain in intervention areas;
3. Support agro-clusters to improve business environment within clusters with significant potentials for processing and encourage SME inclusion into the supply chain;
4. Technical assistance, knowledge management and communication is to build capacity of the project staff and partner in the relevant areas of the value chain development, harness the knowledge acquired;
5. Build capacity of the management to ensure effectiveness and accomplishment of project goals and objectives.

FADAMA projects

Funded by the World Bank, The FADAMA projects were incorporated in the 1990s by the federal government. It was a USD 450 million project implemented in 36 states. FADAMA is the Hausa name for irrigable and arable land. National FADAMA Development Projects (NFDP) were also incorporated into the project as 'implementors'. The objective of The NFDP III was to increase the incomes of the farmers, reduce rural poverty, increase food security and contribute to the development of the Millennium Development Goals. The last phase of the project "additional financing" was added to the project scope based on the impact that was realized from its inception. It focused on aggregating and processing for marketing. Other investors and partners like Cargill and Dangote keyed into the program by establishing farms and processing plants as up-takers.

NEXTT - Nigeria Expanded Trade and Transport (NEXTT)

NEXTT was a USAID-funded project that was initiated to improve domestic and international trade in Nigeria. Its objectives were centred around growing awareness of the WTO facilitation agreement, removing obstacles to free flow of goods in Nigeria, promoting investments in agriculture production and processing building capacity in Nigerian government. Main achievements include: NEXTT forged partnerships that promoted investments along the country's main Lagos-Kano-Jibiya (LAKAJI) Corridor and facilitated \$40 million in new agribusiness investments. NEXTT helped the Nigeria Trade Facilitation Committee ratify the World Trade Organization's Trade Facilitation Agreement (TFA). When fully implemented, the TFA will streamline and reduce the cost and time to trade goods across Nigeria's borders and make Nigeria's import and export trade more competitive and efficient.

Mastercard Foundation

Mastercard Foundation is funding youth in agriculture initiatives implemented by *Alluvial* (focus on productivity and mechanization at scale using an outgrower delivery model), *Nourishing Africa* (focus on agricultural entrepreneurship) and *IITA* (focus on advanced production systems and business incubation). These are not specific to horticulture, but some beneficiaries in these programs are vegetable farmers and service providers.

YieldWise

Technoserve is implementing YieldWise funded by Rockefeller Foundation and Syngenta Foundation, trains tomato farmers on good agronomic practices (GAP) and post-harvest loss management, supports improved produce aggregation, and facilitates market linkages.

EU funded programs

Oxfam is leveraging EU and DAC funding for a food security and resilience program in conflict areas in North-East Nigeria. While this is a broader program, horticultural components include a greenhouse as aggregator with an outgrower scheme in Taraba, and home gardening for subsistence across the region.

COLEACP through its Fit for Market programme is supporting SMEs in horticulture to meet market requirements, covering food safety, standardization and certification as well as business requirements

including management and traceability. Traditionally COLEACP focused on export markets but the programme is currently also open to SMEs serving domestic markets.

PRELIMINARY CONCLUSIONS

The programmes and projects analysis has the following implications for the Embassy's intervention strategy for a Dutch funded programme supporting the development of the horticulture sector in Nigeria:

- a. Horticulture has only recently gained attention from stakeholders, and the sector does not have an appropriate public private platform for coordination and cooperation.
- b. There is a risk of overlap between programmes with focus on Kano and to some extent Kaduna.
- c. There is a risk that dependencies outside of programmes are not being addressed reducing the potential impact of a programme, this happens for example when a programme only addresses productivity but not value chain issues, or only addresses food losses but does not develop access to finance to scale a solution.

LESSONS LEARNED FROM INTERNATIONAL HORTICULTURE PROGRAMMES

The Netherlands has supported a number of large horticulture sector support programmes in Africa, notably these include: HortInvest (Rwanda), HortiFresh (Ghana/Ivory Coast), HortiLife (Ethiopia), HortiMAP (Uganda) and Hortivoire (Ivory Coast). Lessons learned from these five projects include:

- A sound technical and scaling approach is essential for increasing productivity and income of a large number of farmers. In particular the HortiLIFE project in Ethiopia has proven to reach tens of thousands of smallholder farmers through a farmer field school approach. Scale is of the essence, as it appears that with relatively basic improvements farmer productivity and income can be doubled.
- Increasing horticultural productivity can go in hand in with improving sustainability, but additional activities are needed to decrease pesticide use and increase water and nutrient use efficiency. Much progress is related to farmers' knowledge on understanding the underlying processes of plant growth and plant health (without becoming overly academic) and paying attention to service providers that can assist farmers with this.
- Large-scale demonstration and training programmes put stress on the system of input supply, and incentives can help to stimulate agrodealers and other SMEs in ensuring availability of a wide(r) range of inputs. Specific business opportunities exist for: nurseries, spray service providers and promoting new low-tech agricultural inputs (rain shelters, agro-fleece, plastic mulch, insects traps/baits, etc).
- For the higher-end SME horticulture companies, involved in production, processing and retailing of vegetables, access to finance is often the most limiting factor for growth (innovation/expansion). Blended finance (a combination of loan, grant, equity with or without additional guarantees) has proven to be successful in leveraging commercially available finance for horticulture companies (through de-risking).
- Some form of sector coordination and organisation of business platforms can be beneficial in addressing sector-wide bottlenecks and organizing B2B linkages. Including higher government officials in the organisation and implementation of such platforms increases the probability of

meaningful outcomes in the area of business climate/conducive regulations, though direct impact is often modest.

- The domestic market in most African countries is growing fast and demand for vegetables is increasing rapidly. Emphasis on export vegetables cannot be recommended. The domestic market offers sufficient business opportunities.

5. CONCLUSIONS

5.1 ADVICE ON PROGRAMME COMPONENTS AND THEIR GEOGRAPHIC SCOPE

The analyses and section preliminary conclusions can have the following implications for the Embassy's intervention strategy for a Dutch funded programme supporting the development of the horticulture sector in Nigeria:

Opportunities for Embassy involvement include:

1. Increasing productivity and income of a large number of smallholder farmers in Northern Nigeria; there is a need for smallholder capacity building to simultaneously address smallholder income and improve the sustainability of current production systems (as a form of sustainable intensification).
2. Piloting production systems' innovations and regional diversification in South-West Nigeria; there is an opportunity to include youth in agriculture through entrepreneurship, diversify national production regions and reduce impact of seasonality, while increasing food production for the population and specifically Lagos.
3. Increasing access to finance for SME companies that invest in farming and solving value chain bottlenecks at regional and national level; access to finance for SMEs could open up youth involvement, formalize farming through medium tech production systems, and resolve value chain bottlenecks through inputs provision, logistics services, aggregation and processing.
4. Enhancing sector coordination to solve sector-wide bottlenecks and increase and promote business-to-business linkages; horticulture has only recently gained attention from stakeholders, and the sector does not have an appropriate public private platform for coordination and cooperation.

Tenderers are expected to come up with an overarching integrated framework that combines the following components.

COMPONENT 1: INCREASING PRODUCTIVITY AND INCOME OF SMALLHOLDER FARMERS IN KADUNA AND KANO

For the productivity component focus is to scale out in two states: Kaduna and Kano. From a water management point of view, the smaller irrigation schemes in Kaduna and Kano look more interesting from a water use efficiency and increasing productivity point of view. Already the WB is putting a lot of resources into the large-scale public irrigation schemes (TRIMMING, APPEALS). Though the SDGP (EWS) and Seeds4Change (NABC) projects already have a number of activities in Kaduna and Kano states there is still more than enough scope for increasing productivity and income of a large amount of farmers.

The main objective of this component is to increase productivity and income for a large number of smallholder farmers in Kaduna and Kano states, in a sustainable manner. This builds on the premise that a proof of concept has been achieved on how to double productivity, reduce cost price and increase income. The next step is to bring these results to scale, aiming to reach 10,000s of smallholder farmers.

This component should address the agronomic challenges as described in chapter 2, and take into account: production planning, good agricultural practices, climate change adaptation, increasing water use efficiency, decreasing energy use, reducing pesticide use, improving soil organic matter management. This component can build on other initiatives, both by the government (e.g. NEARLS) and already running development projects.

All vegetables can be included in this component. Also for rotation and production planning purposes a wide range of vegetables seems preferable, including at least: onion, tomato, pepper, okra, cabbage, melons and leafy vegetables. Potato can be excluded as it is mainly produced in Plateau State which is not included in the geographic focus. Also fruits (apart from melons) will not be included.

Capacity building of smallholder farmers will need to take the following into account:

- Productivity can be doubled focusing on both improving input use and agronomic practices (possibly including digital tools for agronomic advice).
- Production planning can reduce the impact of seasonality and price volatility. On-farm diversification and rotation of crops can further improve farmer resilience.
- Efficient use of water and other inputs can be addressed through more knowledge-based training activities, and improvements at irrigation scheme level;
- Entry points exist to put more focus on youth and female-headed households; typically targets of resp. 50% and 20% appear feasible.

COMPONENT 2: PRODUCTION SYSTEMS INNOVATION IN OGUN AND OYO

This component aims to grow overall production volumes, reduce production risk and impact of seasonality, by piloting innovative and climate smart production systems to diversify supply in other regions. The South-West needs to develop evidence-based solutions that are cost competitive and commercially scalable. This would be a blended production system leveraging technologies that mitigate specific production challenges (climate and soil-borne disease), while maintaining affordability by using locally adapted innovations. Innovations can be developed directly with the private sector and/or research organisations.

Lagos state itself has too high cost and demand for land and we will probably not be a viable area for farming. Ogun and Oyo state are the focus regions for these pilots, offering proximity to Lagos markets combined with the ability to secure land and operate cost efficiently.

Pilots for medium tech production systems should consider:

- Product quality and production efficiency can be achieved with mid-tech greenhouses or a covered/fenced structure, planting bags with substrate, irrigation, improved inputs and professional management.
- Growing outside of the main two production seasons can reduce volatility and increase profits for involved SMEs.
- Production opportunities exist both in high-demand crops including tomato and capsicum, as well as exotic vegetables, including red and yellow bell peppers, cauliflower, herbs, spinach and a range of local vegetables.
- Cost competitiveness of new production systems is critical, to be achieved through higher productivity, quality and efficiency.

- Pilot projects should put emphasis on data collection and record keeping, allowing for a detailed analysis of both financial and agronomic indicators.
- Younger farmers in South-West are more tech savvy and heavily focused on social media to access information, and tech-based access to information should be leveraged.

COMPONENT 3: ACCESS TO FINANCE FOR SMES ADDRESSING KEY VALUE CHAIN SERVICE BOTTLENECKS

Several SME service providers have innovative ideas for access to agricultural inputs and support service providers (seeds/seedlings, crop protection products, protected cultivation, information and training), logistics services (storage as a service, crates for rent), market access (aggregation, agro-processing, innovative retail solutions B2B and B2C) or making nutritious and healthy food available to low income consumers (through processing or packaging). Scaling these innovations could address the main inputs, market and logistics issues identified in the value chain. Financial management capacity and access to finance are the main bottlenecks for these companies to expand and innovate.

This programme component would ensure that private sector investments can be made along the value chains, developing SMEs and service providers based on a proper needs and opportunities assessment. There is a preference for a blended finance approach that works directly with SMEs to raise commercial finance for company expansion and innovation plans. This programme component would also have a focus on involvement and creating opportunities for youth as well as women-led companies. The component could consider making use of business incubators and accelerators, but the emphasis should remain on increasing the actual financing of SMEs and service providers.

This component can have a national focus, with priority for those initiatives that are linked to components 1 and 2 of the programme.

The challenges with financing of horticulture SMEs call for a strategy that de-risks investments via a multi-dimensional support model, targeted at companies, lenders and support organizations with a strategic commitment to the horticulture sector.

In addition, the low share of commercial bank lending to agriculture in general, and the horticulture sector in particular, require:

- a broader counterpart focus than commercial banks. Social impact investors, MFIs, NGOs and DFIs can also be targeted.
- a broader product focus than commercial funding. Semi-commercial funding that includes non-repayable grants and repayable grants can also be targeted.

The objective of the access-to-finance component is to facilitate and expand the inflow of (semi-)commercial financing to the horticulture sector, which will remain available after the project ends.

COMPONENT 4: SECTOR COORDINATION AND B2B PLATFORMS

This component aims to promote coordination in order to avoid overlap between development projects, identify synergies and partnerships, and address sector-wide bottlenecks. The platforms are expected to include public sector, private sector and development projects. The platforms can also provide government organisations a platform to present and discuss their plans, as well as hold them accountable for certain policy measures ('speaking truth to power'). Specific sector studies, developed

by the programme, can be used as input for discussion, but also other projects can be asked to co-host the platform. From the start, platforms should look at sustaining its activities beyond the life of the project, looking at opportunities for private and public (co-)funding.

Current bottlenecks identified include for example availability of specialized (soluble) fertilizer, introduction of biological control products, usage of crates and promoting collection centres (in places like Kano and Kaduna), food safety issues, and the formulation of a joint action plan for combating ‘tuta absoluta’.

Sector and B2B platforms are expected to be national, although regional coordination in chapters may have added value to address specific issues and facilitate networking and knowledge sharing.

COMPONENT 5: PROJECT MANAGEMENT AND IMPACT MEASUREMENT

This component should take care of all personnel overheads, office facilities, utilities and vehicles.

Impact measurement will require additional emphasis. Especially for component 1 there is a desire to investigate more intensively how, why and where results are being achieved; and how this can be used in the scaling out process. It is worth considering using an independent organisation for this that applies statistically sound monitoring and evaluation methods.