



Ministry of Foreign Affairs

UNDERSTANDING THE ANGOLAN POTATO SECTOR

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UNDERSTANDING THE ANGOLAN POTATO SECTOR

A view of the current situation and opportunities for development



Provided for:

RVO – The Netherlands Enterprise Agency (RVO)
The Embassy of the Kingdom of the Netherlands in Luanda

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List of abbreviations and acronyms

AIPEX	Agency for Private Investment and Promotion of Exports of Angola
AOA	Angolan kwanza
BDA	Banco de Desenvolvimento de Angola (Development Bank of Angola)
CIP	International Potato Centre
DM	Dry Matter
EDA	Estação de Desenvolvimento Agrícola (agricultural development station)
EKN	Embassy of the Kingdom of the Netherlands
FAO	Food and Agriculture Organization of the United Nations
FAS	Fundo de Apoio Social (Social Support Fund)
FFS	Farmer field schools
HZPC	Seed potato breeder and supplier, NL
IDA	Institute for Agricultural Development
IDH	Sustainable Trade Initiative
IDH Farmfit	Public-private impact fund for smallholder farmers, IDH
IIA	Instituto de Investigação Agronómica (institute of research, development, and innovation, MOA)
MOA	Ministry of Agriculture
MOSAP	Market-oriented Smallholder Agriculture Project, FAO
NAO	Nederlandse Aardappel Organisatie (Dutch Potato Organisation)
NL	The Netherlands
NFP	Netherlands Food Partnership
NGO	Non-government organisation
OECD	Organisation for Economic Co-operation and Development
PRODESI	Programme to support production, export diversification and import substitution, Ministry of Economy and Planning
RVO	Rijksdienst voor ondernemend Nederland (Netherlands Enterprise Agency)
SENSE	Serviço Nacional de Sementes (National Seed Service)
SDM	Service delivery models
SME	Small and medium enterprise
STET	STET Potato Ltd. Potato breeder, producer, and supplier, NL
SWOT analysis	Strengths, weaknesses, opportunities, threats analysis
TPC	The Potato Company. Potato breeder, producer and supplier, NL
UCP	Uniform customs and practice
USAID	United States Agency for International Aid

Executive summary

The potato sector in Angola shows great potential to achieve higher productivity, enhance value chains and operate under an effective enabling environment. In this report, we discuss the current situation in the sector and identify the recurring (systemic) challenges that hamper it. In the last section of this report we recommend seven strategic pathways to unlock the potential of the sector, and several business opportunities to accelerate growth in the short term.

Potato production varies according to the type of farmer engaged: subsistence, small-scale, medium-scale and commercial. Each farmer type experiences different constraints in their business. Nevertheless, the most recurring issues are generally limited access to affordable credit; poor availability and access to quality seed potato and inputs; and the high impact of extreme weather. As production systems become more intensive, yields increase from 3 tn/ha to more than 20 tn/ha reported by medium scale farmers, and above 35 tn/ha in commercial farms. At the moment, less than a handful of farmers are producing seed tubers for the market. Subsistence and small-scale farmers tend to recycle their seeds, while medium-scale and commercial farmers renew their seed stock gradually, throughout a few seasons, by purchasing imported seed tubers. To acquire knowledge, the main resort of farmers (especially subsistence and small-scale farmers) is extension officers. Unfortunately, extension services remain understaffed and wide-ranging.

Farming cooperatives help members access inputs and find markets for their produce. The way a cooperative is organized varies, but overall it features willingness for collaboration among members and joint action. Cooperatives' approaches to delivering services can be developed further.

Beyond production, the generic potato value chain is highly fragmented, sees little trust among actors and is loosely governed. Consumer demand for potato is high but not yet met by national production. Across the border, demand continues to increase. Provision of services also shows room for growth, for example in crop insurance, soil testing or potato-specific chemical and fertilizer products.

At national level, the Government of Angola is yet to introduce potato-specific laws and regulations. Nevertheless, procedures for the importation of tubers and registration of new varieties are comprehensive and uncomplicated. On the other hand, potato varieties do not possess protection in Angola, which discourages international seed companies from establishing local multiplication schemes with partner companies. Another factor that used to hamper companies' ability to do business in Angola was foreign exchange transactions. However these, according to the financial institutions and experts interviewed, have considerably improved in the past 2 years, down to 15-30 days for completion.

(Low-hanging) opportunities in the potato sector can be categorized in seven areas: 1) capacity building, 2) holistic service packages for SME farmers, 3) local seed multiplication schemes, 4) climate-smart farming, 5) market pull-through supply to the processing industry, 6) potato-specific inputs, 7) operational cold storage.

When an inclusive, longer-term transformation of the sector is pursued, the following strategic pathways categorized according to the potato sector transformation framework are recommended:

- Explore a certification scheme that helps farmers capture value and entails them (and prospective growers) to produce high quality potatoes.
- Boost the engagement of (improved) extension services with farmers.
- Investigate the impact of a sector platform or network to increase collaboration (and future coordination) in the sector.
- Stimulate the registration and multiplication of modern varieties.
- Foster the supply of clean and healthy seed tubers through importation and national sources.
- Develop the capacities of small and medium scale farmers through an inclusive capacity-building programme.
- Enhance (market) linkages and boost services in the value chains.

1. Introduction

As the third largest Sub-Saharan country, Angola has more than 29 million inhabitants spread over a surface of 1,246,700 km², mostly in large cities such as Luanda, Benguela or Huíla (World Bank, 2019). Marked by rapid urbanization, about 40% of Angola's population is living in the north-western and western rural areas, mostly depending on agriculture as a means of subsistence. The country faced a civil war for 27 years, which ended in 2002. Since then, the country's economy has grown steadily, with one of the highest GDP growth rates in the world (11.6%). At the centre of this rapid growth is a leading oil industry, only second to Africa's largest oil producer, Nigeria, and representing over 90% of export revenues and one third of GDP.

Agriculture is the third largest contributor to the GDP, having an annual average share of approximately 5.5%. Angola agricultural land is approximately 57.4 million hectares, however only a fraction of this area is currently cultivated, estimated at 8-14% (World Bank Group, 2021). The country however has enormous potential to increase cropped areas and to raise yields through use of improved technology, use of modern agricultural inputs, irrigation, and improved extension services. Lower oil prices and the consequent currency devaluation have increased incentives for domestic agricultural production (IFAD, 2017).

In 2013, the Food and Agriculture Organisation (FAO) stated that, even though large improvements have been made in previous years, Angolan inhabitants are still subject to food insecurity and undernourishment both in rural and urban areas. Although the agricultural sector is thriving, Angola is still importing food crops and horticultural products to meet their food requirements. The Angolan government is undertaking a reform of its economy through the diversification of its activities outside of oil extraction and in particular through the development of the agricultural and private sectors (IFAD, 2018; Carranza et al., 2014; Dijkxhoorn and Wijnands, 2012; World Bank 2019).

In March 2020 a business mission was organised by the Netherlands Enterprise Agency (RVO) to explore opportunities in agri-business in Angola. On this occasion, it appeared that there is untapped potential in the production of potato. Potato is a known crop in Angola, as it was introduced by the Portuguese in the 17th century. Currently, the main production areas for horticulture (including potato production) are in the provinces Huíla, Huambo and Benguela. Angola presents good conditions for the growth of potato in terms of land availability, soil quality and climate conditions. Productivity is however still low and there are opportunities for improvements at all levels of the value chain (Dijkxhoorn and Wijnands, 2012).

However, bringing about change to the sector requires understanding of the sector, its key activities and actors and systemic bottlenecks. As there is little recent information available specifically on the Angolan potato sector, the purpose of this study is to provide an overview of the current situation as well as to propose possible pathways for sector development.

2. Methodology

2.1 Data collection

a) Desk research

Desk research resulted in an overview of the following: historical developments; the structure and size of the potato sector (including farmers, cooperatives, input suppliers, and local networks); export regulations and requirements for potato; the current market; and the players within the potato sector of Angola. It also resulted in a list of interviewees in the Netherlands and Angola and preparation for interviews. Interviewees were selected to provide an exhaustive view of the complete value chain; for this reason the list included stakeholders from as many different segments of the value chain as possible.

b) Implementation

The main methods of data collection have been field observation and interviews with key stakeholders both in the Netherlands and in Angola. Interviews were performed by using several leading questions that had been identified in the desk research and took place both online and in real life. The full list of interviewees can be found in Annex 1.

The visit took place from the 19th to the 26th of November 2021. Given the short duration, the visit focused on the area between Luanda and Huambo. Whenever possible the local authorities were informed and engaged, particularly the Ministry of Agriculture. Governmental extension officers were also involved in identifying additional interviewees at district level.

During the visit, a focus group discussion (FGD) was held for two cooperatives, their members, and the local extension services representatives. During this discussion the main challenges for this group of stakeholders were identified and prioritised. The multi-stakeholder composition of FGDs ensures insights into and ownership of the challenges and ambitions. The results of this session are included in the report.

c) Validation meeting

The validation meeting was organised as an interactive online event in which the preliminary results of the study were presented to the relevant stakeholders in the potato sector including *the Embassy of the Kingdom of the Netherlands (EKN) in Angola*, and RVO. On this occasion the stakeholders had an opportunity to provide feedback on the results, which was in turn integrated into the final report.

2.2 Analysis

The study utilizes the integrated sector and food system framework, as developed by Borman et al. (2022), in order to analyse the sector and identify key bottlenecks.

The food systems approach is increasingly used as an interdisciplinary conceptual framework to better understand the complexity of food systems, including its interrelated drivers, and its transitions in the supply of healthy food, sustainable resource use, and social inclusion. Moreover, food systems are widely used to drive policy instruments; the international development policies of the Government of the Netherlands, for example, are aimed at sustainable solutions for the food and agricultural sectors (Van Berkum et al., 2018).

Sector transformation is a subset of the food systems approach that focuses on one agri-food sector within the larger food system. Sector transformation takes into consideration the production and market base, their relationships with services, finance, and regulations, but also governance and coordination. The sector framework has been closely linked to the food system framework with its food security and nutrition, socio-economic and environmental outcomes.

Figure 1 shows how agri-food sectors can be integrated in the food system framework:

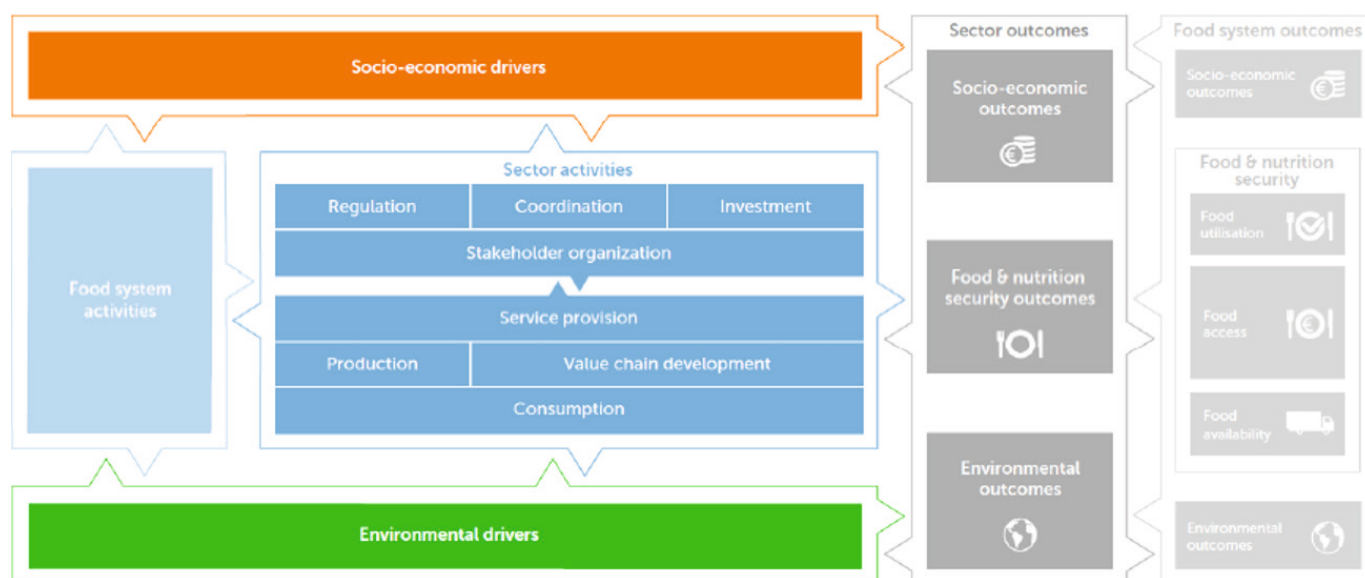


Figure 1. The Integrated sector and food system framework. Source: Borman et al., 2021.

The methodology for the assessment of the potato sector in Angola revolved around the integrated sector and food system framework (figure 1). In short, the potato sector in Angola was analysed according to two steps, each corresponding to one chapter of this report.

1. Analysing sector activities and drivers including production in the prominent growing areas, current value chain functions such as transport, wholesaling, retailing, sector governance (incl. regulations, coordination, investment). This also included analysis of socio-economic factors such as current income and employment opportunities and environmental drivers. This aspect of the research is elaborated in chapter 2.
2. Understanding the main strengths, weaknesses, opportunities, and threats of the sector, and consolidating them in opportunities for short and medium-term growth and actionable sector-wide strategic pathways for development, which are further exposed in chapter 3.

3. The Angolan potato sector

Production areas and climate

The main potato production areas are located in the Huambo province (main producing province), and surrounding areas from neighbouring provinces of Bié and Cuanza Sul. In these areas, potato production takes place at an altitude of 1,800 to 2,000 metres. Not as prominent, yet important for the sector are the provinces of Huila in the South-West and Malanje in the North. Larger zones in the Benguela (with warm, dry, and humid climates), Namibe, Cuanza Sul and Huila provinces are considered as potential production zones with favourable agroclimatic conditions.

Angolan agroclimatic conditions allow the growing of potatoes two to three times a year, twice in the rainy season between October and January and between February and May, and once in the dry season between June and September (Dijkxhoorn & Wijnands, 2012). Other sources give different planting periods: January, April, and August (Chaves et al., 2009), probably depending on the altitude and agro-climatic conditions.

Table 1 provides an overview of the production calendar for potatoes according to a study by Demo et al. (2006).

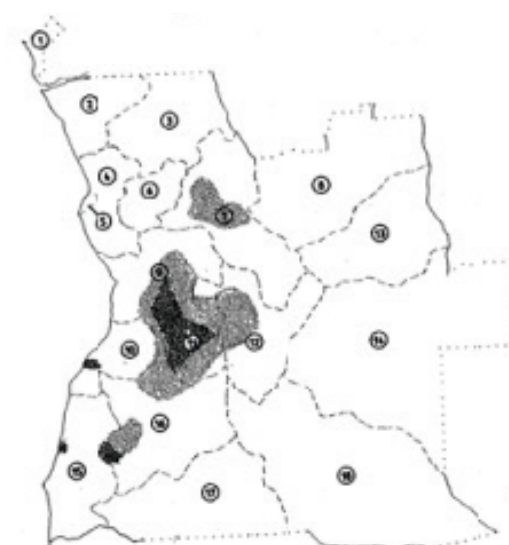
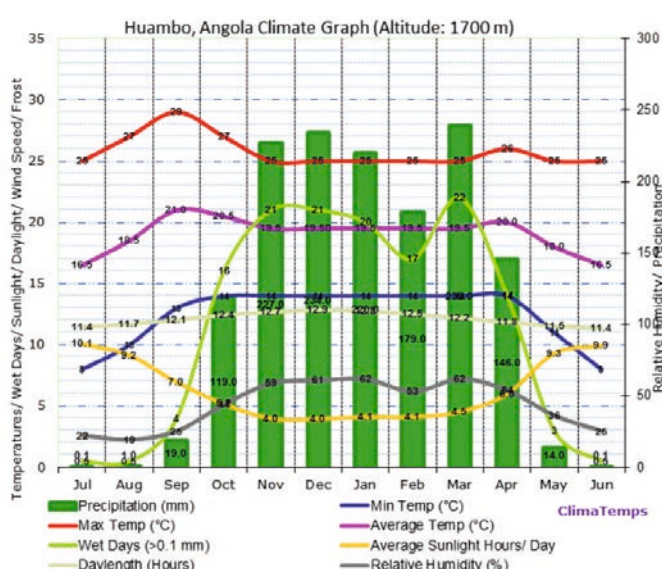


Figure 2. Climate in Huambo throughout the year and current (on the left) and favourable (on the right) areas for potato production in Angola. Source: huambo.climatemps.com and Diniz, 1991.

Table 1. Major rainfed and irrigated production periods for potato by area in Angola. Source: Demo et al., 2006.

Crops per year	Month															
	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT		
Benguela																
Huambo/ Bié																
Huila																
Namibe																

Light red box: Rainfed production
 Dark red box: Irrigation production

Production and productivity

The figure below shows that the impact of the Angolan war is visible before 2002, with a low area harvested and a low production. Nevertheless, between 2002 and 2005, the area harvested more than tripled before varying between 50,000 and 100,000 ha to stabilize between around 60,000 ha. The production level steadily increased following the change in the area harvested, but continued to increase until 2011 before decreasing in relation to a lower area harvested. Production also decreased because of poor crop rotation and therefore increased pest and disease pressure. The yield level notably increased between 2004 and 2008 reaching a value above 8 tons/ha before decreasing to 7 tons/ha.

Yield levels on average are low because of the use of small and sometimes diseased tubers; low application of Good Agricultural Practices particularly related to fertilization, crop protection and poor crop rotation (Dijkxhoorn & Wijnands, 2012). The impact of the COVID-19 pandemic has been felt in rural communities, with a sharp increase in prices of production; a reduction of the availability of labourers; a reduction of the area cultivated and production; and a reduction of food sales at local level, compared to the situation before COVID-19. COVID-19 has also reduced the financial capacity of the rural communities to afford the means of production, including labour and inputs (Quissindo et al., 2021).

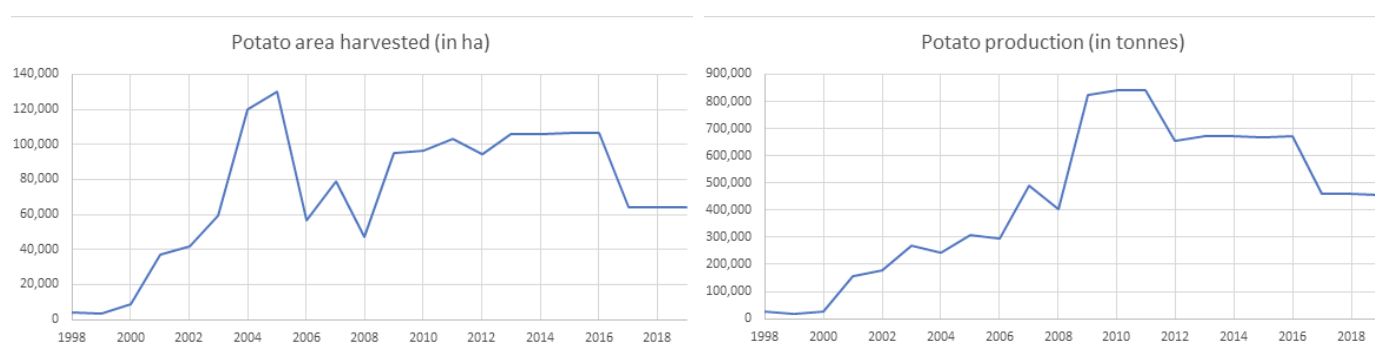


Figure 3. Data on total amounts for Angola of potato area harvested, overall production in tonnes per ha. Source: FAOSTAT b, 2019.

3.1 Production systems

Most potato farms are family based, operating on a relatively small-scale basis, and mainly for subsistence. The average size of land per farm is 1.4 ha. An important part of agricultural production takes place in the Highlands of Central Angola while in the North-western areas there are fewer agricultural activities and only at a subsistence level. It was estimated that commercial growers' potato cultivation areas represented 32% of the total potato cultivation in Angola while producing 37% of the total production. Consequently, small-scale potato farming represents around 2/3 of the production (Carranza et al., 2014; Dijkxhoorn & Wijnands, 2012).

Overall, we can subdivide producers into three main categories: subsistence farmers, small and medium enterprise (SME) farmers, and commercial farmers. A quick look of the characteristics of these categories can be found in Table 2.

Table 2. Characteristics of the different types of farmers. Based on own observations and complemented with information from Dijkxhoorn & Wijnands, 2012 and FAS, 2014.

DEFINITION	SUBSISTENCE FARMER	SME FARMER		COMMERCIAL FARMER
		Small holder	Medium holder	
Type of production	Subsistence production	Production with small surplus	Production with surplus	Commercial production
Area cultivated (all crops)	0-1 ha	1-5 ha	5-20 ha	>20 ha
Productivity	3-5 tonnes/ha	8-12 tonnes/ha	10-20 tonnes/ha	35-60 tonnes/ha
Seeds	Farmer-saved seed from the informal market.	Farmer-saved seed from improved varieties.	Farmer-saved seed from improved varieties.	Own saved seeds complemented with improved seeds
Labour	Family labour	Family and seasonal labour	Family and seasonal labour	Seasonal and full-time labour
Access to market	Low: difficulties in paying transportation costs	Low/medium: some possibilities to pay for transport individually or collectively	Medium: some possibilities to pay for transport individually or collectively	High: possibilities to pay for transport and often own trucks.
Level of mechanisation	Low: hand tools and animal traction	Low to medium: hand tools, animal traction	Medium: hand tools, animal traction and rented tractors	Advanced: rented and own mechanisation
Inputs use	Low: rare use of manure, low use of fertilisers and pesticides	Medium: utilises bought manure. Regular use of fertilisers and pesticides	Medium: utilises bought manure. Regular use of fertilisers and pesticides	High: intensive use of chemicals

1) Subsistence farmer

These are peasant families who cultivate small plots of land for subsistence. The area cultivated can be as little as half a hectare, with little to no rotation of crops practised. About 70% of all rural inhabitants are estimated to belong to this group (Embassy of India, 2021). This group is characterized by limited capacity to purchase agricultural inputs (manure, fertilizers, correctives, phytopharmaceuticals) or external labour. All activities are usually performed by family members. They purchase local farmer-saved seeds or use their own saved seeds from the previous season. Limited availability of land means that crops are often intercropped (Figure 5), spatial planning or crop rotation, resulting in the accumulation of latent diseases in the soil. In general, this group of farmers lack modern knowledge and skills based around agronomy, business management and production planning as well as steady access to markets. Crop productivity in farming systems practised by small-scale farmers is usually very low, usually averaging 4 tonnes per ha up to maximum 7 tonnes/ha (FAS, 2014).

2) SME farmers.

These are small and medium sized producers that distinguish themselves from the previous group by a generally larger access to land. They usually only cultivate a fraction, as they have limited capacity to pay for labour or mechanisation (animal traction or tractor) and limited capacity to purchase a greater amount of inputs. The farmers of this group that were interviewed had insufficient capacity to cultivate up to 20 ha, while the land they actually owned was up to 220 ha. The majority of farmers in this category cultivate rainfed crops.

Farmers in this group usually have higher productivity than subsistence farmers. In the areas visited, productivity ranges between 12-15 tonnes/ha. However, it must be mentioned that these are areas in which production is considered exceptionally good. Productivity is usually lower and decreasing due to the recycling of seed potato over time. SME producers are generally organised in associations or cooperatives, which channel government subsidies as well as facilitate access to the market. They have a slightly higher level of capitalization, either through their own resources or through micro-credits.



Figure 4. potatoes field cultivated to produce farmer-saved seed potatoes. The ploughing is done mechanically while the rest of the activities is done by hand. The farmer interviewed admittedly does not utilise a standard spacing for seed potato.



Figure 5. Maize and potatoes intercropped on a subsistence plot.

3) Commercial farmers.

Commercial farmers own and cultivate large areas of land. Among the farms visited, land areas owned varied between 600 and 9000 ha, while the percentage of area cultivated was very variable and in some places as low as 30%. Commercial farmers have access to high quality inputs such as seeds and fertilizers. They usually own the machinery for land preparation, planting, and harvest, and have set up irrigation schemes (pivots). In some cases these large enterprises are owned by a larger company e.g. retail, that secures its supply in this way. These large farms sell mainly to the formal retail sector, but some of them are also reported to sell through the informal market.



Figure 6. Mechanised harvest at Novagrolider farm. The potatoes are dug out mechanically and collected by hand into big bags.

3.2 General characteristics of the potato crop in Angola:

- **Productivity.** In 2010-2011, the yield of SME growers was estimated at 9.4 tons/ha, while subsistence farms had a yield of 3-5 tons/ha, which remains far lower than neighbouring South Africa with an average yield of 35 tons/ha (Dijkxhoorn & Wijnands, 2012). A few municipalities surrounding Huambo (Ekhunya and Ekahala among others) have a higher average productivity, up to 12-15 ton/ha. However this productivity is reported to be decreasing (10 tonnes/ha) because of the repeated recycling of seeds.
- **Irrigation.** All subsistence farmers, as well as most SME farmers, cultivate potatoes in rainfed systems and are therefore not able to produce during the dry season unless they can access irrigation. Large scale farms usually have irrigation pivots, but these are not always sufficient to cover the whole farm area.
- **Inputs.** All chemicals are imported and very expensive due to the exchange rate of AOA. It is a common practice for large scale farmers to import seed tubers from international exporters annually or every few years. The importation of seed tubers remains only a small fraction of the tubers used for planting in the country. With this limited importation farmers intend to replenish part of their seed stock and avoid planting highly degenerated tubers. SME farmers purchase seed tubers through the cooperative, local agri-input shop or from other farmers. The quality varies considerably as the seed potatoes available in the shops and purchased from commercial farmers can be directly imported but are more often 1st or 2nd generation farmer saved seeds. Cooperatives report that inputs arrive often later than agreed, resulting in delayed planting, and thus constraining yields at the end of the crop. As mentioned earlier, farmers use mostly farm-saved seed tubers because of the high price of certified seeds, but also because of the limited availability of seed potato (the last time it was available was in May).
- **Fertilizers.** The supply of fertilizers is unreliable: a single supplier is usually only able to provide between 50-80% of one farmer's needs. The COVID-19 pandemic has reduced inputs and the mobility of people even more, which has put pressure on the farmers to access good-quality inputs, technical

assistance to the production and markets (Quissindo et al., 2021). The main fertilizers used are NPK 12-24-12 and urea. Fertilizers are expensive and not easily accessible to SME and subsistence farmers. At the same time, during the interviews some actors shared that SME farmers often use more fertilizers than necessary as they do not have the knowledge of how to dose them appropriately. If this is the case, there may be opportunities to reduce the costs of production by implementing training on fertilizer use.

- **Pest pressure and crop protection.** According to the IIA, pest management is an issue of increasing importance, as different types of pests and diseases increase. Pest control is less challenging in the dry season (June to September), because of less favourable conditions for the spread of disease; this is also said to reduce the cost of production considerably. The only pesticide mentioned by farmers during the interviews was Mancozeb. Disease pressure is said to be high, particularly due to soil-borne diseases due to a poor crop rotation. New production or multiplication would be required to make use of new land. The main pests and diseases mentioned are:
 - bacterial wilt
 - early blight
 - viruses (general)
 - 'trajas', a type of larva that nests in the seeds
- **Rotation.** Subsistence farmers do not often practice crop rotation, due to the small size of the land. Other groups of farmers usually do so. Common crops rotated with potatoes are maize, cabbage, onions, and beans. SME farmers who have more land than they can cultivate also sometimes leave the land fallow for one or two cycles to allow it to recover and to reduce pest pressure. Commercial farmers can also be hindered in implementing crop rotation as sometimes the limitation can be the amount of irrigation pivots that they have..
- **Credit.** Access to credit through banks is complicated and expensive according to all farmers interviewed. In the case of cooperatives, farmers can access a loan from the state, however once divided among the members of the cooperative this only amounts to 200,000 AOA per farmer (about 300 EURO) which is about 10% of the amount needed to cultivate one hectare of potato. Commercial farmers also prefer to rely on their own finances for investments rather than on formal banks. Only a minority of medium and large-scale farmers, close to urban areas, have access to credit from national banks. Microcredit opportunities have slowly started to appear, particularly through the PRODESI program or from NGO and external donor projects. The government runs a development bank, the Banco de Desenvolvimento de Angola (BDA) which finances some legally registered projects and businesses; it therefore often fails to reach out to small-scale farmers due to difficult legal procedures (Dijkxhoorn & Wijnands, 2012; Governo da República de Angola, 2022).
- **Production costs.** The cost of production is estimated at 2,000,000 AOA during the interviews per ha of potato. In the dry season the price is lower because less pesticides are required as disease incidence is reduced (about 1,500,000 AOA).
- **Certification.** Certification is not implemented at any stage; producers are responsible for their own quality.
- **Mechanisation.** Land preparation activities can be done by machinery or by using animal traction. SME farmers usually rent tractor services from the cooperative or a private provider. One hour of ploughing with a tractor costs between 7,000 and 9,000 AOA and one hectare (with heavy soil) can require up to 12 hours. Commercial farms own their own tractors and other machinery, but some activities, like the collection of tubers, can still be performed by hand.
- **Labour.** A farm labourer costs about 1,000 AOA per day of work (about 1.7 euro). Improving the performance of the potato value chain may firstly lead to more jobs created, but not necessarily to better paying jobs, especially when it comes to production-related jobs.

3.3 Economic analysis of potato production

An economic analysis of potato production has been performed to estimate the economic performance of potato production depending on different production practices and yield levels. The complete economic analysis can be found in Annex 2.

Today, yield levels are considered on average to oscillate between 7 to 8 tons per ha. Nevertheless, commercial farmers can reach a yield around 16 tons per ha. A yield of 30 tons per ha is rare in Angola but assumed to be reached by those few farmers who have access to improved inputs and equipment as well as more extensive knowledge than smaller scale farmers.

Firstly, costs have been calculated:

- variable costs (equivalent to the costs of production)
- fixed costs including the transportation, packaging, storage and offloading of the production paid by the farmers. Equipment maintenance (e.g. machinery, irrigation systems) has not been included in the fixed costs calculations.

Secondly, benefits have been estimated depending on the yield level and two prices:

- The farm gate price given by the buyer (6,250 AOA per crate of 22 kg so a price of 284 AOA/kg)
- The price indicated on roadside stalls (10,000 AOA per crate, so a price of 455 AOA/kg).

Post-harvest losses, variable but estimated at around 10% of the production, have not been considered in estimating the benefits.

Eventually, profits are calculated by subtracting the total costs from the benefits and prices for each yield level.

Table 3. Economic analysis of potato production in Angola

	Yield of 8 t/ha	Yield of 16 t/ha	Yield of 30 t/ha
Costs (in AOA/ha)			
Variable costs	1,486,000	3,172,000	3,172,000
Fixed costs	356,400	866,700	1,080,000
Total costs	1,842,400	4,038,700	4,252,000
Benefits (in AOA/ha)			
Benefits (Price 284 AOA/kg)	1,846,000	4,544,000	8,520,000
Benefits (Price 455 AOA/kg)	2,957,500	7,280,000	13,650,000
Profits (in AOA/ha)			
Profits (Price 284 AOA/kg)	3,600	505,300	4,268,000
Profits (Price 455 AOA/kg)	1,115,100	3,241,300	9,398,000

The analysis of the projections made through this economic analysis shows that potato production, notably among subsistence and small-scale farmers with limited access to improved inputs and technical support, generates a limited yield level of 8 t/ha that is rather unprofitable. Stemming from field interviews, although external inputs such as fertilizers and pesticides are being used even among small-scale farmers, they are believed to be often overused and misused, impacting negatively on the agronomic and economic performance of potato production. In addition, the large share of rainfed production might still suffer from lack of irrigation. Due to the limited profits generated from the production, farmers are barely able to reinvest into their production activity, and they do not have access to the adapted advisory services required to improve their performance.

However, when looking at the improved yield level of 16 t/ha that has already been reached by more advanced farmers as well as farmers in neighbouring countries, it is clear that the profitability level is already higher for some, substantiating real potentialities of potato production as a sustainable activity for farmers in Angola.

Low profit margins, financial capital or access to credits make small-scale farmers unable to invest significantly in their production, for example in relatively expensive certified seed materials. Therefore low-cost technologies and solutions, as well as capacity-building interventions, could help to improve the agronomic (increase in yield level) and economic performance (reduction of costs, improved profits) of a large number of small-scale producers. Considering the favourable climatic conditions as well as the existence of improved technologies and adapted advisory services, more significant yield levels (around 30 t/ha, as projected in the economic analysis realized in this report) could be reached.

3.4 Producer associations

For SME and subsistence farmers, cooperatives play a role in channelling subsidies and funding from state and financial programs, as well as supporting marketing and finding suitable buyers. Based on our observations and available literature it remains unclear what impact these organizations have on improving the position of farmers in the sector. It was reported however that some of the supermarket chains do source fresh potatoes directly from cooperatives. This is a segment that a single SME farmer would not be able to serve on his or her own.

3.5 Input and service provision

3.5.1 Input suppliers

The segment is responsible for supplying the basic inputs needed to produce potatoes, including seed potatoes, fertilizers, phytopharmaceuticals, machinery, equipment, tools, technology, credit, and technical assistance. Within this segment we can identify different agents.

1. Government agencies.

State sector agents are the IDA/EDA, municipal administrations, and the provincial directorates of agriculture. The provision of highly subsidised inputs such as fertilisers and in some cases seed potatoes is one of the activities of the IDA. The target group of this activity are subsistence farmers, SME farmers members of cooperatives.

For cooperatives, fertilizer bags of the value of 25,000 AOA can be purchased for 5,000 AOA through IDA. The cooperatives interviewed report this benefit to be insufficient as they are only able to access about four or five 50 kg bags for the whole cooperative at this price, which is not enough to support all members.

2. Private sector.

Specialized companies are the main agents involved in the supply of inputs; they are often located in the main municipalities. In Huambo for instance there are a few stores (FertiAngola, Promodes, Angopri), but no company is specialized in smaller settlements around the city. Companies reported that they sometimes also have shortages of inputs, including seed potatoes, fertilizers, and agrochemicals, due to supply failures by importers. Usually these companies do not deliver directly to the producers unless large quantities are purchased, in which case the transport cost is borne by the buyer. Associations and cooperatives also sell inputs to smallholder farmers, as well as some NGOs within the scope of ongoing projects or protocols with official entities.

3. International suppliers.

Large scale enterprises can import inputs such as fertilizers and pesticides as well as seed potatoes in bulk through sea freight. Fertilizers and chemicals come from different origins (Portugal, Spain) while all the seed potatoes reported during the interviews came from the Netherlands. The suppliers in these cases were SchaapHolland, STET, HZCP and TPC.

4. Informal sector.

Some basic inputs are also available in the informal market, including seed potatoes, fertilizers, some equipment, and tools. Informal markets are a source of inputs mainly for subsistence farmers who do not have capital and lack access to specialized stores.

3.5.2 Seed potatoes

Most seed potato in the market comes from the informal sector, as small-scale farmers and even commercial farmers sell tubers as seed potato to the surrounding producers. Some commercial farmers that can import inputs in bulk also trade them to smaller scale farmers. Currently, tubers are usually sorted by size, where smaller sized tubers are kept as planting material for the next year or sold to other farmers.

Overall, there is a shortage of quality seed potatoes. In absolute terms, there is not enough production of seed potato (both formal and informal) at national level to satisfy the local demand, particularly at the time of planting. At the same time, SME farmers perceive the prices of certified seed potatoes (1,000-1,200 AOA/kg) as too high and prefer therefore to utilise their own farm-saved seed.

In response to the known shortage of high-quality tubers for planting, some of the SME farmers interviewed have devoted a considerable part of their potato production (in some cases up to 60%) specifically to grow potatoes that are sold as seed tubers. In this case, although farmers reported narrower spacing, production practices are largely like those of ware potato.



Figure 7. This medium-holder farmer has devoted 60% of his potato area to producing potatoes to be sold as seeds. In the picture you see him with his seed potatoes for the next season.

The seed tubers produced are not certified and have lower quality standards than the seed potatoes imported from abroad. Especially in SME farms, seed potato is not screened before storage, leading to lower quality tubers and stagnant yields (combined with other factors). Seed tubers produced by commercial farms are usually of higher quality and sold at a higher price than those of small-scale and commercial farmers. Table 3 provides an overview of the cost of seed potato in AOA per kg from different sources.

Potato varieties that have been mentioned are Chapa5, Romana (liked by consumers due to high DM) and Jona by SME farmers, while commercial farmers usually mention more recent potato varieties by Dutch suppliers like Safari, Cartagena or Montecarlo. During a project with the CIP, IIA performed trials and selected from an initial 72 varieties of potato imported from Kenya, which resulted in the identification of one variety suitable for Angola. This variety is called Rosa and it is in the process of multiplication by Jardin Da Joba; it is registered as a CIP-IIA variety with agreed breeders rights.

Interestingly, most commercial farmers report that seed potatoes produced from the first generation of imported potatoes tend to outperform the imported seed potatoes themselves. Based on field observations, they theorized that this might be due to a 'climatization' process. The potatoes coming directly from a different continent would be used to different soils and climate conditions and therefore need a cycle to adapt to the local circumstances.

Table 4. Potato prices collected during visit

PRODUCT	PRICE IN AOA/KG
Ware potato (Farmgate, SME farmer)	284
Seed potato (Farmgate, SME Farmer)	455
Seed potato (Jardin da Yoba)	1,000
Seed potato imported (certified)	1,200

It is worth mentioning that among the interviewed commercial farmers, only one (at the time of writing) is currently aiming to profile himself as a seed potato multiplier. The company is already active in the multiplication of seeds from other crops (e.g. maize) as well as potato seed tubers. Their potato is uncertified as there is no certification system in the country, but they are currently trying to follow European standards. Their seed potato production is currently 600 tons/year and there is interest in expanding production; however, capacity investment is needed to increase production and lower costs, in order to make seed potato available for a larger target group. Other interested investors are also likely but need to be identified.

3.5.3 Services

Knowledge and capacity building

- The Institute for Agricultural Development (IDA) is the public institution responsible for the provision of technical assistance to SME farmers and subsistence farmers. For this purpose, the IDA also collaborates with international institutions such as FAO. IDA staff members are usually trained as generalists and there are only a few officers specialising in one crop. In Huambo province there is no potato specialist among the IDA staff. The number of extension officers is low compared to the number of farmers in need of new or modern knowledge on potato production. Currently, 700 agronomists and technicians are estimated to serve 4 million smallholders, with a ratio of 1 to 5722 (World Bank, 2021).
- In Huambo, each extension officer needs to support 32 farmer field schools with 35 members each. As expressed by some of them during the interviews; "there are few incentives to go to the field as maintenance of the motorbikes and fuel costs for transportation to the field are to be paid by us, while our average salary is between 100 and 200 EUR per month". As a result, motorbikes are often not well maintained, resulting in malfunctioning and potential threats to personal safety of the staff.

- FAO is also active in the potato sector with the project 'Market-oriented Smallholder Agriculture Project' (MOSAP) II which follows on MOSAP I (2013-2016). The program will continue until April 2022 and may be followed by a third phase. Within this project, a network of farmer field schools (FFS) has been established where local farmers receive knowledge on good agricultural practices in selected value chains (maize, beans, cassava, and potato). Each group determines its own focus and curriculum. By using the FFS approach, the project aims to disseminate knowledge about these crops in the communities of Huambo, Bie and Melanje. Within the program there are three levels of training: training of IDA staff, training of FFS facilitators, and training of FFS members (farmers).
- During the last decade several projects organized by large organizations such as FAO, World Vision, CIP or USAID have aimed at building the capacity of the rural communities and cooperatives and increasing farmers' income through technical training and support on basic and good agricultural practices.

Soil testing

- Soil testing is not considered by SME farmers due to the high cost and the lack of an operational testing facility in their vicinity. SME farmers report that in the past they were able to access such services through NGOs, which allowed farmers to understand how proper fertilization under the reigning soil conditions would lead to higher yields. It is not known which institutions are able to provide soil testing locally.

Information and data

1. Mavo Diami ('Our Land' in local dialect) project. The purpose of the Mavo Diami project is to promote sustainable food and income security for more than 100,000 smallholder farmers. To reach their objective, Mavo Diami's services focus on providing weather, soil and crop data, among others optimizing farmers' production and yields. Within the project Mavo Diami the start-up Kres has been created, which provides information around agrometeorological information to small, medium and large holders in Angola and will bring on these services once the project is finalised. They have developed an application to be used within the Telegram app platform and are working on expansion with additional modules (for instance, soil, fertilisation, and pests). They are also interested in developing crop-specific services. Currently 6,500 growers are registered, and 600 agents are hired, some of whom also work for the IDA. Agents sell services of Kres but also identify needs at field level.
2. Kepia. Kepia is an online platform that links producers with input providers and with buyers. They also try to expand credit with microcredit mobile phone options. Their product is a component of the KRES product. They have several small warehouses for SME farmers, called 'farmers' service centres', that are simultaneously pick-up points for inputs, shops and (uncooled) storage for the products sold.

3.6 Value chains

The potato value chain in Angola can be categorized in several pathways (or flows) through which the crop reaches the final consumers. A remarkable feature of the Angolan potato sector is the fact that several actors engage simultaneously in multiple steps of the value chain and in some cases for both ware and seed potato. This is partially due to a lack of trust and transparency between producers, buyers, and wholesalers, that motivates each actor to try to manage as many steps as possible of the value chain by him/herself.

Within the generic value chain, we distinguish the ware potato and the seed-potato value chains. Figure 4 provides an overview of the pathways through which ware potato reaches the final consumer. The main ones are as follows:

- *Producer to consumer*: virtually all potato producers engage in direct sales. These sales happen at the farm gate, but also through local informal markets. Subsistence farmers and smallholder farmers, in particular, engage in this practice as they trade smaller amounts in informal markets.
- *Producer to intermediary*: the producer sells to an aggregator, either a trader or a cooperative. The intermediary usually sets up a local buying/collection point for easy access to the producer or picks up the product at the farm gate.
- *Producer to processor*: the producer sells the potato to a processor. For commercial farmers this can be organised individually, while smallholder farmers organise this through cooperatives and traders.
- *Producer to formal markets*: the producer sells directly to the formal retail sector. Supermarket chains usually have their own warehouses. Commercial farmers can deliver directly to formal markets, while in the case of smallholders this goes through traders and cooperatives.
- *Producer to fresh market (informal)*: Similar, to the previous pathway, both smallholders and commercial farmers sell some or all of their products through the fresh informal market which currently absorbs most potato production. The largest informal market is found in Luanda ('Mercado do 30'). This is also an intermediate step to informal export, as Congolese traders reportedly purchase potatoes in bulk here which are then transported to the Congo.

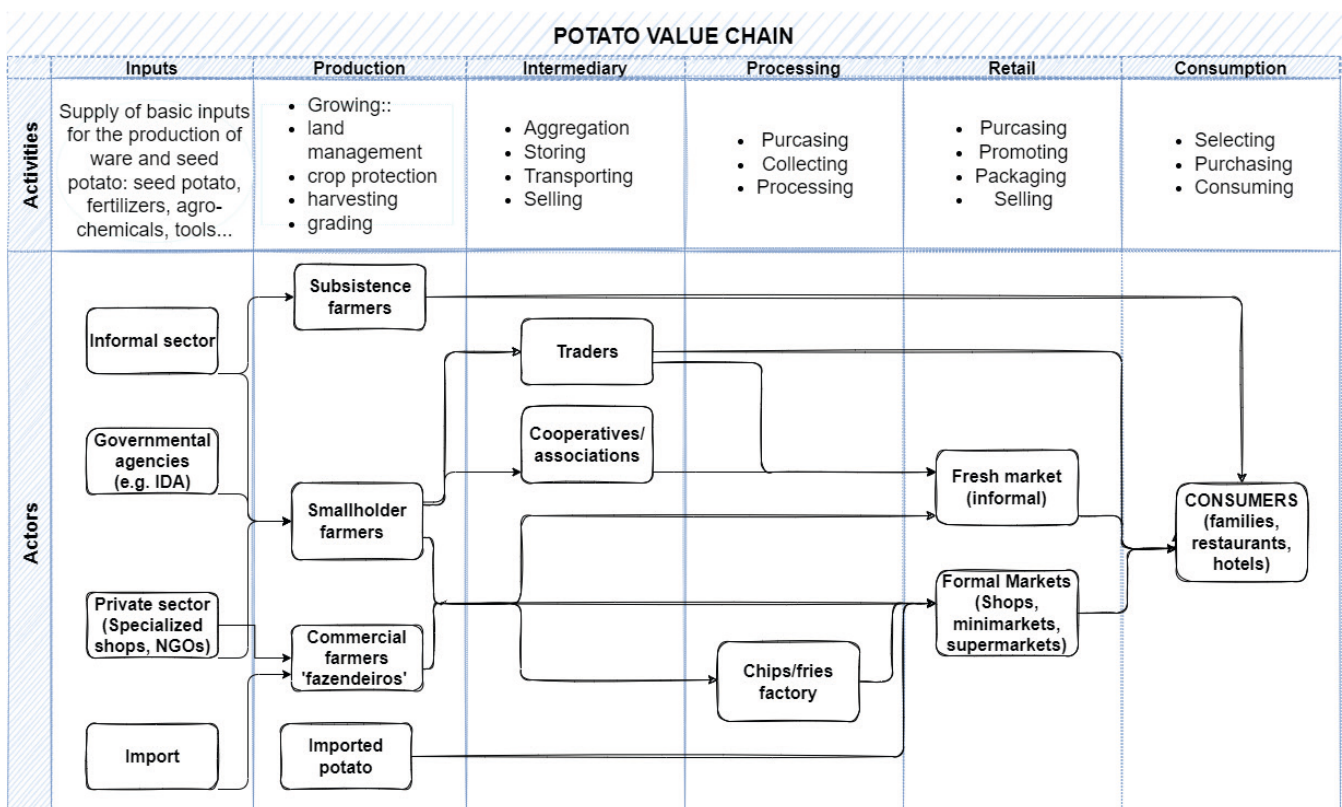


Figure 8. Pathways for ware potatoes in Angola. Own elaboration based on field observations.

3.6.1 Storage

Operational storage units with cooling are a missing link in the value chain: dedicated potato storage is hardly available in Angola as potatoes are mostly sold directly from the field. SME farmers and cooperatives often own or rent storage rooms, but these usually lack cooling, resulting in the potato needing to be sold relatively quickly.

Different problems have been reported in relation to cold storages by different stakeholders:

- Government-owned storages are often not operational, or empty. The reasons why these storages remain underutilized remain unclear.
- The price per kilogram for storing in a shared storage is reported as being “too high” by SME farmers. (mention of 1000 AOA/bag, but the time period is unclear)
- Commercial farms and wholesalers experience challenges in maintaining storages operational due to the poor electricity network/supply. Large investments would be needed to make these spaces self-sufficient from an energy perspective. Electricity is especially a problem for decentralised storages near production (rural) areas, with a highly unreliable network. In 2018 it was estimated that only 7.3% of the rural population had access to electricity versus 45% of the population in urban areas (World Bank, 2020).

Overall, the absence of affordable and operational cold storages has two main implications:

- Throughout the year, huge fluctuations regarding the price throughout as potatoes are brought to the market at the same time. Conversely, prices rise as local supply dwindles.
- Post-harvest losses are estimated to be around 7-10% (FAO, Dijkhoorn). This is lower than other sub-Saharan countries, which can experience post-harvest losses up to 25% in potato (Tadasse et al., 2018; Affognon et al., 2015).
- Quality reduction, which has negative implications for the potential for processing, but also for food safety and consumer experience.

3.6.2 Processing

The potato processing industry in Angola remains in its early stages. At the time of writing, only one industrial potato crisp factory, called Batata Frita Palanca, is reported to be operational in Melanje. It opened in February 2020. The potatoes for processing are mainly sourced locally. They use two 40 feet containers as a storage facility, and store using crates. Batata Frita Palanca is said to be able to produce 16,000 bags of 60 gram of crisps a day. Apart from this chip factory, there seems to be interest by investors in setting up a fries factory to cater for the oil industry, which needs to provide high quality meals for their staff on the offshore oil extraction platforms. However, this statement could not be directly confirmed.

According to the interviewees, several challenges hamper the growth of the processing industry: current subpar quality standards, limited quantities of potato available the whole year around, unstable prices, difficulty in making agreements with the farmers/farmer associations, as well as insufficient varieties suitable for industrial-level processing (for example a lot of deep eyes and low dry matter content). The crisps factory points out that due to high (import) taxes it's hard to compete with current imported crisps (which are sometimes even repacked and marketed as Angolan crisps). Materials they need to process the potatoes into crisps are not always available in Angola and it's hard to get them imported and get the forex to purchase it. To overcome these pressing issues, the crisps factory reportedly purchases tubers from the informal market, which provides low quality varieties not suitable for processing. The quality issues as well as the inconsistent availability of local potatoes has forced them to import tubers from South Africa.

3.6.3 Transportation

Large scale farms usually own their own trucks for transportation to the fresh markets or to the warehouses of the supermarket chains, while SMEs and cooperatives usually entrust transportation to individual truck drivers. Renting a full truck (up to 28 tonnes) from Huambo to Luanda costs around 300,000 AOA. SME producers often do not have the amounts needed to fill a truck themselves; in these cases they collectively rent a truck or pay a fee per bag transported. The fee is 4,000-5,000 AOA for a bag of approximately 150 kg. Transportation costs are paid by either the farmer or by the buyers, depending on their agreements.

Basic road infrastructure is missing in the production areas, some of which can only be accessed with specific trucks due to poor conditions. Inadequate road infrastructure leads to extra costs, and it has been reported that in some cases the price of transportation between the field and the cooperative storage (20-30 km) may have similar costs to transporting from Huambo to Luanda (more than 300km).

Addressing current road infrastructure and logistics are not new issues in Angola. In 2018, the World Development Bank analysed the performance of various logistic indicators. Scores of countries were compared and put into perspective. As figure 9 shows, the overall performance of logistics in Angola is poor and insufficient. Interviewees concurred - the poor road infrastructure and high costs of transportation push the sector to a “higher bottom line” and many systemic issues need to be solved before sector actors can begin reporting significant profits.

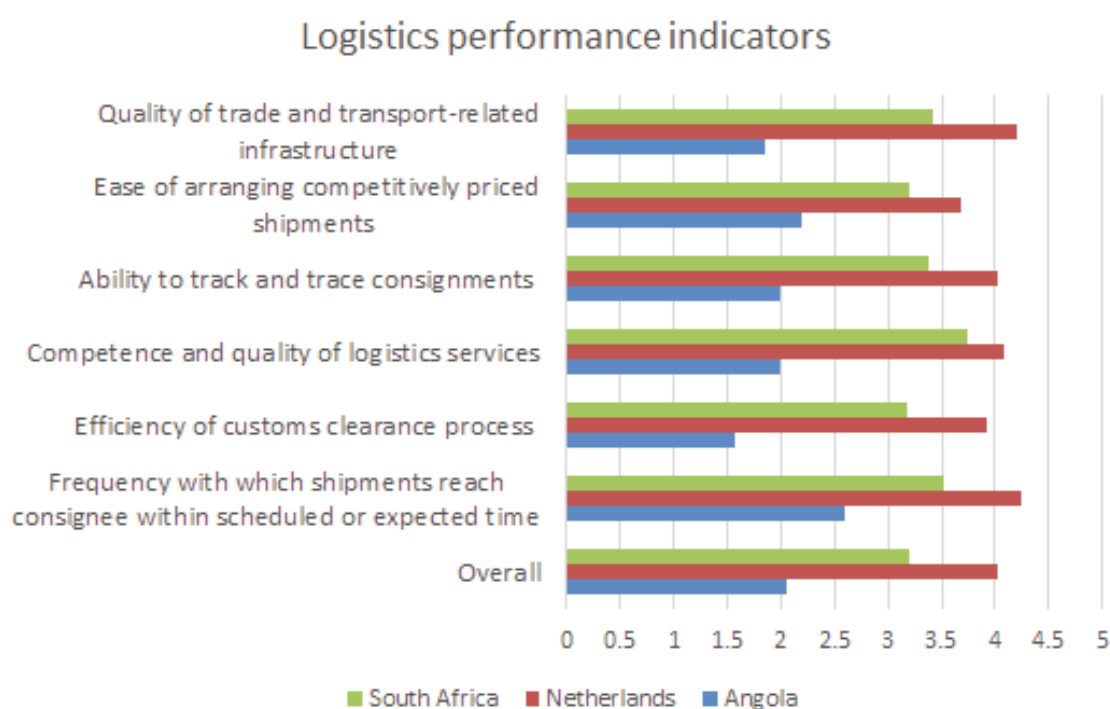


Figure 9. Logistics performance indicators of Angola. Data from database: World Development Indicators (2018).

3.6.4 Intermediaries

Intermediaries are responsible for the collection, aggregation, and transport of fresh product to the following actors of the value chains. In some cases, farmers organise these activities themselves, for instance by taking their own production to informal markets or other points of sale either by own transportation means or hiring transport services. There are however specialised operators in this segment that perform these actions.

The main actors here are:

- Small-scale traders. Usually referred to with a feminine appellation (‘vendedoras’), these types of trader are almost exclusively women. They purchase the product directly from subsistence farmers and SME farmers and transport it to informal markets. In some cases these traders also sell directly to final consumers, making them active in the whole collection-to-retail spectrum. According to Fundo de Apoio Social (FAS) (2014), these traders have a strong bargaining power and in most cases are the ones that dictate the purchase price, an aspect that was confirmed during field visits. As reported, small-scale traders buy the product in bags of 100 to 150 kg at the farm gate and assume the cost of transport to the markets themselves. Arriving at the markets, traders sell to other traders who operate in these markets (grocers) or to street vendors.
- Large intermediaries: there are also operators that own transport vehicles with enough capacity to transport large amounts of production. They buy from farmers and cooperatives and resell in urban markets that provide higher margins (Luanda). These actors are also active in the transportation segment as they can be also hired by cooperatives and farmers associations to transport their product to the market.

Table 5. Costs of handlings in the value chain for traders working at Mercado do 30 in Luanda

ITEM	PRICES (AOA)	UNIT
Packaging service and materials	2000	Per bag
Transportation	4000-5000	Per bag, one way
Transportation (full truck)	300000	Full cargo
Offloading	600	Per bag
Daily fee for a stand at the fresh market	600	Per day

Margins made by traders and other intermediaries, or supermarkets, can be calculated by subtracting the final selling price found in informal markets or supermarkets

Table 6. Traders and other intermediaries' margins, prices reported by interviewed traders in November 2021

	SELLING PRICE IN AOA/T	TRADER AND OTHER INTERMEDIARY MARGINS IN AOA/T (SELLING PRICE – FARM GATE PRICE)
Informal fresh market, Chapa5 variety	447,000	163,000
Informal fresh market, Romana variety (red potatoes)	567,000	283,000
Supermarket, 10 kg bag	799,900	515,900
Supermarket, loose potato (from two different supermarkets)	A 749,000	465,000
	B 690,000	406,000

Farm gate prices of potato are estimated on average at 6,250 AOA per crate of around 22 kg, giving a farm gate price per ton of 284,000 AOA. In supermarkets, loose potatoes were found at prices of 690 or 749 AOA/kg. These data present therefore a margin of, respectively, 406,000 AOA/t and 465,000 AOA/t. 10 kg bags in the supermarket were found at a selling price of 7,999 AOA, presenting a margin of 519,900 AOA/t. Prices in the informal fresh market were lower than in supermarkets, bringing therefore lower total results, although traders may have larger margins as supermarkets also take a share of the final price of the product. By calculating the difference between the farm gate price and the selling price of loose ware potatoes in supermarkets, the farm gate price is estimated at around 40% of the final price, leaving around 60% for all intermediaries.

3.5.5 Retail

In this segment, the potatoes finally reach the end-consumer. The overall segment can be distinguished in two main categories: the formal market and the informal market.

Informal markets

Informal markets are the main retail channel for ware potatoes. They feature different sections in which different types of goods are sold, for instance areas for textiles, vegetables, or meat. Sales are mostly managed by women who pay a daily fee to use the space. There are traders specializing in potatoes, although they usually also trade

a selection of crops (carrots, tomatoes, cabbage, sweet potatoes, etc.). Most products are displayed on the floor, often in mounds or buckets. Hygiene measures in these markets are either non-existent or very precarious. In some cases, there are warehouses in the markets themselves which allow sellers to store unsold merchandise for the next day for a standard fee.

The largest informal market is 'Mercado do 30' in Luanda and this is also the preferred outlet by producers and traders, as sales here provide the highest margins due to the higher prices in Luanda compared to the rest of the country. Smaller-scale markets are also important in terms of volume traded, and value. Mercado do 30 also function as a wholesale market for restaurants, hotels and small shops in Luanda.

Municipal markets (for example in Huambo and Benguela) are reported to have similar characteristics to those of large informal markets but on a smaller size. These markets are managed by the municipalities and sellers also pay a fee for their use.

As a third type, small informal markets can be found also on roadsides where small groups of traders set up their salespoints. These roadside points do not have any facilities and are not covered against winds or heavy rains. Traders often sell the same crops and are highly dependent on the season for the availability of their product.



Figure 10. View of the largest fresh market of Luanda. Left, the 150 kg bags of potatoes used for transportation. Right, display of crops by small traders.

Formal markets

Formal retail happens through supermarkets and minimarkets, which are characterised by the sales of both local and imported potatoes. The local potatoes are usually sourced from local producers or through intermediaries. This type of retail trade demands consistency in the availability of the product throughout the year, turning to imported goods as they bridge the scarcity of supply at different times during the year. Some of the larger supermarket chains also own their own fazendas to guarantee the supply of their outlets.

The actors in this segment have been affected the most by the COVID-19 pandemic. A decreasing trend in the market share of supermarkets has been observed. Conversely, informal markets seem to be on the rise. A key factor in this trend is the dwindling purchasing power of consumers. With less cash available, consumers have resorted to informal markets for their food needs.

Some supermarket chains source directly from cooperatives. For this purpose, they establish decentralised (uncooled) storage spaces ('central do compra') where products are aggregated before transportation to the warehouse in Luanda.

Some general considerations about this segment:

- **Packaging.** On the informal market, potatoes are often sold by mound or bucket (2.5 kg) or by crate (22 kg). In supermarkets, potatoes are sold in 3 or 10 kg packages, which can be put together by either the supplier or at the warehouse itself. No other important criteria for packaging were mentioned during the field interviews. Alternatively, some supermarket chains sell loose potatoes by weight only when a weighing scale is available.
- **Varieties.** Different varieties are sold for different prices. The most common variety on the informal market is 'Chapa5', more affordable than, for example, Romano. The prices for these varieties at the informal market in Luanda are 67.000 AOA and 85.000 AOA per 150 kg bag respectively, so a considerable difference. The Romano is a multipurpose redskin that is liked due to the high dry matter content.
- **Quality and standards.** There is no standard quality guideline that is followed by either informal or formal market operators. Visual inspection is used to assess the quality of the product.

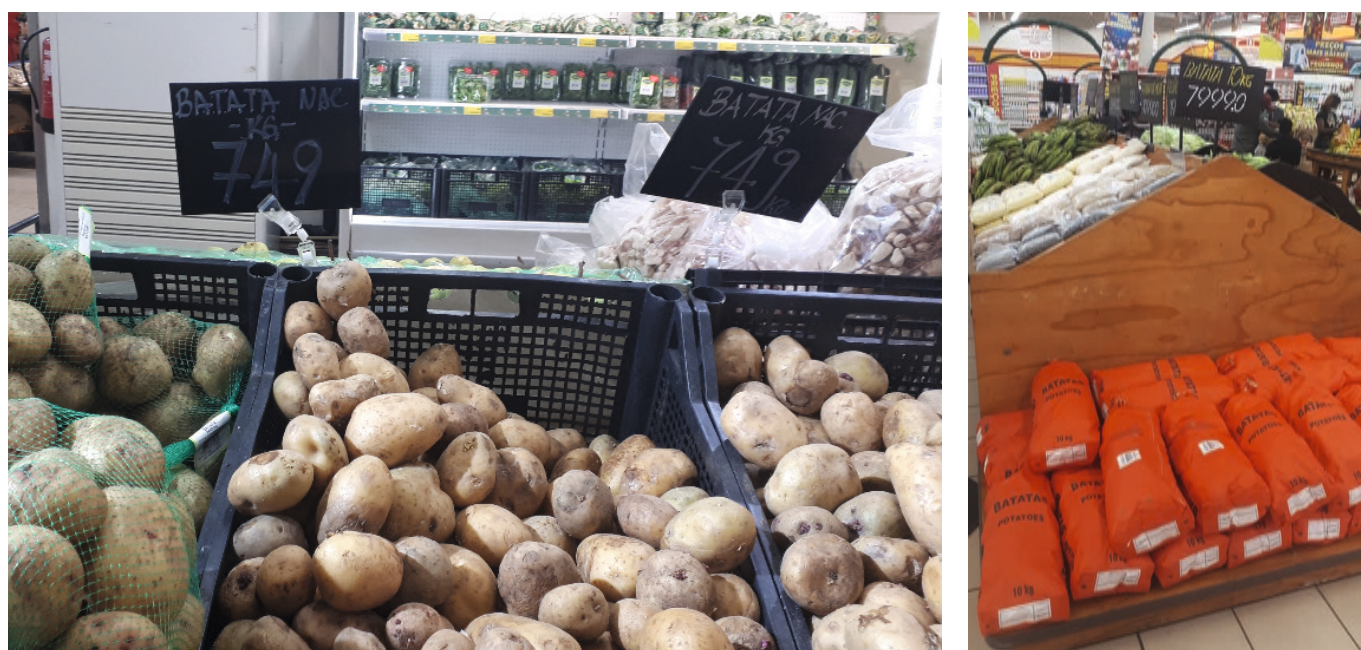
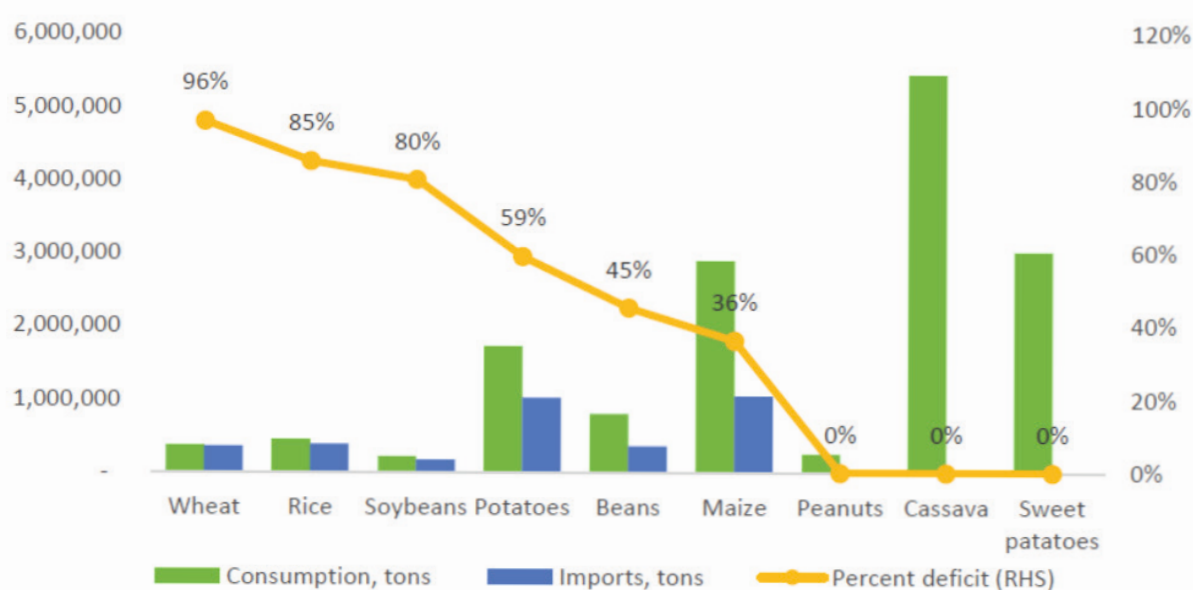


Figure 11.. Potatoes sold at various supermarkets loose, in 3 kg and in 10 kg bags.

3.5.6 Market and consumer preferences

- **Consumption.** Annual consumption of potato per capita is 15kg, and this is expected to grow rapidly with urbanisation (Potatopro.com, 2021).
- **Preferences.** Consumers do not seem to prefer a specific potato skin or skin colour; but multipurpose potatoes like the red-skinned Romano are appreciated. In general, multipurpose varieties (good for frying as well as cooking) are appreciated and get higher prices on the informal market.
- There seems to be a potential to produce for the local market as imports still constitute about 59% of the total consumed amount according to official data. See figure 12.

Figure 48: Import needs for key food staples, in tons



Source: Ministry of Agriculture and Forestry, 2014/2015 agriculture campaign.

Figure 12. Caption: Import needs for key food staple, in tons. Source World Bank (2021) based on numbers from the Ministry of Agriculture and Forestry (2014/2015)

With the above in mind it becomes apparent that a potential increase in potatoes produced in Angola would find their way and be absorbed by the current market segments.

3.7 Enabling environment

Vibrant potato sectors develop well in enabling environments where policies implemented have a positive impact on the actors that populate the sector. In Angola, despite the favourable and diverse agro-climatic conditions, the reigning environment continues to grip Angola's potato sector. In this regard, the agricultural sector at large, especially for commercially oriented SME farms, has potential to be developed (Carranza et al., 2014).

The World Bank's Doing Business indicator and the Corruption Perceptions Index depict a coercive business environment, restraining the creation and growth of all types of businesses. The agricultural sector is suffering from limited public expenditures and investments from the government, limiting the availability and the quality of public agricultural services.

3.7.1 Regulations

Standards and certification.

- No seed potato certification scheme is in place. In practice, farmers defer to size when selecting and selling seed tubers. Small tubers are kept for seed potato production.
- Angola does not currently have a food safety law. A broad public health law, which addresses food safety among many other specific areas affecting public health, is pending approval in Parliament. Following enactment of this general law, the government plans to develop a series of specific laws to regulate the multiple areas addressed by the broad law (Dias, 2020).

Plant variety protection (breeders' rights)

- In Angola, there is currently no law that protects breeder's rights, but this is left to private agreements between the breeder himself and the multiplier. There is a role for the Embassy of the Kingdom of the Netherlands to create awareness of the benefits of this system and facilitate knowledge sharing.

- The protection of the rights of plant breeders is an important stimulus for the development of better plant varieties. As the possibility to claim intellectual property rights on a variety gives a breeder the exclusive rights to exploit it and to prevent others from doing so illegally.

Registration procedure

For the registration of a new variety the procedure is as follows:

- a. The specifications/merits of the variety are submitted by the importer to the National Seed Service (SENSE) of agriculture which checks whether the variety has been introduced in Angola yet.
- b. After the first step, the variety is then trialled during two growing seasons (1 year) either at the Instituto de Investigação Agronómica (IIA) or in a location selected by the importer of the variety. In case the importer is testing the variety himself, he will receive regular visits by IIA researchers that will perform checks and collect information about the crop. The product from these trial fields can be sold on the regular market.
- c. After the two seasons have taken place and data have been collected, IIA provides an approval or rejection for the variety based on the results of the field trials. When the variety is found suitable for Angola, the importer can proceed submitting the necessary documents to complete the procedure.

According to the parties interviewed, the registration procedure is uncomplicated, especially when the variety comes from countries considered to have high standards such as the USA and the EU.

Import tariffs

- To encourage national production, the Angolan government has increased the customs duties and taxes for numerous agricultural products. Law No. 31/20, of 11 August, article 6, lists the changes to the Customs Tariff Book approved by Presidential Legislative Decree No. 10/19, of 29 November introducing tariffs of 20-40% on numerous products including rice, beans, products of the milling industry and meat.
- The customs tariffs on agricultural imports range from 2% to 50%, it is unclear what tariffs apply for agricultural inputs, including seed potatoes, but exemptions should be applicable in many cases (Dias, 2020).
- Law 10/18 identifies several priority sectors that may receive tax reduction or even full exemption for import of goods. Agriculture is one of these fields. The exemption depends on the specific project and is determined by AIPEX.

Foreign exchange for import

- There are limits for foreign exchange to import goods, which are defined in the Central Bank Instruction No. 18/2019 (October 2019) apply to the payment operations of imported goods. Foreign exchange resident importers that are also exporters are exempt from this regulation, and settlement takes place with the foreign currency own funds held in the same account. Under Central Bank Instruction No. 18/2019, there are limits of payments:
 - Advance Payments or Advances: up to \$50,000 per operation, without any annual ceilings.
 - Documentary Shipments: up to \$200,000 per operation, without any annual maximum limits.
 - Documentary Charges and Import Documentary Credits (letter of credit): no limits and must be opened in accordance with UCP 600 rules.
 - Angola follows the Uniform Customs & Practice for Documentary Credits (UCP 600) - Rules and uses, uniform for documentary credits (Dias, 2020)

3.7.2 Coordination

Policy

- Diversification of exports. Angola has initiated an ambitious program to decrease dependence from oil exports. In 2018, Angola adopted the Program for Support to Production, Diversification of Exports and Imports Replacements (PRODESI), which targets capacity improvements in food and in the agricultural industry among others. Under this program, measures are introduced to attract investment, improve competition,

reduce the cost of doing business, and increase private sector participation in service delivery.

- The government is aiming at transforming agriculture from a subsistent system towards a more commercially oriented one, self-sufficient and less dependent on food imports to meet the nutrition needs of a growing population (Carranza et al., 2014; Dijkxhoorn & Wijnands, 2012). While there is no Potato-specific policy, tuber and root-crops are a category of attention in the government policies.

Research

- The national research agenda in the field of agriculture is shaped and implemented by the Instituto de Investigação Agronómica (IIA). The IIA consists of 11 research stations spread around the country. Their mission includes developing technologies to improve the performance of agriculture value chains such as potatoes, maize, rice, and wheat, among others. Next to that, farmers have a very poor access to public extension services (Dijkxhoorn & Wijnands, 2012; Katata, 2019). The IIA's objectives include contributing to the establishment of potato varieties in the country. Together with CIP, they performed trials of 72 promising varieties from Kenya, which were planted in the IIA research stations in the Huambo area. As a result of this project, 5 varieties appeared to be suitable for Angola. Unfortunately only one variety was finally registered. This variety is called Rosa and it is in the process of multiplication by Jardim Da Joba, it is registered as a CIP-IIA variety with breeders right. The remaining four did not complete their registration due to the high incidence of diseases.

3.7.3 Investment

National agricultural investment

According to a study by the World Bank (2021) Angola provides one of the highest levels of support to agricultural producers among developing and developed countries monitored by the OECD. However, agriculture support in Angola is mainly geared towards private goods (subsidies and market price support) rather than attracting investments in agriculture public goods and services such as agricultural innovation, rural infrastructure, or plant health services. According to this study, during 2018 and 2019, 60 percent of agriculture public expenditures were made on investments in private goods (subsidies), such as payments based on inputs—programs like land preparation support, seeds programs, and machinery subsidies.

Access to credit

Access to credit is experienced as a challenge in the agricultural sector at large but especially for smallholders and SME farmers. Angolan banks are reportedly cautious to lend to the private sector, partly because of poor legal protection and lack of credit information by the borrowers, as well as insufficient bankable projects (World Bank Group, 2021).

Only 2 percent of farmers report access to credit (World Bank, 2021) and all farmers interviewed express hardship in accessing credit through formal institutions. Often the only way for SME farmers to access credit through banks is in the context of a National Bank project in which the bank acts as an intermediary. All unregistered small and medium scale farmers can only resort to cooperatives to channel these credits.

Conversely, although large producers have better access to credits from formal institutions, they often prefer to rely on their own resources, as credit through banks is considered as expensive.

Microcredit solutions are said to be available, but they are often located too far from the areas where farmers are active. Some organisations (e.g. Kepyra) are working on ways to connect farmers to microcredit providers through telephone money.

Moreover, a factor to consider is the risk associated with erratic weather and droughts. Below we bring the experience of a company that, after having accessed finance successfully, had to deal with the consequences of a lost crop due to drought (see box 1).

Box 1: Erratic weather becomes an increasing risk for farmer when accessing finance

One of the only ways for smallholders and subsistence farmers to access formal credit is through a larger organization, such as a cooperative or a company, who takes responsibility for the repayment in front of the bank. However, due to the risks involved in production, even good-willing farmers are not always able to repay their loan.

Within an (anonymous) project started in 2019-2020, a company mobilized credit from Banco de Negocio Internacional (BNI), which was divided among the beneficiaries of the project (subsistence and smallholder farmers) in the form of maize-growing packages. Each of the packages included chemicals and seeds for a season of maize production, which would be paid by farmers after selling the yield.

All farmers repaying the loan for the maize package, would have the opportunity to receive a second loan in the form of a potato package. Compared to maize, potato is much more profitable, but more costly in terms of inputs. The idea was to select the trustworthy farmers before entrusting them with a higher loan.

When the severe drought of 2020 hit the area of the project, farmers lost their maize crop and lost thus the opportunity to access further loans in the form of a potato growing package, while also keeping their debt for the maize package.

Foreign currency

- The possibility of exporting foreign currency abroad is one of the main challenges experienced by Dutch companies involved in the provision of inputs such as seed potato. Export of money is experienced as very difficult and highly regulated.
- The National Bank is responsible for the ease of access to foreign currency, as well as for the prioritisation of access in case of shortage.
- According to all banks interviewed, access to foreign currency has considerably improved in the last 2 years. Previous difficulties in accessing foreign currency are attributed to the financial crisis that hit the country in 2014-2016 due to a sharp reduction in oil prices. The economy seems now to be picking up again according to African Development Bank estimates, and this should result in improved access to foreign currency.
- The current average processing time for an international transaction is estimated by formal credit institutions as 15-20 days, with 30 as a maximum. However, according to some of the international seed companies interviewed, a transaction can take up to 6 months to get through, also in recent times. There is virtually no maximum amount transferable by a company, while 220.000 USD is the maximum amount exportable by an individual per annum.

3.8 Environmental drivers: water and climate change.

Angola is among the countries in Africa that will likely be most affected by climate change (figure 13). Since 1960 considerable changes have already been observed. Temperature has increased on average 1.5 C, with more 'hot' days observed especially in the months of September to November.

A steady decrease in annual rainfall has also been observed, particularly the Huila highlands and the central south transition area. For Angola, the greatest decrease in precipitation has been observed in the March-May period, a trend that is also visible in other southern Africa countries such as Namibia and Congo (World Bank Group, 2021).

All stakeholders report that droughts have been picking up in the last few years. Farmers reported a 90-day drought in October 2020 that caused crop failure. According to the local authorities this has been disastrous for subsistence farmers in particular, as they have lost all of their planting materials so have had to start from scratch with limited government and NGO support. Crop insurance is virtually non-existent for SME farmers, making them extremely susceptible to extreme climate events. Flooding during the rainy season also has the potential to hamper production. In 2009, floods (caused by historically heavy seasonal rains following several years of drying) destroyed 90,000 hectares of land, mostly in the Cuvelai basin (USAID, 2018). It is estimated that the changes in temperature and rainfall will result in yield reduction in both rainfed and irrigated crops by 2030 due to rising temperatures, increased aridity, increased rainfall variability and heavy rainfall events (Table 5).

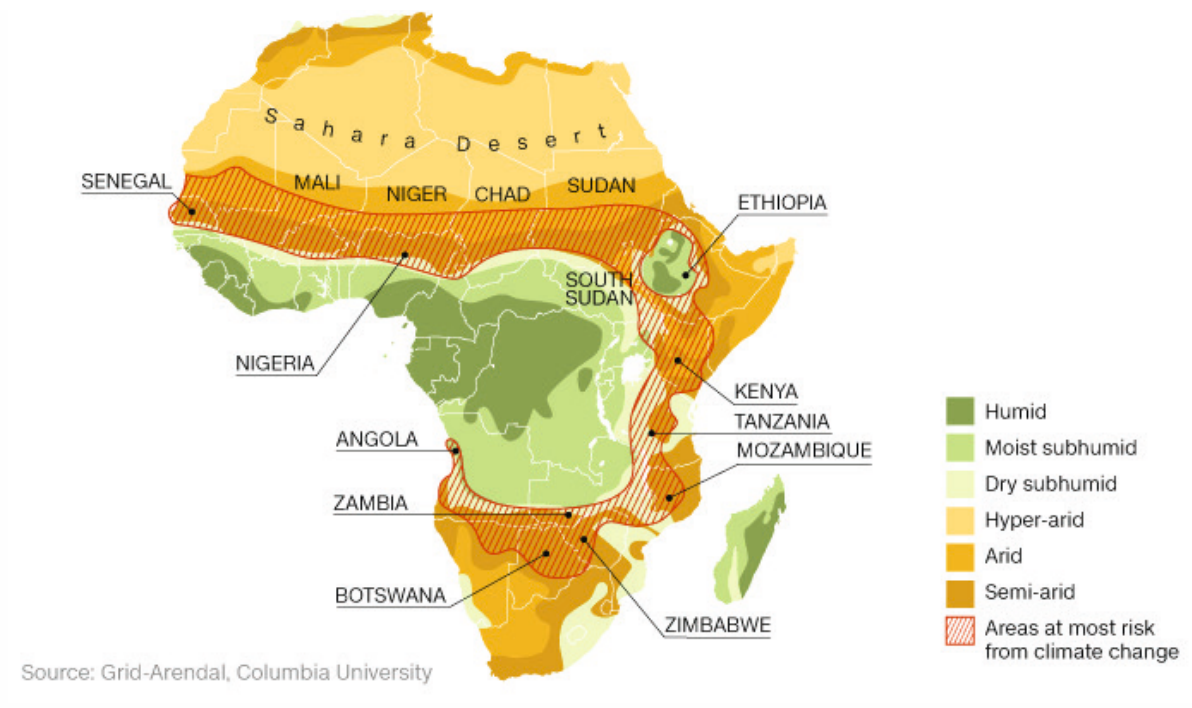


Figure 13. Areas most at risk of climate change in Africa, source Grid-Arendal, Columbia University (2021)

Climate Stressors and Climate Risks AGRICULTURE	
Stressors	Risks
Rising temperatures	Increased evaporation and reduced moisture in the soil, limiting plant growth and reducing crop yields
Increased aridity and drought conditions	Adverse impacts on livestock health and production due to reduced pasture and water availability
Increased rainfall variability	Expanded range of crop pests such as the burrowing nematode and black leaf streak disease
Heavy rainfall events	Spread of zoonotic diseases, e.g., those transmitted by tsetse flies
	Flooding of croplands

Table 7. Climate stressors and climate risk for agriculture in Angola due to climate change. Source: USAID, 2018

4. SWOT analysis of the sector

The information shared in the above chapters is used here to construct a SWOT (Strengths-Weakness-Opportunities-Threats) analysis for Angola's potato sector.

For this analysis, the report lists business opportunities to be observed throughout the sector and possible strategic pathways to initiate a potato sector development programme in Angola. There is potential to improve the potato value chain by increasing the level of opportunities and reducing the threats.

Strengths	Weaknesses
<ul style="list-style-type: none"> • Potato in its various forms is highly appreciated by the local population. • Potato is a prominent cash crop with good market value. • Large areas in Angola have a conducive climate that allows multiple growing seasons in a year. • Availability of (uncultivated) land. • Mechanisation is already present to cultivate on a large scale. • Awareness by producers on the added value of improved varieties of seed potatoes. • Presence of companies with experience in multiplication of imported seed potato. 	<ul style="list-style-type: none"> • Lack of trust between different actors in the various value chains. • Low availability of affordable quality seed tubers for planting. • Farmers face difficulties in accessing inputs (seed potatoes, technical assistance, tools, animal traction) due to limited capital available and limited access to credits. • The high price of imported seed potatoes makes it difficult for farmers to purchase them. • Low crop productivity is often observed, especially among subsistence farmers . • Transporting produce is cumbersome and costly due to poor secondary and tertiary access roads. • Lack of affordable storage systems for potato that allow its commercialization in times of limited supply and higher price. • Quality systems are almost non-existent. • Control and monitoring systems around sale of inputs, production, and sale of goods in local markets are weak. • Product losses along the chain due to the issues mentioned above remain significant , around 10% (FAO). • Extension officers are limited in numbers and lack modern and specialized knowledge/skills in potato production. • Fluctuating forex availability.

Opportunities	Threats
<ul style="list-style-type: none"> • Government policies of diversification. Investments in different economic sectors are targeted (other than oil). There is a protection tax on fresh vegetables. • An upward trend on potato consumption per capita provides scope for increased production to meet consumers' needs. • At the national level, the IIA is being strengthened through programs such as MOSAP from FAO. • Existence of multiple processing possibilities (purées, starches, French fries, starch) to be explored. • Opportunities to export to neighbouring countries (Congolese traders come to Angola to purchase products). 	<ul style="list-style-type: none"> • The economy is very sensitive to petrol's price fluctuation with implications for overall forex availability and state support. • Reduced purchasing capacity due to the COVID-19 pandemic . • Impoverishment of agricultural soils and disease pressure can compromise crop productivity, as well as contribute to negative environmental impact. • Possible impact of climate change (i.e. droughts) on potato production in the coming years. • Rural exodus of young people from the countryside is on the rise.

5. Strategies for development

5.1 Business opportunities

During this study, several business opportunities were identified, and are elaborated on below. These may be seen as 'low-hanging fruits' as they have the potential to create a high impact in a relatively short period of time in the sector. These business cases can be addressed individually, but also combined as the building blocks of a larger programme or strategic pathway. An overview of these opportunities is provided in table 7, while the potential Angolan parties are listed in annex 3.

A1- Capacity building

The lack of crop-specific knowledge on (seed) potato production has been mentioned as a major challenge for local extension services when supporting farmers with cultivation. Even in areas defined as 'potato municipalities' there are no potato specialists among IDA officers. Knowledge gaps include pest and disease recognition and management, tuber management for planting materials, fertilizer management and how to deliver effective training on practical extension (knowledge transfer).

One factor that supports the observed knowledge gap, (which can be extended to the agricultural sector in general) is that skill-intensive farming companies (commercial) rely heavily on expatriate workers (World Bank Group, 2021).

Capacity-building topics include good agricultural practices, pest and disease management, harvest and post-harvest handling, phytosanitary and certification aspects. To start with, the beneficiaries would be small and medium farmers and extension services. Interested private companies, international (knowledge) organizations or development programs such as FAO could take up the role of capacity builder. Within the MOSAP II program, FAO has already established a network of Farmers' Field Schools (FFS), which has proven to be a very effective method with which to increase the knowledge and skills of horticultural smallholders. Potato-specific capacity building efforts could build upon this or other existing structures.

Synergies could also be found with other existing initiatives. For example, professional training can be offered as a stand-alone service, but also included in a package of services or products. Multiple studies all over Africa have shown that SME farmers often do not directly see the value of knowledge as a paid service; however, they are willing to invest in it should it come alongside a broader benefit such as a secure market offtake or input supply. The Mavo Diami/Kres initiative recently started experimenting with providing paid information services in Angola. Their experience with user acceptance for this system is likely to provide valuable insights that could be used in setting up models for professional potato-specific training and consultancy.

It is advised that any capacity-building trajectory in the future should be formulated around systemic change, one that involves various actors active in the production sphere (apart from target group farmers and extension services) and that involves seeking broader outcomes, for example the inclusion of youth and gender.

A2- A comprehensive package of services for SME farmers

Service delivery models (SDM) revolve around private or semi-private parties that serve the needs of (smallholder) farmers, and result in an increase of output and quality of their production. As a principle, SDMs benefit both farmers and buyers, and ensure that as much value as possible remains with the farmer. Such models are established by SDM operators: neutral organizations who holistically provide producers with all the services they need in order to reach export markets (IDH Farmfit, 2020).

Based on lessons learned with more than 50 SME farmers in different development countries, IDH Farmfit (2020) concluded that the provision of bundled ("holistic") services creates more value at farm level than the provision of only one or a few stand-alone services and is more likely to pay for the SDM operators providing them. In the specific case of SME farmers, a holistic product package usually includes training, inputs, finance and at least one other additional service. Services can be divided into 'core' and 'complementary' services, where complementary services can only be provided in combination with core services.

A SDM package could include the following items:

- access to quality seed potato and inputs ('growing package')
- credit
- crop (drought) insurance
- capacity building/technical backstopping
- information provision (e.g. weather, pests)
- soil testing services.

SDM operators able to provide these services would need to be identified (or established by a consortium) for the potato value chain. Cooperatives can play a key role in this model, however their involvement requires an in-depth assessment of the current organisational capacity. Companies and NGO specialised in working with cooperatives (e.g. Agriterra) can conduct this analysis.

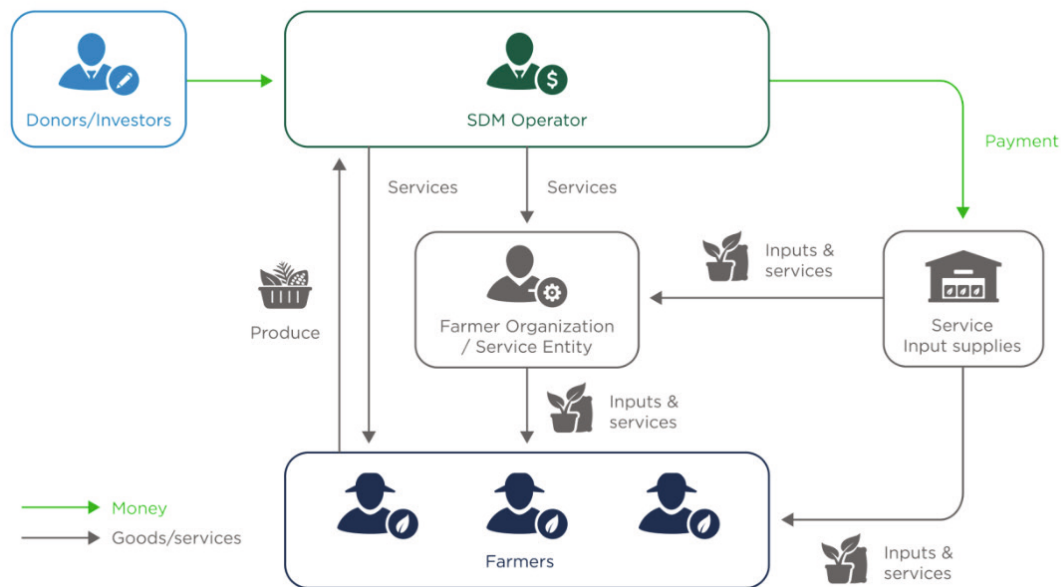


Figure 14. An example of a basic service delivery model structure. Source: IDH Farmfit, 2020

A3- Establishing a local seed multiplication scheme

While in many African countries SME farmers are not aware or not convinced of the benefits of improved seeds, this does not appear to be the case in Angola. Farmers are aware of the positive impact of this technology on crop productivity and pest prevention. Yet the sector sees limited access to (certified) quality seeds, primarily due to the costs involved. At the same time, there is a shortage of seed potato at country level that is currently filled by producers that sell their own farmer-saved seeds to other farmers. Interest in purchasing healthy and quality seed potato is now being expressed not only by farmers, but also by the government.

During an interview, the Ministry of Agriculture was quoted saying that “when new varieties can be multiplied in Angola, the government would like to buy seeds to disseminate to subsistence farmers through IDA”.

Setting up a local seed multiplication scheme can help reduce the cost of seed and simultaneously increase availability of certified seed at country level. When imported potatoes are multiplied once or twice under high quality standards and field conditions the farm gate price is likely to become more attractive for prospective seed users.

Usually, commercial farms are in a good position to become reliable seed multipliers thanks to higher-than-average knowledge and skills, advance planning regarding crop production and protection and existing infrastructure, as well as capacity to invest in quality inputs. Some of the parties interviewed have expressed their interest in being involved in such activity and possess experience with seed multiplication. However, seed multiplication is a knowledge-intensive business and would require a strong engagement of (Dutch) seed potato companies to

set up the process efficiently and be able to achieve the required standards. Some of the Angolan interviewees suggested that a way to do this would be by creating a joint venture in which the Dutch seed potato company can provide the starting materials alongside knowledge and capacity building. However, from the perspective of the Dutch potato sector, venturing in a partnership requires careful planning and insurance that varieties can be protected. Parties need to be identified in order to create strong and long-term partnerships. An advantage here is that the connections already exist as most commercial farms already import their seed potato from Dutch companies.

A4- Climate smart farming

According to Hunter (2020), 'One of the primary constraints to Angola's future food security in all provinces is likely to be the reliability and volume of seasonal rainfall, particularly in the semi-arid coastal and southern provinces.'

Knowledge and infrastructure for water management will become ever more relevant in order to manage the fluctuating amounts of water, not only in case of drought but for damage prevention in case of flooding. Strategies to approach these challenges will likely involve a combination of irrigation, water harvesting techniques, alternative production systems (e.g., agroforestry) and drought tolerant varieties.

In addition to supporting basic food security, Angola's potential for production of various high-value horticultural crops can be unlocked through improved access to reliable irrigation. Potatoes can be an interesting crop to begin with as its profitability justifies investment in infrastructure at private but potentially also public level.

Farmers as well as government entities see the added value of irrigation and water managing systems, there is thus a potential to develop business cases around water solutions and climate resilience for Angola.

A5- Market pull through processing

Although it was not possible to interview processors directly during this study, there is at least one operational crisps factory in Angola, and potential interest by investors to invest in more processing for fries. These parties require a steady amount of potatoes suitable for processing and can therefore act as a market pull for producers and small traders, providing a secure, year-round, offset market.

As the processing segment becomes more established, more opportunities will emerge for cooperatives (and/or out-grower schemes with SME farmers) to supply processing factories. In this development, both cooperatives and SMEs will benefit from external support in order to achieve the potential yield, which is still twice as high as the current average yield.

A6- Potato-specific inputs

Increased availability of potato-specific inputs can boost the productivity as well as the quality of potato production. These are opportunities to address the needs of potato farmers with regards to fertilisers and crop protection products. This aspect needs to be addressed in combination with capacity building on the effective use of the introduced fertilisers and pesticides. In this shift towards a professional and more potato-specific input industry, input suppliers are often willing to collaborate in joint initiatives whereby new or existing products are tested and/or demonstrated. Often, companies active in the same space (i.e. crop production) are willing to join this type of initiative.

Moreover low-cost solutions for small-scale farmers are required, as simply increasing access to improved high-quality fertilizers will not help SME farmers if they are not affordable.

A7 – Operational cold storage locations

Proper storage adds value to the potato sector in general. As a service, farmers that lack storage equipment in their farms could make use of satellite storages to store their potatoes and sell them in the period when less

' We would like to invite Dutch companies specializing in water management, irrigation equipment and the likes. to establish themselves in the country. The need is twofold: equipment and capacity building'

- Ministry of Agriculture-

product is available, and prices are higher.

Well-designed and run storage facilities provide the following benefits:

- constant supply of potatoes for the customer
- helps maintain high quality of the potato
- Improved bargaining power

For seed potatoes, storage is particularly relevant in order to allow the potato to overcome dormancy and be ready for the planting seasons.

Some factors that must be considered for this:

- Multiple cold storage locations are already built by the government and are currently not operational. When establishing activities on potato in a certain area it is advised to assess the quality of these locations before building new ones.
- The electricity network is not reliable in all places, especially rural areas. This needs to be kept into consideration when selecting an area.
- Capacity building needs to go hand in hand with the establishment of infrastructure to ensure good practices in storing potatoes.
- Storage is poised to become a good opportunity for value addition for cooperatives.

Table 7. The identified business cases and their expected impact, beneficiaries, and potential partners

INTERVENTION	PRIORITY	TARGET GROUP	OTHER BENEFICIARIES	POTENTIAL PARTNERS
A1 – Capacity building	High	Extension services SME farmers	Input suppliers, actors active in the production area	International donor organisations (e.g. FAO), NGO, information/knowledge providers
A2 – Holistic service package for SME farmers	High	SME farmers Subsistence farmers Commercial farmers	Input suppliers, extension services	Information/knowledge providers, Input providers, Extension officers, NGOs, agri-service providers,
A3-Local seed multiplication schemes	High	Commercial farmers SME farmers Subsistence farmers Extension services	Input suppliers, seed breeders and international seed companies, local authorities	Planting materials providers, training providers, knowledge institutes, commercial farmers, breeding companies.
A4- Climate smart farming	High	Commercial farmers SME farmers Subsistence farmers Extension services Citizens	Input suppliers, international companies	Specialised consultancy firms, input providers, knowledge institutes, breeding companies.
A5- Market pull through processing	Medium	Farmers and cooperatives Processors	Hospitality sector Retailers	Planting materials providers, training providers, knowledge institutes, commercial farmers, processors
A6 – Potato specific inputs	High	Farmers Input providers	Extension officers	Knowledge institutes, fertiliser factories, input providers, extension services
A7 – Operational cold storage	Medium	SME farmers Cooperatives	Retailers Consumers	Cooperatives, training providers, IDA, knowledge institutions, NGO

Box 2. Results from Focus group discussion

A focus group discussion was organised on 22-11-2021 in order to identify and prioritise the main bottlenecks in production as experienced by SME farmers. This session was organised in Ekhunya, and participants included SME farmers of two cooperatives, together with the cooperatives leads and an IDA extension officers.

The table below provides an overview of the main problems identified as well as the proposed actions by this specific group of stakeholders (SME farmers) and does not represent the views of commercial or subsistence farmers.



Figure 15. Participants to the FDG and facilitators

Table 8. Main problems as identified and ranked by the board and members of two cooperatives in Ekhunya, together with the local extension officer. For the top 3 problems, actions have been proposed by the FDG participants.

PRIORITY	PROBLEM	NOTES/PROBLEM DESCRIPTION.	ACTIONS
1	Acquisition of certified seed potato	<ul style="list-style-type: none"> Seed potatoes are not refreshed for years so experience 'tiredness' Prices are high (mentioned 30k Kw for 25kg) Limited availability (which increases the price) 	<p>Increase access to seed and input by credit facilitation (loan). Technical assistance on seed multiplication</p>
2	Access to fertilizer	<ul style="list-style-type: none"> High price but low availability. Limited subsidies 	<p>Effective subsidy structures from governments, where the cooperative receives it and ensures appropriate distribution among beneficiaries. Credit availability</p>
3	Infrastructure and logistics	<ul style="list-style-type: none"> The road from production area to cooperative. Only specific types of trucks can access there. High cost of transportation is result (same price from farm to coop(20km) as from coop to Luanda (800+ km) Limited access to alternative markets compared to the informal market. 	<p>Inventorise key-junctions for the potato value chain to be maintained (government).</p>
4	Irrigation equipment	<ul style="list-style-type: none"> Pumps needed to get water from the river. Equipment is only available in the informal market for them. These materials are not always available locally; often the only option is to go through the informal market which is characterised by very high prices. 	N/A
5	Access to mechanisation/ hand ploughs	<ul style="list-style-type: none"> These are costly items to both buy and rent (tractor use is 7000 kw/labour hour) 	N/A

5.2 Pathways for development

In previous chapters, the state of affairs of the current potato sector in Angola has been described in detail. Based on the analysis, we provide in this chapter strategic pathways for the development of the sector. Note the reader that the following chapter intends to help enablers such as the EKN in Angola and RVO formulate future funded interventions in the sector, if they so decide. Strategic could be further developed into a Potato road Map what would serve as a framework for transformation.

Strategic pathways are presented in no particular sequence of importance or prioritization, following the sector approach to transforming sector in emerging economies (Vision document).

But, where to start? it is recommended that a small working group composed of representatives of the Angola potato sector discusses what strategic pathways for impact should be prioritized, a key input for enablers such as EKN and RVO to find focus in their future interventions in the sector. This prioritization exercise can be followed by a consultation with a few representatives of the Dutch sector for best possible alignment.

Over the years, the world-renowned, high-performing potato sector in the Netherlands has served as a business partner, learning ground and source of inspiration for countries with high potential but low performing potato sectors in emerging economies. Composed of a wide array of stakeholders, the Dutch potato sector acknowledges their key role in advancing agriculture in low-income countries.

In an effort to “improve potato production systems and markets in developing countries and emerging economies,” the Dutch Potato Organization (NAO), stakeholders, and the Netherlands Food Partnership (NFP), compiled a vision document¹ that lays the foundation for collective (and structured) action in emerging economies. The document provides a unified approach in supporting the transformation of potato sectors while enhancing stakeholders’ contributions in the process.

Transforming a potato sector is complex, context specific and requires local stakeholders’ ambition and joint action. Six components are key to effective potato sector transformation:

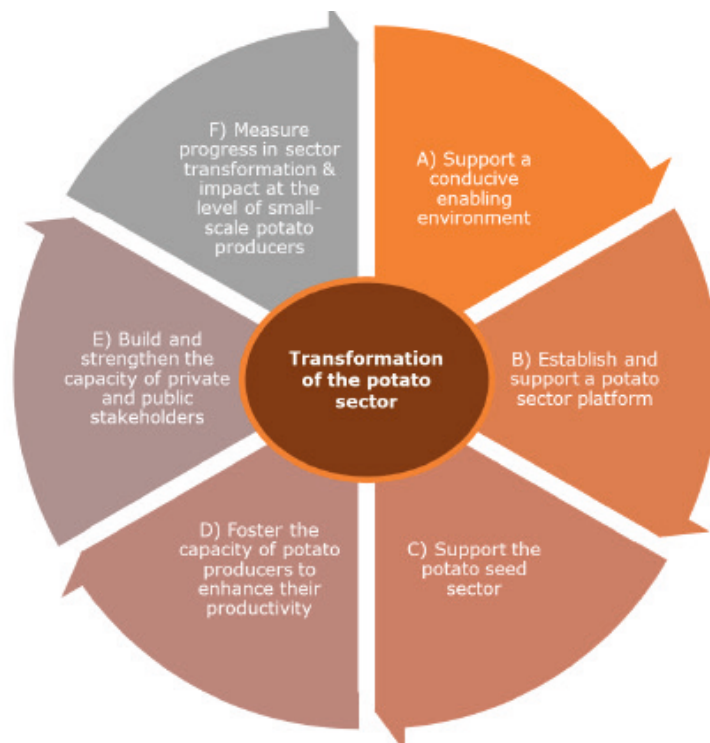


Figure 16. the six components of potato sector transformation (retrieved from vision document)

¹ Download the full report at https://www.nlfoodpartnership.com/impact_coalitions/potato-sector-development/

With the above in mind, we use the framework depicted in figure 16 to categorize possible pathways for development of the potato sector in Angola.

Support a conducive enabling environment

Angola's current potential as an environment in which companies and actors can thrive can be enhanced. From the wide spectrum of topics studied, two areas come to the fore:

Strategic pathway 1: Explore a certification scheme that helps farmers capture value and entails them (and prospective growers) to produce high quality potatoes.

As a whole, the sector in Angola recognizes the importance of quality seed tubers availability as a key factor for future growth. However, what constitutes a high-quality tuber, its attributes, conditions for production, and how and where to source them, remains largely unaddressed. It is advised that future initiatives in the potato sector explore the potential of a certification or quality-based scheme by which the interest of breeders, seed producers and seed users can be safeguarded. In this regard, it is important to remember that at the moment no law for the protection of breeder's rights is implemented in Angola. As far as facilitating companies' growth in the sector is concerned, efforts can be made to ensure (international) companies complete their forex exchange transactions successfully as the enabling environment continues to improve.

Strategic pathway 2: Booster the engagement of (improved) extension services with farmers

Extension officers face difficulties in providing modern advice to potato farmers. Challenging and costly logistics as well as limited knowledge and skills on potato production further constrain farmers' access to information. On the other hand, the Ministry of Agriculture expressed their willingness and interest in improving the quality of extension services through partnerships or collaboration agreements with national and international organizations. Effective extension services can help farmers improve crop productivity as the country shifts to more efficient and environmentally friendly production systems. Increasing the volume of production while building resilience in the farming systems is posed to be one of Angola's top priorities in the potato sector in the near future.

Establish and support a potato sector platform:

The fragmentation in the sector causes a large number of stakeholders to operate individually to a widespread extent. Sector-wide coordination is, for the most part, absent, and public and private players report only occasional interactions with one another. In this regard, fostering horizontal and vertical linkages between stakeholders at different levels of the value chain can stir competitiveness and investment in the sector.

Strategic pathway 3: Investigate the impact of a sector platform or network to increase collaboration(and future coordination) in the sector

Self-steering and vibrant potato sectors worldwide often feature organizations, networks and/or platforms that provide a space for stakeholders to voice their challenges, share their objectives and build a joint vision. It is recommended to explore the usefulness of a sector-wide platform, or similar, in order to bring together stakeholders, and determine the purpose and functioning of such a structure. A joint sector vision and action plan could derive from this collaborative effort. In addition, it is important to analyse the role of the private and public sector as the platform becomes constituted.

Support the seed potato sector

Farmers' access to quality seed potatoes of modern varieties and basic material is limited. Commercial farmers import (occasionally) small quantities of tubers from overseas. The local flow of basic material sees a similar trend and only a few commercial farmers can access basic materials, which after further field multiplications provide only a small fraction of today's seed potato supply. A potential potato sector programme can benefit from exploring several pathways to increased seed potato supply.

Strategic pathway 4: Stimulate the registration and multiplication of modern varieties

At present there is lack of farmer awareness when new varieties become multiplied and available for commercial use. However, during our study commercial farmers expressed their interest in multiplying new varieties should they receive support and guidance along the way.

Having modern varieties registered in the/a national list widens market opportunities for farmers (i.e. yield increase, merits for other markets such as processing, better resistances). In this light, an extensive list of varieties becomes a particularly valuable resource if farmers, after having seen the performance of the varieties, were able to purchase their preferred choice from a trusted source.

Cooperatives are often well positioned to implement demonstration plots for and with their member farmers. Demand for new varieties would then be generated at a grassroots level, based on actual performance. An emergent actual demand for varieties would encourage interested and resourceful farmers to move into the seed multiplication business. *Strategic pathway 5: Foster the supply of clean and healthy seed tubers through importation and national sources*

A major bottleneck when transforming a potato sector is guaranteeing a supply of healthy seed tubers to seed users. As flows get disrupted, crop production starts to stagnate and potentially decline over time. In Angola, the supply of healthy seed tubers is very scarce, only accessible for a few commercial farmers who in turn use these limited quantities for their own needs. Seed production as a business remains in its early stages in Angola.

A sector should be able to offer various pathways for farmers to obtain clean and healthy seed tubers, which would align with the capacities and priorities of the national government and local stakeholders. Future efforts when developing seed systems may include; i) increasing the importation of healthy tubers, ii) strengthening the production of early generation seeds at national level, with the collaboration of the Dutch potato sector, and iii) supporting farmers to renew their seed stock over the seasons. Establishing viable seed systems in Angola would be complementary and would cater for the needs of a variety of stakeholders in the sector.

Foster the capacity of potato producers to enhance their productivity

The potential to increase crop productivity through advances in production practices and input use sets out the need for a capacity building programme for small and medium scale farmers in the region of focus (for example, Huambo).

Strategic pathway 6: Develop the capacities of small and medium scale farmers through an inclusive capacity building programme

A sector-wide programme that includes farmers, extension officers, input suppliers, cooperatives, and other stakeholders active in the production arena can deliver a positive impact on increasing crop productivity, with the added benefit of enhancing collaboration among stakeholders and creating linkages in the various value chains. The focus of such a program could be regional. In addition, a building programme could be inclusive of gender and youth groups for example and promote environmentally friendly production practices. Exploration is also recommended into how to engage with local research/education institutions for future embeddedness and lasting impact.

This program should address the agronomic challenges as described in previous chapters and take into account land preparation, seed/seedbed preparation, planting, integrated pest management, water use and other good production practices. Such programmes can be connected to existing and future initiatives initiated by the government or any other organization. Note that seed potato production (including introduction of new varieties) can also be part of a programme of this nature, making it possible to distinguish ware and seed-specific production practices, with its target group (current and potential seed producers), and specific program sub-goals formulated.

Approaches for effective capacity development include the establishment of demonstration plots, study and exchange visits (among the chain), on-the-job training, and applied research projects.

Build and strengthen the capacity of private and public stakeholders.

Well-functioning value chains create significant value to those stakeholders involved. In Angola, the flow of the product from the field to the final market follows various streams, is often cross-province and features numerous stakeholders. In this context, the performance of these (sub)value chains could be improved if key systemic bottlenecks were addressed.

Strategic pathway 7: Enhance market linkages and boost services in the value chains

Linking input and service suppliers with farmers and off takers helps create a “connective tissue” in the value chains, which can streamline new products and services in the market. Within the generic potato value chain, there is ample breadth for introducing services around seed supply, tailored crop protection solutions, water management, information delivery and training, logistics (e.g. storage), financial solutions for small and medium scale farmers, or access to higher end markets (hotels, restaurants, and supermarkets). Cooperatives approaches to delivering services can also be broadened as they focus largely on channelling government subsidies to SME farmers for input purchase and accessing markets. Considering adding value to farmers’ products by managing storage, grading, sorting, or even packing can yield a higher net revenue to farmers in the future. Similarly, cooperatives could play a role in demonstration varieties, in coordination with commercial farmers (or seed multipliers in the future), and/or breeders. As value chains deliver more benefits, the focus could then shift towards boosting the processing segment with the establishment of crisp and chips factories.

Fostering new linkages and services would help attract investments along the value chains and accelerate the growth of SMEs and other stakeholders in the sector. It is important that any intervention in this area creates opportunities for youth and women to move into the sector.

Measure progress in sector transformation & impact

With a sector transformation framework, impact can be aimed at various sector activities (e.g. production and value chains), taking into account key drivers such as the scarcity of natural resources, and plans for sector-wide outcomes such as increase in income, youth inclusion, and increased employment. It is recommended that any future intervention in the sector should revolve around a sector approach and strive to measure the impact on the intended areas, with the expected outcomes on a yearly basis and accompanied by a transformation dashboard. Stakeholders from both the public and private sectors would in this way be able to continue to work together towards a common goal and better align their own objectives and goals.

Conclusion and Recommendations

During this study the current state of the potato sector in Angola was assessed and the information collected was used to identify possible pathways for development and business cases within this value chain.

Potato is cultivated widely for the local market, in particular in the areas of Huambo, Benguela and Huila. Due to its high demand and favourable market prices, farmers are interested in producing potato as a cash crop. Average yields, however, are sub-optimal, and hampered by limited access to chemicals, lack of credit solutions, high pest and disease incidence, and little knowledge about modern production practices. In this regard, local extension services face difficulties in developing their skills and providing potato-specific advice. In the meantime, less than a handful of farmers are producing seed tubers for the market, resulting in a lack of affordable and healthy seed potatoes for seed users.

- Strategic pathways to develop **production** in the sector include:
- Exploring a certification scheme that helps farmers capture value and enables them (and prospective growers) to produce high quality potatoes.
- Boosting the engagement of (improved) extension services with farmers.
- Developing the capacities of small and medium scale farmers through an inclusive capacity building programme.

Beyond the potential for production growth, Angolan and international organisations have shown interest in professionalizing the value chain. Services remain narrowed in their scope. For example, lack of access to credit solutions is experienced as a challenge in the sector in general, but especially felt by smallholders and SME enterprises. Angolan banks are reportedly cautious about lending to the private sector, partly due to poor legal protection and lack of credit information on borrowers. Moreover, current fragmentation leads to breaches of trust among actors.

Strategic pathways to develop **value chains** in the sector include:

- Enhancing (market) linkages and boost services (i.e. finance) in the value chains

At national level, access to foreign currency, a recurring problem in the past, has considerably improved in the last two years according to financial institutions. Similarly, the regulations for the registration of new potato varieties are uncomplicated according to both Angolan and Netherlands parties, and so is the importation process. However there is currently no legislation protecting breeders' rights.

Strategic pathways to develop **governance and an enabling environment** in the sector include:

- Investigating the impact of a sector platform or network to increase collaboration (and future coordination) in the sector.
- Stimulating the registration and multiplication of modern varieties.
- Fostering the supply of clean and healthy seed tubers, through importation and national sources.

If enablers such as EKN in Angola were to explore (low-hanging) opportunities to accelerate growth in the potato sector, the following recommendations should be considered: 1) capacity building, 2) holistic service package for SME farmers, 3) local seed multiplication schemes, 4) climate-smart farming, 5) market pull-through supply to the processing industry, 6) potato-specific inputs, 7) operational cold storage.

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Annex 1. List of interviewees

COMPANY /ORGANISATION	INTERVIEWEE	
RVO	Geert Boode	Teams meeting, October 2021
Embassy of the Netherlands	Armino Teuns, Marc Mazeirac	Teams meeting, October 2021
World Vision, Mavo Diami	Matteo Tonini	21-10-21, phone call
Koppert	Frank Enthoven	26-10-21, Phone call
HZCP	Arjen Plomp	1-11-21, mail
Solynta	Charles Miller	09-11-21
TPC	Gaby Stet	10-11-21, Microsoft Teams
Europlant	Kamal Smid	11-11-21, Microsoft teams call
Schaap Holland	Dirk Stellingwerf	11-11-21 – Teams Meeting
Jardin da Yoba	Joao Saraiva	25-11-21 - interview
Facenda Vinevala	Vinevala Cinguar	25-11-21 – phone call
Facenda Novagrolider	Farm manager	24-11-21 – field visit
Cooperative CoopEkunha	Management and members	21-11-21 – focus group discussion
Cooperative Vale do Kalai, calenga community	Domingo Scapita (president) and 7 members	21-11-21 - interview
Medium holder	Felix Longueda	21-11-21 field visit and interview
BAI (Huambo)	Antonio Carvalio	26-11-21 interview
Banco de Negocio Internacional (BNI)	Agostino Concalves	23-11-21 interview
Banco Desarrollo Angola		26-11-21 online meeting
IIA (Instituto Investigacion Agraria)	Sao Maliti	23-11-21 interview
FAO	Cesar Valencia Cabrera	23-11-21 interview
Kepya	Wanderley Ribeiro	26-11-21 interview
Pomobel	Raul Mateus	25-11-21 interview
ECODIMA	Associacao de Empresas de Comercio Distribucao moderna de Angola	25-11-21
Private consultant	Imacolada Henriques	
Ministry of Agriculture	Manuel Dias, national director for agriculture	26-11-21
AIPEX	Wilson M. da Silva. Técnico de acompanhamento de projectos de investimento.	26-11-21
IDA	Victorino Chonguela	22-11-21

Annex 2. Economic analysis of potato production in Angola

Ware potatoes, 8 T/ha

ITEM	VALUE	UNIT/HA	PRICE PER UNIT	TOTAL PRICE
Saved seed (35-45mm)	1,500	kg/ha	0	0
Manure	0	t/ha	?	0
Urea	0	kg/ha	360	0
NPK fertilizer	1,000	kg/ha	540	540,000
Disking and ploughing with tractor	12	h/ha	8,000	96,000
Labour in man days	350	days/ha	1,000	350,000
Pesticides				500,000
Variable costs				1,486,000
	Value	Unit	Price per unit	Total price
Transport per bag	44	Bag of 150 kg	4,500	198,000
Packaging	44	Bag of 150 kg	2,000	88,000
Storage	44	Bag of 150 kg	1,000	44,000
Offloading	44	Bag of 150 kg	600	26,400
Other costs				356,400
Total costs				1,842,400
Benefits				
Farmgate price ware potato	6,250	kw/crate	284	1,846,000
	10,000	kw/crate	455	2,957,500
Profits				
Farmgate price ware potato	6,250	kw/crate		3,600
	10,000	kw/crate		1,115,100

Ware potatoes, 16 T/ha

ITEM	VALUE	UNIT/HA	PRICE IN KW PER UNIT	TOTAL PRICE
Seed (35-45mm)	1,500	kg/ha	1,100	1,650,000
Manure	0	t/ha	?	0
Urea	100	kg/ha	360	36,000
NPK fertilizer	1,000	kg/ha	540	540,000
Disking and ploughing with tractor	12	h/ha	8,000	96,000
Labour in man days	350	days/ha	1,000	350,000
Pesticides				500,000
Variable costs				3,172,000
	Value	Unit	Price in kw per unit	Total price
Transport per bag	107	Bag of 150 kg	4,500	481,500
Packaging	107	Bag of 150 kg	2,000	214,000
Storage	107	Bag of 150 kg	1,000	107,000
Offloading	107	Bag of 150 kg	600	64,200
Other costs				866,700
Total costs				4,038,700
Benefits				
Farmgate price ware potato	6,250	kw/crate	284	4,544,000
	10,000	kw/crate	455	7,280,000
Profits				
Farmgate price ware potato	6,250	kw/crate		505,300
	10,000	kw/crate		3,241,300

Ware potatoes, 30 T/ha

ITEM	VALUE	UNIT/HA	PRICE PER UNIT	TOTAL PRICE
Seed (35-45mm)	1,500	kg/ha	1100	1,650,000
Manure	4	t/ha	?	0
Urea	100	kg/ha	360	36,000
NPK fertilizer	1,000	kg/ha	540	540,000
Disking and ploughing with tractor	12	h/ha	8,000	96,000
Labour in man days	350	days/ha	1,000	350,000
Pesticides				500,000
Variable costs				3,172,000
	Value	Unit	Price per unit	Total price
Transportation (full truck + bags)			360,000	360,000
Packaging	200	Bag of 150 kg	2,000	400,000
Storage	200	Bag of 150 kg	1,000	200,000
Offloading	200	Bag of 150 kg	600	120,000
Other costs				1,080,000
Total costs				4,252,000
Benefits				
Farmgate price ware potato	6,250	kw/crate	284	8,520,000
	10,000	kw/crate	455	13,650,000
Profits				
Farmgate price ware potato	6,250	kw/crate		4,268,000
	10,000	kw/crate		9,398,000

This is a publication of
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This publication was commissioned by the ministry of Foreign Affairs.
© Netherlands Enterprise Agency | April 2022

Publication number: RVO-110-2022/RP-INT

NL Enterprise Agency is a department of the Dutch ministry of Economic Affairs and Climate Policy that implements government policy for Agricultural, sustainability, innovation, and international business and cooperation. NL Enterprise Agency is the contact point for businesses, educational institutions and government bodies for information and advice, financing, networking and regulatory matters.

Netherlands Enterprise Agency is part of the ministry of Economic Affairs and Climate Policy.