UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

MANGO

An INFOCOMM Commodity Profile

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1. Presentation

1.1. Origins; early trading history

Botany

The genus *Mangifera* belongs to the class Dicotyledons, sub-class Archiclamideae, order sapindales, sub-order Anacardioideae and family Anacardiaceae. This family encompasses numerous species such as the cashew, the ambarella - a familiar sight in the West Indies – and the pistachio. The mango tree is derived from *Mangifera indica* L[1].

The plant and fruit

A vigorous growing tree which can exceed 20 metres in height, with a more or less horizontal branch habit depending on the varieties. The cylindrical trunk can be up to 1 metre in diameter. It is a long-lived tree, with fairly brittle wood. The leaves, oblong and lanceolate, are a varnished dark green colour, measuring up to 15 to 40 centimetres. They drop and are renewed throughout the vegetative cycle, leaving an abundant and permanent crown. The yellowish or reddish flowers sprout in their hundreds on panicles around thirty centimetres long.

This document will focus only on grafted mangoes, the only type which are significant in terms of cultivation and trade. Non-grafted mangoes are marginal in terms of trade.

The mango is a drupe, differing in shape between the varieties: dissymmetric, round, ovoid or reniform, with more or less flattened sides, and with or without a lip. It has a smooth skin, punctuated with lenticels, which is fairly thin yet tough. Green after fruit-setting, it can then take on numerous colours, from green-yellow to orange or red-purple. The fruit coloration may be uniform, or piecemeal. Certain varieties are covered with a layer of bloom of varying size. The yellow-orange pulp is more or less tender and scented. The central stone is flat, fairly big, garnished with short fibres giving it a firm hold on the flesh. Depending on the varieties and sources, the fruit can weigh 130 g to more than a kilo.

Origins

The mango tree appears to have originated in Malaysia, or more probably the Indo-Burmese region. Its cultivation rapidly spread to neighbouring countries, becoming an intensive crop in South-East Asia from the 4th or 5th Century BC[2].

In Africa, the mango was apparently introduced by the Arabs on the East Coast, in Madagascar and the Indian Ocean ports, whence it spread inland. Africans also played an important role in disseminating the mango across intertropical Africa before the colonial age. In addition to fruit production, the tree was frequently planted for its shade.

Portuguese navigators propagated the mango to Brazil, from where it spread across South America and then to North America. It was introduced to Australia only during the 19th Century. Some plantations were set up in Europe from the 17th to 19th Century, but without any real success.

At the outset, mango was propagated by sowing, which yielded small, highly fibrous fruit which had a pronounced taste of turpentine. It was only from the 19th Century that graft propagation of monoembryonic varieties developed, giving rise to West Indian varieties such as Julie, Amélie, Divine, etc., which were introduced in West Africa.

Commercial mangoes are most often derived from free or controlled hybridisation of original polyembryonic or monoembryonic varieties, the cross characteristics of which make it possible to obtain fruits meeting the market requirements. In the 20th Century, extensive research and selection efforts led to the production of the Haden variety, derived from the Indian variety Mulgoba, and obtained using the bud grafting technique. Numerous other varieties would follow, which have now spread around the world.

Mango cultivation is favoured by the intertropical zone, but recently it has progressed in peripheral regions such as the Mediterranean, where it is prospering in Israel, Egypt, Morocco and Spain.

The fresh mango was long restricted to local or regional trade, given its perishability. It was only after the Second

[1] De Laroussilhe F., 1980. Le manguier [The mango tree], Maisonneuve et Larose, Paris

[2] De Laroussilhe F, 1980. Le manguier [The mango tree], Maisonneuve et Larose, Paris

World War that it began to be traded over longer distances, as air transport developed. Refrigerated sea transport in the 1980s-1990s would rapidly boost mango flows to North America and Europe, major consumption centres.

1.2. Cultivation, harvesting, processing, from transport to consumer

Cultivation

The mango is a fairly hardy tree, but it struggles to withstand temperatures below 5°C; even for a short period, they generally prove fatal. Its optimum growth temperature is between 23 and 27°C, but it can withstand high temperatures (above 45°C) if it is shaded by hedges. High-altitude production is possible, but also restricted by temperature loss due to elevation; an altitude of 1 250 to 1 300 appears to be the limit. [3]

Mango growth follows a succession of apparent vegetative peaks and dormancy periods. A vegetative dormancy period of at least two months is required to induce flowering. This dormancy is triggered naturally by the alternating wet and dry seasons, or by a succession of hot and cooler periods, or a combination of the two. Hence a period of cool temperatures can trigger flower induction, just like a dry period. In an equatorial climate, the mango tree does not undergo vegetative dormancy, and has little or no flowering. The more relatively long and intense the dormancy, the greater the chances of obtaining grouped and abundant production. Two to three flower inductions are triggered every year. [4]

The mango tree grows in regions where annual rainfall varies very considerably. Its water requirements relate to the volume received, and also its distribution over the year. The volume of water required to support production intended for sale is estimated at between 700 and 800 mm. In zones receiving less than 750 mm per year, the orchards must be irrigated.

Depending on their strength, winds can destroy harvests and even uproot trees, especially in zones affected by hurricanes or cyclones. In these regions, it is desirable to select deep rooting mango trees. Furthermore, particularly hot winds (e.g. Harmattan) increase evapotranspiration and can cause a water imbalance. They also have an adverse action on pollinating insects. Hence it is often recommended to protect the plots using windbreaks.

The mango tree is undemanding in terms of the soil, provided that it is fairly deep, more than 2 metres. An aerated and well-drained soil promotes good rooting, and consequently satisfactory production. Sandy soils can lead to a water shortage for the tree. Conversely, a silty-clay soil is prone to water retention in the event of heavy precipitation, which would damage the root system. The mango tree grows well in ferralitic soils. Zones exposed to sea spray should be avoided, since the tree is sensitive to salts, which damage the plant and impair its production capacity. In intensive production, the pedological conditions are often improved by applying manure or fertiliser, in addition to controlled irrigation.

Low-relief terrain is preferable. On a slope of approximately 20 %, the trees should be planted in accordance with the contours. The land will need to be clean, i.e. free from roots and plant debris which could transmit parasites to the soil. The land used will preferably have been cleared and left fallow for two years, or previously planted with food crops. A soil analysis will be used to determine the subsequent fertiliser inputs. The water resources and plot drainage study, the dominant or seasonal wind exposure and the location of the packing stations should all be taken into consideration in selecting the orchard location.

Orchard maintenance consists first of all in regular weeding around the plants to prevent weed growth. Over the first three years, irrigation promotes plant growth and robustness. Upon entering production, it will be applied differently, to respect the tree's vegetative dormancy and to enable flower induction. It will be suspended two months before flowering, and resumed upon full flowering until harvest, in the absence of rain. It will then be continued, though more moderately, until the next vegetative dormancy, to enable the plant to accumulate as many reserves as possible.

The mango tree is propagated by sowing, grafting, layering and cutting. However, layering and cutting are rarely employed, given their practical difficulty, the time required and the less reliable results than with grafting,

[3] De Laroussilhe F., 1980. Le manguier [The mango tree], Maisonneuve et Larose, Paris
[4] Pip/Coleacp (2013), Mango Technical Itinerary: http://en.calameo.com/read/00344026960f7ef6985a5

which remains the most common process for plantations aimed at the export sector. The rootstock is selected from polyembryonic varieties ensuring plant homogeneity by conserving the genetic heritage of the plant. They must be robust, since they are responsible for the rooting and vigour of the plants. The graft is responsible for the longevity and characteristics of the chosen variety[5].

Grafting is carried out via buds or twigs. For bud grafts, shield budding is commonly employed, though there are multiple variants. For twig grafts, two methods are used: plain grafting or tongue grafting. Head grafts are also employed, for grafting plants or regrafting already productive trees in order to change the variety. Regrafting enables varietal modification of an orchard, enabling it to adapt more quickly to changes in demand. After grafting, plants undergo intensive care in terms of hydration and nutrition. Twelve to eighteen months later, they are robust enough to be transplanted into the soil.

Harvest and transport

Harvest comes 120 to 130 days after flowering. The mango is a climacteric fruit (i.e. reaches maturity after harvesting), which must be picked at physiological maturity, i.e. mature/green, to withstand the various stages of the marketing process. If picked too soon, it will wrinkle, deteriorate and not ripen; if picked too late, it will reach the market over-mature, or even decomposing.

There are some indicators of physiological maturity which can help select the fruit: time between flowering and harvest stage, swelling of the fruit cheeks, hollowing-out of the stalk attachment zone, modified coloration, yellow-orange coloration of the pulp around the stone, percentage sugar, etc. Yet they remain uncertain, given that there is no complete correlation between coloration and maturity, that each variety reacts differently depending on the production zone, and that the position of the fruit in the tree can accelerate or delay its physiological maturity. Due to the great variation in maturity stage of fruits from the same orchard, the harvest is carried out in several goes, a practice which helps ensure better mango quality[6].

The harvest is most often manual. On industrial orchards, mobile height-adjustable platforms can facilitate picking. In the case of trellised orchards, these operations are easier, since the trees are short and the fruits more readily accessible. For more traditional plantations, or if the trees are tall, the pickers are forced to climb the trees to reach the fruits, which can prove dangerous because of the brittle nature of the mango wood.

The mango, a fragile and particularly impact-sensitive fruit, must be picked with care. The fruits are placed in crates with minimum stacking to prevent any impacts or crushing, and protectors (newspaper, foam mats, etc.) are sometimes inserted between layers of fruits.

At the packing station, the fruits are cooled as quickly as possible to help them keep for longer. After the incoming batch has been identified (traceability), the mangoes follow the steps below:

- washing,
- drying,
- grading,
- packing by size (generally in 4-kg boxes for sea-freight fruits, and 6 to 7-kg boxes for air-freight fruits),
- palletisation (possible pre-cooling for sea-freight fruits),
- forwarding to the airport where the pallets are then loaded onto air-freight pallets,
- or transfer into a shipping container pre-cooled to the transport temperature. The container, closed and sealed, is then taken to the port, where it is hooked up until it is loaded onto a ship.

Certain traditional exporters do not palletise the boxes leaving the station, but forward them directly to the airport, where they are placed on air-freight pallets before loading.

The sea-freight sector uses containers, or polythermal reefers able to transport the fruits directly in the hold. The latter mode of transport is generally available from sources exporting other products, such as the banana or pineapple, providing a logistical synergy.

For mangoes bound for the United States, fruits must undergo hot water treatment in order to eliminate any risk of fruit fly infestation. Hence after washing and grading, the mangoes, still in their field crates, are directed to an insect-free part of the packing stations, immersed in a hot water bath, and then cooled in a cold water bath and finally dried. At this stage the final packing is performed.

[5] Didier C., 1998. Technical guide on the mango, CIRAD.
[6] GERBAUD, P. Personal documentation.

These products are the subject of a specific certificate issued by an agent authorised by the competent US authorities, and assigned to each station for the duration of the export campaign.

1.3. Varieties, quality standards, classification

The polyembryonic and monoembryonic types of mango tree lead to a degree of varietal instability. Free pollination of trees can generate new varieties. The same race may be expressed as multiple types of tree, depending on the cultivation site. Around a thousand types of varieties have been listed, though we should be aware that the same type or variety can be named differently in different countries. Here we will mention only the stabilised varieties, ranked in decreasing order of commercial importance on Western markets.

- **Tommy Atkins**: a Floridian variety with medium to large fruits (450 to 700 g), ovoid in shape, with a rounded apex. Green-red coloration, numerous large green-yellow lenticels. Firm orange juicy flesh, containing fibres. A productive and fairly hardy variety. Medium taste quality. Highly widespread in Latin America.
- **Kent**: a Floridian variety with large fruits (up to 800 g), round in shape. Green-red coloration, sometimes with yellow-orange areas, which varies considerably between production zones. Firm yellow-orange flesh. Thick, tough skin. A productive and hardy variety. Good taste quality. Kent has gradually become the benchmark. A mid-season variety, it is produced in most Latin American and African exporter countries.
- **Keitt**: a Floridian variety with medium to large fruits (500-700 g), oblong in shape. Green-yellow-pink coloration, with a pastel tinge. Numerous small yellow lenticels. Firm, juicy orange flesh, with thin unobtrusive fibres. Good taste quality. A productive end-of-season variety. Widespread in Latin America and Africa. It often tops up the export campaigns after Kent.
- **Palmer**: medium to large fruits (450-700 g), elongated and oblong in shape, with a slight apical lip. Red to purple coloration. Thick, tough skin. Yellow to yellow-orange flesh, firm. Satisfactory taste quality. Fairly productive late mid-season variety.
- **Amélie**: a West Indian variety with medium fruits (300-600 g), round in shape, with a more or less pronounced lip. Green to yellow-orange coloration. Intense orange flesh, free from fibres and tender. Good taste quality. An early and mid-season variety, behind the growth in African exports to Europe. Gradually falling out of favour because of its unappealing, mainly green coloration and its sensitivity to sea-freight.
- **Valencia**: a variety with medium to large fruits (400-700 g), elongated in shape. Green-yellow coloration with an orange tinge. Yellow-orange flesh. Good taste quality. Fairly early.
- **Haden**: a Floridian variety with medium fruits (350-550 g), rounded in shape. Yellow and red coloration with lenticels. Not very productive. Yellow-orange flesh, slightly sour. Good taste quality.
- **Irwin**: a Floridian variety with small fruits (200-350 g), ovoid in shape with slightly flattened cheeks. Yellow-orange to intense red coloration. Good taste quality.
- **Osteen**: a variety with medium to large fruits (400-800 g), elongated in shape. Green to purplish coloration. Yellow-orange flesh. Productive. Good taste quality. Nearly exclusively cultivated in Spain and, to a lesser
- **Maya/Aya**: an Israeli variety with small fruits (200-350 g), oblong in shape. Green to intense yellow coloration. Yellow-orange flesh. Good taste quality.
- **Kasturi/Omer**: an Israeli variety with medium fruits (300-600 g), rounded in shape. Green-yellow to bright red coloration. Yellow-orange flesh.
- **Alphonso, Chausa, Totapuri**: Indian varieties with small to medium fruits (200-500 g), elongated in shape, with a more or less pronounced lip. Green to more or less intense yellow coloration. Highly aromatic orange flesh. These varieties are aimed at the fresh market, but are also widely used in processing.

This is not an exhaustive list. We could also add the varieties Smith, Springfield, Zill, Ataulfo, Kensington, R2E2, etc.

Quality standards

The Codex Alimentarius[7] international standards were established by a mixed programme bringing together the World Health Organisation (WHO) and the Food and Agriculture Organization of the United Nations (FAO). The Codex mango standard (Stan 184)[8] sets out the

[7] Codex Alimentarius: http://www.codexalimentarius.org/codex-home/en/

[8] Standard Stan 184-1993:http://www.codexalimentarius.org/input/download/standards/315/CXS_184e.pdf

various quality aspects that fresh mangoes (*Mangifera indica L.*) must satisfy. After the definition of the produce and the scope of the text, the quality aspects are stipulated as follows:

- provisions concerning quality (minimum characteristics, maturity criteria),
- classification (Extra class, class I, class II),
- provisions concerning sizing,
- provisions concerning tolerances (quality by class and sizing),
- provisions concerning presentation (uniformity, packaging, description of containers),
- marking or labelling of packages for the end consumer, and of non-retail containers,
- contaminants,
- hygiene.

This normative text, drawn up by experts from producer/exporter countries and importer countries, sets out a common terminology for commercial transactions, and stipulates the various qualitative aspects. It is applicable by countries belonging to the United Nations, whose governments have ratified it. It may be useful both for exporters and for the inspection services of recipient countries.

The Codex Alimentarius working party for standardisation of fruits and vegetables has drawn up several standards relating to processed mangoes, in particular:

- the Codex standard for mango chutney (Stan 160 - 1987),- the Codex standard for certain canned fruits (Stan 319 - 2015),

- the Codex standard for jams, jellies and marmalades (Stan 296 - 2009),

- the Codex general standard for fruit juices and nectars (Stan 247 - 2005),

- the Codex standard for canned tropical fruit salad (Stan 99 - 1981).

All these texts specifically define the processing and production conditions for the processed products, whether the mango is on its own or combined with other produce. They determine the authorised additives and preservatives, as well as the test methods to ensure their correct use.

The United Nations Economic Commission Trade and Timber Division Agricultural Standards Unit also draws up standards for fruits and vegetables, which are designed to facilitate international trade, promote production of high-quality products and protect consumer health. They are aimed at producers, traders and inspection authorities. Hence there is a standard concerning the marketing and commercial quality control of mangoes (FFV-45)[9]. Its plan and criteria are practically identical to those of the Codex Alimentarius standard for fresh mangoes, besides the contaminants and hygiene aspects specific to the Codex standard. UNECE has also drawn up a standard for dried mangoes, under reference DDP-25[10], 2013.

Besides its standardisation work, UNECE produces interpretative brochures for the standards, in collaboration with the OECD, including one for the mango published in 1993.

There is no European Union standard on the mango. However, as for any produce imported into the Community, there is an applicable framework standard, which boils down to the requirement that the produce must be of sound and merchantable quality. EC regulation 1221/2008 enables European Union official services to inspect an imported product based on the UNECE standard, if there is one (which is the case for the mango), on the sole condition that the container specifies or refers to one of the elements in the UNECE standard. The product is then deemed to have implicitly opted into this standard.

The low stringency of current standards (Codex or UNECE) does not exempt the mango from private quality requirements, such as specifications or certification.

1.4. Use

The mango is largely consumed fresh, especially in producer countries. It is also increasingly being exported to non-producer countries.

The mango is mainly processed into juices and nectars, canned cheeks, segments or pieces with syrup added in

[9] UNECE, 2012. Standard FFV-45: https://www.unece.org/fileadmin/DAM/trade/agr/standard/fresh/FFV-Std/English/45Mangoes_2012.pdf
[10] UNECE, 2013. Standard DDP-25: https://www.unece.org/fileadmin/DAM/trade/agr/standard/dry/dry_e/DDP25_DriedMangoes_2013_e.pdf

the canning process. Frozen purées or pulps, a growth market, are used for making dairy products (yogurts, etc.), ice cream and biscuit making (chocolate & cereal bars, etc.). Dried or crystallised mangoes are seeing resurgent interest as part of appetisers or snacking assortments. It can also be found in jams, fruit pastes, chutneys and sauces.

Mango tree wood is little used in construction or furniture, but more frequently as fire wood in the producer countries. The waste (skin and stone) can be fermented to make biogas, and the oil extracted from the kernel is used in cosmetics.

1.5. Diseases, pests

Diseases

Anthracnose (*Colletotrichum gloeosporioïdes*) is the most widespread fungal disease of the mango tree, bearing in mind that it also affects many tropical fruit trees (avocado, papaya, citruses, etc.). It attacks the flowers, leaves, twigs and fruits. The main symptom is the appearance of brown to black spots on the leaves and/or twigs, which join up as they expand, forming circular necrotic black spots. They eventually result in the leaves and/or twigs completely drying up. On the inflorescences, it is expressed as miniscule brown or black dots which as they expand cause the death of the flower, or even the entire panicle.

The disease appears at various stages of development of the fruit, in the form of black dots generally on the upper part, fairly close to the stalk. As they expand, these dots become spots which join up, and can thereby cover a large area of the fruit. They can also take the form of a “tear flow”, generated by run-off from contaminated branches or leaves above the fruit. The spores can penetrate the lenticels, where they find conditions favourable for their development. In this case, even post-harvest washing of the fruits does not prevent the attacks. Moisture is a factor boosting parasite pressure, especially upon the first rainfall in regions with an alternating dry/wet season.

Destruction by incineration of the affected parts is effective, but a lengthy and recurrent treatment. Synthetic organic fungicides are used to contain the disease. On fruits, copper-based solutions may be effective, as well as other synthetic products, but in this case the products used will need to be authorised, and the residual contents will need to comply with regulations in force. Numerous fungal diseases have similar symptoms: *Alternaria alternata, Cercospora sp., Stemphylium spp., Drechslera sp, Phoma sp. Bipolaris sp*., etc.

Stem-end rots are fungal infestations which affect the twigs and leaves. They are transmitted to the fruit by attacking the stalk area in the form of greyish-brown spots. Very quickly reaching the lower layers of the skin, they cause rapid alteration of the flesh. The high volatility of the spores and their varied origin (*Dothiorella sp., Lasiodiplodia theobromae, Phomopsis mangiferae, Pestalotiopsis microspora*, etc.) facilitate dissemination. High post-harvest storage temperatures can promote their development.

A post-harvest heat treatment can limit rot. Some synthetic products can also be used, such as thiabendazole, provided that the persistence of the products is taken into account, in order to comply with regulations in force.

Mildew is caused by the fungus *Oïdium mangiferae*. It grows particularly well in hot and humid countries, upon flowering and fruit-setting. It attacks the flowers, stalks and young fruits, which it covers with a white mycelial felt. It feeds on the sugars entering the epidermal layer cells. The flowers wilt and the young fruits blacken and rapidly drop off. Sulphur dusting treatment can reportedly limit the damage.

Bacteriosis is widespread in mango cultivation areas. It is caused by a bacterium of the species *Xanthomonas citri* which damages the plant and fruit by developing dark angular and oily spots, accompanied by yellowish rings. They grow along the leaf veins until completely drying them out. The bacterium forms cankers and purulent wounds on the twigs and fruits, and can kill the plant. Isolated individuals must be destroyed, in order to limit contagion. Copper-based products seem to impede its development.

***Phytophthora* canker** affects the mango tree trunks with dark longitudinal wounds in the bark, which conceal brown necrosis of the underlying tissues, bleeding gum. It spreads over the trunk, disrupting the tree’s nutrient supply.

Scab, caused by the fungus *Elsinoe mangifera*, attacks leaves, flowers, young shoots and fruits. Brown, black or greyish spots appear on the leaves. At a more advanced stage, the centre of the spot gives way to leaf perforation. Greyish pustules form on the trunk bark. Spots similar to those on the leaves develop on the fruits. They can become corky and cracking in the centre, promoting spore penetration. Copper-based solutions help combat this disease.

Soft nose is not a mango tree disease, but a physiological disorder of the fruit frequently observed in certain production regions. It is manifested by alteration of the flesh in the apical zone, which exhibits an over-mature appearance, whereas the rest of the fruit is still green. At an advanced stage, the flesh has a spongy brownish appearance.

Pests

Numerous species of scale insects feed on mango tree sap at the most sensitive points (leaves, young shoots, buds, etc.). Their attacks are especially serious since they can be extremely numerous and greatly weaken the tree. Mealybugs secrete a honeydew on which sooty mould develops, causing discoloration of the skin which adversely affect the fruit's commercial presentation. Natural predators help balance the populations. In case of excessive proliferation, chemical treatments are possible. Certain scale insects possessing a sort of shell can withstand the treatments, in which case more appropriate products are used.

Chinch bugs more particularly attack buds, which can reduce or even eliminate production. These insects can be effectively treated by certain synthetic products.

Mites feed on the leaves, resulting in a burned appearance before dropping off. They also attack the fruits, leaving grey marks incompatible with marketing requirements. Acaricidal treatments are a possibility.

Thrips are extremely widespread polyphagous insects which cause extensive defoliation, in both nurseries and plantations. They generally live on the lower surface of the leaves, which they feed on. They secrete a red liquid, which solidifies and becomes enclosed in the leaf until causing it to die and fall off. They also attack young fruits, causing skin cracking. There are effective chemical treatments, if applied rapidly during the attacks.

The numerous fruit fly species are one of the biggest scourges affecting the mango, but also many other fruits. The flies lay by holing the fruit epidermis. The eggs rapidly hatch, producing larvae which feed on the flesh. The fly damages the fruits, preventing their sale. Furthermore, the holing caused by the laying, practically undetectable to the eye, provides entrances for other parasites. Fruit fly management is complex, given their distribution, their rapid propagation and the costs incurred. This problem is especially crucial for producers, with certain consumer markets prohibiting fruit fly introduction for phytosanitary reasons.

Parasitic animals. Rats, squirrels and other small rodents can attacks the fruits, young plants or mango tree bark. Fruit bats more readily attack mature fruits, causing significant damage. Wandering livestock in a grazing zone can also cause damage in orchards.

1.6. Environmental and social impacts

Environmental impacts

Unlike mass-produced fruits such as the banana or pineapple, which can cover thousands of hectares, mango production most often involves more modest surface areas. In addition, it is a perennial crop which does not require major topographic alterations. What intensive production zones there are, are generally divided into plots combining different crops. The practice of associated crops, installing windbreaks, etc., give mango orchards a more traditional than industrial configuration. Since the plant is by nature fairly undemanding, setting up an orchard does not entail fundamental modifications irreversibly imperilling the ecology of the zones concerned. Its water requirements remain moderate, given the tree's rooting capacity.

Use of agricultural inputs is restrained, and in many cases, very little or no use is made of external products. Frequent spraying of the orchards calls for plenty of transportation to reach the packing stations. Transport from the packing stations to the ports or airports can sometimes be long (thousands of kilometres), causing relative pollution and road network damage.

Social impacts

The seasonality of production results in significant workforce turnover. Industry professionals cannot guarantee a permanent job to all the personnel required

for harvesting, packing and dispatching the fruits. This is sometimes a handicap since training must be constantly repeated. Nonetheless, the sector as a whole generates jobs, albeit on a seasonal basis, not to mention indirect jobs: packaging and pallet supply, but also all transport-related activities. Finally, selling mangoes commercially is in many cases the sole source of income for small producers. The processing sector also plays a role in terms of jobs.

1.7. Nutritional qualities

Below is a summary table of the main components per 100 g of edible foodstuff.

Table 1: Nutritional qualities of mango

Constituents	Average content		
	Fresh mango	Juice	Nectar
Energy (kJ/100 g)	269	172	262
Energy (kcal/100 g)	63.5	41	61.7
Water (g/100 g)	83.1	86	84.3
Proteins (g/100 g)	0.7	0.2	0.2
Carbohydrates (g/100 g)	13.6	9.5	14.4
Fats (g/100 g)	0.2	0.2	0.2
Sugars (g/100 g)	13.1	9.3	-
Amidon (g/100 g)	0.3	0.2	-
Fibres (g/100 g)	1.76	Traces	0.6
Mineral elements			
Sodium (mg/100 g)	2	11	2.7
Magnesium (mg/100 g)	13	14.3	4.97
Phosphorus (mg/100 g)	16	25	-
Potassium (mg/100 g)	180	21	-
Calcium (mg/100 g)	12	2	5.22
Manganese (mg/100 g)	0.3	0.02	0.0474
Iron (mg/100 g)	0.7	2.6	-
Copper (mg/100 g)	0.12	0.02	0.0256
Zinc (mg/100 g)	0.1	0.02	0.0686
Selenium (µg/100 g)	0.6	0.1	< 2.2
Iodine (µg/100 g)	1.14	3	1.1
Beta-carotene (µg/100 g)	1220	375	131
Vitamins			
E (mg/100 g)	1.05	1.05	-
C (mg/100 g)	37	30	-
B1 (mg/100 g)	0.04	0.005	-
B2 (mg/100 g)	0.05	0.01	-
B3 (mg/100 g)	0.5	0.6	-
B5 (mg/100 g)	0.16	0.14	0.05
B6 (mg/100 g)	0.13	0.12	0.04
B9 (µg/100 g)	31	27.1	9.5

Source: Anses, 2013[11]

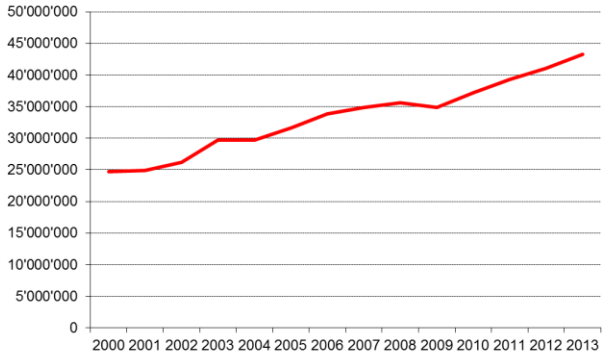
[11] ANSES, 2013. Ciqual table, nutritional composition of foods: https://pro.anses.fr/tableciqual/index.htm

2. Supply

2.1. Production

With just over 43 million tonnes, the mango is the eighth most produced fruit in the world. Its production saw a steep rise of 75 % between 2000 and 2013.

Figure 1: World's production of mango, in tonnes, 2000-2013



Source: FAOstat[12]

2.2. Top 10 producers

While it is widespread in the intertropical zone, production is nonetheless concentrated in certain countries. The top ten producer countries produce nearly 77 % of worldwide volumes.

Table 1: Top ten producing countries of mango, in tonnes, 2012

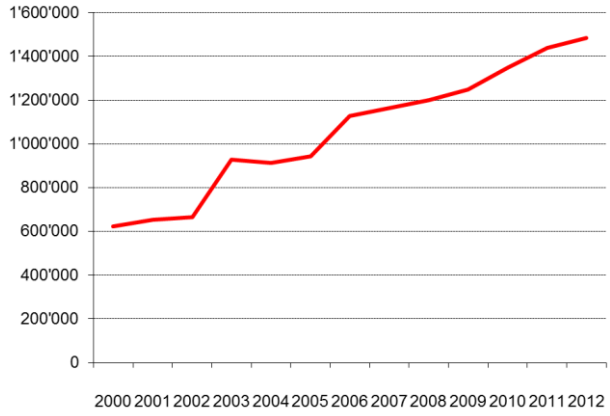
India	16 196 000
China	4 400 000
Thaïlande	2 985 530
Indonesia	2 376 339
Mexico	1 760 588
Pakistan	1 680 388
Brazil	1 175 735
Bangladesh	945 059
Nigeria	860 000
Egypt	786 528

Source : FAOSTAT, 2012

Asia accounts for 72 % of total world production. This is followed by Africa with 17 %, and then Latin America with 10 %.

2.3. Exports

Figure 2: Evolution des exportations mondiales de mangues, en tonnes, 2000-2012



Source: Trademap[13]

Exports relate to just 3.4 % of volumes produced, which implies a high level of self-consumption by the producer countries. Nonetheless, the flows have reached a particularly high tempo, climbing by more than 138 % between 2000 and 2012.

Table 2: Top ten mango exporter countries (in tonnes)

Mexico	**297 295**
India	**214 640**
Thailand	**196 441**
Brazil	**127 132**
Pakistan	**101 164**
Peru	**99 790**
Ecuador	**60 139**
Yemen	**43 467**
Philippines	**24 076**
Egypt	**19 564**

Source: Trademap

While the main exporter countries, besides China, are among the main producers, a number of modest producer countries play an important role in the international trade, such as Côte d'Ivoire, Israel, Puerto Rico and the

[12] FAOSTAT: http://faostat3.fao.org/home

[13] Trademap : www.trademap.org

Dominican Republic. The top ten exporter countries represent nearly 80 % of world trade. The significance of the various production regions in terms of trade does not necessarily reflect their weight in production. Asian countries account for just 46 % of world exports. For Africa, the figure is just 3 %. Conversely, Latin American countries, whose production represents just 10 % of the world total, account for 48 % of international trade.

It is difficult to estimate the magnitude of the processed mango sector. Statistical data is non-existent, or often several mango-derived products (purée, juice, etc.) are bundled together with products derived from other fruits. However, there are some indicators available. Besides the dried mango, European imports of which are evaluated at approximately 3 400 tonnes, mango-based processed products are primarily canned fruit, frozen purées and nectars. The main frozen pulp producers are India, the Philippines, Thailand and Mexico. China, Peru and Brazil apparently contribute smaller quantities. In addition to frozen pulp, Thailand dedicates some of its production to canned fruit. Volumes of mango-based processed products seem to have risen since the 2000s, accelerating between 2006 and 2010.

Monthly exports over the last two years considered follow an identical profile, with temporary variations in production wiped out by the magnitude of world production in relation to the tiny proportion which is traded. Since monthly world data is unavailable, the statistics suggested below are based on Comtrade data consolidated by Eurostat statistics. We can note that the flows intensify between March and August, a peak production period for the biggest suppliers such as India, Pakistan, Thailand or Mexico. European countries concentrate their imports between October and May, the counter-season period for European fruit production.

2.4. Factors affecting the supply

Climate fluctuations are the main factor that can affect the mango supply. Water surplus or shortage during the vegetative cycle of the tree can lead to considerable variations in production. The irregular dry season/wet season cycles, or Asia's monsoons, are obvious disruptions, as are the violent or persistent winds at certain times of year, the cyclones or El Niño on the west coast of Latin America. The main producer countries are proportionally less affected than the most modest countries, given the larger cultivated areas with a wider territorial spread. The high seasonality of mango production entails resorting to several sources to provide a continuous supply to the markets, but the ties and trading habits of consumer countries with certain sources mean that climate disruption can cause major fluctuations in the supply.

2.5. Prospects

World exports illustrate the vitality of this product. Thanks to production far outstripping trade, sales should continue to grow over the coming years. Imports into the big consumption centres, North America, Europe and the Asian countries, are still on the rise, although a slowdown has been apparent for several years. Certain countries, such as Eastern Europe and Russia, are consumption reservoirs, which could develop as living standards improve. Furthermore, intra-continental regional trade, still under-exploited, offers some potential. Trade between South American, African and Asian countries is progressing, though slowly. Seasonality of production promotes this type of trade, as do regional treaties such as Mercosur, Asean, Apec or ECOWAS.

Furthermore, a number of producer countries are not managing to market their production due to a lack of logistical and commercial infrastructures, leading to a considerable loss of produce. Finally, the processing sector represents a useful avenue for dealing with the big volumes of unsold fresh fruit. Although the produce does not lend itself to all sorts of processing, given its high proportion of dry matter, the food industry is growing and may be an attractive outlet, which in addition eliminates the seasonal aspect of production.

3. Demand

3.1. Consumption, trends analysis

Mango consumption is distributed fairly uniformly worldwide. A distinction can be made between purely consumer countries, whose own production is non-existent or insignificant: North America (United States and Canada), the European Union and Persian Gulf States. Unlike the former, the Asian countries are producers and big consumers. The size of the population of China and India implies a big potential which is a long way from being saturated.

Table 3: Main mango consumption centres (in tonnes)

	2010	2011	2012	2013	2014
North America	378 744	436 178	431 699	496 375	443 852
European Union	232 495	258 521	246 267	267 186	288 421
Asia	332 859	307 687	358 929	310 426	nc
Persian Gulf	186 573	207 204	210 683	198 835	nc

Source: FruiTrop[14]

[14] CIRAD, 2015. "Mango dossier", Fruitrop no.230, p.64-65.

The monthly statistical data for imports remains fragmentary or non-existent for some high-consumption countries. The monthly imports rate is close to the exports rate, with flows from 100 000 to 200 000 tonnes between March and July. The months with the lowest supply levels obtain between 50 000 and 80 000 tonnes (August to February). The high summer consumption is primarily due to the Asian countries and their trade outlets such as the Persian Gulf States.

3.2. Top 10 consumer countries

Table 4: Top ten mango importer countries (in tonnes)

TOP TEN MANGO IMPORTER COUNTRIES (in tonnes)	
United States	385 861
China	190 182
Netherlands	101 826
United Arab Emirates	99 728
Canada	57 991
Saudi Arabia	57 858
Malaysia	55 000
Spain	35 498
Singapore	21 234
Germany	15 369

Source: FruiTrop[15]

Re-exports need to be factored into the analysis of apparent consumption. US imports more or less equate to the country's consumption, barring a few thousand tonnes re-exported to Canada. Conversely, Dutch imports are mainly re-exported to other EU States. To a lesser degree, Spain siphons off some of Latin America's exports, which are forwarded on to European Union countries. Saudi Arabia and the United Arab Emirates play an identical role with their neighbouring countries.

Some of the biggest producer countries do not appear in the table above based on import figures. Yet it seems obvious that India, Thailand, China or Mexico are high-consumption countries. The 16 million tonnes produced in India are in large part consumed locally. The exports and quantities aimed at the processing sector fall well short of production.

3.3. Imports

Asia (31 %), North America (29 %) and Europe (27 %) import 1.5 million tonnes. The remainder involves countries such as the Near and Middle East (13 %). Imports are on the rise overall, with some seasonal fluctuations. Each import zone is linked to certain sources for primarily logistical reasons. Hence North America is supplied practically exclusively by the Latin Americans. The Asian countries maintain a special trading relationship with their neighbours, however small the stagger in their harvest calendars. The South-East Asian countries export to China, whereas India, Pakistan and the Philippines aim their produce at the Middle East, and to a marginal degree to Europe. The European supply is particularly diverse, with large flows from Latin America, though also from Africa, the Mediterranean and, more modestly, from Asia, which ensures an uninterrupted supply year round. The supply plans remain fairly fixed due to the perishability of the produce and the transport times between production zones and consumption centres.

3.4. Factors affecting demand

Overall, demand is well covered by supply. However, the seasonality of production, combined with trading habits, can affect demand. Demand may be turned by an early or late start to an export campaign. Excessive prices, which prevent distributors from making their expected margins, can affect the demand level. Conversely, a product influx, leading to a considerable fall in prices, may temporarily invigorate demand.

The marketing periods can also have an influence. Hence mango consumption is lower in Europe during the summer, when customers prefer domestically or regionally grown fruits, which are generally abundant and cheap. Festive periods often lead to a consumption peak, such as the end-of-year holidays or Easter in Europe. Under-representation of a variety at a given period can explain a dip in demand or a switch to another variety. Finally, demand can vary with size (fruits too small or too large) and quality (attractive or spotted fruits). In non-producer countries, consumers sometimes reject certain fruits through simple ignorance.

[15] CIRAD, 2015. « Dossier mangue », Fruitrop n°230, p.64-65.

3.5. Prospects

Mango consumption is on the rise, and this trend should continue. While certain markets seem to have matured, as demonstrated by a slowdown in imports, others are only at the discovery or expansion stage. Furthermore, self-consumption by producer countries may increase considerably with improvement and intensification in transport networks between production zones and consumption centres. Mango processing is also in a growth phase, both in food uses and re-use of fruit by-products, hitherto under-exploited or poorly exploited.

4. Prices

4.1. History

The price of mangoes on the various world markets has risen continuously over the past dozen years. It varies with the purchasing power of the consumer countries, though also with the cost prices of the products reaching the markets.

Table 5: Import unit values (in USD per tonne)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
World	865	871	998	1056	1184	1248	1197	1138	1178	1251	1362	1395
USA	741	719	860	903	866	996	1020	915	930	1006	1030	1148
Netherlands	1236	985	1150	1233	1426	1458	2068	1324	1246	1448	1657	1688
China	804	859	1101	1259	1518	1217	1222	1343	1384	1602	1770	1991
Germany	1157	1317	1395	1479	1568	1689	1740	1817	2080	2136	2342	2465
Canada	816	853	1107	1059	1179	1269	1345	1348	1235	1523	1533	1532
United Arab Emirates			554		626	709	738	823	760	601	753	790
Spain	1317	1244	1208	1229	1427	1597	1549	1456	1628	1695	1879	2035
Arabia	523	620	573	572	607	672	696	837	807	796	848	821
Singapore	745	710	761	880	865	957	891	1077	1269	1265	1368	1347
Malaysia	211	199	212	173	221	229	213	211	235	263	424	390

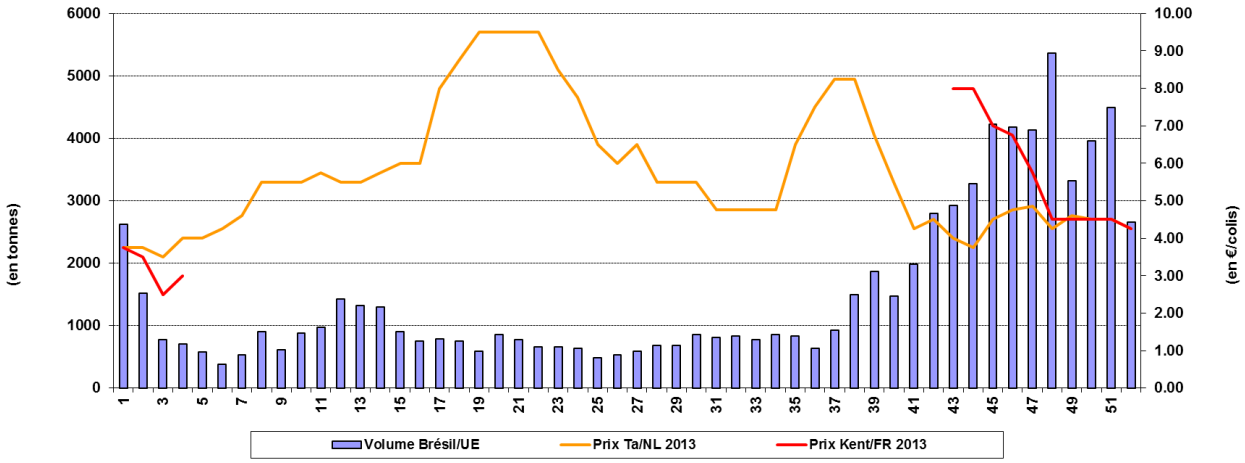
Source: Comtrade[16]

Prices on the top ten import markets followed a positive long-term trend over 2003 to 2014, apart from the United Arab Emirates, where they stagnated, while import volumes rose steeply. Overall, the price rises was considerably higher in the so-called developed or emerging countries. For the rest, progress was at a slower tempo in line with the development of their purchasing power.

The graphs below illustrate the import volumes of Brazilian mangoes into Europe in 2013 and 2014, as well as the average price of Tommy Atkins on the Dutch market, and of Kents on the French market, with the former variety present year-round, and the latter considered the benchmark variety in Europe. Rates are shown per 4-kg box.

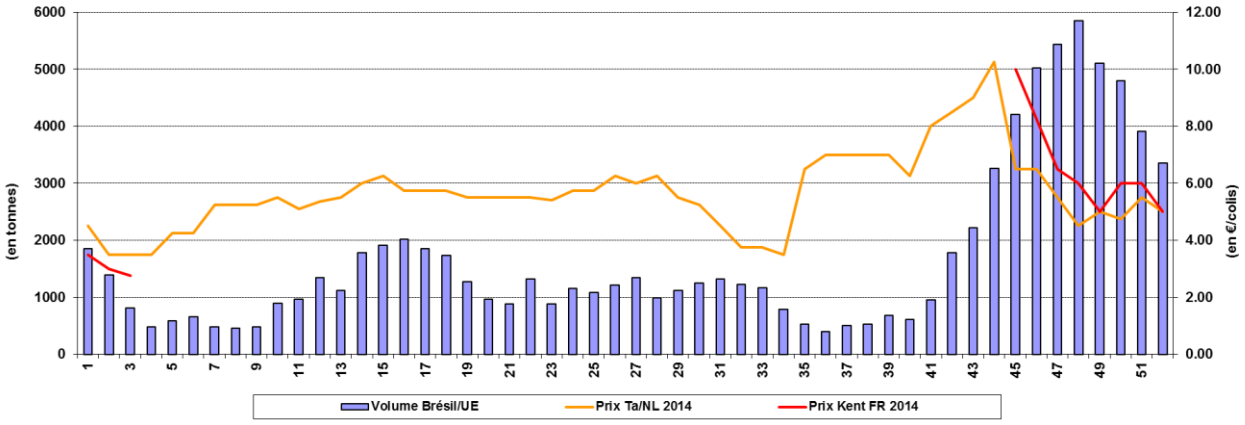
[16] COMTRADE: http://comtrade.un.org/

Figure 3: Weekly incoming mango shipments from Brazil and average prices, to the Netherlands (Ta) and France (Kent) in 2013, in tonnes and EUR/box



Source: Weekly monitoring by the author

Figure 4: Weekly incoming mango shipments from Brazil and average prices, to the Netherlands (Ta) and France (Kent) in 2014, in tonnes and EUR/box



Source: Weekly monitoring by the autho

These graphs clearly show the price fluctuations with the campaigns. The Kent rate fluctuates fairly similarly both years, with a slump parallel to the increase in supply. At this time of year, Brazil is practically the sole supplier to the European market. Conversely, the Tommy Atkins rate remains dependent on the more or less marked presence of other suppliers. Hence in 2013, the steep price increase in April-May can be explained by a dip in supply levels caused by the rapid end to the Peruvian campaign and the delay from the West African sources. This period of steep price rises was eliminated in 2014 by the large volumes from Peru, which recorded its most abundant campaign - which moreover finished later - and by the larger shipments from Brazil. For the two years selected, we can also observe a rise in Tommy Atkins rates in September due to a smaller supply.

ii) Price prospects

According to the rules of supply and demand, increased trade should gradually bring prices down, but nothing of the sort is happening. In most consumer countries, prices are following a linear rise. Conversely, more in-depth study shows large fluctuations which can as much as double depending on the periods (see graph above). If we assume that the production cost of the mango accounts for approximately 25 % of the sale price, it is the

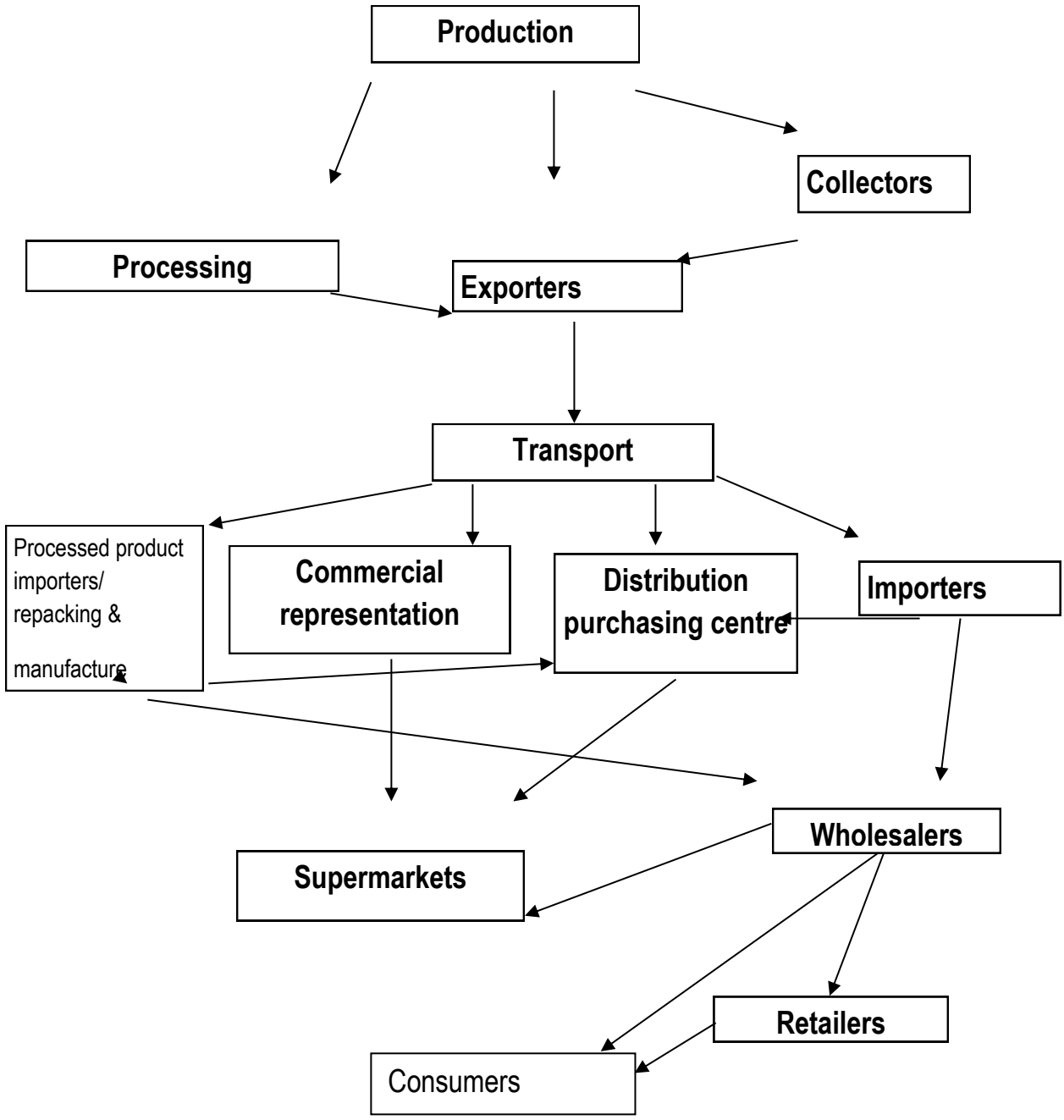
ancillary costs which make up the majority of the final cost price of mangoes placed on the destination markets. These costs are due to increasing use of inputs on the crop (especially phytosanitary treatment products), packaging, transport and distribution costs; and these costs are constantly rising around the world. As such, it is hard to see how a price reduction could be applied. These fixed and increasing costs can be limited only by seeking greater competitiveness, which often lies in cutting the margins of the various players, be they producers or traders.

5. Market structure

The mango market overall retains a traditional structure. Marketing is mostly carried out by export companies with a varying degree of involvement in production. Unlike the banana or pineapple, the mango is rarely subject to intensive production managed by transnationals. There are large-scale production facilities, but they are limited to surface areas of up to 800 ha. Conversely, a multitude of small producers, whether in Latin America, Africa or Asia, generally sell their produce to exporters which vary greatly in size.

The production/export sector is linked to the import sector. For the mango, it is rare for the distribution sector to be supplied directly by producers or exporters. A few large production/export companies have commercial representations on the recipient markets, which act as importers, and then sell their produce via the distribution circuits.

Figure 5: Diagram of the import mango industry.



Source: author

5.2. Public/private standards

Public standards

Various texts issued by the public authorities of the consumer countries govern the import systems. There are regulations on phytosanitary problems, the object of which is to safeguard import zones from the introduction of pests. They incorporate lists of insects, bacteria, viruses, etc., whose presence in the fruits leads to rejection or destruction of the merchandise, or enforces specific treatments. These rules are managed by the USDA in the United States and by the European Commission for the European market. They are generally drawn up under the aegis of dedicated international organisations. In the case of the mango, prone to insect infestations, they are fairly restrictive. For the European markets, the ban on the introduction of non-European fruit flies quite simply entails the destruction of the merchandise in case of interception. For the US market, mango suppliers are forced to submit their fruits to a certified heat treatment monitored directly by a USDA agent or an official representative. The increased parasite pressure over the past few years has led the competent services in the recipient countries to increased vigilance, which might result in the temporary suspension of imports from a source failing to meet the requirements in terms of pest management. The same applies to the sanitary aspects aimed at regulating use of agricultural inputs, and more particularly the treatment products used for mango cultivation or post-harvest. These texts cover use of phytopharmaceutical products and their marketing approval, but also the residual contents authorised for import, in order to protect consumer health. We can also find regulations on hygiene and food safety, and on organic produce. Since different countries are not exposed to the same environmental pressures, the phytosanitary and sanitary rules are not necessarily the same. They may be harmonised in certain cases, though not systematically. Hence operators should familiarise themselves with the regulations by consultation with the competent services of the recipient countries.

Private standards

Under the pressure of crises such as BSE in Europe and eco-lobbying, specific certifications for foods have been drawn up, very often by distributors whose main aim is to avoid penal liability, and consequently guarantee the safety of the products that they sell. Based on a benchmark, they reproduce and reinforce the public regulations, often by adding environmental and social aspects. Drawn up using the HACCP approach, they represent a way into the distribution sector of certain countries, but also enable better structuring of the export and marketing companies. The best known are GlobalGap, BRC and IFS.

The ISO standards, drawn up by the International Organization for Standardization, comprise two main series: ISO 9000 Quality Management System and ISO 14000 Environmental Management System. They relate primarily to processed products, ensuring that processes are run properly. They are validated by approved specialist independent bodies, which conduct regular audits.

There are also specific certifications issued by independent bodies, such as Fairtrade, the primary aim of which is to increase the revenue of small producers.

5.3. Contracts

As regards fresh mangoes, contracts between supplier and recipient remain fairly simple. They are often based on agreements relating to a campaign schedule setting out the quantities concerned, the breakdown by variety, size, etc. Depending on the circumstances, the merchandise is purchased prepaid, governed by the incoterms in force. The merchandise is often paid for in part upon loading, with the remainder settled after receipt and acceptance of the fruits. Other contracts stipulate commission sales: the merchandise is sold under optimum market conditions, with the agent taking a percentage of the sales. In this case, it remains the property of the sender until handover to the customer by the agent. There are also intermediate forms, with a mixed system involving a commission but supplemented by a minimum price guaranteed by the recipient. These various contract forms depend on the magnitude of the flows, and the strength of the commercial relationship between vendor and purchaser.

For processed products, contracts are most often based on prepaid sales, but tied to world rates. Fluctuation of processed product prices leads to long-term price negotiations, though they can be revised depending on availability and competition from other products, especially for juices and purées. In the case of prepaid contracts, transactions are governed by the incoterms in

force, which specifically define the ownership transfers and responsibilities of every player: vendor, purchaser, transporter, etc.

5.4. Niche markets

The main niche market is the air-freight fresh mango market, which represents 8 to 10 % of export volumes. Picked later than sea-freight mangoes, they have superior organoleptic qualities. This mode of transport makes for a quicker start to the season, and for certain landlocked countries, it remains the only means of exporting.

"Ready-to-eat" fruits are a booming segment. They are selected at the import stage, manually or by machine, and re-packed in boxes or individual containers before being shipped to the distribution sector. This added-value process makes the product more expensive, but it seems to be a positive factor in promoting demand.

The mini-mango market remains limited. They are aimed primarily at luxury stores, or as part of fruit baskets for catering or special events.

In the field of processed mangoes, dried fruits are developing in the snacking segment. Chocolate bars or energy biscuits also increasingly incorporate dried or puréed mango.

6. Regional/international trade

6.1. Top 10 exporters and importers

Table 6: Top ten mango exporter countries (in tonnes)

Fresh mangoes	Processed mangoes
Mexico	India
India	Peru
Thailand	Thailand
Brazil	Mexico
Pakistan	China
Peru	Brazil
Ecuador	Philippines
Yemen	
Philippines	
Egypt	

This table reiterates the significance of the Asian countries trading at an international, but above all regional level. Given the magnitude of their production, they also have a stranglehold over the processing sector: canned fruits for Thailand, and primarily frozen purée for the other countries. Peru, Mexico and Brazil sell their fresh produce to the United States and Europe, and their processed products (juice and frozen purée) to the US market.

Table 7: Top ten mango importer countries (in tonnes)

TOP TEN MANGO IMPORTER COUNTRIES (in tonnes)	
Fresh mangoes	Processed mangoes
United States	United States
China	China
Netherlands	United Arab Emirates
United Arab Emirates	Hong Kong
Canada	Netherlands
Saudi Arabia	Arabia
Malaysia	
Spain	
Singapore	
Germany	

It is more or less the same countries that import the most fresh and processed mangoes. However, Asian and Middle Eastern countries seem to be breaking away in processed mangoes. These products are more slowly being adopted in the dietary habits of European and North American countries.

6.2. Top 10 trading companies

It is difficult to discern the world's biggest companies, given the very nature of mango production. The seasonality and fragmentation of the crop impede the formation of large facilities for this product alone. Unlike the pineapple or banana, produced over vast surface areas managed by big multinational groups, the mango is produced on smaller, fragmented areas. The biggest orchards are no more than a thousand hectares, and most cover only tens of hectares, or less. Commercial facilities cannot be single-product, as is the case for the pineapple and banana, often coupled via logistical and commercial synergies. By way of example, it is estimated that the biggest European companies marketing mangoes handle no more than 8 000 to 10 000 tonnes per year, while their counterparts in the banana and pineapple handle tens of thousands of tonnes. The

commercial representations of production/export companies on the recipient markets (most often Brazilian or Peruvian in Europe) sell several products in addition to the mango, such as the avocado, grape, melon, etc., in order to ensure a profitable annual activity.

6.3. Fairtrade initiatives

Fairtrade initiatives involving the mango remain marginal. Fresh and perishable produce finds it more difficult to enter this segment. Certain projects are under development, but they need guaranteed commitment from all operators, from production to distribution. This type of approach works better on certain markets such as Switzerland, the Scandinavian countries and Germany for example, where consumer awareness is higher. In other countries, "Fairtrade" certified products are sold primarily via dedicated distribution circuits, in marginal volumes. The big distribution chains also offer Fairtrade produce, though more for marketing purposes.

Processed mangoes, which are less perishable, probably provide more opportunities in the field of Fairtrade. Numerous projects in Sub-Saharan Africa and Latin America involve dried mangoes sold under this label.

6.4. Trade issues (disputes, negotiations, agreements)

Despite the magnitude of both fresh and processed mango flows, there are few disputes; those that there are mainly involve the more perishable fresh mango. Losses are often attributable to the mode of transport. While shipping by reefer generally runs smoothly thanks to high-performance polythermal ships, refrigerated containers are known to suffer some incidents. The malfunction of a refrigerated unit can lead to damaged merchandise. In this case, the recipient commissions a joint survey to determine the cause of the losses, and its economic impact. Sea-freight shipments are generally insured, which covers the depreciation of the merchandise in case of an incident proven to be due to transport. For processed merchandise, the same often applies. A survey is ordered in order to determine the reason for the losses, which may be due to the transport, but also to a manufacturing flaw. In either scenario, the insurance comes into play to compensate for the economic losses. In rare instances, if the surveys cannot determine the causes of the losses or if they remain incompatible, the case may be referred to a commercial court, as per the terms of the contract binding the various parties.

Air-freight shipments, on the other hand, are rarely insured given the short transport time (governed by the Warsaw Convention). Disputes are most often settled amicably between supplier and customer, possibly after a survey. In case of disagreement, the parties concerned may also call on a court of arbitration.

7. Useful links

7.1. Statistics

FAOSTAT: http://faostat3.fao.org

COMTRADE: http://comtrade.un.org

TRADEMAP: www.trademap.org

USDA: www.usda.gov

Agricultural Marketing Service – USDA: www.ams.usda.gov

EUROSTAT: http://ec.europa.eu

7.2. International organisations and associations

Codex Alimentarius: www.codexalimentarius.org

Export Helpdesk, EU: http://exporthelp.europa.eu/thdapp/index.htm

UNECE: http://www.unece.org

OECD: www.oecd.org

Max Havelaar France: http://www.maxhavelaarfrance.org/

International Trade Centre: http://www.intracen.org/default.aspx

Faitrade International: www.fairtrade.net

7.3. Latest news

The United States and European Union are stepping up their vigilance in terms of combating fruit fly propagation. In 2015, the United States suspended imports from the Dominican Republic. The European Union did the same to India and Thailand in 2014. In 2015, a warning was issued to Côte d'Ivoire. A management plan presented by the Ivorian authorities was approved by the European Commission subject to a massive reduction in interceptions during the 2015 campaign. It seems to have been effective, since interceptions have considerably decreased over the past campaign. The speed of propagation of the fruit fly in the intertropical zone countries in recent years is leading the main importer countries to strengthen their controls and monitoring.