



## **Business Case: Modern high yielding export mango orchard**





## Description of Business Model

This model is a professional mango orchard that produces largely for the export market. The orchard will be 100 ha of mango, under irrigation.

The orchard will be fully fenced. Expected yields under this system are up to 30 tons per ha with 70% export grade. However, it takes up to 10 years for an orchard to reach full production.

The orchard could be located in Lac du Guerre and Saint Louis where phytosanitary pressure is lower and irrigation from the SRV is possible. Sandiara, in Les Niayes area is also possible, but this faces several challenges detailed in the report.

The farm will invest in a modern packhouse equipped to process 8 tons of mango per hour or 2 x40-foot containers per day during the export season.



## Typical Entrepreneur

### *Entrepreneur*

- Vertically integrated EU fruit importer, sourcing from multiple origins to offer 12-month supply
- Professional mango farmer currently producing in Senegal

### *Financier*

- Equity from entrepreneur (50% minimum)
- Vertically integrated EU mango importer





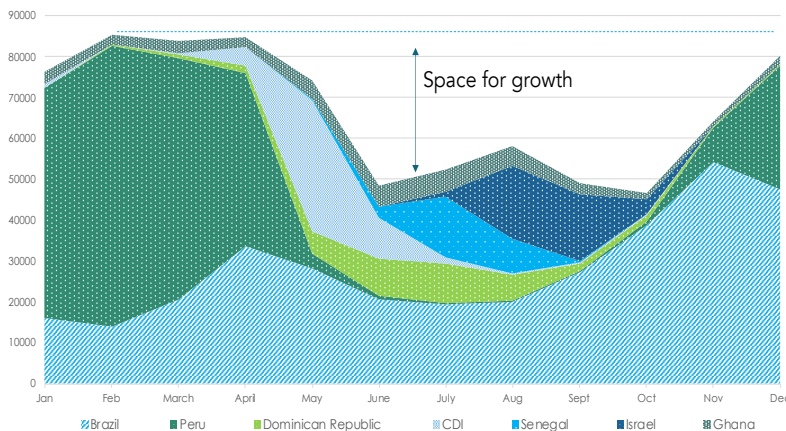


### Market

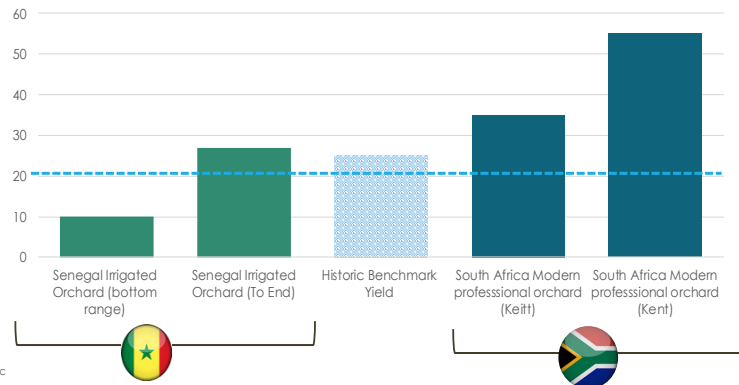
Senegal has a unique export window from May to July during which there is no other Kent or Keitt mango on the EU market. This allows Senegalese mango farmers to export at a very high price of between €5 and €6 per 4 kg box FOB Dakar. Non export grade are sold to processors and local market traders.

- **European Market (May to July):** Due to Senegal's unique geographical location and harvest season, Senegalese Kent and Keitt mangos fetch a premium price on the EU market, while no other supplying countries are in production, Ivory coast having exited the market in May and Israel only entering the market in September
- **Local fresh market:** Prices paid on the local market are only 16% of the premium price received for export mangos. However, by comparison to other West African production areas the local market price of 0,225 € is still a very high, exceeding the farm gate price of export grade fruit in Ivory Coast €0,18/kg and slightly less than the export grade price in Ghana of €0,25 per kg.
- **Local processors:** Mango processing in Senegal is not well developed, due to the very high local market price and strong demand on the local fresh market. Processing in Senegal is not competitive by comparison to countries such as Mali and Burkina Faso who have much cheaper and abundant local grade mango.
- **Regional processors:** Only Blue Skies in Ghana, who airfreight fresh cut fruit salad to the EU have sufficiently high margins to be able to import process grade fruit from Senegal. This is done to compliment the production window in Ghana and extend the processing season.

European Imports by Lead Origins  
2019, Euros



Yield per hectare, Senegal compared to South Africa



### Rationale for investment

- **Senegal's unique EU market window:** From Mid-May to September there is a real shortage of mango on the EU market, which only Senegal can supply, attracting exceptionally high prices
- Importers have 12-month supply contracts with clients
- Investment in a mango farm in Senegal is a long term invest to secure supply during this period when no other production areas can supply
- **Senegal is on the European doorstep:** Senegal is also the northern most African mango producer and has a significant advantage in shipping time to the EU.
- **Mango production areas on the coast:** Proximity of Les Niayes and St Louis to the port also reduces road freight to port time and cost vs other countries

### Product or Service

	Tons*	Price
Export grade Kent	1 680	€1,375 per kg FOB Dakar
Export Grade Keitt	420	€ 1,375 per kg FOB Dakar
Local grade Kent and Keitt	900	in bulk €0,225 per kg (FCFA 150) farm gate

\* Orchard in full production from year 10 onwards.



Key Assumptions for the model

Yields

Yields of 30 tons per ha have been established in Senegal. This remains below the South African maximum potential yields (50 tons per ha). It does however allow for an improvement over the current norms. **30 tons per ha** has been assumed yield used in the model

Adequate capital reserves

The investor has **adequate capital reserves** for a 7-year payback period. No commercial loan interest is included in the model.

Grafted clones

This model requires quality grafted trees that allow for improved yields and certainty around the variety. Certified scion are thus best sourced and grafted on to local root stock. This also ensures greater control over diseases such as fusarium wilt. It's assumed that these clones are bought in from a specialised nursery.

Kent: Keitt Ratio

The model allows for Kent and Keitt. However, later in the season phytosanitary pressure increases. So larger exporters halt exports early to reduce risks of interceptions. This is typically when Keitt is at it speaks. So the trend has been increasingly to focus on Kent production over Keitt. **80% Kent, 20% Keitt** is assumed in the model

Irrigation investment costs

Irrigation is a critical component of the operation. The investment costs for irrigation infrastructure would be similar whether the farm is in Sandiara using boreholes, or in St Louis pumping the water from the Senegal River. This depends on the distance from the river to the orchard. It requires careful management and continuous renewal. This is included in the model at a renewal rate of **50% of the drip lines etc each year & a renewal of the core infrastructure every 20 years.**

Specialised Orchard Maintenance

Good pruning practices are essential to tree yields and managing phytosanitary pressure. This requires specialised skills and so training of staff. It's assumed that this is managed **inhouse** rather than through outsourcing to a specialised service provider.

Export and local market sales

The model is primarily an export model. It does however allow for maximum returns on by including a portion of “reject” fruit to be sold on the local market. High local prices of mango mean that this is a value creating option. **50% export grade** is assumed in the model.

Scale Up

After the 3 year initial establishment period, the model assumes a steady scale up of operations. This includes a minor crop in year 4, which increases steadily over several years. The packhouse is thus established in year 5

Transport costs

It's assumed that the transport costs are included in the price to the exporter/importer. This is thus not included in this model.



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### Cash Reserves To Manage The 10-year Time Horizon

- Without income in the first 3 years, it will not be possible to pay interest on a commercial loan, therefore the entrepreneur will either need to be self funded or have access to development capital. Intercropping with vegetables in the start up phase is sometimes considered. But this additional complexity must be compared to the potential benefits in revenue and effects on profitability.

Total funds required:	€ 5 867 073
Investments	€ 1719 073
Working capital for first 5 years:	€ 4 148 000
Return on investment in year 10	



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### Managing Water Risk: Choice Of Location

- There are 3 locations proposed for the model. These have access to water from the Senegal River Valley based on access to land with suitable water. Firstly, St Louis in the Senegal River Valley, Lac du Guerre and perhaps in Sandiara.
- The big risk in Les Niayes is the increasing salination of ground water
- However, the land in Les Niayes is appreciating rapidly in value and is itself a good investment.
- Sandiara has extremely fertile vertisols.
- It may be wiser to locate the farm near St Louis.
- However, this is further from the port.
- The soil is pure sand, and all plant nutrition needs to be supplied, possibly using fertilisation.



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### Access To Certified Grafted Clones

- The intensive high-density orchard model requires large investments to achieve high yields and percentage of export grade to be profitable.
- High yielding and early bearing planting material is the foundation for this.
- Certified disease-free grafted clones are essential to avoid bringing diseases like fusarium into the orchard



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### Strict Phytosanitary Controls In The Orchard And Packhouse

- The risk of a container rejected in the port of destination is managed by fruit fly & other disease control in the orchard e.g., BBS. There are several practices that will need to be introduced and strictly enforced. For example, the sterilization of pruning equipment & crates,
- In some cases a mild "hot bath treatment" can be considered in the packhouse. Longer, hotter temperatures affect the fruit quality especially on Kent which has a thin skin. So, this must be done thoughtfully.



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### Capability and Skills

- Farm management should have extensive experience in managing a high-density intensive mango farm (Brazil, Peru or South Africa bring technical expertise that could prove helpful) . This learning curve is at least 3 years to stabilise techniques.
- Staff must have access to training for safety, pest control, equipment managements and repair etc.



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### Community engagement

- Large scale investments attract scrutiny from local communities. Investors should work to create a strong social compact with the surround community and industry associations.
- This includes well run CSR programs, engagement with state authorities and industry professional associations.



### Community Support to access land

Land in Senegal cannot be bought. And because fertile, productive land, with access to water is limited, accessing land-especially large tracts for development- almost inevitably involves the transfer of land from communities to investors. If done sensitively and sensibly it works. If not, it can result in land grabs and blockages to successful implementation of the project.



### Lessons can be drawn from successful cases:

#### 1 Identify land and de facto owner:

The traditional system of land rights means that it's not always clear who owns the land. Start by working with associations, local partners, state actors to identify suitable land. APIX can support to identify the "owners" of the land. They also moderate the discussions as one work to get community support.

#### 2 The Delibération Step:

This is negotiated with the community, usually through the mayor. Through community discussion and debates involving the local village, residents, town etc they come to an agreement around their willingness to vest usage of the communal land to the investor. This also involves the community making clear what they expect in return by way of jobs, contributions to community development etc.

#### 3 Formalise with a lease:

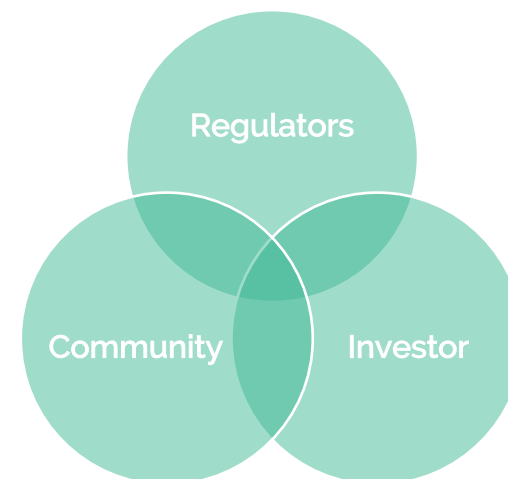
Land can be leased. This is managed through the state. A small annual fee is paid to the central government Small annual fee to the central government, an asset in loans.

#### 4 Secure Land Right Titles for critical infrastructure points :

Often issued for a small portion of the land you have. This is typically where you are making major capital investments, such as investing in pack houses etc.

#### 5 Ongoing Community Relationship Building

The long term nature of orchard investments makes it especially critical for the relationship on both sides to be mutually beneficial. CSR efforts are a key part of sustainable investment activities. It builds trust, cements the role of the investment in the community and stabilises continued support of the and lease arrangement. Some initiatives include social welfare efforts such as access to water, clinics or improving schools. But building business linkages is another way to strengthen ties and a mutually beneficial relationship.





# Business Case- Export Mango Farm in Senegal

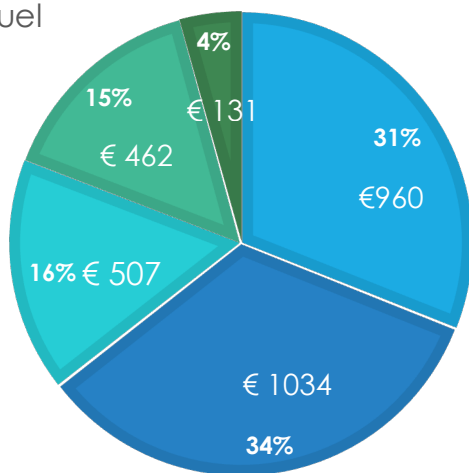
## Production Costs & Gross Margins

Name of the product/service	Revenues per product	Variable costs per product	Gross margin per product	Gross margin per unit of sales	Gross margin per unit of sales (in %)
Export Grade Kent	1 540 000	173 286	1 366 714	1,220	88,7%
Local Market Kent	108 000	74 265	33 735	0,070	31,2%
Export Grade Keitt	385 000	43 321	341 679	1,220	88,7%
Local Market Keitt	27 000	18 566	8 434	0,070	31,2%

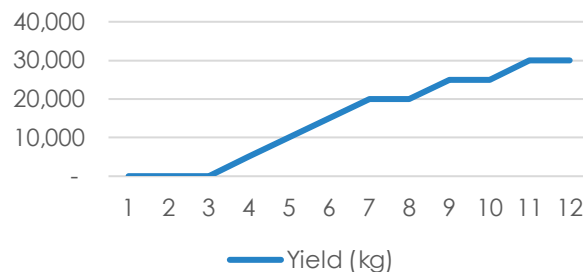
The local market is a cost recovery mechanism for non-export grade fruit.

### VARIABLE COST PER HA

- Water/energy
- Fertiliser
- Crop protection
- Labour
- Fuel



### Yield (kg) per ha per year



Investments	Cost €
Fence	8 000
Farming Equipment	29 128
Reservoir	50 000
Vehicles	82 037
Buildings	150 000
Packhouse equipment	212 000
Land and Planting	531 200
Irrigation	656 708
Total	1 719 073

## Economic Logic

### Investments Required

#### Phase 1-Orchard Establishment:

- The project will require investments of approximately **€ 1,380,000** in land, irrigation infrastructure, equipment and orchard establishment.
- In the first 3 years there are substantial operating costs but no income. The cumulative net cashflow position is expected to reach **-€ 2 774 715** before the 1st, small crop is harvested.
- Working capital required for running costs up until year 7 is estimated at **€ 4 148 000**.

#### Phase 2 -The Packhouse:

- In year 4 the farm will need a HACCP compliant packhouse building estimated cost: **€100,000**.
- A Maf Roda packing line, including pre-cooling and cold storage for 3 containers: **€ 200,000**
- An additional tractor to facilitate rapid transit from orchard to packhouse, picking crates and other equipment will bring the total investments, including the working capital for the first 4 years brings the total investment necessary to **€ 5 867 07**.

### Return on Investment

- The first 4 years of the model, the investor will need sufficient working capital to afford running costs, without income: Working capital requirements for this period are calculated at **€ 4 148 000**.
- As from year 11 the farm will be in full production and generate net profit before tax of **€ 2 202 737**.
- The investment should be recovered in year 10 of the model.
- The orchard and packhouse have an economic lifespan of at least 20 years.

### Available Financial Instruments

- It is unlikely that a commercial bank would be interested in lending on a 10 year horizon .
- Or, the entrepreneur would need at least 50% own capital.





### Profit and Loss year 1 to 12

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Yield (kg)	-	-	-	5 000	10 000	15 000	20 000	20 000	25 000	25 000	30 000	30 000
<b>Revenues</b>												
Export Grade Kent	-	-	-	385 000	770 000	1 155 000	1 540 000	1 540 000	1 925 000	1 925 000	2 310 000	2 310 000
Local Market Kent	-	-	-	27 000	54 000	81 000	108 000	108 000	135 000	135 000	162 000	162 000
Export Grade Keitt	-	-	-	96 250	192 500	288 750	385 000	385 000	481 250	481 250	577 500	577 500
Local Market Keitt	-	-	-	6 750	13 500	20 250	27 000	27 000	33 750	33 750	40 500	40 500
<b>Total revenues</b>	-	-	-	<b>515 000</b>	<b>1 030 000</b>	<b>1 545 000</b>	<b>2 060 000</b>	<b>2 060 000</b>	<b>2 575 000</b>	<b>2 575 000</b>	<b>3 090 000</b>	<b>3 090 000</b>
<b>Variable costs</b>												
Export Grade Kent	173 286	173 286	173 286	173 286	173 286	173 286	173 286	173 286	173 286	173 286	173 286	173 286
Local Market Kent	74 265	74 265	74 265	74 265	74 265	74 265	74 265	74 265	74 265	74 265	74 265	74 265
Export Grade Keitt	43 321	43 321	43 321	43 321	43 321	43 321	43 321	43 321	43 321	43 321	43 321	43 321
Local Market Keitt	18 566	18 566	18 566	18 566	18 566	18 566	18 566	18 566	18 566	18 566	18 566	18 566
<b>Total variable costs</b>	<b>309 439</b>	<b>309 439</b>	<b>309 439</b>	<b>309 439</b>	<b>309 439</b>	<b>309 439</b>	<b>309 439</b>	<b>309 439</b>	<b>309 439</b>	<b>309 439</b>	<b>309 439</b>	<b>309 439</b>
<b>Gross margin</b>	<b>-309 439</b>	<b>-309 439</b>	<b>-309 439</b>	<b>205 561</b>	<b>720 561</b>	<b>1 235 561</b>	<b>1 750 561</b>	<b>1 750 561</b>	<b>2 265 561</b>	<b>2 265 561</b>	<b>2 780 561</b>	<b>2 780 561</b>
<b>Fixed costs</b>												
Maintenance and insurance	63 307	63 315	63 461	88 821	88 821	88 694	88 694	88 694	88 694	88 694	88 694	88 694
Fixed staff	25 200	25 200	25 200	42 300	46 800	46 800	46 800	46 800	46 800	46 800	46 800	46 800
Other fixed costs	2 032	2 032	2 032	96 782	253 032	378 032	379 032	379 032	379 032	379 032	379 032	379 032
Depreciation	42 177	42 194	42 376	61 276	61 276	60 959	63 298	63 298	63 298	63 298	63 298	63 298
<b>Total fixed costs</b>	<b>132 716</b>	<b>132 740</b>	<b>133 069</b>	<b>289 179</b>	<b>449 929</b>	<b>574 484</b>	<b>577 824</b>	<b>577 824</b>	<b>577 824</b>	<b>577 824</b>	<b>577 824</b>	<b>577 824</b>
<b>Profit before tax</b>	<b>-442 155</b>	<b>-442 179</b>	<b>-442 508</b>	<b>-83 618</b>	<b>270 632</b>	<b>661 077</b>	<b>1 172 737</b>	<b>1 172 737</b>	<b>1 687 737</b>	<b>1 687 737</b>	<b>2 202 737</b>	<b>2 202 737</b>
Applicable tax	-	-	-	-	-	-	173 496	293 184	421 934	421 934	550 684	550 684
<b>Net income</b>	<b>-442 155</b>	<b>-442 179</b>	<b>-442 508</b>	<b>-83 618</b>	<b>270 632</b>	<b>661 077</b>	<b>999 241</b>	<b>879 553</b>	<b>1 265 803</b>	<b>1 265 803</b>	<b>1 652 053</b>	<b>1 652 053</b>
<b>Cumulative net income</b>	<b>-442 155</b>	<b>-884 334</b>	<b>-1 326 842</b>	<b>-1 410 460</b>	<b>-1 139 828</b>	<b>-478 752</b>	<b>520 489</b>	<b>1 400 042</b>	<b>2 665 845</b>	<b>3 931 647</b>	<b>5 583 700</b>	<b>7 235 753</b>

Yields per ha evolve from 5 tons/ha in year 4 to 30 tons/ha when the orchard is in full production.

First year of revenue in Year 4.

Positive ROI.



## Risk Analysis

**Phytosanitary Issues:** In the hot dry climate of Senegal, the primary phytosanitary risk is the arrival of fruit-fly during the rains which occur during the later half of the season (July to September).

This risk is amplified for export farmers, with the possibility of fruit rejections in port of destination.

**Disease pressure:** Compared to more humid countries such as Ghana and Ivory Coast, there is much lower disease pressure in Senegal. The exception is a Fusarium wilt, which is a fungal disease that is usually spread by poor phytosanitary practices in nurseries or from planting infected material and grafted scion.

**Salination of ground water:** A major risk in Les Niayes area is the increasing salination of ground water. This is due to increasing and under-regulated use of boreholes for irrigation in the region. This has long term affects on the viability and risk of the business should you choose to locate there.

**Land Rights :** The land rights system means that proactive steps need to be taken to keep local Senegalese communities from whom the land is transferred to support the investment.



## Risk Mitigation

**Phytosanitary issues:** Pesticide spraying and fruit fly traps are essential part of Integrated Pest Management. **Removal and destruction of fallen fruit from the orchard** removes “stung” fruit with eggs and larvae, preventing reproduction of the fruit flies.

**Complete the harvest in July** to reduce the risk of interceptions in EU ports and may have a beneficial effect on yields as trees have longer to recover before the next season. However, this requires that a packhouse with capacity to pack at least 2 containers per day will be required, at substantial investment cost.

**Disease pressure:** While various fungicides have been tested against Fusarium wilt, it can best be avoided by the importation or purchase of certified disease-free grafted clones from a reputable professional nursery.

**Salination of ground water in Les Niayes region:** The risk of salination of the borehole water over the next years or decades needs to be very carefully studied before the orchard is established. The risk can be managed in a number of ways:

- Underground watersheds in Les Niayes have been very well studied and mapped
- Inclusion of a water conductivity meter in the irrigation system can detect even minute increases in salinity and shut down the pumps before damage is done to trees and soil
- In this situation the farm would have to connect to SDE (municipal water) at a significant cost per M<sup>3</sup>. **A thorough assessment of this risk should be conducted before the site is chosen**

**Land Rights:** Ensure that the business plan included proactive community engagement systems. This includes CSR activities that benefit the surrounding community, businesses, farms and professional associations to demonstrate a relationship based on ‘give and take’.





### Economic & Social Impact

- Community upliftment
- Job creation
- Wealth Creation
- Increased disposable income to buy more nutritious food
- Increased training and skills transfer
- Reduction of Senegal's trade deficit



### Environment Sustainability

- This has the potential to counteract desertification through reforestation of degraded lands
- Possible chemical misuse/ spillage
- Risk of over-exploitation of groundwater, resulting in salination



### Women & Youth

- Over 100 seasonal jobs for women and youth
- Source of income for local market mangoes traders (mostly women)
- Potential to provide income and jobs , which has some benefits for
- Reduction of youth migration to cities through local job creation
- Availability of wood from pruning to the local population (mostly women)



### Knowledge Transfers

While the Netherlands is a key import hub for mango entering the EU, this is not a producing country. As such the potential for specific mango growing knowledge is low.

However, the Netherlands are expert at water and have specific service providers who specialise in optimizing irrigation to minimise salinisation.

Also, Dutch research institutions are increasingly looking for measures to manage more frequent water shortages over the Summer. There could be opportunities to transfer some of the low-tech solutions. This would be a helpful intervention for existing farms, new development, site selection etc.



### Commercial Interests

Dutch importers could be interested in vertical integration in the mango chain. This is especially as securing volumes in Senegal would further entrench dominance especially over the EU months.

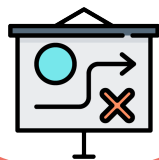


### Technology

There are no clear technology transfers for farming techniques.

Dutch irrigation technology tends to be far more sophisticated than what is required in Senegal.





### State Institutions, Universities

#### **ISRA:**

ISRA is responsible for agricultural research in Senegal. They would be an important stakeholder in importing root stock and in cloning. They are also helpful in identifying location and providing some local agronomics.

#### **Extension Services**

ANCAR is responsible for coordinating extension services. They work through agencies that focus on specific tasks in the various regions.

Mango development has not been tackled by ANCAR to a great extent. Nevertheless they could be useful allies in setting up the system and integrating knowledge into existing programs.

#### **ASEPEX, APIX**

These agencies are involved in investment promotion. They play a key role in access to land, identifying locations, negotiating with local communities etc.

#### **DPV – Plant protection agency**

They play a key role in managing phytosanitary pressure, negotiating the dates for the export season and issuing phytosanitary certificates to producers.

#### **AzuraFôret**

This agency is responsible for reforestation. Food forests are a recent interest and could prove to be a helpful alliance in state structures.



### Private Sector

#### **Large exporters who source from small scale producers**

These producers are also growers and would benefit from being able to source quality fruit from small scalars in their system. They could be a key resource in identifying small scale producers suitable to carry out the nursery project. As a potential off taker they could play an important role in securing finance required from MFI's or banks.

#### **Industrial Producers interested in mango production**

These producers are involved in CSR projects that could strengthen the social compact in Senegal. As potential stakeholders they can provide critical technical support to nursery growers. These could be staff, community members around their farms etc.

#### **MFI's**

The funding required for these producers is better suited to MFI's. As a result developing interest and understanding from MFI's could be a useful support to new nursery developers as they establish their facility.



### Professional Associations

#### **AUMN**

This is the leading market gardener association in the Niayes. They would be a helpful resource in identifying potential locations for the nurseries, identifying investors who could be individuals or cooperatives.



This business case was developed by Sense  
[www.timeforsense.com](http://www.timeforsense.com)

