



Ministry of Foreign Affairs

Economic Feasibility Dried Fruit Angola

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Economic Feasibility & development potential for dried fruit Angola

For RVO/ Netherlands Embassy Angola

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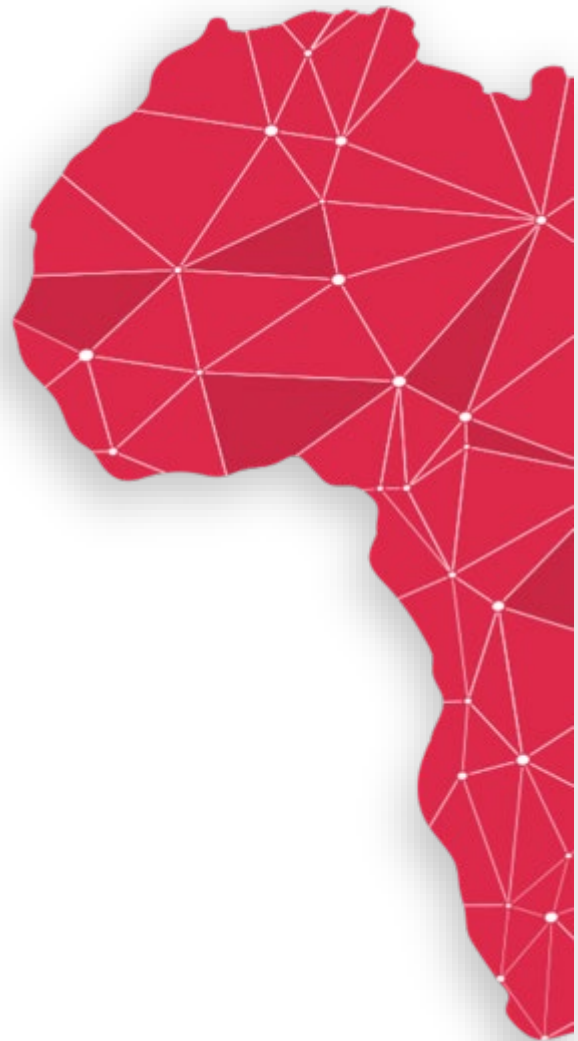


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1 Introduction and methodology

1.1 National context

The fruit sector in Angola is a relatively new sector, that is in the early stages of development. With the renewed focus of Angola on diversification of economic activities away from oil the fruit sector is receiving more interest from the government and other stakeholders.

The main crops are currently Banana, followed at a considerable distance by Mango, Pineapple, Papaya and citrus. Upcoming crops are avocado and dragon fruit (Pitaya). With the sector being relatively young, the main activity is fresh fruit production for the domestic market and neighboring countries such as Congo, Namibia and South Africa. Processing and intercontinental fresh fruit export is still at its infancy.

The development potential however seems substantial. Angola has various climatic and agro-ecological zones that are suitable to the various tropical and subtropical fruits, and combined with the large availability of land, low cost of energy and labour and the logistical developments such as the Lobito corridor and the ports this gives the potential to develop a very competitive fruit sector.

Over the past years about 5 entrepreneurs have tried to set-up a fruit drying business, but so far with limited success. With the sector being in early stage development, now seems to be an excellent time to assess the economic feasibility of a number of activities such as fruit drying.

1.2 The assignment

The Netherlands Embassy is one of the more active donors in the Lobito corridor. In addition The Netherlands is one of the biggest players in the global trade of fresh (tropical) fruits and processed fruit products such as juice, dried fruit and frozen fruit. The Embassy in Angola has commissioned therefor a study to assess the economic feasibility of fruit drying in Angola, as well as advice on how this sector can be developed. The embassy has asked us to focus on 3 fruits, being mango, pineapple and pitaya.

This study therefor aims to answer three main questions:

1. Is it possible for Angola to be competitive in the global market for dried mango and dried pineapple in the short and medium term?
2. Is there potential for the development of dried pitaya as a product?
3. How can the fruit drying sector be developed? E.g. how must we organize the sector, who should be involved, where should the production take place, who would be involved

1.3 Methodology

1.3.1 activities

We used four different steps:

1. Market research: interviews with importers of dried fruits by phone, and during the Biofach organic trade fair in Germany
2. Remote stakeholder interviews with stakeholders in Angola & data collection
3. Field visit, particularly to visit farms and current processors
4. Analysis and reporting



The aim is to present the findings of this report to the stakeholders of the fruit sector in Angola to incorporate their feedback and gather who is interested in a follow up.

During the research we have used our decades of experience in the fruit drying sector to reflect on the situation in Angola. For example, we know the right machinery, scale of production, production efficiencies and cost required to be successful on the global market. As Sense we are in regular contact with importers of dried fruit, who we often link to exporters we work with. We have used these relationships to understand the current state of the market. We also used the market orientation mission with a group of dried pineapple producers from Benin to connect to importers. As part of this mission we visited the Biofach trade fair in Germany, where we spoke to about 15 importers of dried fruit.

In order to find any producers of dried fruit in Angola, we looked for products in local stores, and worked our way back to the manufacturers. Secondly, we asked the three suppliers of drying equipment that dominate the market for fruit dryers in Africa to share contacts of any companies they sold dryers to or that requested quotations. We also got recommendations from the embassy. The annex contains the list of people interviewed.

1.4 Limitations and challenges of the study

The first challenge is that there is no established market for dried pitaya (dragon fruit). There are a few companies that mention this product on their website, but they could not be reached to participate in this research. This means it has not been possible to get an idea of the current demand and market price of pitaya. However, the fact that we have not been able to obtain this information also tells you that it is not a common product and there is no established market price.

The second challenge is that currently there is no real commercial production of dried fruit in Angola. There is only artisanal production in very small quantities of several kilograms per week, that is sold on the domestic market. Hence, we cannot assess any of the production techniques, factory layouts, operational management of drying plants.

The third challenge is to find the farm-gate prices for mango and pineapple. These prices are very important to estimate the economic feasibility of fruit drying in Angola. However, because there are relatively few farmers operating in the sector and a large chunk of the sector is informal, there is no stable clear market price.

In countries like Burkina Faso, the market leader on the EU market, there are an estimated 20,000 farmers selling to 3 large industrial juice plants, 10 fresh fruit exporters and 200 drying plants, plus fresh market traders. This means that every day there are hundreds of transactions taking place, and everyone knows the going market price. In Angola on the other hand, there are perhaps 20 to 30 mango farmers that interact, selling mostly on the informal market. Price fluctuations are therefore large, and it is difficult to establish a real market price.

The operational challenge we came across was logistical; the visit was scheduled for the first week of December to fit into the calendar of the embassy, but this was also the week of the rescheduled visit of President Biden. Information was very scarce, and often not available at all. Road closures, airport closers and complete city closures caused delays and required frequent adaptation of the schedules. In addition, not all respondents were available.

We were also hoping that the visit in early December would allow us to taste the local mango. However, the mango season started a bit late, and there was no ripe mango available for tasting.



Finally, the last remaining challenge is to establish the price of exporting in refrigerated containers. In theory lots of containers should be available as they go back empty haul, having been used for meat imports. There are many shipping companies present. However, because there is no large-scale fresh produce export, this is not an established market yet. Also, transport companies across Africa are notoriously reluctant to give any price estimates.

1.5 Additional detailed market information

Over the past years Sense has conducted several market studies for processed mango products, including dried mango. The most recent study is available for download on

https://resources.colead.link/en/system/files/file_fields/2023/10/04/02-driedmangostudyweb.pdf

Therefore, in this report we will not repeat this information but a small summary overview of the market.



2 Current state of the fruit drying industry

The fruit drying sector in Angola is at an experimental stage, with no real commercial companies operating and no export on a commercial scale, meaning per seafreight container. Small quantities of several hundreds of kilos have been exported by plane to Portugal, but commercial companies export/ import in 40 foot containers that take about 20 tons.

Out of the three South Africa suppliers of mango dryers, only Dryers for Africa sold two small dryers to Angola. We interviewed four companies who have tried fruit drying, of which none were producing when we visited. They occasionally dry small quantities as a side activity. They use small tabletop models that can produce a few kilos per cycle of 20 to 24 hours. These are dryers intended for home use, or to produce samples or product testing. For all these entrepreneurs, fruit drying was a side activity. The only company that has larger cabinet size dryers has stopped fruit drying due to a lack of market and profitability. They struggled to source enough fruit at the right price, which made their product more expensive. They tried to market their product on the local market, which does not really know dried fruit. Most people in Angola also cannot afford dried fruit, which was sold for around 10 euro a kilo. It is a luxury product, even in Europe.

Figure 1: example of a cabinet dryer with a small capacity of approximately 20kg of fresh fruit slices



None of the companies interviewed had a real idea of the production cost of dried mango and pineapple and other products. They also could not give a good estimate of the ratio of fresh fruit to dried fruit achieved in their process, which is the most important benchmark or key performance indicator. Most had difficulties even understanding the question. The few product samples we did see however were of good quality.

Figure 2: Samples of dried pineapple, mango and Banana from Angola



Another observation with regards to the producers is that none of the companies made serious attempts to find European importers of the product. They did not visit trade fairs or got into contact with any of the larger or smaller dried fruit importers. Some have exported small quantities by air to Portugal for sale to retail stores there.

The main reason why the dried fruit business failed to take off was a lack of a working business model. The dried fruit producers focused on the national market, with a product that is too expensive for this market. Even if you are a globally competitive producer of dried fruit you will struggle to sell large quantities in Africa because it remains a very expensive product. It takes at least 13kg of mango or 18kg of pineapple to produce one kg of dried fruit. Most of the African population cannot afford to buy a product with a retail price of 10 euro per kg. They rather buy fresh fruit, if they purchase fruit at all.

We can see this also clearly throughout West Africa, where the entire fruit drying industry is based on exports.

For the first decades only export rejects were sold in the local market at a strongly reduced price. Currently a few importers manage to sell a few tons to supermarkets in capitals such as Abidjan, but the volume remains negligible in comparison to exports. There is no dried fruit producer that manages to sell even close to a container of fruit (20 tons) on the domestic market. This means that it is essential to develop an export market, which none of the current and past producers managed to do.

Another challenge we have seen is that the sales prices have been high, even too high for export. The high production cost is partly due to the high fresh fruit prices on the domestic market for mango and pineapple over the past years, as well as inefficient processing. Prices of between 300 and 400kwanza per kg of fruit seemed normal over the past years. With these prices it is difficult to develop a competitive fruit drying sector. You would have to be super-efficient from day 1. Stakeholders also mentioned the reluctance of some local farmers to sell at more realistic prices. The owner of a small company that operated close to Luanda mentioned that the producers close to Luanda preferred to leave their fruit rotting than to sell it at a reduced cost to him. The supply challenges meant that he stopped the fruit drying in Luanda.

Since then, the situation in the fresh fruit market seems to have changed, and prices have come down considerably. The main reason is that the formal domestic market channel of the supermarkets seems to have collapsed. During retail visits around Luanda, we noticed many supermarkets without mango and or pineapple in the shelves, while the product we did find was of poor quality, and in one case even unsorted with small overripe mangoes part of the lot. Farmers we spoke to have largely stopped selling to supermarkets because they take months to pay. Only large farms with diversified income streams and enough cash can afford to sell to supermarkets.

We can therefore conclude that the drying sector in Angola is still in an experimental stage, where it needs to find a working business model. This means for this study we are focusing on looking at the development potential of the sector, rather than what should be improved. Any drying business that would be set-up needs to be regarded as a greenfield.



The main question we need to answer is thus: what product are we going to produce for which market, with which technology and which type of business?

Our first step in this analysis is to look at the market, followed by production and farming, because about 70% of the direct cost of production of dried fruit is the fruit itself. We then conclude by looking at the other cost of production, and potential stakeholders in the development of the sector.

Figure 3: Locally produced Mango and pineapple in Angolan supermarket. The mango is of poor quality while the price is exceptionally high



3 The market for dried mango, pineapple, pitaya and other fruits

3.1 Dried mango

3.1.1 Usage of dried mango and dried pineapple

Dried mango is the biggest selling tropical dried fruit by far. It can also be a very profitable product, giving gross margins from 40% and upwards provided you are an efficient producer with access to large quantities of affordable mango. The market for dried mango is essentially the European and North American snack market, where it is used often as a healthier alternative to chocolate bars etc. It is often consumed as a snack on the go, for people who do outdoor sports, are travelling and or for school lunchboxes. There are no official trade statistics for dried fruit, but based on our knowledge of production volumes we estimate the EU and US market to be around 10,000 tons of dried mango per annum each.

Dried pineapple has a similar market, but the volumes in dried pineapple are perhaps 10% to 20% of those of dried mango. It is a product that remains largely unknown amongst consumers. The problem is that most importers do not purchase it because they claim there is no demand, but at the same time most consumers do not know the product because it is not in store, and therefore there does not seem to be demand. Importers have not been very active in promoting dried pineapple amongst supermarkets.

Another challenge in dried pineapple is supply and quality. The biggest challenge for pineapple is that it can be very sticky, which makes it impossible to pack in smaller bags. Some importers indicated that they cannot develop the market because they cannot source a consistent quality product. Dried pineapple is usually a bit more expensive to produce than dried mango; because of the higher water content you need more fresh fruit to produce 1kg. The fruit itself is often also more expensive than mango. One of the reasons is that in pineapple you have very little second grade fruit that is not suitable for fresh market but that can be dried.

There is however a good opportunity on the dried pineapple market at the moment, because one of the main suppliers and market leaders, Ghana, is struggling to produce enough fresh fruit for processing. Togo and Ivory Coast also fail to produce sufficient quantities of good quality product at affordable prices. In addition, demand seems to be increasing over the past months. Numerous importers are looking for supply.

Many people think that there is a large market for dried fruit in the baking sector and in muesli. However, most dried fruit used there is cheaper, such as raisins. Where tropical dried fruit is used, it is often candied papaya blocks and small dried fruit offcuts, often referred to as industrial grade. For example, these are the small pieces cut of a mango strip because it is too long to fit the specification of size.

3.1.2 Demand for other dried fruit

The biggest sellers in the dried fruit sector are still raisins, dates, prunes etc. but Mango has become a best seller. Apricots are also popular.

Dried banana has never really caught on as a product, for several reasons. Firstly, the fresh banana is cheap, available everywhere and a convenient on the go snack as it is. Whereas a fresh mango you cannot consume on the go, or a fresh pineapple. Drying the banana has therefore limited added value for consumers. Secondly, most dried banana becomes brown which makes it look unattractive.



Finally, most of the business is in fried banana chips. The dried banana that can be found on the EU market is from Ecuador and not great in terms of flavour and colour.

Consumers however love the flavour of dried banana, and it is a cheaper product to make because of the lower cost of raw material and a better conversion rate from fresh to dry. The opportunity is perhaps for banana as an ingredient in a dried fruit mix to bring down the price.

Another opportunity could be to move into fried banana chips, or perhaps smaller bananas with an interesting cut.



There is no real demand for air dried papaya. The product does not have much flavour once dried and is more expensive to make than dried mango because of the higher water content. It is therefore not competitive. Furthermore, papaya as a fruit is not very popular in the EU because of the flavour, so the dried product has limited appeal. The only dried papaya that is sold is candied, and for this to be a good business you need access to large quantities of cheap sugar, which is not the case in Angola.

There is a market for crispy coconut shavings in modest volumes; sense developed the product for the German market with producers in Burkina Faso and it is still around. Other producers in Ghana and Ivory Coast also produce this. However, coconut is in scarce supply in West Africa which makes the product expensive. Ultimately Asia is much better positioned for this product, because 98% of coconuts are produced there.

3.1.3 Demand for dried pitaya

Pitaya as a dried product is currently largely unknown. It is mentioned on a few websites of European dried fruit importers, but we did not manage to get in contact with those importers, while others who did mention it on their website did not trade in the product. The product samples from Angola were spectacular in colour, while the flavour was interesting. We are however not sure if this is the kind of product that consumers would eat 50 grams of in a sitting. The spectacular colour could make it an interesting product for dried fruit or snack mixes though.

For now, we have to assume Pitaya is an experimental product for which a market still needs to be developed. This means it can be added as a diversification product to a factory that does larger volumes of dried mango and or pineapple, but it is not a product that can be the foundation under a dried fruit business at this stage.

Figure 4: Pitaya in local supermarket in Angola

3.1.4 The value chain for dried fruit

Farmers sell their fruit to drying plants who produce dried fruit. Most of these plants will export themselves and sell dried fruit in bulk to importers, who are mostly located in The Netherlands, Germany and the UK. Other EU countries like France, Austria, Belgium, Italy and Spain also have importers but those tend to be smaller and focused on their local market. The German and Dutch importers resell to clients across Europe, while UK importers are focused on their own market, which is large though.



In West Africa there are also many smaller factories who sell their product to a local exporter instead of exporting themselves. These exporters are responsible for quality control, export logistics, marketing and sales of the product. The advantage of this model is that this offers a route to market for smaller producers who cannot fill a container fast enough, or who do not have the marketing skills to export themselves. In most of Africa it is also common for a factory to subcontract part of the production to other factories if they do not have the capacity to service a client fully. These plants are then both processor and exporter.

Importers of dried mango in turn sell to general supermarket chains and chains of organic and health stores. This can be under their own brand, or a private label brand from the retailer. A few larger importers have their own packaging lines, but most of them use contract packing facilities. These are companies who specialise in packaging a range of products for others as a service. At this stage the dried mango from 2,5kg bags is repackaged in sachets of 30, 50, 100 or 200 grams using automatic packaging lines.

Many importers are also traders, who sell to packers or brands who have contracts with retailers. Some importers hold stock, which means the sourcing is not directly linked to the orders they have, while others only purchase volumes covered by specific contracts.

Importers do not always have their own warehouses where they can store product, do quality control or repack. Sometimes they have temporary storage they hire, or containers are directly moved to their clients. This means that many importers have limited possibilities to solve quality and packaging problems. They cannot repackage product into new boxes if the old ones have collapsed, or open bags to re-sort the product. If there is a problem with the quality, the container is simply rejected and sent back.

In a few cases, there is also vertical integration in the chain. For example, Westfalia from South Africa has also invested in production in Burkina Faso, and they have an importer in the UK called Greencell. Gebana is originally a Swiss importer that developed into an exporter of dried mango and cashew in Burkina Faso sourcing from local plants. They have now also constructed an own factory, and they have an import company based in the Netherlands that buys dried mango from their own company in Burkina, but also from third parties. HPW is another dominant Swiss player that is an importer in the EU with own factories in Ghana and Ivory Coast, but also sources from independent plants. Tradin BV from the Netherlands invested in a joint venture plant in Burkina Faso.

Importers typically source from 2 to 5 different suppliers, and often from a few countries to spread risk and have year-round supply. It also depends on their client portfolio, as different clients require different types of product, e.g. conventional or organic. Some importers focus on discount supermarket chains such as Lidl and Aldi, which means they are very focused on price.

Increasingly supermarkets have a competitive bidding process for suppliers. They must subscribe with an offer, and if they win the tender they can supply. This means that the trade from importers can have large fluctuations, based on the tenders they win or lose.

3.1.5 Transport and order size

The dried mango trade is a container trade, with the standard being a 40feet refrigerated container, that can take about 20 tons. There is no real market for air-freighted dried mango, because this makes the product too expensive.

Larger importers typically trade between 100 to 600 tons of dried mango per year. They are generally not interested in investing in new suppliers who cannot supply at least 3 to 4 containers per year in



the near future. Because they need to market large volumes, they have a need for HACCP and preferably BRC certified product. Many European and US supermarkets do not take product that is not certified. However, trade with a new supplier generally starts with one container as a test.

There are also many smaller importers, and often they are part of the organic and fair-trade market segment. These importers are happy with suppliers who can do even one container or half a container. They are often more flexible when it comes to HACCP certification but often require organic or fair trade. They are also more likely to make advance payments for new producers.

Doing 20ft containers with 10 tons is not very practical, because 20ft reefers tend to be difficult to find. This means either the product needs to be shipped unrefrigerated, which has the risk of reduced shelf life and quality loss during transport which can lead to the container being rejected. The other option is to take a 40ft container that is not full, which also increases the transport cost per unit of product. The third option is a combined load with for example other dried products. However, when combining loads, one must be aware of the risk of cross contamination of flavour etc. between the products.

In conclusion, to play on the market of dried fruit you need to be able to produce multiple containers per year.

You also need to be able to fill a container within the period of one month, to avoid loss of quality. This is particularly the case if you do not use sulphur as a conservation agent. Producing a 20-ton container of dried mango in one month requires a production of 666kg of dried mango per day, which in turn requires 8600kg of fresh mango to be processed per day, assuming 13kg of fresh mango for 1kg of dried mango. That is the benchmark for the varieties in Angola like Kent, Keitt and Tommy Atkins. This in turn requires 3 large container dryers with a capacity to produce 220 to 240kg of dried fruit per 20 hour cycle.

If you have cold storage, you can take more time to fill a container, but the aim should be to do at least 2 containers in a mango season that is usually 3 to 4 months. I would argue that 2 tunnel dryers with a capacity of 240kg of dried fruit per cycle is the minimum capacity you need.

3.2 Types of dried product

The main types of dried fruit are:

- Air dried, meaning it is naturally dried in dryers or in the sun; this is probably 80% of the current market. We estimate that about 80% to 90% of the EU dried fruit market fits in this category.
- Candied, which means it is dried by putting the product in a sugar solution that takes out the water in a reverse osmosis process. This product is mainly available in the UK and in open markets in the Netherlands. We estimate that the market share has gone down to perhaps 5% to 10% at most.
- Freeze dried, which is a newer technology that creates completely dry pieces of fruit that look like foam. They have lost most of the colour and don't always look like fruit, but the flavour is great and the crunchy mouthfeel. This segment does seem to be growing fast, and could be up to 5% of the market.
- Mango rolls, which are made by pulping and drying leftover mango flesh or pineapple flesh, and rolling the thin sheets. This remains a niche product in the EU with a limited market share.
- Dried fruit dainties, or bars which are made by mincing and extruding dried fruit pieces. Often second grade product is used, and different types of fruit can be mixed. This category is growing but is still smaller than 5%.



Africa predominantly plays in the air-dried fruit. Freeze dried comes from China and other countries, because it is technologically more complex, the machines are expensive, and they require reliable electricity. It is still a small market but growing. Candied fruit mainly comes from Asia and is a category that has been in decline for years. It does help to turn fibrous mango into an edible product though. Mango rolls and bars mainly come from South Africa, where the fruit has become relatively expensive, forcing processors to do waste recovery to remain profitable.

Another difference in the products is the pre-treatment. Products can be organic, unpreserved or sulphured. Most dried fruit producers use a form of SO₂ to preserve the product. This helps the product to retain a vibrant colour and moist structure. However, increasingly consumers request unsulphured product for health reasons. Sulphur is also not allowed on Organic mango. Unpreserved is the name in the trade for conventional dried mango that is not preserved with sulphur.

3.3 Buying criteria for dried fruit

The main buying criteria for dried fruit are:

- **Structure/ texture:** should be easy to eat, not too chewy. This means a humidity of 13% to 16% and a gentle drying process. The thickness of the pieces also has an influence on this, as does the variety of fruit (fibrous versus less fibrous)
- **Colour:** Bright yellow or light orange for mango, golden yellow for pineapple. Fruit can easily turn brown, particularly when no pre-treatment is used, and it is not properly packed and stored. This makes it look unattractive and difficult to sell. You also want a uniform colour. Incorrect peeling, drying at too high temperatures and using unripe or overripe fruit all impact colour. Variety also influences colour
- **Size & Shape:** Each client has its specifications, with long slices of between 5 and 7 cm being the most common for mango, and 1/8th or quarter rings (titbits) for pineapple. Mango chunks which are cut in 1-2cm are also common. Full pineapple rings are sold, but cannot be machine packed.
- **Flavour & Aroma:** Absence of off notes such as burned smells, gas smells, fermentation when the mango is too ripe; clear fruit flavour and smell. The best fruit for drying also has some acidity to give the dried product complexity of flavour. The production process has a large influence on this, but also the variety and ripeness.
- **Stickyness & free flowing:** it is important the product does not stick, so that it can easily be taken out of the bulk bags and put on the automatic packaging line. If the product sticks it cannot be packed by machine, and manual separation or packing is too expensive. Free flowing means that in the bag the fruit pieces can move easily.
- **Preservation:** unpreserved or with metabisulphate. Depends on preference of client
- **Packaging:** certified food grade plastic bags of 2kg, packaged in good quality double ply cardboard boxes with a coating that take 10 to 20kg.

Good varieties for pineapple are Smooth Cayenne and MD2, while Queen Victoria is a premium product that is in demand, but expensive to produce because they are small pineapples requiring a lot of fresh fruit for 1kg of dried fruit. The sugar loaf variety is less suitable because it has even more stickiness due to its high sugar content.

For mango the best varieties are Kent, Keitt, Brooks. Palmer, Tommy Atkins, Amélie are also acceptable and sometimes Lippens.



3.4 Main competitors for dried mango

The Philippines are the original market leader in dried mango, but their market share has declined dramatically because they mostly do candied fruit. Apparently, their mango is fibrous and therefore not suitable for air drying. They are mainly big in the UK.

Burkina Faso has become market leader in dried, organic mango over the past decades, due to a large availability of cheap mango that is suitable for drying and interventions from European companies and donors. Mali has a few producers but failed to take off fully despite having received the same support., mainly because of a lack of real entrepreneurs willing to invest their own funds and with leadership and entrepreneurial skills. Ivory Coast started very late in the dried fruit game, but production is growing steadily.

Ghana is a major player, being home to HPW which is probably the biggest company by market share in dried mango and certainly in dried pineapple. However, the price of mango in Ghana is high, and only very efficient processors can survive. HPW itself imports fresh pineapple from Ivory Coast but also produces in Ivory Coast and purchases from independent producers in Burkina Faso and Ivory Coast.

The challenge of West Africa, and in particular Burkina Faso is quality, certification and customer service. Doing business with most companies is not easy because generally they do not have any English-speaking staff. They do not understand European or US business culture well, for example how to negotiate prices, how to respond timely to emails etc. Most companies are traditional family businesses with one owner manager who employs unqualified family members. They struggle to modernize and professionalize.

This also has an impact on product quality. There is a lot of product of mediocre quality in the market. There are however also several more professional companies, and several donor programs have worked to professionalize the industry. The other challenge they have is to obtain the certification necessary to open the doors, such as HACCP and BRC.

South Africa was the traditional market leader in air-dried mango. However, the industry is struggling because during the boom years in the sector when competition for raw material was high, farmers increased their sales price. This together with increases in energy cost and labour have made the product expensive. Furthermore, they do not have any organic product and struggle to produce unpreserved product. However, in terms of customer service, certification etc. they are very strong.

When the market was larger than what South Africa could supply, many South African companies got involved in producing fruit elsewhere. Sense for example brought them to Burkina Faso. Others tried Peru. Currently South Africans are involved in Mozambique and Malawi as well. South Africa remains a hub for processing technology.

Mexico is a large player in the industry, but mostly focused on the US market. Their product is of decent quality and their pricing is competitive. Kenya, Malawi, Mozambique Ecuador and Peru are destinations that can be found in market, but not in large volumes yet. Though India is one of the largest producers of Mango and responsible for about 50% of the global mango juice production, they do not produce dried mango.

India is not a producer of dried mango; their industry is much more focused on Juice where they are the world market leader, and recently they have added in Frozen fruit production.

3.5 Main competitors in dried pineapple



Dried pineapple is a much smaller category, and currently there seems to be a shortage of supply. Ghana may be the largest player on the market. They have the right varieties (MD2 and Smooth Cayenne) and considerable production areas, mostly for export by air and fresh cut fruit salad production. However, cost of production in the Agri sector in Ghana tend to be high and supply limited. Plantations are mostly focused on fresh export. Unlike mango, in pineapple there is only about 10% to 20% second grade in a field, which means most of the crop can be sold on the lucrative fresh export market. Processing normally utilises the cheaper less visually appealing 2nd grade fruits.

Ivory Coast like Ghana was once a large exporter of fresh pineapple but struggled to convert from Smooth cayenne to the MD2 variety and compete with Costa Rica. Like Ghana they are focusing on niche export markets by air or sea, such as organic, premium segment air freight etc. During the crisis most producers left the sector and land was converted to rubber plantations. Currently competition for pineapple is stiff between juice plants and drying plants and fresh exporters. This makes the product expensive and to get larger volumes, you need to pre-finance farmers. HPW is probably the only producer of dried pineapple active there.

Togo has been mentioned for years a supplier of organic dried pineapple but seems to fail to develop further. Suppliers are small, dependent on donor aid or exporters and importers who provide a lot of support. The exporters Gebana and Burkinature who pioneered the dried mango sector in Burkina Faso have also invested a lot of effort in Togo. However, as Gebana mentioned the producers are still not able to produce consistent quality in high quantities. Therefor they cannot develop the market further. The challenge seems to be a lack of entrepreneurial skills and technical assistance.

Benin has a lot of potential, but the drying companies there are all very small still, and will require several years to grow to the level where they can export containers directly. Though there is a lot of pineapple available, production is shifting to the less suitable sugar loaf variety that is loved on the local fresh market and easier to produce. However, this variety is not that suitable for drying, because it lacks acidity and produces a flatter taste when dried. In addition the colour is not that appealing (pale yellow), and it has so much sugar that the final product becomes too sticky.

South Africa currently has one large exporter of dried pineapple doing the Smooth Cayenne variety. Asia mainly produces candied pineapple.

Finally, one would expect Costa Rica to be a dominant player, give the enormous volumes of pineapple they produce and having 90% of the fresh market in the EU. However, this has not materialized so far. We did find small quantities of dried pineapple from Costa Rica in a German shop, and the quality was excellent.

3.6 Pricing for dried pineapple and dried mango

Pricing for both products are very similar. For more than a decade now the sales price has been between 6,5 EUR and 8,5EUR per kg, CnF Rotterdam, Hamburg, Antwerp or UK (Tilbury). The price depends on demand and supply, quality, certification, and the variety.

The difficulty in dried mango is that there is no organic premium, because most dried mango from Burkina is organic certified because it comes from 0-input famers. A lot of dried organic mango is sold as conventional. Export prices for conventional and organic dried mango are currently between 7 and 7,50 EUR per kg. Those who sell into fair trade and organic importers sometimes manage to get prices from 7,50 to 8 euro, and more if there is fair trade certification. But to play in this market there needs to be sourcing from small farmers, farmer cooperatives etc.



Companies with lesser quality and no HACCP certification, are often forced to sell below 7 euro to mostly German importers, or for less to regional exporters who do quality control, marketing and logistics.

Dried pineapple prices are similar, but in contrast with dried mango there does seem to be an organic premium. It is not easy apparently to find organic pineapple. Historically prices of 7 to 7,5EUR per kg for conventional and 7,5 to 8 EUR per kg for organic seemed normal, but recently prices seem to have increased. Even prices of 8,5 euro are possible, though this would decrease demand.

3.7 Trends in the dried mango market

After going through a difficult period, the dried mango market seems to be back stronger than ever. In 2022 most of West Africa had a bumper harvest, and most companies produced a lot, but with substandard quality in many cases. Optimistic importers purchased most of it. Simultaneously the cost-of-living crisis really started to impact consumers, who have less disposable income. The retail price of dried mango increased rapidly, but without the export price increasing. Retailers took extra margin to cover their cost. The high retail prices made the product too expensive for certain customers, while loyal customers cut back on the volumes they bought. Therefore demand has decreased we believe as well.

Throughout the first 5 months of 2023 many importers did not receive any orders, and there were many stories of importers sitting on massive old stocks they were trying to sell for prices far below 7 euro. Only by the end of West African season in June did stocks run out and new orders came in. However, by then it was too late for most factories to still fulfil these orders. We estimate that both Burkina Faso and South Africa lost about 500 tons of exports in 2023.

2024 was a slow year at the start as well, but demand picked up. Because the old stocks have now been sold and 2024 was not a great season in West Africa, there is now again a healthy demand. Companies are actively looking for hundreds of tons of supply again. However, there are several smaller German importers that are trying to gain market share by dropping the price. This combined with the old stocks being sold at below market prices had given the impression to buyers that prices can be reduced. We expect prices of around 7 euro per kg this season.

We have also noticed that the retail prices in the EU have come down again, which may be the reason that demand is recovering. It is well possible that retailers noticed a drop in sales and corrected their prices.

So far, the market remains dominated by air dried mango. However, the market seems to have entered a stage of maturity where demand is not growing as fast as it used to, and competition of suppliers is increasing. Across Africa Dried mango production is seen as an interesting economic development option, so more players are entering the market. What the category needs is product innovation, and marketing campaigns to drive demand. However, so far, the sector has not been capable to do this.

3.8 Trends in the dried pineapple market

Until recently demand for dried pineapple was very weak. Most importers said there was no interest from supermarkets, but at the same time we found in consumer research that consumers simply don't know the product, because it is not promoted, and most stores do not stock it. Interestingly, over the past months several importers have indicated they are receiving requests for dried pineapple, but they are not able to supply.



One of the reasons is that most importers in the past have not been interested in investing in the development of the supply chain. The only exception are a few small exporters in the organic fair-trade field who have developed pineapple drying in Togo.

For mango many importers have even pre-financed drying equipment for exporters in West Africa. They have provided advance payments, travelled out regularly to inspect factories. However, they simply have not been willing to make the same investments for pineapple. Probably because the demand was low and did not warrant the investment in time and money. This now seems to change. Hence the moment seems right to enter the dried pineapple business.

Another reason for the lack of supply is that dried pineapple production is more complicated. The biggest problem is that dried pineapple is very sticky. When the pieces stick together, they cannot be packed by machines by the importers and need to be rejected.

In West Africa a lot of producers have switched to the sugarloaf variety for the local fresh market because it is easier to produce. However, it is more difficult to dry because the final product is usually too sticky. Browning is another challenge associated with high sugar pineapples.

The second challenge is supply of fruit. Where you need 13 to 16kg of fresh mango for 1 kg of dried mango, you need at least 17k to 19g of fresh pineapple. This means that the raw material price is even more important. Pineapple also has far less second and third grade, usually only 10% to 30%, compared to mango which can have 90% of non-export grade. This means drying plants are competing directly with the fresh market, juice etc. for supply, which increases prices. Finally fresh pineapples take a lot of volume, which increases transport cost. Hence to profitably produce dried pineapple you need to be close to plantations that have large volumes of quality pineapple available at the right prices.

All this means there is a real opportunity for new dried pineapple producers. If you can produce good quality non-sticky pineapple you have very limited competition.

3.9 Certification

Certification plays an important role in the dried fruit market. Importers who sell to supermarkets require HACCP as a minimum but prefer importers with an advanced food safety certificate such as FSCC22000 or BRC. When there is limited supply, importers can allow non-HACCP product after inspection of factories and when questionnaires have been filled in, but they want to see a long term plan for how certification is achieved. There are also importers who don't require HACCP, but they tend to do smaller volumes and are more focused on the organic and fair-trade market, and sales via smaller specialised organic stores. HACCP certified product is three times easier to sell than non-certified product.

Organic certification plays an important role, as the market started out in health stores and organic specialty stores. However, for dried mango there is an oversupply of organic product and there is no price premium. Organic certification is essential if you do not have HACCP. The challenge with organic certification is that there are many different certificates, e.g. there is organic for the EU market, Switzerland, the US and Japan. They are all different.

The market for fair trade is much smaller, but fair trade can help when you target specific niche markets.

3.10 How to win in the dried fruit market: critical success factors



The ideal supplier of dried fruit makes life easy for dried fruit importers. They can supply several containers of dried fruit per year, they have an advance food safety certification such as BRC, and can supply quality product for less than EUR7,50 CnF Rotterdam. They can provide unpreserved and preserved product. They have English speaking staff that understands logistics and customer service. They do not require an advance payment but accept 50% on bill of lading and 50% on arrival. They have representative factory premises that meet Western standards. Finally, they can offer multiple products to the importer, e.g. dried pineapple and mango, so the importer needs fewer suppliers. Finally, having a distinct social story around the company can be an advantage.

3.11 Other dried products: lessons from Burkina Dry-more

3.11.1 Burkina dry-more

During the 3-year Burkina Dry-more program financed by the Netherlands Embassy in Burkina Faso, Sense together with Advance Consulting and Agrodev worked on the diversification of dried mango exporting companies. Their key challenge is that it is difficult to professionalize a business that only operates 3 to 4 months of the year, because there is not enough profit to pay for a professional middle management team. In addition, as the past years have shown being reliant on a single product is very risky.

The Dry-more project started with crop selection. We were looking for a crop that was already produced in Burkina in decent quantities that needs to be processed, has a ready market and where Burkina Faso can be competitive. Furthermore, it would need to have synergies with dried mango; either in sourcing, processing or marketing. For example, because the product is produced by the same farmers, sold to the same clients, or uses the same equipment. Finally, the season would need to be different from the Mango season.

From previous work in the sector we knew that dried banana, papaya, pineapple and coconut would not work. We then started looking at a number of others and finally settled on dried and sliced ginger for the international spices market, fonio and hibiscus. During the project we interviewed about 50 importers of these crops, trained farmers, processors; developed processing equipment and facilitated the export of these crops.

3.11.2 Ginger

There are three main products that can be interesting based on ginger. The biggest opportunity is sliced and dried ginger for the international spice market. Ginger root is sliced to make drying easier, and dried to 12% humidity, and exported in bags. Peeling is not necessary. The ginger is then ground to powder, or the essential oils are extracted by placing it in ethanol. This is a market of about 900,000 tons, with the main producers being India and Nigeria. It is a very price competitive market, where you must do large volumes with a limited margin. However, it is a relatively easy product, because it is an ingredient for industrial processing.

The main selection criteria are the percentage of volatile oils (>2%), colour (yellow), aroma, absence of pesticide residues, salmonella and E.coli, humidity (<12%) and price. Importers have the possibility to accept loads that are slightly out of spec because they can 'blend out' the problem. A small quantity mixed with a large quantity will bring the average level of pesticide residues for example within range. What is of lesser importance is traceability and HACCP certification. Prices are very competitive and range between 2\$ and 3\$ per kg.



Currently there is a shortage of ginger because Nigeria is suffering from a fungal disease, and this will take many years to solve. The market seems dominated by Dutch, US and Indian spice companies.

Ginger production is relatively technical, but very lucrative. Yields range from 5 tons per ha in Burkina Faso and Ivory Coast to 60 tons in South Africa under drip irrigation and mechanized modern farming. For the spice market the size of the rhizome is less important, and the ginger can be very spicy. For fresh and candied ginger, you need larger rhizomes and less spicy product. Spiciness and rhizome size is influenced by the variety and growing conditions, with hot and dry conditions and direct sunlight leading to spicier ginger. Production in very fertile soils with ample water and partial shade will produce a milder product.

Figure 5: Locally produced ginger in local supermarket next to a piece of imported ginger. Local ginger can be used for sliced and dried export, but not fresh market export or candied ginger



The processing of ginger requires a good washing machine, that can also be used to wash mango, to remove the dirt, and industrial slicing machine and either sun drying or the same tunnel dryers for mango. For sun drying the same drying racks can be used that are used in the mango dryers. The drying time is about 6 hours. The conversion of fresh to dried ginger ranges between 4 and 6kg for 1kg of dried, depending on the variety and production efficiency.

The other ginger products are candied ginger for the snack market, which is produced by placing sugar cubes in a sugar solution with an agent to break down the fibers. The challenge is that you need a non-spicy variety for candied ginger, because the final product cannot be too spicy for the EU market.

The other product that is interesting is fresh ginger for the EU fresh market. Here you need a product with large rhizomes that again is not too spicy, as well as excellent logistics to bring this

to market quickly.

There is a clear market for organic in all three products with an interesting price premium. However, being a root crop ginger seems very susceptible to pesticide residues.

3.12 Hibiscus

Hibiscus flower is one of the top 3 ingredients for fruit teas, providing it with a red colour. It is mainly produced in Egypt, Sudan, Nigeria and other Sahel countries such as Burkina Faso. The past years have seen several diseases that have decimated crops across North Africa. The main demand is for full traceability, low acidity product. Like ginger, hibiscus seems susceptible to pesticide residues. The main issue is cross contamination with chemicals used in cotton production in West Africa.

Processing of hibiscus is simple but labour intensive. The callus needs to be separated from the leaves by hand, and foreign matter needs to be sorted out. The product can be sundried. There is a market for whole leaves, crushed leaves and powder.

3.13 Chili peppers

Within the Dry-more project dried pepper was not selected because the existing mango farmers of the companies were not chili producers, and we had questions about competitiveness. Subsequently



we have done more detailed market studies, which have shown an interesting niche for dried bird's eye chilis in Europe and South Africa.

For the regular spice market it is difficult to compete with Asian producers, who sell whole dried chilis, flakes and powder for around 2\$ per kg. However, there is a small niche for whole dried bird's eye chilis, both in conventional and organic. They are used in jars, sauces, oils for the visual effect. Because of their small size they can be added whole. Prices for dried bird's eye range between 7 and 9\$ per kg. The product is not really produced in Asia. Based on business planning we assume that the high price premium comes from the labour needed to harvest these tiny chilis. More than half of the production cost is just harvesting labour.

Chilis are produces using drip irrigation on relatively small areas because of their high yields and large labour requirements. Drying can take place in the sun, or in the same dryers as used for mango. They are sold to spice importers.

3.14 Conclusion: the market opportunity

There is a clear market opportunity in dried mango and dried pineapple. For mango the market is competitive but there is always space for a HACCP certified plant that can provide high quality at competitive prices and provides ease of doing business through excellent customer service. The pineapple market has great potential, while there is great potential for a company who can supply both dried mango and dried pineapple.

The market for dried pitaya is very limited, and would require cooperation with importers who can actively promote the product. It should therefor be regarded as a product that can be added on to a plant that already produces pineapple and mango.

Other more concrete diversification opportunities are dried and sliced ginger, dried bird's eye chilis and hibiscus. Dried banana and fried banana chips also offer potential.

3.15 More detailed market research

A detailed overview of the dried mango market can be found on:

https://resources.colead.link/en/system/files/file_fields/2023/10/04/02-driedmangostudyweb.pdf

This study was conducted by Sense for COLEAD, using information that was gathered until about 2022.



4 Raw material supply: farming

4.1 Introduction

For any fruit processing sector to develop, we need a steady supply of fresh fruit at the right price at the right moment of the year and of the right quality. Fresh fruit is the main cost driver in the production of dried fruit. We therefore need to look at the production of dried pineapple and dried mango as well as pitaya in Angola, but particularly the Lobito corridor.

In preparation of the field work we read through the earlier mapping of the sector carried out by Resilience in 2019. The main objective was to map the fruit sector in the provinces of Huambo and Benguela. This report can be downloaded from:

<https://www.agroberichtenbuitenland.nl/documenten/rapporten/2019/11/19/report-lobito-corridor>

Based on our fieldwork we agree with most of the findings in this report, though a few things seem to have changed since 2019, and in some areas we can provide additional insights based on our specific practical experience in the sector. We therefore use the findings of this Resilience fruit mapping in this chapter but enrich it with additional observations.

4.2 Overview of the fruit production sector in Angola

4.2.1 Production and international trade

Before the civil war, Angola was mostly self-sufficient for most crops and a major exporter of banana. However, it has been a major importer of fruit ever since. Exports have only started since 2017, but grown rapidly since. This is mostly Banana, followed by mango, pineapple and other crops, but focused on neighbouring countries. Currently fruit imports and exports are more or less balanced, with main imports being fruit that requires colder temperatures from South Africa, such as apples, pears, grapes, citrus etc.

4.2.2 Geographic spread of production

According to Resilience about 40% of fruit is produced in the provinces of Benguela, Huambo and Kwanza Sul. The figures underneath show those provinces, and where the various fruits are produced. Benguela is the main producer of banana, Mango and Pineapple, while Cuanza Sul and Huambo are the main producers of citrus. This means that for the purpose of our study we can focus on the Benguela province.

Figure 6: Map of the provinces of Angola (Resilience)



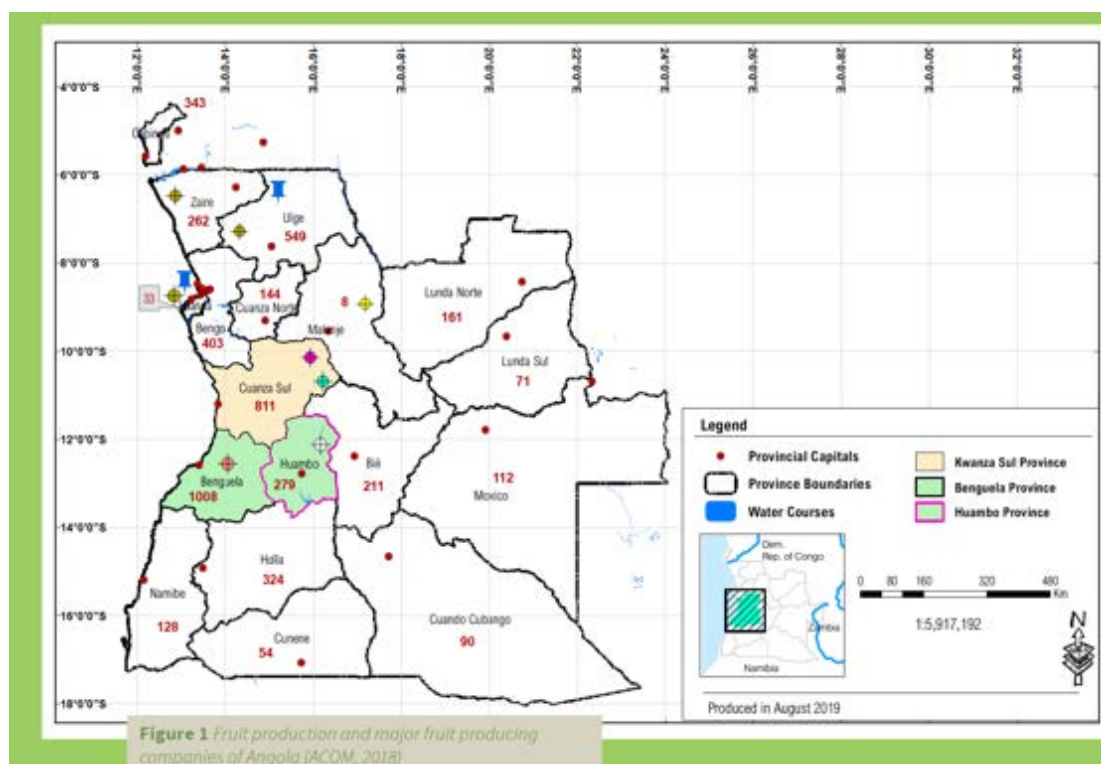
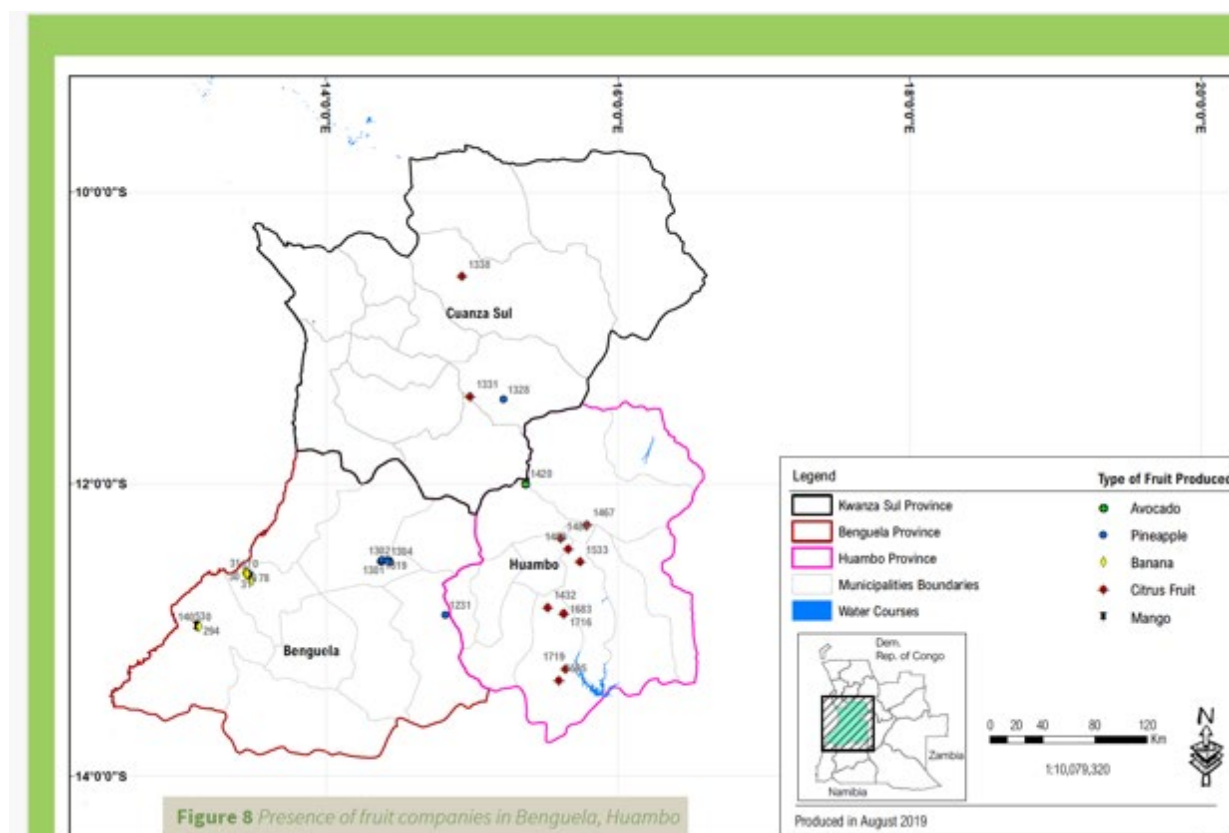


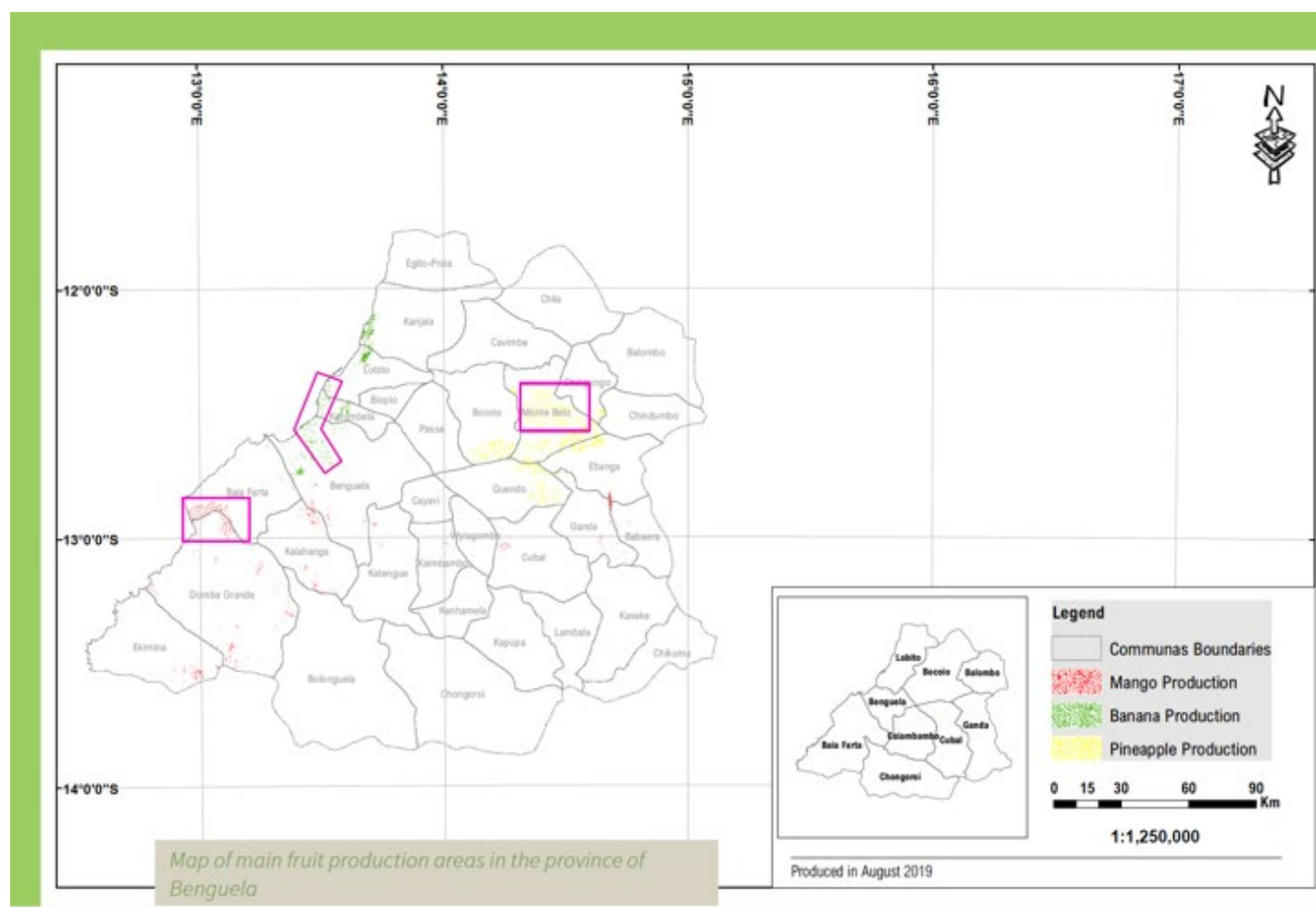
Figure 7: Map of fruit companies in Cuanza Sul, Huambo and Benguela provinces (Resilience 2019)



The figure underneath shows the location of producers of pineapple, banana and mango in Benguela province. Mango is produced mostly with irrigation in the low lying dry coastal area, with Baía Farta,

Dombe Grande as strong clusters. Pineapple production is concentrated in the highland area of Monte Belo, where it is produced in a rainfed extensive system. Banana is produced along the coastal strip.

Figure 8: map of main production clusters (Resilience 2019)



Finally, pitaya is only produced close to the capital Luanda. The coastal strip also has many papaya plantations.

According to the producers in the coastal strip the soils there are not suitable for pineapple production. Whether this is the case we do not know; however if pineapple can be produced easily in a rainfed system further inland there may not be an economic incentive to do this under irrigation in the coastal strip.

4.2.3 Farm size & typologies

Based on our experience in nearly 30 African countries we can say that the fruit sector in Angola is almost unique, because of the absence of thousands of small scale and subsistence farmers, the large average size of farms and the relatively high level of professionalism amongst farmers. Only South Africa has a similar context in Africa.

The amount of land that farmers own is large. Many farmers have several hundreds of hectares or even 1000 ha available to them. Farmers with 15ha for example are seen as small, where in most of Africa this would be considered a medium sized emerging farmer, and everything from 30ha is considered as large.



What is more in line with the rest of Africa is that most farmers, particularly the pineapple farmers, only farm a small percentage of the land they have available to them. Like elsewhere in Africa the perceived absence of markets, and lack of funding are main reasons.

What also stands out is the small number of farmers. Resilience identified only 83 commercial farms in the provinces of Benguela and Huambo, of which 32 are in Benguela. We only visited 8 farms during our visit, but we did not see many other farms that we could have visited. Based on the Resilience mapping and our own observations we estimate there are at most 10 commercial mango farmers and 10 commercial pineapple farmers. With commercial we mean that actively invest in their crop, have about 3ha under production and sell for cash.

This low number is strange, and indicates that the fruit sector is very small, with very limited processing and exports taking place. In comparison, Burkina Faso has an estimated 20,000 mango farmers with orchards being 5ha on average. South Africa has 2700 commercial farms in the lowveld alone, which is the main production area for mango, litchi, banana in the country and a major citrus producing area. Considerable volumes of those crops are processed and exported in fresh form.

One could argue that this is because they only took into account commercial farmers. However, while travelling through the countryside we did not see signs of subsistence or small scale mango or pineapple farmers. In most of Africa you would see small orchards of an acre, a hectare etc. Hence this large block of farmers that usually dominates the sector in Africa seems mostly absent.

The large tracts of land that commercial farmers have access to can be explained by the large migration to Urban areas, particularly Luanda, during the civil war. This means rural areas are sparsely populated, and large numbers of farmers have left the subsistence farming practices making land available for others.

What we have also observed is the large area of land that is not under production, even in the wetter highlands where rainfall is sufficient for rainfed farming. Allegedly much of the land adjacent to roads is owned by politically connected people but not used. Many farms there seem to be located away from main roads, with very poor rural roads.

The farmers we did speak clearly have access to substantial investment and working capital. They all have tractors for example. The coastal farmers have pumps, irrigation systems and use high levels of inputs such as fertilisers, foliar fertiliser, crop protection chemicals etc.

4.2.4 Pineapple farming systems

The pineapple farms are all clustered around Monte Belo. They are mostly located a few kilometres from the main road over very rough dirt roads. The area has undulating hills, visibly good soils and ample rainfall. The farmers are all mechanised. Production is rainfed.

The pineapple production system is unique in that it is a very extensive system. We have never seen a similar production system. The planting density is very low, with large space in-between rows to allow for mechanical weeding by tractor. Planting is done only once per 5 to 8 years, while any other farmer in the world replants every cycle. The normal production cycle is 12-14 months after planting. Fruit is harvested, the plant is uprooted and replanted. In Nagaland, India where they farm organic Smooth Cayenne as well, they replant after 2 harvests. The crop gets a first large pineapple, then a few months later a second one and then the cycle ends. What is fascinating is that the plant in Angola is opposite: it produces a small pineapple first, and then a larger one from the second one.

No granular fertiliser or foliar fertiliser is applied, and limited crop protection. There does not seem to be forced ripening taking place. Sometimes animal manure is applied. Essentially this is a 0-input



system that can be organically certified. The variety used seems to be a smooth cayenne, but the name is not known locally. There is no certified planting material available, replanting is done by using the old slips.

The level of technical knowledge of farmers seems fairly low. They don't know the name of the variety they are farming, what major diseases there are, and what their yield is, and when exactly the production season is. They have no idea of their cost of production either.

The yields in this system are very low, but we cannot estimate this because no records are kept. Resilience estimated in 2019 yields at 5 tons per ha. In comparison, small commercial farmers in West Africa often get 25 to 35 tons per ha, while 55 tons per ha is possible for commercial farmers. Allegedly yields in Costa Rica are more than 100 tons per ha.

The size of the fruit and the quality however seems great. The pineapples we have seen in store and in the field are 1,5 to 2kg each.

Despite the low yields, we are certain this is a very profitable model, because essentially, it's a 0 input model. Apart from the fact that nothing is spend on fertiliser and chemicals, there is no cleaning and replanting which is normally a large cost. IN this case those cost are spread over 5 to 7 harvests. Weeding is largely done only in-between the rows by a tractor. Hence the only real cost in production is harvesting.

When a farmer has limited land available or the land is expensive, that farmer cannot afford to get such a low yield per ha. To get a good income, he or she would need to reach a certain tonnage which can only be done with intensive production. For example, in Ghana, Benin and Ivory Coast land is expensive and limited.

However, in Angola the farmers seem to have land in abundance. They are only farming a fraction of their land. Therefor the current model can work well, because practically anything that gets harvested is pure profit. If more production is needed, you plant more hectares. The low density undoubtedly helps with pest and diseases control and lowers fertiliser requirements. With so much land a farmer can also afford to leave land fallow for 10 years to allow the soil to rejuvenate. A large pineapple farm in Hluhluwe, South Africa also practises this model, though the plant there produces only once.

The pineapple seasons seems to run from November to the end of May. This seems to be linked to e the dry months in the area are May till September. When there is sufficient water, pineapple can grow year-round, and the day of harvest can pretty much be planned by choosing the planting moment. However, in the extensive rainfed systems where there is no planting, forced ripening or supplementary irrigation nothing is done to influence the moment of production.



Figure 9: Pineapple plantation in the Dombe grande region. Note the large space between lines, for mechanised weeding and the large size of pineapples

4.2.5 The market for pineapples is the limiting factor

The limiting factor for pineapple farmers is the market. Some farmers do not even harvest all of their pineapples. Most farmers have reduced the area under production over the past years due to lack of market. Farmers face the choice of selling for a fixed price to official retail, but this means they need to pay for harvesting and transport and wait 3 months for their money. If they sell on the informal market, they need to hire their own truck and transport product to the wholesale markets in Luanda. However, there they never know what price they will fetch. Often, they are forced to sell at a loss.

All farmers indicated they are looking for an industrial buyer who can buy all of their product for a pre-agreed price. They indicated to be happy with prices as low as 20 kwanza for a pineapple of 1,5kg. Having said that, the experiences of processors are that when they do offer lower prices, farmers are often not willing to sell and prefer to leave the product unsold in the field. For example, the local rum distillery has tried to purchase at that price without success.

4.2.6 Mango farming systems

The mango farms we have seen are a much more intensive production system when compared to pineapple. Various types of fertiliser and chemical treatments are used, the plantations are irrigated, trees are pruned, and even soil analysis has taken place. The plantations visited were tens of hectares with space to expand.

As opposed to the pineapple farmers, the mango farmers are multi-crop farmers. They do other crops such as bananas, papaya, onions etc. Interestingly the level of knowledge and professionalism and thus performance on these crops far exceeds the mango production.

Figure 10: Very professional onion and banana plantations with drip irrigation



For example, Banana yields are around 55 tons per ha, which is in line with professional plantations elsewhere in Africa; basic planting material is imported from South Africa and locally multiplied. They farm multiple varieties, and everything is known about these varieties. Diseases are known and treated. The Mango plantation in Dombe Grande also hits the best-in-class benchmark for open field onion production from elsewhere in Africa.

However, the mango farming practices are far from optimal, and there is a lack of knowledge. Firstly, the planting density is far too low; we estimate this to be between 130 and 200 trees per ha. About a decade ago the norm for irrigated modern production was 450 trees per ha. Nowadays this has evolved to 1200 to 1500 trees per ha.

Figure 11: Mango plantation with low planting density



The problem with doing intensive irrigated farming with a low planting density is that you do not achieve the yield necessary to compensate for the high cost. This is one of the main reasons that fresh mango in Ghana is too expensive for most processing. The trees fill a lot of space and produce a lot of foliage but not fruit.

The other issue observed are the pruning techniques. Despite the large size most pruning seems to be done by hand, which creates rough cuts prone to infections. The pruning is also not severe enough, and the window-pruning technique is not used. In window pruning the centre of the tree is thinned out so that fruit can also grow on the inside of the crown and gets more sun to get red coloration.

The result is large trees with large branches that need support, so they do not break off under the weight of the mangoes; large trees that only produce fruit on the outside but not in the centre, and limited space between the rows. This reduces air flow which in turn leads to fungal diseases, less sun on the mangoes etc.

Figure 12: Incorrectly pruned tree (left) that takes up a lot of space, has no fruit in the centre and with branches that are about to break off. Right: relatively young plantation that should have been pruned back to avoid the branches growing into each other.



The varieties farmed are the right ones, being Tommy Atkins, Keitt and Kent and Palmer which has been introduced recently. Of those varieties Tommy is the more fibrous and least desirable, but it can still be used for dried mango, juice or the fresh market. Tommy is normally an early season variety with high production, so it is useful in lengthening the season.

The knowledge level of farmers on mango is also limited. In addition to the lack of knowledge on proper planting distance and pruning techniques, they also seemed to struggle to name the main mango pests and diseases, though this could be a language issue. They do not really know their yields per ha, and the knowledge on the difference between varieties is limited. They can recognise them but struggle to tell when which variety is in production and what they yields are. Usually, the yield depends strongly on the variety, with 25 to 30 tons per ha for Kent but Tommy and Keitt can get above 45 tons per ha. They also don't know their cost of production too well.

Some of the orchards are also flood irrigated which is highly unusual for mango. It also seems uneconomical, because you must pump more water and spend labour on levelling and channelling the land. The large farmer we interviewed that was using flood irrigation mentioned though that the orchard was rented and therefore they did not want to invest in drip irrigation.

What was impressive is that the orchards use mist blowers for pesticide treatments, they are mechanised and have access to irrigation water. Some also invested in solar pumps. Water is pumped from wells, with the groundwater being shallow at around 10 meters depth. In addition, they have done soil sampling and calculated fertiliser usage.

The yields estimate ranged between 15 and 25 tons per ha, but these were rough estimates from respondents. Also, they did not know the difference in yields. An orchard that prunes, irrigates, uses mist blowers and fertilisers should get at least 25 tons on Kent and 45 tons on Keitt, Tommy Atkins etc.

Finally, the importance of using good quality trees is not well understood for mango it seems, and there is no local source of trees. Farmers complained about the high cost of trees, but even in a system with high density planting the cost of trees is usually only 5% to 10% of the orchard investment cost. The rest is the cost of land clearing and levelling, fencing, irrigation, manure and fertiliser, digging of

holes and planting and maintenance during 3 years before the harvest starts. However, when the tree is not the right quality, there is nothing you can do to solve the problem, apart from regrafting the tree which costs 1 to 2 years of production.

Currently trees are either imported from South Africa or from a nursery close to Luanda. Farmers talk about wanting to learn how to graft trees so they can produce their own trees and save money. However, as soon as you compromise the quality of the tree, you reduce future earnings.

The mango season runs from early December to the end of March. This coincides with South Africa. In mango one variety usually fruits for a period of 4 to 8 weeks, so with the use of multiple varieties the season can be lengthened. The combination of Tommy Atkins (early), Kent (Mid-season) and Keitt and Palmer (Late season) should provide a long season. However, it is not entirely certain which varieties ripen when in Angola. According to one farmer, the order in Angola is the inverse with Keitt being the first to produce and Tommy Atkins the last. Other farmers did not know exactly when what ripens.

4.3 Market for fresh mangoes

The market of mangoes is not as complicated as that of pineapple. Farmers are finding outlets in the informal markets as well as supermarkets and a juice processor. The larger farmers have the cash flow to wait for supermarkets to pay. One farm is selling to a juice plant which has the same owner. Sales prices range to about 300 Kwanza per kg. However, the owner of Fazenda Nelito Monteiro mentioned they are interested in processing because they do have rejects and unsold quantities up till 30% of their production.

4.4 Pitaya farming

There are currently 2 pitaya farms close to Luanda, and this industry is still at its infancy stage. Pitaya is sold on local informal and formal fresh markets. Because both the market is small and the production is small, and it is not taking place close to pineapple and mango farmers, pitaya does not seem to be great option at this stage.

4.5 Conclusion: Fruit supply

The fruit sector in Angola is still at the early stages of development, except for bananas. There are few farmers, there is very limited processing for local market and exports and limited fresh exports. There is almost no formal market that functions well, and prices fluctuate strongly because of the small size of the market with few buyers and sellers.

However, many ingredients of success are available. The climate is suitable for pineapple and mango, there is ample availability of water and land, there is a port with reefer containers nearby (Lobito) and there are experienced farmers who are willing and able to invest to professionalise production.

What farmers require for further development is a stable market, that has more or less stable prices and can absorb large volumes. Creating this market requires export-oriented processing and potentially fresh fruit exports. This in turn requires a vision and sector strategy.

For a drying plant specifically there seems to be enough supply of pineapple at low prices and mango at reasonable prices in the Lobito corridor. The most logical location for a plant would be in Lobito, Benguela or Catumbela, because both mango and pineapple production is relatively close-by.



A challenge in the supply would be seasonality. In an ideal scenario, you dry mango during the mango season and pineapple during the rest of the year. However, in Angola there is a large overlap of the season. As it is now, November and early December there is only pineapple, mid-December till the end of March there is mango and pineapple, and then April and May Pineapple again. June till September would be a period without production.

To change this problem, one would have to work with pineapple farmers to influence the production season, most likely by providing supplementary irrigation during the dry months. Given the hilly landscape and large rains, it should be relatively simple to collect water in farm dams and use this for irrigation using a drip system.

Influencing the mango season is more difficult and can usually be done mostly by planting different varieties. More knowledge is necessary on which varieties produce when in the area, which requires some tests and monitoring of existing trees.

Given the low production cost, large availability of land and limited competition for raw material it should be possible to procure large amounts of pineapple for processing at very reasonable to low prices. For mango this may be more complicated, because farmers invest a fair amount in irrigation, pest and disease control, pruning without getting the corresponding high yields. Work needs to be done to optimise this farming system as well. This most likely requires the economic analysis of this system, training of farmers and developing a new optimised production model.



5 Economic Feasibility of dried fruit production in Angola

5.1 Introduction

This chapter estimates the future production cost and profitability of dried pineapple and dried mango in Angola. To make this calculation, we use benchmark data from our decades of experience in fruit drying in Africa, combined with local costing. For example, we know how much mango is needed to produce one kilogram of dried mango, and by multiplying this with the cost per kilogram in Angola we can estimate the cost per kg of dried mango for raw material.

A challenge in this process is that there is no real established market price for fruit, because of the low volumes that are traded. As a result, prices are volatile. For example, there may be a price of 200kwanza per kilogram of pineapple, but this is a theoretic price because most farmers are not able to sell at this price.

The only way to solve this problem is to develop in time a bottom-up production cost for fruit together with farmers. This will allow us to estimate the actual production cost and add a healthy margin to arrive at a sales price at which a farmer can sell fruit to a processing plant and still have a healthy profit margin.

Another challenge is obtaining the cost of a refrigerated container, because of the low volumes, this remains a theoretical price for now. However, based on our experience in other countries we can provide an estimate.

5.2 The main variable cost drivers, international benchmarks & estimated local cost

The main variable cost drivers in the production of dried fruit are:

- Fresh fruit & transport cost of fresh fruit
- Production labour
- Energy
- Packaging material
- Transport to market

Like most companies in agricultural processing, fixed cost should account for 30% of cost and variable cost for 70%. The goal is to have a gross margin of at least 30%, but preferably 40%.

5.2.1 Fresh fruit

The benchmark for efficiency in dried mango production is 13kg of fresh fruit for 1kg of dried mango. For pineapple it is 17 to 1. The efficiency is determined by:

- **Quality of the fruit & variety:** Fruit quality is depending on the farming, harvesting and transport methods and the variety.

larger mangoes have a better flesh to pip-and-peel ratio. Some varieties tend to give bigger fruit, such as Keitt, Tommy Atkins etc. others like Brooks tend to be smaller.

Fruit that is infected with insects, flies, stone weevil, or diseases such as bacterial blackspot or anthracnose. needs to be discarded or bad parts need to be cut out. The challenge with these internal problems is that they are not always visible on the outside and can develop during



ripening. By this time the processor has accepted the fruit and paid for it. Late season varieties tend to suffer more from fruitfly infections.

Fruit that is roughly handled during harvesting and transport tends to have more internal defects.

Ripeness also plays an important role. Pineapple or mango that is too ripe will cause more losses during cutting, as more fruit needs to be discarded, and rotten or overripe flesh cut away. Fruit that is too ripe will lead to brown and black coloured final product, and pineapple that is too sticky to package and sell. It can also lead to caramelization and burning.

The benchmark processing ratio for Palmer, Kent, Keitt and Tommy Atkins is 13kg of fresh for 1kg of first grade dried mango. It is 17 to 1 for pineapple made from Smooth Cayenne or MD2.

To incentivize farmers to deliver quality fruit, most drying companies sort on arrival and only pay for accepted fruit. The rejects can be picked up by the farmer for sale elsewhere or composted. On some occasions the rejects can also be used for juice, for example if they are overripe. Some processors also do not pay for mango that is rejected after ripening because of internal defect.

Fruit quality is guarded by having specific product criteria. These can include size, variety, ripeness etc.

- **Processing management:** The second factor that influences processing efficiency is the management of the processing.

With dried mango production this starts with ripening. And this starts with fruit washing, because dirty fruit ripens faster and less homogenic. If ripening is done in the open air, in large piles or basins that losses can be up to 30%. Good factories ripen in 500kg or 20kg crates at least under cover and with netting to keep flies out, with space for air circulation around the crates. The more is invested in the ripening room, the more uniform the ripening will be, the lower the losses and the lower the need for sorting. Closed rooms, fans, and controlled temperature, co2 and humidity levels all improve ripening.

The next step is the peeling and cutting, where the target is to convert between 50 and 55% of the mango in slices. This is determined by the peeling technique and material used and staff training. Efficiency in the drying stage is determined by the quality of the dryers used, and the humidity at the end. Better quality dryers lead to less third grade and second grade product. The dryer the final product, the bigger the losses. The goal should be to dry as close to the upper limit of the client specification as possible, hence if the client allows 16% humidity this should be the goal. However, most factories in West Africa estimate humidity but do not measure. This leads to losses.

The sorting and grading stage also influences efficiency, because if it is done too strictly you have more second grade. Hence this needs to be checked.

Client specifications also play a role. Certain sizes, shape or colour requirements lead to higher losses.



For pineapple the same issues apply, though many processors currently do not ripen the pineapple. However, they probably should avoid too much overripe fruit.

To be an efficient processor you need to set clear performance indicators for each section in the plant and monitor performance real time, and adapt where necessary immediately.

- **Waste recovery:** factories in South Africa are forced to utilize second grade and industrial grade dried mango and even the flesh that is left on the pip after cutting to be profitable. Second grade fruit is converted into mango bars by grinding the pieces and extruding it in various shapes. The flesh on the pip is turned into a mango pulp that is dried in thin layers and rolled up like a pancake. Companies who do this can obtain an efficiency of 1:10,5 in dried mango. We don't know any factory who does this for pineapple, but it should be possible.

BENCHMARKS FOR MANGO AND ESTIMATED COST IN ANGOLA

Well managed factories in South Africa, Ivory Coast and Burkina Faso manage to get to 13kg for 1kg of dried on Kent, Keitt and Tommy Atkins. We expect the same for Angola. Performance in Burkina Faso on other varieties tends to be 1:15 for Amélie and sometimes 1:18 for Brooks.

For dried pineapple, the best producers can obtain 1:17, with less efficient moving to 1:19. Given the size of the pineapples and the variety we feel 1:17 is possible in Angola.

Mango in Ivory Coast is about EUR 0,06 farm gate for non-export grade. In Burkina Faso which is the market leader on the EU market this is about EUR 0,11 but depends on variety and season.

In South Africa mango cost were low for a long time, until competition from drying plants drove up the price to between 0,25 and 0,30 cents per kg. This is why South African plants developed methods to use waste and by products from Mango. The last couple of years the demand for South African dried mango has decreased and thus demand for fresh mango. Coupled with the devaluation of the rand it means prices are now on average back to EUR 0,10 per kg.

Non-export grade mango in Central and North Senegal costs between EUR 0,23 when bought in bulk from large export orchards and EUR 0,30 from small plantations. This is one of the reasons that mango drying in Senegal finds it difficult to compete with Burkina Faso and has never really taken off.

In Ghana, prices have also been around EUR 0,25 per kg. At this price it is difficult to make a profit, and the mango drying sector in Ghana survives by importing cheaper mango from Ivory Coasts or producing in Ivory Coast and Burkina Faso.

The lesson here is that as soon as prices increase above EUR 0,20 per kg it is difficult to be competitive in Mango Drying.

Prices for mango are difficult to determine, but we have heard farm gate prices of 300 to 400 kwanza, and at these prices Angola would struggle to be profitable in dried mango. The first large farm we visited sold for 300kwanza to a processor. The second farm estimated production cost around 300kwanza, but not really based on any data. However, they also mentioned to have about 30% of product that is second grade, and they cannot sell.

We will need an estimate of the cost of production to determine what a realistic sales price would be in Angola for mango. We will run different scenarios to determine what the maximum price is a drying plant can afford to pay for mango.



BENCHMARKS AND COST IN ANGOLA FOR PINEAPPLE

Prices for smooth cayenne pineapple in Benin range from EUR 0,14 for conventional and EUR 0,21 for organic, but there is fluctuation within this range. Prices in Ivory Coast and Ghana for pineapple are considerably higher, starting from EUR 0,27 in the high season in Ivory coast.

Prices for Angola are hard to determine because of the small market.

Pineapple producers are currently willing to sell at 20kwanza per pineapple, that can way 1,5 to 2kg. This however seems an unsustainably low price. We for now want to work on 50kwanza per kg, which is EUR 0,05.

5.2.2 Fresh Fruit transport cost

Transport cost depend on the distance to the factory, condition of roads, availability of hired transport, and farm size. In Angola, we don't estimate the transport cost to be significant, because a farm located in or around Lobito can source from Mango farms within a few hours' drive and pineapple farms as well. Furthermore, because farms are large, the whole load can be sourced from one farm. This means trucks are not traversing the countryside picking up small quantities all over the place. Furthermore, many large mango farmers have their own transport to deliver mango. Pineapple farmers do need to navigate bad access roads, but one can organize with the farmer to use the tractor and trailer to bring pineapple to the main road for collection. We therefore have not added a separate cost for transport. However, it may be good to consider purchasing 5 ton or 10 ton secondhand truck.

5.2.3 Production labour

The second or third most important cost depending on the country and product is the labour involved directly in the production. Dried fruit production is very labour intensive. The amount of labour used ranges from probably 0,05 man-days per kilogram of product in very automated and efficient plants in South Africa or Ghana, to 0,8 man-days per kilogram of dried fruit in poorly managed plants in West Africa with completely manual processes.

There are two factors influencing this: workforce organisation and management, and the level of automation.

Automated plants will use automatic fruit washing lines, and move fruit and dried fruit and the various intermediate stages around using forklifts and pallet jacks. They can have transport belts with knives at the end that cut fruit in cheeks or slices. Some factories can even have automatic fruit peelers. Automatic packaging is also an option.

Traditional plants move fruit around in crates that are carried on heads; they have each mango washed three times by hand in a succession of 3 wash basins. All fruit is peeled and cut automatically. They have special staff that during the night opens the small artisanal dryers and moves racks around to get uniform drying.

The level of investment in automation depends on the scale of the company and the cost of labour. For example, automatic peeling machines are so expensive that it is cheaper to peel by hand in most of Africa. Other interventions like automatic washing lines are more relevant for larger companies. Manual plants when they reach a certain scale become difficult to manage because of the large amount of labour walking around.

The other important factor that influences labour productivity is management. Efficient plants pay set targets per section in the factory based on the fastest employee, and they pay dependent on the quantity produced or processed per individual or team. They will have further incentives to motivate



people and let people leave once the target is completed. They also make sure that employees have sufficient space to work and move to avoid people waiting for others to pass. Airconditioning and fans are also important to keep productivity high, as well as limiting the working hours to 5 to 8 hour shifts. Generally, at the end of a shift pace declines sharply. Staff meals are also important to keep moral and energy. Finally, training and supervision are crucial. Companies with a high staff turnover tend to have low labour productivity.

ESTIMATED COST IN ANGOLA AND BENCHMARKS

Given the intellectual level of entrepreneurs in Angola, and the amount of starting capital they have it should be possible to reach a labour productivity of 0,2 man-days per kg of dried product in the first year, and 0,1 during the next years.

The minimum wage in Angola is 70,000 Kwanza. Assuming 6 days of work, 25 working days per month this works out to 2800kwanza per day, or EUR 2,91. This is higher than the 1500CFA (EUR 2,28) paid in Burkina Faso, but at this rate factories struggle to find labour. Many have shifted to paying on performance which has allowed the better workers to earn 2000CFA or more per day. Ivory Coast wages are around 2500 per day, or EUR 3,81 which is more expensive. In our case we propose to use 3000 kwanza per day, linked to performance of the workers.

5.2.4 Energy usage

The usage of energy in dried mango production is strongly dependent on the type of dryers and the other equipment used in the plant. Mango dryers in Africa tend to have electronic fans and control panels, while the heat source is either a gas burner, or a heat exchanger powered by hot water. The water in the boiler is heated by using coal (South Africa) or biomass such as coconut shell (Ghana) or cashew Shell (Ivory Coast, Burkina Faso). Dryers with electric elements are available, but they consume a lot of electricity which makes them a very expensive option in most of Africa. Furthermore, they require very strong generators to power during power outages.

For Angola, gas heated dryers are probably the simplest option, given the fact that natural gas is available and cheap. Gas usage for modern fruit dryers is generally between 0,2 and 0,4kg of gas per kg of dried fruit. The dryers use about 0,2KwH per kg of dried fruit in electricity.

Other equipment that is energy intensive are cold storage for final product, and automated ripening rooms as well as cooling for the building (air conditioning). Mango washers, transport belts and lighting require less energy.

Energy cost for drying of pineapple tends to be 20% higher than for mango, because there is more water in the fruit. The same quantity of cut fresh fruit will take the same amount of gas and electricity to dry, but the production per dryer in finished product is 20% lower. On the other hand electricity usage in the rest of the plant will be slightly lower for pineapple, because washing it not necessary and not is controlled ripening.

For Angola we can budget for 0,4Kwh electricity per kg of dried mango and pineapple assuming we use cold storage to store dried fruit until it can be transported to the client. The cost per kwh is 11,83kwanza or EUR 0,01 which is very cheap even for African standards.

Gas in Angola is also very cheap compared to African standards, at 80 kwanza per kg or EUR 0,08. In most of Africa gas is 1 euro per kg.

All of this means that the energy cost in fruit drying in Angola are negligible.

5.2.5 Packaging



Packaging costs are not the largest cost but they are substantial. The most important cost is the cost of a good quality cardboard box, which is essential to avoid the product being refused. Bad quality boxes tend to collapse during transport. This leads to product getting squashed and sticking together like a ball. If this cannot be easily separated, the container will be rejected. A good quality cardboard box needs to be double ply and preferably has a wax coating so that condensation cause by temperature differences in the refrigerated container does not make the cardboard wet and weak.

The cost for cardboard boxes tend to be the same if they are imported or purchased from a local manufacturer, because the paper pulp needed to make the boxes tends to be imported anyway. Cost ranges from about 1 euro for a 10kg box to 1,5euro for a 20kg box. However, it is more difficult to make strong boxes that are large.

The second packaging cost are the plastic bulk bags used to pack mango. The standard is 2kg or 2,5kg per bag. It needs to be certified food grade polypropylene. The cost per bag is usually EUR 0,10.

The third packaging cost is pallets and corner strips. This is only needed if the product is palletised. However, most of West Africa does floor loading to fit more in the container, and because proper fumigated euro pallets are difficult to find. Therefore we have not included this cost.

5.2.6 Transport to market

In dried fruit it is customary to quote CnF Rotterdam, Antwerp, Felixstowe or Hamburg. Importers tend to have limited knowledge about logistics in Africa and prefer to not be responsible for transport. Sometimes they accept FOB.

Dried fruit should be transported in a refrigerated container to maintain the quality, particularly in Africa and particularly if it is organic. The challenge is that in Africa containers can easily stand in port for 2 weeks before they get onto a ship. If they are parked in the sun, temperatures can increase to 50 degrees inside. In addition, temperatures can be high on the ship, depending where it is placed. High temperatures will speed up the browning process and reduce the quality on arrival and the shelf life of the product. This is to be avoided.

The cost of refrigerated containers depends to a large extent on the amount of overland travel to port. In Burkina Faso, cost can be as high as 6000euro, but half of this is the transport to port. Rates for sea transport tend to be similar across the world, and do not depend that much on distance. Having said that, if an empty-haul route is used transport can be considerably cheaper. For example, many containers travel empty to Asia.

Another interesting fact about container transport cost is that the difference between 20ft and 40ft containers tend to be small: around 25%. This is because the administration and loading fees are the same for a small and large container, and these make up a substantial amount of the cost. Also the difference in max loading weight between the two is about 25%.

Because the factory will be 30 minutes from port, and that there are many empty reefer containers due to high volumes of imported meat we assume cost will be between 3000USD and 4000USD per 40ft reefer container. 20ft reefers are scarce.

5.3 Gross margin and profit on dried mango

5.3.1 Scenario 1: high labour cost and fruit cost

In this scenario we take 300 kwanza per kg as a sales price, which is about the upper limit of what is affordable, and we take a labour productivity of 0,2 man days per kg of dried fruit. In this scenario the



gross margin is still 34%, or EUR 2,46 per kg. The table underneath provides an overview. The main reason why even at this high price the activity is still profitable is the low energy cost, as well as the relatively low transport cost to market because the business will be in port. This compensates for the high fruit price somewhat. Nevertheless, the margin in Burkina Faso or Ivory Coast can be 40% to 50%.

Table 1: Cost of production and gross profit per kg of dried mango

5.3.2 Scenario 2: lower labour cost

In this scenario we assume the labour cost are reduced to 0,1 man-day per kg of final product. This can be achieved in a very well managed factory from year 3 onwards. In this scenario the gross margin is 38% which is sufficient for agri-processing.

Table 2: Estimated production cost and gross margin per kg for dried mango with more efficient labour

5.3.3 Scenario 3: lower fruit cost

If we can work with fresh mango producers to optimize their production system and thereby reduce the sales price to 200kwanza per kg, the gross margin improves drastically to 53%. Given that the production costs are lower elsewhere in Africa, and particularly in South Africa, this should be possible.



Table 3: Production cost and gross profit per kg of dried mango with reduced cost of fresh mango

5.4 Gross margin and profit on dried pineapple

5.4.1 Scenario 1: low raw material cost

The gross margin on dried pineapple is unusually high. Even in a scenario where we pay 50 kwanza per kg, there is a gross margin of 77%. In this scenario we have assumed that half the pineapple is sold as organic with a modest EUR 0,50 premium per kg. If we were to bring the labour cost down to best-in-class factories in Burkina Faso margin would be above 80%. The main reason is that pineapple can be farmed at very low cost in Angola. Currently the sales prices for dried pineapple are even higher than in our calculation, but we are not sure whether this is a long term price increase. Hence we have stuck to more conservative sales price estimates.

Table 4: cost of production and gross margin per kg of dried pineapple

5.4.2 Scenario 2: high raw material cost

In this scenario we have increased the cost per kg of pineapple to 200 kwanza. Still, we make a 40% gross margin which is excellent for an agricultural processing factory in Africa.



Table 5: Cost of production and gross margin with increased cost of fresh pineapple

5.5 Conclusion: Gross margins per product

The conclusion is that fruit drying in Angola is most likely profitable. The rule of thumb we have developed that the minimum gross margin on a processed product in Africa needs to be 30%, and both products have a better estimated margin.

Pineapple drying is particularly profitable, because of the low production cost and the ability to produce organic dried pineapple, which has a price premium. However, even mango drying can be profitable. However, there is work to be done with the mango farmers to bring down the cost of production per kg, and thereby the sales price of mango. There is no price premium for organic dried mango, because there is more production of organic dried mango in Burkina Faso than demand.

Because the mango season and pineapple season overlap it would be more profitable in theory to only dry pineapple. However, the market for dried pineapple is a lot smaller than for dried mango. Hence, we are not certain whether there is sufficient demand to only focus on pineapple. Furthermore, dried mango is easier to sell. We therefor expect the company needs the dried mango to get the client into the door, and then up-sell the dried pineapple.

In addition, we have also seen that it is risky to be dependent on one product alone. If there is a bad pineapple season, for example due to a new disease, the business could collapse.

We therefor assume the business dries Mango for 3 months, and pineapple for 4 months. If methods can be found to prolong the pineapple season, production of pineapple can be further increased. Even if this requires expenditure on irrigation, the business can afford this.

5.6 Production volume

For this business case we have chosen a scale of 3 tunnel dryers with a capacity of around 1250kg of fresh fruit slices and 200kg of dried pineapple or 240kg of dried mango per 24-hour cycle. The rest of the plant is all adapted to this scale.

The reason for choosing 3 dryers is that dried fruit needs to be shipped in 40 ft containers of 20 tons. With 3 dryers, a container can be filled every month. This is an acceptable amount of storage time for



finished product, particularly if there is a proper cold storage. With one dryer it would take around 3 months to fill a container, and the loss of shelf life and quality on the first batches would be too high.

A second reason for choosing multiple dryers is that it is easier to sell dried fruit if your potential to supply large quantities is higher. Importers are reluctant to invest in relationships with new suppliers if they are too small. Though they most likely start by ordering one container, they need to know this volume can be increased in future.

Finally, many costs in this business are fixed, notably the cost of the management staff, marketing and certification. A factory with one or two dryers is too small to fund a professional management team and plant with the right certification.

However, we do advise a business to start with one dryer to learn the profession of fruit drying and get a proof of concept. This may mean export in containers that are not full at the start at lower profit. If there are two producers each with one dryer, the shipment can be combined.

The table underneath provides the production volume per year for a factory with 3 tunnel dryers. We have assumed 3 months of dried mango production, with 240kg per day, 7 days a week for 12 weeks. For pineapple we are assuming 16 weeks, but at a lower production of 200kg per day because there is more moisture in pineapple. The total production with 7 months of production is about 127 tons of dried fruit. This is a little over 6 containers.

Table 6: Production capacity in tons of the drying plant per year

Long term the ambition should be to have a factory with 6 to 10 tunnel dryers, so that there is sufficient gross profit to further professionalize the business by expanding the management team, investing in advanced food safety certification etc. With 6 dryers 250 tons can be produced per year.

If the pineapple season can be expanded with irrigation, the total production volume can be increased without investing in additional dryers.

5.7 Gross profit of the business as a whole

The table underneath shows the revenue, variable cost and gross profit for a factory with 3 dryers. We have assumed 300 kwanza per kg for fresh mango and 50 kwanza for fresh pineapple. The company can make a gross margin of 57.13% and a gross profit of EUR 529 807 which is exceptional. Total revenue from both products would be EUR 927,000.

Table 7: Gross profit of the plant



If we assume a higher price of pineapple of 200 kwanza, there is still a gross margin of 37% and a gross profit of EUR 346 535.

Table 8: gross profit with higher pineapple prices

5.8 Fixed cost

5.8.1 Types of fixed cost

The most important fixed cost we will be discussing here are:

- Fixed staff
- Investment, depreciation, maintenance and insurance cost
- Interest cost
- Certification
- Marketing and sales
- Accounting cost
- Local taxes and levies

5.8.2 Fixed staff

If the business operates only a few months of the year, it is difficult to employ fixed staff, even at management level. A minimum of 200 tons of dried fruit per year is needed to afford a qualified professional sales and marketing manager, CEO, financial manager, factory manager and supply manager. What is also needed is a HACCP and quality manager. For a starting business roles can be combined, but we should have a minimum of 2 senior managers.



The table underneath provides an example of the business case with 3 dryers, where we have 3 skilled managers in the company. For example a general manager who is also responsible for sales with a sales and logistics assistant, a Financial manager with an assistant for raw material supply and a factory manager with an assistant manager.

Table 9: estimated fixed staff cost

5.8.3 Investment, Depreciation and maintenance & insurance

A sizable cost is the depreciation, maintenance and insurance on assets. Most African entrepreneurs do not calculate depreciation, and when they receive donated equipment of buildings they tend to 'eat the asset', meaning they do not earn enough to replace the asset after the economic life spend has ended. We normally calculate with 20 years for buildings, 10 for large equipment such as dryers, 4 years for vehicles and 3 years for small assets such as plastic harvesting or packing crates, knives etc. Uniforms last about a year.

Another challenge is that in Africa, most companies underspend significantly on maintenance. This leads to equipment breakdowns, which can have significant impact on profitability, when production days are missed and fruit rots. Our rule of thumb is to budget between 3 and 5% of the value of an asset in annual maintenance. For vehicles and equipment this is higher, and lower for buildings.

Insurance is also something that is underbudgeted. If companies do not take out insurance they should put money aside to prepare for theft or fire damage. Again we used a percentage of 3% of the value of the asset to budget for this.

The total investment depends on the size of the factory and the level of automation. For this scenario we are going for a plant of 3 South African tunnel dryers with the capacity to produce 240kg of dried mango or 200kg of dried pineapple per cycle of 18 to 22 hours. We require a plant of 1000m² for this, on land of 4000m² so there is space to expand the factory. We use one transport belt with automatic cutter/ slicer. We also add a 40m² cold storage, roughly the size of a 40ft reefer container, for finished product storage that awaits shipment. We are adding two generators of 15kva that can power 2 dryers each. Optional is a small laboratory set-up with a fridge for samples, some simple microbiology testing equipment and a hydrometer to measure the moisture levels.

The table underneath contains the estimated investment cost for this plant. The total investment cost is EUR 654 363. About 55% of the cost is the building, which is relatively expensive because building cost in Angola are amongst the highest in Africa, more than twice as expensive as South Africa. We have assumed there are no import duties on equipment, since according to various stakeholders there is no duty. We need to consider adding in a truck for transport. The total depreciation per year is 45 436. The cost to purchase land are difficult to estimate, because it depends entirely on the location: on farm or in an industrial zone. However, because you do not depreciate on land these costs have limited effect on the profitability.

Table 10: estimated investment cost



5.8.1 Interest cost

Dried mango is a very expensive product, and it requires a lot of working capital. The value of a 40 feet container is around 150,000 euro (20 tons @ 7500 euro per ton). Some clients particularly in the organic and fair-trade domain are willing to prefinance production, but this is not likely for new regular importers. Importers normally can agree on 50% payment on bill of lading (when the container is loaded on the ship) and 50% upon arrival, after client inspection. Given that the direct out of pocket cost for the production of a container is usually around 50 to 60%, and we assume that the company is working on one container at a time we can assume that the company needs about 75,000 euro working capital on a continuous basis. When the container is loaded about 50% is paid, and this money can then be used to start the next container.

The other interest cost would be the cost for a loan on the investment capital. In this business case we assume that 50% of the capital comes from shareholders (equity) and 50% from a 5-year loan.

The current prime interest rate in Angola is 19,5%. Once we would add a risk premium and margin for the bank, the rate could easily be 25%. This seems high, but the inflation in the past years has been just below or above the interest rate. This means that the real interest rate (nominal rate minus



inflation) is around 0%. Furthermore, the business is essentially earning euros, and spending Angolan Kwanza. This means it is potentially possible to obtain euro based finance and interest rates, also because investments are done in euro or dollar. Furthermore, there seems to be a lot of government sponsored finance available in Angola. Given all of this, we decided to work with an interest rate of 10%.

Table 11 Estimated interest cost

5.8.2 Certification

Certification cost consists of two parts: the initial training and audit and investment cost to obtain the certification, and the annual renewal of the certificate. One could argue that the initial cost should be regarded as an investment you write off over a few years though.

Costs depend on the type of certification, with organic being the easiest and cheapest, haccp somewhere in the middle and advanced certificates such as fsc22000 and BRC the most expensive. For food safety there is usually a preliminary audit involved, then a final audit that may need to be redone if not everything is in order. Many drying companies in Burkina Faso have taken five years or more for HACCP, while others managed in one or 2 seasons.

The annual cost per certificate also depends on the local presence of certified auditors. In Angola we have to assume auditors and trainers need to be flown in from South Africa, which will increase cost.

The cost for renewal of certificates ranges from about 1000EUR to 2000EUR for organic and HACCP if there are local auditors. It also depends if multiple businesses can be done on one trip so that cost can be shared.

There are also multiple types of organic certificates, such as for the US market, EU, Japan, Switzerland etc. Each certificate adds a cost. Hence one needs to be strategic about the size of the market.

For Angola we assume a basic organic certificate for pineapple that incorporates the farms is required and HACCP, for now. We estimate the once off investment at 10,000 euro for both and 3000 euro annual renewal cost.

Given the large size of the farms and the limited size of the fair-trade market we don't think there is a real business opportunity in fair trade certification.

5.8.3 Marketing and sales cost

The fruit drying industry is essentially a business-to-business sector which reduces the need for marketing spend drastically. The main costs that need to be budgeted for are development and maintenance of a good website, participation in trade fairs, development of brochures, technical product sheets, sending samples to clients by DHL, laboratory tests on pesticide residues, chemical residues, e-coli, salmonella etc. This most likely needs to be done at an accredited laboratory in South Africa. This in turn means DHL costs.

Trade fairs play an important role in the marketing of dried fruit. They help the exporter to meet with 10 to 15 importers per fair. They are an opportunity to see the competition, potential clients, distribute samples but even look for equipment suppliers. There are two ways to participate: as a visitor, and an exhibitor. The first option is much cheaper, but many development organisations such as CBI in the



Netherlands and IPD Germany organize Africa pavilions where 5 to 10 smaller companies occupy a stand together. The cost are shared between participants and subsidized. Participants tend to pay their own travel and hotel costs.

The main fairs to visit are Biofach in Germany for organic fruit (every year in February), SIAL in Paris (conventional and organic, every second year in October), and ANUGA in Germany (October every second year, alternating with SIAL).

These trips to Europe are best combined with visits to existing clients and prospective clients. We assume that a starting business requires two visits per year to fairs, and that in future they will have one participation per year as an exhibitor and one as a visitor. Cost for a week long marketing trip to Europe are 6 nights of hotel, food, local transport and a flight. We can work on 200 euro per day, and 1000 euro for a flight, 50 euro entry fee and 50 euro for the Schengen visa, 200 euro for miscellaneous cost. Total is 2500 per visit. For a subsidized shared booth 2500 euro is charged. The table underneath contains an overview of the marketing cost.

Table 12: overview of marketing, sales and communication cost per annum

item	cost/ item	no items	total cost
Website maintenance, hosting	€ 500	1	€ 500
Cell phone, internet	€ 150	12	€ 1 800
EU travel & trade show visit	€ 2 500	2	€ 5 000
Trade show participation	€ 2 500	1	€ 2 500
Client samples DHL	€ 150	20	€ 3 000
Lab testing	€ 300	4	€ 1 200
TOTAL			€ 14 000

5.8.4 Accounting cost

For a smaller business we assume that a local accountant with a bookkeeper can process the expenses on a monthly basis, and produce accounts on an annual basis. When the business grows, an inhouse admin assistant can book the transactions into a simple system such as quick-books. We budget EUR 10,000 per year for outsourced accounting and bookkeeping.

5.8.5 Local taxes and levies

These are taxes such as municipal levies. The cost tends to be low, and they are difficult to determine on forehand, hence why we have left them out.

5.8.6 Total fixed cost

The table underneath provides an overview of the total fixed cost. We have added an extra 5000 euro in for other unexpected cost. The total annual fixed cost stands at EUR 261 682, of which 42% are staff cost. Depreciation and interest expenses are the next biggest cost followed by maintenance and insurance, and marketing cost.

Table 13: Overview of the estimated fixed cost



5.9 Overview of profitability

The figure underneath provides an overview of the profitability of the business, bringing together all the information discussed earlier in this chapter. This overview is based on a price of 200kwanza per kg of pineapple, and 300 kwanza per kg of mango. Under this scenario the business has a net profit before tax of EUR 84 425, which is 9% net margin. This is healthy enough.

If the pineapple price decreases to 50 kwanza per kg, the net profit increases to EUR 268 125 per year, which is 29%. This would be very profitable. However, we have to keep in mind a common expression in business: if it looks too good to be true, it probably is. Hence it is better to calculate with slightly higher prices.

Table 14: Profit and loss of a fruit drying business in the Lobito corridor



5.10 Conclusion

Fruit drying in a factory based in the Lobito corridor seems economically feasible. Both dried mango and dried pineapple are profitable, but for now the profitability of dried pineapple is substantially higher. However, there is some uncertainty in the prices of raw material.



6 Potential entrepreneurs for the development of the sector

For any economic activity to develop, we need entrepreneurs with a keen interest to make a business out of the activity. The best market potential, raw material supply and equipment and support will not result in thriving businesses without good entrepreneurs. A good entrepreneur is someone who is willing to work hard and take risks, a quick but rational decision maker who can manage people. Ideally they have ample experience in the sector, and already invested in buildings, equipment, product and market development.

In the case of Angola, we are looking for people interested in starting a fruit drying company in Lobito, because this is where the raw material is, and where the port is for export.

We have at least three interested entrepreneurs in the Lobito corridor who are interested in setting up a potential fruit drying plant at scale for export. All three do have considerable assets and show they have been willing to invest in business development. In our opinion this is sufficient base to consider a modest development project in the sector.

It is well possible that other interested parties will also manifest interest. For example there are two local companies who have tried to set up a fruit drying business before, who may be interested in restarting production with a new business model focused on exports. Other larger fruit farms may also express an interest in order to find an outlet for their mango or pineapple.

Now that we have a clearer idea of what a dried fruit business could look like in Angola, what the potential profitability is, what products it can produce and where it should be located it is easier for other entrepreneurs to decide whether they are interest or not.



7 Socio-economic impact

7.1 Introduction & assumptions

In this chapter we will discuss the potential positive and negative impact of the development of a dried fruit sector in Angola. To make these calculations we have to make assumptions with regards to the size of the production of dried fruit. As a starting point we are taking a company from the earlier scenario that can reach a scale of 3 tunnel dryers and roughly 127 tons of dried fruit. We can then calculate the labour in the fruit drying, and the farming side.

Finally, we have to assume a percentage of indirect jobs that can be created, for example in functions such as transport, equipment maintenance, farm input dealers, accounting etc.

We convert casual or temporary work to full time jobs, or Full-time equivalents (FTE) by dividing the number of working days by 215. This is the number of week days in a year, minus public holidays, leave days and sick days.

7.2 Jobs created in production

For each dried fruit company that produces 127 tons we are assuming 6 permanent jobs and 0,2 days of labour per kilogram of dried fruit. When we have one working factory of this scale, 125 full time equivalent jobs are created. With 3 factories this increases to 374 jobs. However, a factory with 3 tunnel dryers is still small, and the goal of the program should be to create 3 plants with 6 dryers each. This is comparable with 6 smaller plants. The number of jobs that is created in production with 3 large or 6 small plants is 749.

7.3 Jobs created in farming

To calculate the number of jobs created in farming we first need to calculate the tonnage of fresh fruit required by the factory. For mango this is 13 times the volume of dried fruit produced, and for pineapple this is 17.

We can then calculate the labour required to produce 1 ton of mango and one ton of pineapple and multiply this with the tonnage of fresh fruit required to estimate the number of working days. The last step is then to convert the days into FTE.

Based on a comprehensive benchmark study carried out in 2021 where we compared the cost of production in mango orchards in South Africa, Senegal, Ivory Coast and Ghana we estimate the cost of the intensive irrigated orchards in Angola at 100 working days per ha. This includes everything from pruning, rolling our driplines, spraying, fertilising, repairing fences and harvesting. The average yield with a blend of Tommy Atkins, kent and Keitt should be at least 35 tons per ha. This means we need 2,9 days of labour to produce 1 ton of fresh mango.

The estimate for pineapple is more difficult because we do not know the yield per ha or the labour required in this extensive system. However, based on our experience we feel that 15 days per ha is



required, consisting of manual land preparation and planting every 5 years, manual tractor weeding and harvesting. In fact, 10 out of these 15 days are likely to be harvesting. Assuming a low yield of 8tons per ha due to low planting density, we estimate we need 1,9 days of labour to produce 1 ton of fresh pineapple.

The table underneath provides an estimate of the employment created in farming. One drying plant would require 22ha of intensive mango orchards and 143ha of pineapple plantation to supply it. A total of 139 FTE would be required. With 6 smaller or 3 large plants, 835 FTE would be created in farming.

7.4 Multiplier effect: indirect jobs

The percentage of indirect employment in the agricultural sector in Africa varies by region and specific country, but estimates suggest that it can account for a significant portion of total agricultural employment. In many contexts, indirect employment may represent anywhere from 30% to 60% of all jobs related to agriculture, including roles in transportation, food processing, and retail.

The extent of indirect employment in the food manufacturing sector varies significantly by country and region, but it is generally substantial. Indirect employment in this sector can account for a considerable percentage of overall jobs related to food production, often ranging from 25% to 50% depending on the level of industrialization and the structure of the food supply chain.

Because we want to avoid double counting (indirect jobs in agriculture also include processing, and those in food manufacturing may include farming) it seems safer to use the lower end of the estimate at 25% indirect jobs.

7.5 Total number of full time jobs

The total number of jobs created for 1 smaller factory would be 125 FTE in production, 20 in farming and 35 indirect jobs (25% of the farming and production jobs). In total this would be 174 FTE. This can increase to 1044 FTE if we have 6 smaller factories or 3 larger plants.

7.6 Household impact

In most of Africa on average at least 5 people depend on the income of one person. If we would follow this logic, 1044 FTE would improve the livelihoods of over 5000 people. Because the work in the factories is largely seasonal there will be more people impacted, but with lower earnings per person.



8 Environmental Impact

The table underneath provides an overview of the environmental impact along the chain, and ways in which the impact can be reduced and managed.

Impact	Explanation	Mitigation strategy
Energy usage in fruit drying : gas and electricity	Fruit drying requires a large amount of gas, and electricity to run plants. Cold storage, refrigerated transport add to this	Find sources of biomass to replace gas as a heating source ; this is common in West Africa ; usage of solar energy to generate electricity ; use energy efficient dryers & equipment
Processing waste : mango and pineapple peels, cores, pips, overripe fruit etc.	For each kg of dried fruit 5 to 8kg of fruit waste is created. If this is simply dumped in pits, this will lead to acid soils, pests and general nuisance	Blend material with other agricultural products to produce compost that can be sold to farmers ; use waste to generate biogas, and utilise waste to produce by-products such as mango rolls, pineapple juice etc.
Pesticides and fertiliser usage in mango farming	Mango farming is very intensive; mineral fertiliser has high CO ₂ emissions	Proper training to minimize usage, use only products approved in the EU, explore organic/ natural pest control alternatives, use compost to replace part of mineral fertiliser
Water and energy usage for irrigation	Flood irrigation and drip irrigation is used in mango production, that is pumped from ground water. Extensive pumping of groundwater can lower the water table and lead to salination of land	Switch all plantations to drip irrigation that uses only 20% of the amount of water compared to flood irrigation. Switch even more to solar pumps. For pineapple use rainwater harvested in dams and gravity fed drip irrigation
Emissions in transport	Fruit needs to be transported from field to factory, and finished product from factory to market	Use modern energy efficient vehicles with limited emissions
Water usage in factory	Water is used for fruit washing and cleaning	Use modern fruit washers that recycle water, use water efficient high-pressure cleaners for factory cleaning.



Land clearing for mango and pineapple farming:	If virgin land is cleared, the removal of trees, shrubs etc. will lead to carbon emissions and loss of biodiversity	Vast amounts of farm land have been cleared in the past for pineapple but are not farmed due to lack of market. Expansion should focus on using already cleared land. Mango plantations are established in semi-desert zone, with limited loss of vegetation. Mango trees would absorb CO ₂ during growth, and therefor there may be a net sequestration of carbon.
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9 Public sector actors and business associations

We have had several interactions with public sector associations, such as INAPEM (SME development), ARCLA (Logistics, certification), AIPLEX (Investment promotion) and AAPA (Agricultural association). What strikes us is that these organisations are very helpful, are well organized with qualified staff. However, they can benefit from an increased knowledge on fruit processing and the international market for processed fruit products. Ideally in a program we would also build their capacity to support companies in the fruit sector, so that they can take over from whoever is executing the program. One of the ways we can build their capacity is by involving them in studies, trainings and other activities.



10 Conclusion

There is good potential for the development of a dried fruit business in the Lobito corridor. There is still space on the dried mango market and particularly on the dried pineapple market. The area has the right varieties of mango and pineapple for fruit drying, and there is sufficient supply. Mango farmers are actively expanding, while pineapple farmers can easily scale up. Both types of farmers are actively looking for an institutional client that can purchase large volumes reliably at a stable price. The level of professionalism of the farmers in the mango areas shows they are not scared to invest in their business.

A logical place to establish the business would be in Catumbela, Lobito or Benguela. This would make supply of pineapple and mango easy, as well as export. In addition, it is easier to obtain skilled and unskilled labour in a major city. Our calculations show that such a business can be very profitable in Angola.

The most important part of any business however is the entrepreneur. We have already identified 3 potential pilot entrepreneurs who have an interest in dried fruit and may be capable to bring this to scale. At least two of these also seem to have a capacity to invest in such a business.

A point that requires attention is the uncertainty and fluctuations in the farm gate price of pineapple and mango. Any dried fruit project will require close cooperation with mango and pineapple farmers. The first step would be to map their current cost of production and develop improved scenarios where through investments in better agricultural practices yields can be increased and the cost per kg of fresh fruit reduced.

In addition, there is a clear need for knowledge exchange and the development of a vision and development strategy for the fruit sector.

Interesting other opportunities also exist for diversification into dried birds' eye chilis and dried ginger. These can be dried in the same dryers as the fruit, provided the season is complementary.



11 Recommendations and next steps

This chapter discusses several recommendations and next steps to further explore the development of a dried fruit industry in Angola.

11.1 Develop a pilot program for dried fruit processing in Angola

We think there is sufficient potential to further pursue the development of a dried fruit sector in Angola. The next step would be to find pilot companies and accompany them to create a proof of concept. Such a program would probably take a few years, but the duration and intensity really depend on the motivation, speed and risk appetite of the entrepreneurs.

The program would ideally also include support to mango and pineapple farmers to increase production, bring down cost and get commitment on sales prices to processors.

There are several steps required to come to the development of a program:

1. **Finalisation of the business case.** We present the business case to the pilot entrepreneurs and ask for their feedback with regards to certain cost estimates, notably the cost for fixed labour, manual labour, fruit, transport and investments in particular construction cost and land. They can also provide feedback as to if they have funds to invest, what they are willing to invest etc.
2. **Understand the economics of mango production in Angola better.** The goal here is to get a better understanding of the current cost of production of Mango in Angola, and identify how these can be improved. This should help us to estimate what a realistic sourcing price for mango would be, and how profitable dried mango production would be.

We would work with the two large producers we have visited to map the agricultural calendar and activities on mango, and what the cost are. When there are gaps in knowledge, we can fill this in using benchmark data. For example, we know how many man days are required for different styles of pruning, for crop spraying, harvesting etc.

The second step is then to compare this data with the benchmark data we have from various farms in South Africa, Ivory Coast, Senegal and Ghana, and identify areas of improvement.

The third step is to develop an improved scenario where we change certain agronomic practices, and estimate the impact on yields and costs.

With this analysis we can then estimate what a sustainable purchase price is for mango now, and to what level this can be decreased in the future if we work with the mango farmers to improve performance.

3. **Present the results of the final study during a stakeholder workshop** with public and private actors in the fruit value chain. We need to develop a presentation and take people through the findings and conclusions. We present the business model for processing. Participants should be able to pose questions. After this we can present the next steps.

We can ask the stakeholders to identify where they see a role for themselves in the process of building the dried fruit sector. We also use this platform to launch an expression of interest for entrepreneurs who would be interested in developing a dried fruit business, and willing to invest.

4. **Call for applications, participant selection & audit** for potential companies interested in the pilot program. We use the same networks to ask entrepreneurs to express interest in



participating in the program. We set selection criteria, and we score the applicants according to the criteria. We shortlist the most promising ones and conduct a visit and an assessment of their situation. We can then make a preliminary selection.

5. **Design the pilot program and identify sources of finance.** We use the company assessments to finalise the design of the program, that can be taken to potential donors for funding.

11.2 Recommendations for a pilot program

The design of a potential pilot program can only be finalized once budgets are clear, the number of participants and the current skills, finance, risk appetite etc. of those participants. However, we can provide a list of activities we would normally expect to include. These are:

1. A training program consisting of three groups of training:
 - a. **Entrepreneurial spirit:** these are fundamental entrepreneurial skills that are required to progress. Without working on the attitude of the entrepreneur, a very limited part of the technical skills taught will be implemented. Examples of modules include company vision and mission, rational decision making & cost benefit analysis, locus of control, resilience and drive, risk management & problem solving
 - b. **Leadership and HR management.** Modules would include leadership, company culture, organizational design, recruitment, performance management and firing, and dealing with family in the business
 - c. **Technical skills:** Sales and marketing, financial management, Fruit drying techniques, production management, food safety, cost-price calculation, negotiation tactics, contracting, logistical management and supplier management, setting up outgrower systems.

From our experience we have learned that a good training stretches out over a period and involves implementation plans, assignments and implementation coaching. The result of once off trainings tend to be low, because there is no time to focus on implementation. Once the training is over participants need to catch up on work, and there is always something more urgent.

To enable this longer training we have started to work with blended learning, which is a combination of self-study modules, webinars, in-person trainings and assignments. We use a Learning Management system for this. There is scepticism whether online works in Africa, but the reality is that the world is online and digital. If you cannot do online learning, you cannot export your product to the EU either.

Several of these modules have been developed in CBI and GIZ programs, for example.

2. **Market orientation mission:** this is typically a 10-day visit to Europe, organized around a trade-fair for processed fruit products such as SIAL, ANUGA or BIOfach. The group visits importers, food factories, contract packers and does store visits to understand how dried fruit is sold in the different types of retailers, what the competition is etc. The tradefair is another opportunity to meet with importers.
3. **Trade fair participation.** Those companies who are export ready can be supported in participating in Biofach or sial. Often donors such as CBI or IPD have pavilions with space for multiple participants, so cost can be shared. Typically, the program covers part of the cost while participants pay for their flights, accommodation and visa. For fairs it is important that all



requirements are met; the company needs proper samples, business cards, website with normal email address (not yahoo or gmail), price and product list, technical specifications and company presentations. In addition, they need to be able to speak English.

4. **Client matchmaking**, where one helps to find potential clients and link them to the exporter(s) with the best potential match in terms of scale, certification, product quality, pricing. Often this involves facilitating factory inspections in Angola by the importer, where one would travel for a week to visit orchards and different factories. It also involves supporting the entrepreneur in contract negotiations and fulfillment
5. **Technical support for factory design & equipment purchase**; we would help them to develop simple factory layouts and connect them to equipment manufacturers where they can obtain quotes. They would get coaching in which suppliers to choose, and how to manage the procurement
6. **Factory inspections, where we walk through the plant and look for issues, and make recommendations**.
7. **Business coaching**, with quarterly (online) meetings where priorities are set, progress is discussed, and general trouble shooting can be done.
8. **Facilitating joint shipments**; particularly in the early stages we may need to combine the production of several companies to fill a container and satisfy the demand of the client. This process needs to be facilitated. For example, the structure needs to be decided, pricing, management, risk sharing etc.
9. **Supporting the development of the enabling environment**; this could include support to logistical service providers, or other services such as certification services, packaging suppliers, local mechanics who can service and repair fruit dryers etc.
10. **Support to the development of sector associations**.
11. **Regional exchange visits** are also a powerful tool in development. We can organize visits to dried mango producers in Ivory Coast or Burkina Faso and dried pineapple producers in Benin. These companies have benefited greatly from development support of the Netherlands, and therefore will be willing to cooperate. Exchange visits to South African plants may also be possible, but could be more challenging. Visits to South African mango and pineapple farms are possible, since South Africa does not export much, and therefore Angola is not a direct competitor.

For Angola specifically we would also recommend a supplier development plan, because for the drying plants to be profitable, production will most likely need to increase. In addition, we may want to support mango producers in lowering their cost of production, so their sales price can also be reduced. Furthermore, it would be important to work on lengthening the pineapple season.

In other dried fruit development programs in West Africa, this aspect is usually not included, because there are thousands of small farmers who can supply, and the market is competitive and well-functioning. Also because of the number of farmers it would increase cost drastically.

In Angola however, the few existing fruit producers are in a position of power, once drying plants have been built. When supply is limited and the processors has already invested, he or she has limited negotiation power. There is a real risk of the farmers jeopardizing the success by insisting on high prices. Allegedly this happened in the case of the fruit drying company in Luanda.

To lower this risk, it is important to make the producers part of the program, so that processors and exporters work towards a common goal, and there is a form of constructive dialogue. The promise of training and support can also act as a carrot to ensure farmers moderate prices. Ideally



farmers understand that they can get access to a reliable institutional market with reliable prices and technical assistance under the condition that they moderate prices.

The activities with farmers could include:

- Technical training, for example in pruning techniques, pest and diseases scouting, pest and disease management, soil fertility management and fertilization, irrigation system management, establishing irrigation systems
- Agronomic pilots, for example demonstration plots where new farming practices are tested; new variety testing, new farming system testing with monitoring of cost and yields.
- Support with the development of professional nurseries that produce good quality mango trees and other fruit trees
- Business training; for example we could choose to enrol selected farmers in some of the modules for the processors. This makes sense for small and large farmers when it comes to entrepreneurial modules, and particularly for larger farmers who also have to manage staff for the leadership and management modules. When farmers and processors follow training together, this will also strengthen the trust between them
- Exploring the potential for regional and European market exports; part of a healthy business model for farmers is that they can sell premium quality for premium prices on the fresh market, and lesser quality to processors and local informal market. It may be in the interest of processors that farmers can make their money on fresh export so that they can sell processing grade at lower prices, because the export has paid for most of their cost already.

This export program could then contain some of the same activities as for processors, e.g. a market orientation mission, trade fair participation, client matchmaking etc. These activities can even be combined with the processors.

11.3 Development of a fruit sector strategy

The fruit sector in Angola is still at an early stage of development. This is the ideal moment to develop a shared vision and sector development strategy; before anyone has invested massively in specific processing companies or fresh export packhouses. Once there are vested interests it is always difficult to come to sharp strategic choices. There seems to be a lot of interest from various public and private sector associations for such a strategy. In the past we have developed a mango sector strategy for the Ivory Coast government.

The goals of a sector strategy is to develop a shared vision of public and private sector where the sector needs to go and what needs to happen to get there. This starts with an understanding of the different markets for the different products, and the competitive advantage of Angola in these markets. Ultimately the question that needs to be answered is what products Angola can produce for which market, using what kind of technology and business model.

Examples of these choices could be that Banana is for regional fresh market, Mango is for fresh market in the EU, drying and freezing for the EU, Pineapple for juice and drying and freezing in the EU, etc.

What helps is that many markets for fruit products have been mapped recently, e.g. Sense has documented the Eu market for all processed mango products and fresh mango products, the EU market for dried pineapple, pineapple juice and frozen pineapple, the market for processed avocado products, and the EU market for fresh citrus and citrus juice. Similarly, the fruit production sector has been mapped in Angola, e.g. by Resilience.



The development of a fruit sector strategy can start with the identification of gaps in market research, e.g. the regional market for fresh pineapple, and covering those gaps. Market research can then be presented during a series of webinars, or during a workshop. Together with the sector stakeholders, strategic choices can be made, and action plans formulated.

The advantages of a good sector strategy are:

1. Clear guidance for private companies and government in which sectors, markets etc. to invest and where not to invest; e.g. you want to avoid investing in citrus if you cannot be competitive. Government should not promote citrus farming and processing in that case.
2. Clear guidance on what public sector should do and not do. For example focus on certification, export promotion, attracting foreign investors and logistics but not building storage for fresh produce for farmers.
3. Focus on a few priorities that can be executed well
4. Avoids spending time and effort on opportunities that seem interesting but not in focus. For example, an international investor may arrive that wants to invest in fresh pineapple export, but when our strategy clearly says this is out of focus, government should avoid investing too much into this opportunity.
5. You can target the right experts and companies to develop the sector. For example, if you want to focus on juice, you can actively target companies that operate juice plants in other African countries, or importers of juice.



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