

Organic Farming in the Tropics and Subtropics

Exemplary Description of 20 Crops

Mango



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Franz Augstburger, Jörn Berger, Udo Censkowsky,
Petra Heid, Joachim Milz, Christine Streit.

The cultivation guidelines are available in English, Spanish and German for the following crops:

banana, brazil nut, cashew nut, cocoa, coconut, coffee,
cotton, hibiscus, macadamia, mango, papaya, peanut,
pepper, pineapple, sugar cane, sesame, tea, vanilla.

The cultivation guidelines for Bananas, Mangoes, Pineapples and Pepper were revised in 2001 for the United Nations Conference on Trade and Development (UNCTAD) by Udo Censkowsky and Friederike Höngen.

In 2002 two more guidelines, for rice and date palms, were published in English.

All the authors emphasize, that the cultivation recommendations at hand can just provide general information. They do not substitute technical assistance to the farmers with regard to the location.

All indications, data and results of this cultivation guidelines have been compiled and cross-checked most carefully by the authors. Yet mistakes with regard to the contents cannot be precluded. The indicated legal regulations are based on the state of the year 1999 and are subject to alterations in future. Consequently all information has to be given in exclusion of any obligation or guarantee by Naturland e.V. or the authors. Both Naturland e.V. and authors therefore do not accept any responsibility or liability.

Furthermore the authors kindly call upon for critical remarks, additions and other important information to be forwarded to the address below. The cultivation guidelines will be updated regularly by Naturland e.V.

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Organic Cultivation of Mangoes

1. Introduction

The mango tree originates from the Indian/Burmese monsoon region. The Mango fruit (*Mangifera indica* L.) is the most important tropical fruit after the banana, yet due to its sensitivity to bruising, in terms of numbers, it plays only a small role in world trade (fresh mango). Mango has been disseminated for a long time, and is cultivated in all warm countries down to the sub-tropics.

1.1. Botany

Mango belongs to the family of Anacardiaceae, a rapidly growing, evergreen tree with a dense, outspread coronet. Its leaves grow alternately, and red-violet or bronze-coloured in the early stages, then of a dark-green, leathery consistency. The blossoms are generally hermaphrodite, and pollination occurs through flies and other insects. Certain types of mango need to be manually pollinated. Mango blossom up to 3 times a year, depending on climate and fertilisation conditions. If the first blossom is not pollinated, a new blossom is induced.

Ripe fruits are between yellow, orange-yellow, red or red-green in colour, and contain a flat stone, which is very difficult to separate from the thick fibres of the pulp.

Mango trees can reach a height of 40 m. In a diversified agro-forestry or mixed cultivation system, it belongs to the uppermost trees, alongside, or under which, according to site conditions (soil, rainfall, humidity etc.), a variety of cultures can be planted.

1.2. Varieties and countries of origin

The varieties differ in taste, size, shape and texture. India has the largest variety. But a variety of different trading types are also available in Florida. One typical characteristic of mangoes is its alternation, which is also strongly dependant on variety. Balanced nutritional and climatic conditions will have a positive effect on fruit development. For this reason, strongly alternating varieties can offer a steady harvest when the supply of nutrients is well-balanced.

In principle, it is possible to differentiate between two large groups of mango according to their origin:

A group from Indo-china/Philippines, and one coming from India.

Latin American varieties are crossbreeds of both. Using the varieties "Mulgoba" and "Cambodiana" as an example, all of the different variety characteristics can be displayed:

Characteristic	Mulgoba	Cambodiana
Country of origin	India	Indo-China/Philippines
Shape	variable, mostly round, elongated	Somewhat flat, elongated
Colour	Bright red, purplish or bright yellow	Yellow-green when ripe, seldom purple
Fibre content	Variable, with/without fibre possible	No fibres
Taste	Sweet, little sour, very aromatic	Sweet, little sour, very aromatic
Seeds	One embryo (compare 2.2.)	several Embryos (compare 2.2.)
Susceptibility to anthracnose	very	Yes to not very

Certified organic mangoes are mostly exported to Europe from the following countries: Burkina Faso, Burundi, Columbia (dried), Costa Rica, Dominican Republic (pulp), Ghana, Guinea, India (fresh, dried and pulp), Madagascar, Senegal (fresh and dried), South Africa, Togo, Uganda, USA, Venezuela (pulp).

1.3. Uses and contents

Mango has many uses. Young fruits whose tegument have not yet hardened, are used in Asiatic countries as a vegetable, fresh or pickled. In Latin American countries, slightly unripe pulp is eaten with some salt.

Ripened fruits are eaten fresh everywhere, and to make juice or marmalade, and also dried and made into candy (compare No. 3). All remnants from the fruits can be used as animal feed (e.g. for pigs). The young leaves for example are very good as cattle feed, because they have a protein content of 8-9% and a high Ca content as well. The bark and leaves of mango trees can also be used as a dye for cloth. The wood of the trees is highly suitable for making charcoal.

Contents and amounts in 100 g fresh pulp¹:

Contents	Amount
Water	87 g
Edible carbohydrates	11 g
Raw fat	0,7 g
Raw fibres	0,7 g
Vitamin A	1000-3000 I.E.
Vitamin C	30 mg
Energy in kJ	210 kJ
Reduction before eating (%)	34%

¹ REHM, S. und ESPIG, G.: (1996) Die Kulturpflanzen der Tropen und Subtropen, Ulmer Verlag.

2. Aspects of plant cultivation

2.1. Site requirements

The mango grows best in tropical summer rain regions, at temperatures between 24°C and 28°C. Despite being fully foliated, the trees are remarkably resistant against drying out. A dry period or cooler temperatures enliven the blossoming and the production of mangoes. A period of respite in the growth of vegetation is necessary to enable blossoming. The trees will therefore not produce any fruits in those moist tropical regions that lack a definite seasonal rainfall or temperature fluctuations.

Mango trees can also thrive in the sub-tropics (Egypt, Israel). Some varieties can even withstand a light frost. Young seedlings must nevertheless be protected from damage through frost (e.g. with straw or palm leaves).

Mangoes have few soil requirements. A healthy, high yielding plantation is nevertheless only possible on fertile, deep and well-drained ground.

2.2. Seeds and seedlings

There are many different varieties of mangoes. Different varieties are preferred in different regions (differences in the taste, texture and colour of the pulp etc.). The most popular varieties have mono-embryonic seeds, and can therefore only be pollinated vegetative. This has the advantage of producing a uniform product, while seedlings (fruit with poly-embryonic seeds) can even segregate a parent plant very strongly, producing very heterogeneous fruit.

Seedlings are used on mango plantations as rootstocks, to which the scions are either grafted (diagonal cuts of the same size in both scion and rootstock are then bound together) or budded (the scions are cut diagonally, while the bark of the rootstock is cut and then pulled out to form a pocket. The scion is then pushed inside the bark and tied up again) in tree nurseries. This work requires much experience, and is therefore usually carried out by state propagation facilities. It is only worth setting up your own tree nursery when a large scale mango plantation is planned, and should then also only be carried out with the co-operation of an advisory centre.

2.2.1. Propagation

Propagation is usually carried out in the following way:

Mango seeds are selected from the fruits of healthy, well-grown parent trees. In tree nurseries, polyethylene bags (PE bags) are used. The PE bags need to have a diameter of around 15 cm, and be about 30-40 cm high. The best earth to use is 50% well rotted compost and 50% top soil (humus-rich earth which has best yet not been agriculturally cultivated). The best place to cultivate seedlings is in half-shadow (e.g. a shadow canopy, palm leaves). When they have reached a height of

around 50 cm and 8-10 mm diameter, the seedlings are then grafted or budded with the chosen scion.

In selecting parent trees for scions, choose those which have well-developed coronets and are the of right variety, and which have plentiful blossoms and fruit over the years. You should therefore have been able to observe the trees over a number of years, or know someone else who has. To bud, choose scions from young woody twigs, that are somewhat thinner than the seedling rootstocks in the tree nurseries. Remove the leaves from the twig one week before cutting away the scion, which is cut to a length of 10 cm.

After budding, the seedlings remain a further 4 weeks in the nursery before being planted out into the fields. The hole should be at least 40 x 40 cm big and 50 cm deep, according to local conditions. Mix in 5 shovels of compost with the excavated earth. Part of this is then stamped into the hole in order to make contact with the earth. Then the seedling is planted with the rest of the soil, and again, pressed firmly down. In order to save on irrigation, it is best to plant out at the beginning of the rainy season, which means that the plant will be encouraged to grow during the dry period.

2.2.2. Flower formation

Young seedlings blossom in the first year. They should not be allowed to carry fruit though, as this would inhibit the growth of the tree. To encourage growth, the blossoms are therefore plucked away until the 4th year.

2.3. Planting methods

The method chosen for planting is dependent upon the way they are being cultivated and the site conditions. On a mango plantation where mangoes are the main fruit sort, the following distances between plants must be upheld:

- ◆ On fertile ground with sufficient rainfall 10 x 10 m
- ◆ at semi-arid sites up to 15 x 15 m

Because mango trees grow rather slowly, it can take a relatively long time (up to 15 years) until the trees have occupied the room allotted to them. During this development phase, there exist several possibilities to use the space available in a balanced way:

1. When the soil quality and rainfall are sufficient, plants that quickly produce fruit can be planted between the rows of mango trees, e.g. Papaya, Banana or pineapple..
2. Making use of the surfaces for sowing of green manure plants (compare 2.4.).

2.4. Diversification strategies

Quite often, mangoes are planted in the mixed crop systems of the house gardens in small farmholdings, or on extensively cultivated meadows and marginal ground, where relatively acceptable harvests can be achieved.

On organic farms, mango should also be integrated into a mixed crop systems. On the one hand, this will reduce the risk of pests through a large population of useful insects, and on the other, the risk to the harvest engendered by the natural alternation of mango can also be lessened.

Annual plants such as maize, hibiscus, beans, etc. can be planted during the early growth period, according to site conditions. If the soil and climatic conditions allow, more demanding crops such as papaya (a culture with a 3-5 year vegetation period), bananas (20 years and longer) as well as avocado, mangosteen (*Rheedia ssp.*, Achachairú), corossol (*Anona muricata*), coconut, lemons, nutmeg and many more besides can also be planted along with mango.

At sites with poor or dry soil, it is possible to cultivate a mixed-crop system with such low-demand crops as pineapple, guava, cashew, figs or other annona varieties.

Pasture land can slowly be transformed into better cultivating land by planting mangoes and guavas, if the grazing is controlled or cut as feed.

The following criteria should be heeded when choosing plants to include in a cultivation system with mango:

- ◆ Intercropping plants as well as green cover crops cannot be watered for a 2 month phase during the dry period, as otherwise the mangoes will only form an insufficient amount of blossoms.
- ◆ The bottom crops should not contain a high percentage of legumes, because the accumulation of nitrogen would otherwise inhibit the growth of the Mango tree, which then limits the production of fruit.

If the spaces between the fruit trees is to be used as crop acreage, it makes sense to establish a fruit rotation system. A phase with fruit, beans, vegetables, other fruits (e.g. pineapple) and animal feed is possible here. If the shade allows it, bell peppers, tomatoes and egg plants etc are also a possibility.

2.5. Nutrients and organic fertilisation management

2.5.1. Nutrient requirements

Mangoes require few nutrients. Nevertheless, it is advisable to supply a mango plantation with compost and green manure during the growth period. The fertiliser should be applied after the tree has blossomed, so that it has enough nutrients to produce fruit. A high level of production can be achieved in this way by supplying compost in the mixed system of domestic garden.

If the mangoes are on a plantation with other crops, then care must be taken not to supply fertiliser to the other crops during the time that the flower buds appear on the mangoes (e.g. that bottom crops are not irrigated during the first 2 months of the dry season), This would otherwise spoil the production of buds.

Special care should be taken when beans are used as a bottom crops that nitrogen is not made too readily available, because the vegetative growth of the fruit trees would then dominate.

Under good conditions, the following yields can be achieved (without taking alternation into account):

Variety (examples)	Yield per ha
Keitt, Tommy Atkins	30 tons
Kent, Palmer, Irwin	25 tons
Haden	10 tons

Average harvests over several years under less than optimum conditions usually yield between 5 and 10 tons per ha and year. The yields per tree can vary, and can deliver between 100 and 500 kg, according to conditions. The yields in household garden systems can be significantly more in comparison to mango plantations.

2.6. Biological methods of plant protection

2.6.1. Diseases

The most usual diseases with mango trees are **fungus** and **bacterial diseases**. The first important preventative measure is make sure that the propagation segments are healthy. The scions that were raised in tree nurseries and whose origins are maybe unclear, should be carefully examined. They shall not have been treated with any synthetic or chemical agents.

Anthracnose, caused by the fungus *Colletotrichum gloeosporioides*, is the most wide-spread disease among mangoes. The varieties vary in susceptibility. *Colletotrichum gloeosporioides* causes anthracnose on fruits, and drop of flowers on young branches. Anthracnose always appears as a result of scurvy (*Elsinoe mangiferae*). Fruits stricken with anthracnose can be plunged into a hot water bath (3-5 min./55°C), in order to kill off the fungus. Preventative measures are nevertheless preferable, to preclude injuries and an infection with scurvy, because anthracnose can usually only take a hold on damaged fruits that are also affected by scurvy. A case of scurvy can usually be prevented by removing all dead plant material (branches, leaves and fruit). In exceptional cases, the fungus can be brought under control again with 1% Bordeaux Mixture².

² According to the European Regulation for Organic Agriculture (EEC) 2092/91 the use of copper preparations for plant protection (e.g. Bordeaux Mixture) is allowed for a transitional period which will

While anthracnose generally attacks ripe fruits (only seldom the blossoms), a **bacterial infection** from *Erwinia sp.* can also affect young fruit. The symptoms are very similar to the flecks caused to the leaves and fruit by anthracnose. The bacteria usually survive in the ground – a heavy rainfall will then splash the spores against the lower leaves and fruits. Covering the ground can therefore help to protect against this. Active life in the soil will also help to prevent an explosive growth of bacteria. Sites where it can rain inside the blossoms can also be a problem.

Young fruit and also blossoms can be damaged by **powdery mildew** (*Oidium mangiferae*). This fungus grows during warm and moist weather, during blossoming and when the fruit appears. A case of powdery mildew can dramatically affect the harvest. An open, well-ventilated population and regular cutting back of the coronets can best help to prevent mildew. In acute cases, mildew can also be brought under control with sulphur. When carrying this out, there should be no wind blowing, and the leaves should still be moist with dew.

The **leaf spot disease** (*Cercospora mangiferae*) on mangoes is visible as dented spots on leaves and fruit. The same applies for this fungus, an open and quick-drying population is the best protection against infection.

Fruit infected with *Cercospora* can no longer be sold, furthermore, both the leaf spot disease and scurvy prepare the way for a case of anthracnose. In exceptional cases, the leaf spot disease can be brought under control again with 1% Bordeaux Mixture³.

2.6.2. Pests

The worst pests for mangoes are cotton scales, mealy bugs, cicadas and black flies (create honey dew). These are all **sucking insects** that live on the leaves, young buds and shoots. They can cause a lot of damage. Yet they all have natural enemies, such as e.g. ladybird larvae, wasps, spiders and other types, such as parasitic fungi e.g. with cicadas and black flies.

An ecological plantation with a variety of crops, enough plots under different crops e.g. forest and a sufficient amount of vegetation to cover the soil and enrich the variety of species (e.g. mulching only right after the plants have flowered), will provide enough enemies to combat the pests that measures against them are usually unnecessary. Cicadas are averse to open, well ventilated soil, also drain the soil well to avoid wet patches.

end at the 31st of March 2002. However, any use of copper preparations until 2002 has to be approved by the certification body. In case copper preparations have to be applied it is recommended to use preparations which contain less copper and therefore to reduce the accumulation of copper in soils (e.g. tribasic copper sulphate, copper hydroxide).

³ Compare footnote No. 2

In emergencies, the following methods should help:

- ◆ **Scale insects** can be regulated with a 'winter-spraying', i.e. with paraffin oil (white oil) shortly before the larvae hatch from their eggs. The paraffin oil is sprayed on as a 3 % water emulsion.
- ◆ Plant spraying mixtures made of stinging nettles or Neem⁴ can be against **cicadas**. The worst damage occurs during blossoming, so the plantation should be checked regularly around this time in order to make up the brew and spray it early enough
- ◆ **Mealy bugs** lay their eggs on the ground next to the trunk. By wrapping smooth plastic bands around the trunk, the larvae can be prevented from infesting too large an area. Should they infest the tree, a solution of 1% soft soap (potassium soap) with 1 % pure alcohol is quite effective.
- ◆ **Black fly** can be kept under control by useful insects. A variety of **prospatella** species can be of use here. This requires a good functioning control system, because the useful larvae need to be made available for release in time. Where this is not possible, spraying white oil shortly before the pests hatch, as such as with scale insects can be sufficient.

2.7. Crop cultivation and maintenance

2.7.1. Young plants

In a newly set up plantation or when young mango plants are being planted in an existing plantation, the young trees can be planted together with the other crops. The other crops which have only a short life-cycle will not disrupt the mango's growth (as long as they are harvested afterwards). This also applies to crops with medium-long vegetation cycles, e.g. bananas or papaya. As soon as these enter their ripening phase and end their life-cycle (papaya after 4-5 years) they need to be removed. The resulting vegetative material is then hacked up and spread across the soil. This also applies with secondary forest systems that nevertheless need to be regularly cut back. As soon as the mango trees enter into their harvesting phase, the trees that belong to the species comprising the secondary forest system should be cut back far enough so that the mango trees' tips are at least on the same level as they are and are not covered by them. The area around the trunks must be kept covered with mulching material. This can either be gained from the mown natural vegetation, the cuttings which become available and from palm leaves. The material should be spread carefully so that it does not touch the trunk, and thus give rise to fungus infections.

⁴ According to the European Regulation for Organic Agriculture (EEC) 2092/91 the application of Neem preparations is restricted and only allowed for the production of seed and seedlings. This regulation is discussed controversial. An up-date information is available from your certification body.

The soil between the trees can be used as crop acreage. Should this be impossible due to site conditions (e.g. too little rainfall), the naturally growing vegetation should be left to grow and then cut down before it blossoms, in order to encourage the establishment of useful insects and to produce bio-mass. These are then mown down to provide a mulching layer that protects the soil, to aid the tilts of the soil and to positively influence the water-retaining capacity of the soil.

Mango trees react positively to being cut. It can become necessary in mixed cultivation systems to limit the height of growth and the crown diameter by pruning. Pruning stimulates the production of new shoots and thus provides more bio-mass. Using this method regularly, sites with only very little organic material can help to raise the fertility of the soil.

2.7.2. Crop monitoring

In addition to measures such as pruning the trees, applying fertiliser, caring for the bottom crops, occasional crop protective measures and harvesting, it is also necessary to regularly check on the development of the fruits. If the crown is well formed during the early stages of the trees, and allows enough light to filter through and air to circulate, then only old, dead wood needs to be removed. The development of blossoms and fruit must be checked regularly. The alternating phases of mango yields also need to be taken into account. In addition to this alternation, poor blossoms and fruit development can have several causes. In the case of young trees, too much nitrogen (either through fertilisers or from a bottom culture with a high legume content) can prevent blossoming, as can watering the bottom crops during the blossoming period. In addition, an over-ageing of the crown in older trees can also lead to a lack of fruiting lateral. This can be alleviated with rejuvenation pruning.

The possible appearance of diseases and pests also needs to be monitored during the fruit development stage, so that the necessary measures can be taken (compare 2.6.). This is especially important when a heavy infestation of scales or black fly appears, as these need to be sprayed with white oil at exactly the time before the larvae hatch.

As the harvesting period nears, this needs to be regularly checked to predict the correct time (comp. 2.8.). Fruit harvested too early or too late will suffer massive disadvantages on the market, as fruit harvested too early will not keep for very long.

2.8. Harvesting and post-harvest treatment

2.8.1. Harvesting

A mango plantation will supply its first commercially marketable amount of fruit around 4-5 years after being planted.

At the end of the fruit's development period, the peel will turn leathery. The fruit is ripe for harvesting when the skin has turned from green to red or yellow. Some farmers wait with the harvesting until the first fruits have fallen to the ground of their own accord. Yet because the fruits do not all ripen at the same time, the colour change must nevertheless be regularly checked.

The fruits are harvested by breaking them off or with a pair of scissors. A pair of steps or a cherry-picker will be needed for tall trees. With medium tall trees (up to ca. 4 m), the fruits can be picked individually with the help of a harvesting rod. Not too many fruits should be placed into one sack to avoid bruising them. Such fruits will not keep for long, and cannot be sold as fresh. Any damaged fruits should be separated during harvesting to prevent the spread of fungus infections.

2.8.2. Post harvest treatment Usually, a post harvest handling is not required. For safety reasons, treatment with warm water is recommended (see below), and is absolutely necessary in cases of anthracnose infection.

The fruits are packed into sturdy cases. They are sorted visually, because machine sorting is expensive and complicated. For export to Europe, sizes from 270 g to 335 g. are preferable.

The fruits are generally packed in untreated wood wool, free from harmful substances, to prevent them lying too close to one another.

The cases must also be well aerated. Cartons which hold 5 kg of fruit have become standard for export to Europe, as this size is also easily managed in the retail business (compare No. 3).

3. Product Specifications and Quality Standards

3.1. Fresh mangoes

3.1.1. Preparation

With hundreds of varieties, mangoes are differentiated by weight (250 g to 2 kg), shape (oval, pear or kidney-shaped), colour of the skin (green, yellow, orange-yellow, orange-red) and taste (more or less aromatically sweet). The flesh is yellow to yellow-orange, juicy and has a varying fibre content according to variety, whereby fruits with a high fibre content are generally not sold as fresh fruit, but are processed during which the fibres need to be removed. Mangoes have many different uses. Ripe fruits can be eaten fresh, or processed into juice, pulp, concentrate, candied fruits, jams, chutneys, canned fruits or dried.

If the mangoes are to be sold as fresh fruits, they must be treated with a warm water bath to remove any dirt or funguses from the peel. It is recommended to place them in a 55°C water bath for 5 minutes and then let them cool down slowly. Afterwards, they are dried, sorted, classified, packed and stored before shipment.

- ◆ The EU quality standards are shown in the Annex

3.1.2. Packaging and storage

Packaging

The regulations concerning carton labelling were dealt with in section VI of the 'UN/ECE standard FFV – 45 for mangoes'.

Storage

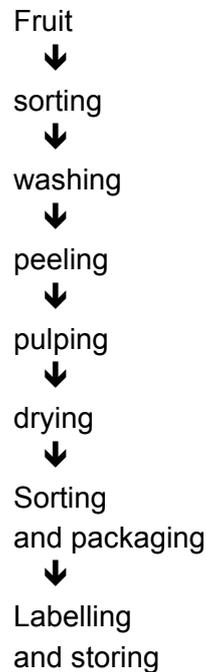
- ◆ Not fully ripened mangoes that are to be shipped by sea, should be stored at a relative humidity of 90% and not under 12°C.
- ◆ Fully ripened mangoes that are to be shipped by sea, should be stored at a relative humidity of 90% and at a temperature of 10°C.

3.2. Dried mangoes

3.2.1. Processing

Drying is the oldest method of making food storable for longer periods. It is based on the fact that micro-organisms tend to cease growing below a certain level of water content. During drying, it is important to extract the water from the fruit as carefully as possible. The most important features are a good circulation of air and not too high temperatures

The preparation stages from fresh to dried fruit are outlined and then described more fully below:



Sorting

After harvesting, the fruits are sorted as only fresh, unripe and not fermented fruits can be used for drying.

Washing and peeling

Mangoes must be washed very carefully, in order not to damage them. Afterwards, inedible parts such as leaves, seeds, pips, heartwood and skins are removed.

Pulping and drying the fruits

The fruits are now cut into same-sized pieces, and laid out to dry in the air and sun in thin layers on racks, in solar dryers (drying tunnels) or drying ovens (artificial drying at 70°C).

Sorting and packaging

Before they are packed, the fruits are inspected and sorted again, to rid them of discoloured, skin remnants and seeds etc..

Labelling and storage

The packaged fruits can now be labelled and stored prior to being shipped. During and after drying, the dried fruits are not permitted to be treated with methyl bromide, ethylene oxide, sulphur oxides or with ionising radiation.

3.2.2. Quality requirements

The following is a list of quality characteristics with minimum and maximum values for dried fruits, that are usually required officially or by importers. Different minimum

and maximum values can be agreed between importers and exporters, providing these do not clash with official regulations.

Quality characteristics	Minimum and maximum values
Taste and smell	Variety-specific, aromatic, fresh, not mouldy
cleanliness	Free from foreign particles, such as insects, sand, small stones etc.
Water content	max. 18 %
Aw-value	0.55 to 0.65 (at 20 °C)
Residues	
Pesticides	Not measurable
Sulphur oxide	Not measurable
Bromide and ethylene oxide	Not measurable
Micro-organisms	
Total number of parts	max. 10,000/g
Yeasts	max. 10/g
Mould fungus	max. 10/g
Staphylococcus aureus	max. 10/g
Coliforms	max. 1/g
Escherichia coli	Not measurable in 0.01 g
Enterococci	Not measurable in 1 g
Salmonella	Not measurable in 20 g
Mycotoxins	
Staphylococcus enterotoxin	Not measurable
Aflatoxin B1	max. 2 µg/kg
Total aflatoxins B1, B2, G1, G2	max. 4 µg/kg
Patulin	max. 50 µg/kg
Heavy metals	
lead (Pb)	max. 1.25 mg/kg
Cadmium (Cd)	max. 0.125 mg/kg
Mercury (Hg)	max. 0.10 mg/kg

In order that the quality requirements are upheld, and no contamination of the fruits occurs, preparation should take place under clean, hygienic and ideal conditions. The following aspects should be adhered to:

- ◆ Equipment (tubs, knives etc.), as well as working and drying surfaces (racks, mats etc.) and preparing and storage rooms, should be cleaned regularly.

- ◆ Personnel should be healthy, and have the possibility to wash themselves, or at least their hands (washrooms, toilets) and wear clean, washable garments.
- ◆ Water used for cleansing purposes must be free from faeces and other contaminants.
- ◆ Animals or animal faeces must not come into contact with the fruits. If the fruits are to be dried in the open, then fences must be erected to guard the racks against birds and nearby animals.

3.2.3. Packaging and storage

Packaging types and material

In order to be exported to Europe, the dried fruits can be packed in consumer packs, or wholesaler packs (bulk) in bags made of saleable, foils, impermeable to steam (e.g. polyethylene or polypropylene). Before sealing, a gas (e.g. nitrogen) may be added (nitrogen flushing).

Details given on packaging

If the dried fruits are packed directly for consumers, then the following details must be included on the outside of the packets:

- ◆ Product name ('trade name')

The name of the product, e.g.: Mango slices organically grown⁵

- ◆ Manufacturer

Name and address of the manufacturer, importer, exporter or trader within the country of origin, and which country.

- ◆ List of contents

A list of ingredients and additions, beginning with the heaviest proportion of total weight at the time of packaging.

- ◆ Weight

Details of the total packed weight in grams

The numbers describing the weight of the contents must be of the following sizes

Weight of contents	Letter size
Less than 50 g	2 mm
More than 50 g to 200 g	3 mm
More than 200 g to 1000 g	4 mm

⁵ When products from organic farms are being declared as such, it is necessary to adhere to the requisite government regulations of the importing country. Information concerning this is available from the appropriate certification body. The regulation (EEC) 2092/91 are applicable to organic products being imported into Europe.

- ◆ Best before date

The 'Best before ...' details must include day, month and year; e.g.. best before 30.11.2001

- ◆ Batch number

Function of the product packaging

The product packaging should fulfil the following functions:

- ◆ Protect it from loss of aroma and against undesirable smells and tastes from its surroundings (aroma protection).
- ◆ Offer sufficient conservation properties, especially against loss or gain of moisture.
- ◆ Protect the contents against damaging.
- ◆ Provide a surface area for advertising and product information.

Transport packaging

Some form of transport packaging is required in order to ship the bulk or singly packed fruits. In choosing a type of packaging, the following should be heeded:

- ◆ Transport packaging made, for example, out of cardboard, should be strong enough to protect the contents against being damaged by outside pressure.
- ◆ The packaging should be dimensioned to allow the contents to be held firmly, but not too tightly in place.
- ◆ The dimensions should be compatible with standard pallet and container dimensions.

Information printed on transport packaging

The transport packaging should display details of the following:

- ◆ Name and address of the manufacturer/packer and country of origin
- ◆ Description of the product and its quality class
- ◆ Year harvested
- ◆ Net weight, number
- ◆ Batch number
- ◆ Destination, with the trader's/importer's address
- ◆ Visible indication of the organic origin of the product⁶

Storage

The dried fruits should be stored in dark areas at low temperatures and relative humidity.

Under optimum conditions, dried fruits can be stored for up to 1 year.

⁶ Organic products must be protected from contamination by non-compliant substances at each stage in the process, i.e. processing, packaging, shipping. Therefore, products originating from a certified organic farm must be recognisably declared as such.

If the organic product is being stored in a single warehouse together with conventionally grown mango slices mixing of the different qualities must be avoided. This is best achieved using the following methods:

- ◆ Training and informing of warehouse personnel
- ◆ Explicit signs in the warehouse (silos, pallets, tanks etc.)
- ◆ Colour differentiation (e.g. green for the organic product)
- ◆ Incoming/dispatched goods separately documented (warehouse logbook)

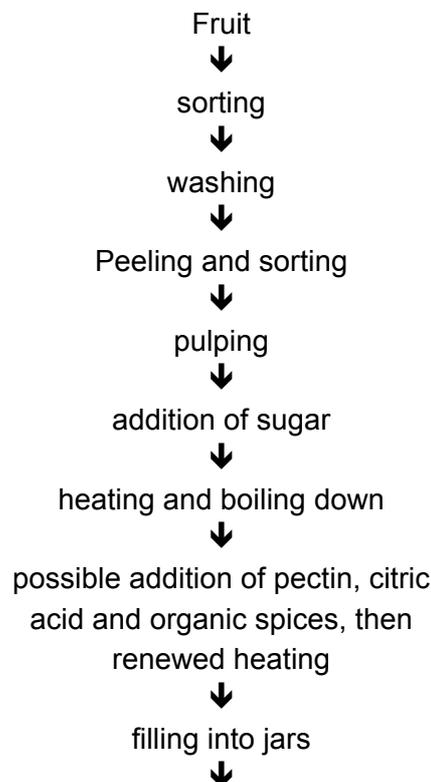
It is prohibited to carry out chemical storage measures (e.g. gassing with methyl bromide) in mixed storage spaces. Wherever possible, storing both organic and conventional products together in the same warehouse should be avoided.

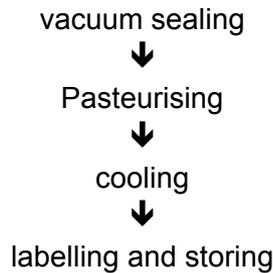
3.3. Mango marmalades

3.3.1. Processing

Jams are basically preparations made of fruit (jams) and various sugars that are made conservable mainly by heat treatment (boil down). The half-set yet spreadable consistency of these products is achieved by releasing the pectin found in the fruit pulp during the boiling process, and using this together with further pectin added to form a jelly-like mass.

The preparation stages from fresh fruit to jam are outlined and then described more fully below:





Sorting

After harvesting, the fruits are sorted, because only those that are fresh, ripe and not rotten can be used to make jams. Jams can also be made from previously prepared, frozen fruits and pulp.

Washing

The fruit should be washed very carefully as it can easily be damaged.

Peeling and sorting

This follows the procedure of removing leaves, wooden pieces, pips or seeds and peel. Peeling is often done manually, or with knives, yet sometimes the skin is loosened with steam and then subsequently rubbed away mechanically. Finally, the fruits are sorted again to remove any blackened pieces, bits of peeling seeds etc.

Pulping and adding sugar

The peeled fruits are then pulped, and sugar added. They might also be mixed with water or fruit juice. To make jam, at least 350 g fruit per 1000 g finished product must be used; to make jam extra, at least 450 g fruit per 1000 g finished product must be used. The sugar must be organically grown.

Description	Fruit content during manufacture
Jam, extra	450 g fruit per 1000 g product
Jam	350 g fruit per 1000 g product

Heating and boiling

The mixture is now heated to 70-80°C and boiled down, while constantly being stirred, at 65°C until shortly before it reaches the desired consistency.

Adding citric acid, pectin and spices (optional)

If necessary or desired, citric acid, pectin and spices (spices from certified organic agriculture) can be added, and the mixture again briefly heated to 80°C.

Filling into jars, vacuum-sealing and Pasteurising

The liquid mass is now poured into jars, vacuum-sealed and pasteurised.

Cooling, labelling and storage

After the heating process, the jams are first cooled to 40°C, and then subsequently down to storage temperature, labelled, and finally stored.

3.3.2. Quality requirements

In addition to the previously mentioned quality requirements, such as clearly defined fruit content, the jams also have to conform to the following specifications. These quality requirements, with their minimum and maximum values, are generally issued by the authorities or importers. Yet agreements may be reached between individual manufacturers and importers upon different values, providing they still conform to official requirements.

Quality requirements	Minimum and maximum values
Smell and taste	Variety-specific, aromatic
Cleanliness	Free of foreign substances such as peel, stalks etc.
Contents of jam extra	Min. 450 g per 1000 g product
Contents of jam	min. 350 g per 1000 g product
Soluble dry matter in percent (measured refract metrically)	min. 60 %
Mycotoxins	
Aflatoxin B1	max. 2 µg/kg
Total aflatoxins B1, B2, G1, G2	max. 4 µg/kg
Patulin	max. 50 µg/kg
Residues	
Pesticides	Not measurable
Sulphur oxide	Not measurable
Bromide	Not measurable
Ethylene oxide	Not measurable

In order to conform to the quality requirements, and to prevent the fruit becoming contaminated, all preparations must be carried out under clean, hygienic and acceptable conditions. The following aspects must be heeded:

- ◆ Equipment (tubs, knives etc.), as well as working surfaces (tables etc.) and preparing and storage rooms, should be cleaned regularly.
- ◆ Personnel should be healthy, and have the possibility to wash themselves, or at least their hands (washrooms, toilets) and wear clean, washable garments.
- ◆ Water used for cleansing purposes must be free from faeces and other contaminants.
- ◆ Animals or animal faeces must not come into contact with the processed fruits.

3.3.3. Packaging and storage

Packaging types and material

In order to be exported to Europe, the jams are usually filled into consumer-size jars with twist-off lids.

Details given on packaging

The label on the jar must display the following:

- ◆ Product name ('Trade name')

The name of the product, consisting of: Name of the fruit with or without the description extra – according to fruit content; e.g.: Mango jam extra, organically grown⁷

- ◆ Manufacturer

Name and address of the manufacturer, importer, exporter or product trader, plus country of origin.

- ◆ List of contents

A list of ingredients and additives in the jam, beginning with the heaviest proportion of total weight at the time of packaging

- ◆ Details of the total sugar content

Total sugar content per 100 g product (measured refractometrically at 20 °C) must be represented with the words "Total sugar contentg per 100 g".

- ◆ Details of fruit content

The fruit content per 100 g product must be given with the words "manufactured from....g fruit per 100 g".

- ◆ Notice about cooling

The notice about storing the product in a cool place must be given with the words: "After opening, store in a cool place".

- ◆ Weight

Details of the total weight in grams

- ◆ Best before date

The 'Best before ...' details must include day, month and year; e.g.. best before 30.11.2001

- ◆ Batch number

Transport packaging

A form of transport packaging is required to ship the sales packages. In choosing them, the following aspects should be heeded:

- ◆ Transport packaging made, for example, out of cardboard, should be strong enough to protect the contents against being damaged by outside pressure.
- ◆ The packaging should be dimensioned to allow the contents to be held firmly, but not too tightly in place.

⁷ Compare footnote No. 5

- ◆ The dimensions should be compatible with standard pallet and container dimensions.

Information printed on transport packaging

The transport packaging should display details of the following:

- ◆ Name and address of the manufacturer/packer and country of origin
- ◆ Description of the product and its quality class
- ◆ Year harvested
- ◆ Net weight, number
- ◆ Batch number
- ◆ Destination, with the trader's/importer's address
- ◆ Visible indication of the organic origin of the product⁸

Storage

The jams should be stored in a dark, cool room at temperatures of max. 15°C. Under optimum conditions, jam may be stored for 1-2 years.

If the organic product is being stored in a single warehouse together with conventional mango jam mixing of the different qualities must be avoided. This is best achieved using the following methods:

- ◆ Training and informing of warehouse personnel
- ◆ Explicit signs in the warehouse (silos, pallets, tanks etc.)
- ◆ Colour differentiation (e.g. green for the organic product)
- ◆ Incoming/dispatched goods separately documented (warehouse logbook)

It is prohibited to carry out chemical storage measures (e.g. gassing with methyl bromide) in mixed storage spaces. Wherever possible, storing both organic and conventional products together in the same warehouse should be avoided.

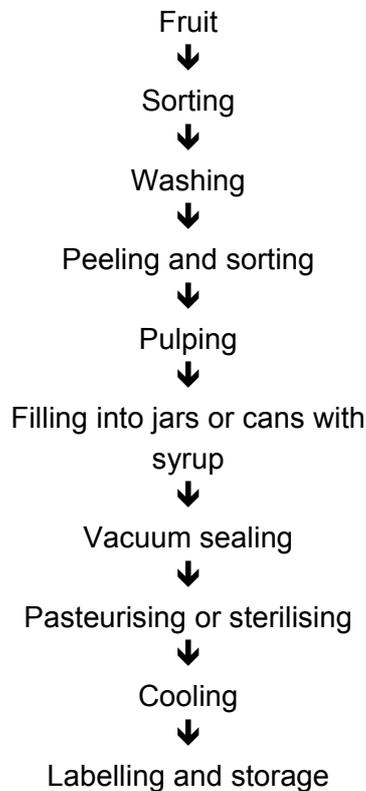
3.4. Canned mangoes

3.4.1. Processing

Canned foods are products that can be stored over a long period in airtight containers (metal or glass jars). They are preserved mainly by heat treatment, during which the micro-organisms present in the fruit are significantly reduced in number, or their development so restricted, that they are prevented from spoiling the product.

⁸ compare footnote No. 2

The process involved in turning fresh fruit into canned products is described schematically, and then in more detail below:



Sorting

After harvesting, the fruits are sorted, because only those that are fresh, ripe and not rotten can be used to make jams. Jams can also be made from previously prepared, frozen fruits and pulp.

Washing

The fruit should be washed very carefully as it can easily be damaged.

Peeling and sorting

This follows the procedure of removing leaves, wooden pieces, pips or seeds and peel. Peeling is often done manually, or with knives, yet sometimes the skin is loosened with steam and then subsequently rubbed away mechanically. Finally, the fruits are sorted again to remove any blackened pieces, bits of peeling, seeds etc.

Pulping

The peeled fruit can be cut into a variety of shapes, according to type (indicated by the crosses in the table). The shape of the cut fruit must be given on the can (slices, diced, pieces etc.).

Description	Cut shape	Pine-apple	Mango	Papaya	Banana
Whole fruit	Peeled				X
Slices	Slices of fruit cut into approximately the same size	X	X	X	X
Half slices	Uniformly cut, semi-circle shaped slices.	X			
Diced	Fruit cut into dice shapes of roughly the same size.	X	X	X	
Balls	Fruit pulp pieces cut into roughly ball shapes		X		
Pieces	Pieces of fruit cut into irregular shapes	X			
Grated	Irregular thin strips and pieces of fruit	X			
Chunks	Large regularly cut pieces of pineapple	X			
Titbits	Trapeze-shaped segments of pineapple	X			

Filling in jars or cans

The cut pieces are now filled into jars or cans and covered with syrup. Additional information must be given on the can according to the sugar content of the syrup.

Sugar concentration* of the syrup	Description on the can
9-14 %	Very lightly sugared
14-17 %	Lightly sugared
17-20 %	Sugared
over 20 %	Strongly sugared

* The sugar must be organically grown.

If the appropriate fruit juice has been used as syrup then "...in natural juice" must be included on the label, e.g.: Mango in natural juice.

Vacuum sealing, pasteurising or sterilising

After the jars or cans have been vacuum sealed, they are either pasteurised (temperatures above 80°C) or sterilised (temperatures above 100°C).

Cooling

After the heating process, the canned fruits are first cooled to 40°C, and then subsequently down to storage temperature.

Labelling and storage

After they have been cooled, the canned fruits are labelled and stored.

3.4.2. Quality requirements

In addition to the previously listed quality requirements, such as clearly defined sugar concentrations of the syrup and shapes specific to certain fruits, the contents should also conform to the following characteristics. These quality requirements, with their minimum and maximum values, are generally issued by the authorities or importers. Yet agreements may be reached between individual manufacturers and importers upon different values, providing they still conform to official requirements.

Quality requirements	Minimum and maximum values
Taste and smell	Variety-specific, aromatic, not mouldy
Cleanliness	Free of foreign substances such as peel, stalks etc.
Mycotoxins	
Aflatoxins B1	max. 2 µg/kg
Total aflatoxines B1, B2, G1, G2	max. 4 µg/kg
Patulin	max. 50 µg/kg
Residue	
Pesticide	Not measurable
Sulphur oxide	Not measurable
Bromide	Not measurable
Ethylene oxide	Not measurable

In order to conform to the quality requirements, and to prevent the fruit becoming contaminated, all preparations must be carried out under clean, hygienic and acceptable conditions. The following aspects must be heeded:

- ◆ Equipment (tubs, knives etc.), as well as working surfaces (tables etc.) and preparing and storage rooms, should be cleaned regularly.
- ◆ Personnel should be healthy, and have the possibility to wash themselves, or at least their hands (washrooms, toilets) and wear clean, washable garments.
- ◆ Water used for cleansing purposes must be free from faeces and other contaminants.
- ◆ Animals or animal faeces must not come into contact with the processed fruits.

3.4.3. Packaging and storage

Packaging type and material

In order to be exported to Europe, the fruits can be packed into single or wholesale packages (bulk) made of glass, aluminium or tin cans.

Details given on packaging

The label on the jar must display the following:

- ◆ Product name ('Trade name')

The name of the product, consisting of: Name of the fruit with or without the description extra – according to fruit content; e.g.: Mangoes in slices, lightly sugared, organically grown⁹

- ◆ Manufacturer

Name and address of the manufacturer, importer, exporter or product trader, plus country of origin.

- ◆ List of contents

A list of ingredients and additives in the jam, beginning with the heaviest proportion of total weight at the time of packaging

- ◆ Weight

Total and dry weight of the fruit

The numbers describing the weight of the contents must be of the following sizes

Weight of contents	Letter size
Less than 50 g	2 mm
More than 50 g to 200 g	3 mm
More than 200 g to 1000 g	4 mm
More than 1000 g	6 mm

- ◆ Best before date

The 'Best before ...' details must include day, month and year; e.g.. best before 30.11.2001

- ◆ Batch number

Transport packaging

A form of transport packaging is required to ship the sales packages. In choosing them, the following aspects should be heeded:

- ◆ Transport packaging made, for example, out of cardboard, should be strong enough to protect the contents against being damaged by outside pressure.
- ◆ The packaging should be dimensioned to allow the contents to be held firmly, but not too tightly in place.
- ◆ The dimensions should be compatible with standard pallet and container dimensions.

⁹ compare footnote No.5

Information printed on transport packaging

The transport packaging should display details of the following:

- ◆ Name and address of the manufacturer/packer and country of origin
- ◆ Description of the product and its quality class
- ◆ Year harvested
- ◆ Net weight, number
- ◆ Batch number
- ◆ Destination, with the trader's/importer's address
- ◆ Visible notice of the organic origin of the product¹⁰

Storage

The conserved fruit (especially in jars) should be stored in dark rooms at low temperatures (max. 15°C). Under optimum conditions, conserved fruit can be stored for 1 year (when pasteurised) or 2 years (when sterilised).

If the organic product is being stored in a single warehouse together with conventional canned mangoes mixing of the different qualities must be avoided. This is best achieved using the following methods:

- ◆ Training and informing of warehouse personnel
- ◆ Explicit signs in the warehouse (silos, pallets, tanks etc.)
- ◆ Colour differentiation (e.g. green for the organic product)
- ◆ Incoming/dispatched goods separately documented (warehouse logbook)

It is prohibited to carry out chemical storage measures (e.g. gassing with methyl bromide) in mixed storage spaces. Wherever possible, storing both organic and conventional products together in the same warehouse should be avoided.

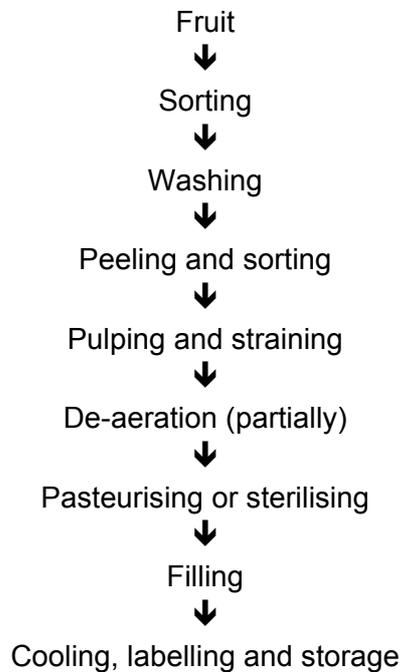
3.5. Mango pulp

3.5.1. Processing

Canned foods are products that can be stored over a long period in airtight containers (metal or glass jars). They are preserved mainly by heat treatment, during which the micro-organisms present in the fruit are significantly reduced in number, or their development so restricted, that they are prevented from spoiling the product.

¹⁰ compare footnote No. 6

The process involved in turning fresh fruit into canned products is described schematically, and then in more detail below:



Manufacture of mango pulp

- ◆ To manufacture mango pulp, only fresh, ripe and non-mouldy fruit should be used. After harvesting, the fruits are sorted, carefully washed and peeled. Heat-treating them makes peeling easier by either placing them in a 90°C bath for 5 minutes, or for 2-3 min. in steam.
- ◆ Afterwards, the fruits are placed in a straining machine with strong rotors and large-meshed sieve, where they are reduced in size without harming the pips. The pulp is pressed out, while the pips and peel residue are removed at the outlet to the machine. Small pieces of skin and fibres can be removed by using machines with several stages of sieve (with 0.8, 0.6 and/or 0.4 mm sieves). It is advisable to use sieves smaller than 0.5 mm in order to remove all of the fibres and thus produce a homogenous product which will keep longer. To avoid discoloration and reduce the loss of vitamin C during storage, it is advisable to aerate the pulp with a suitable aeration device.
- ◆ Finally, the pulp is heated in a heat-exchanger up to 95°C for 2 minutes, in order to kill off any micro-organisms and to de-activate any enzymes. The mango pulp can now be filled into tin cans whilst still hot, whereby the cans are sealed while being steamed, the temperature maintained for 5 min., and then rapidly cooled down. At temperatures of around 15°C, the pulp can be stored for up to 1 year. After pasteurising, the pulp can also be cooled down and filled into polyethylene bags placed in 50-200 kg barrels. It is then rapidly frozen, and can be stored at -18°C for

18 months. Pulp which has been filled under antiseptic conditions (bag-in-box) can be stored for up to 1 year at room temperature.

3.5.2. Quality requirements

These quality requirements, with their minimum and maximum values, are generally issued by the authorities or importers. Yet agreements may be reached between individual manufacturers and importers upon different values, providing they still conform to official requirements.

Quality requirements	Minimum and maximum values
Smell and taste	Variety-specific, aromatic
Cleanliness	Free of foreign substances such as peel, stalks etc.
Relative density (20/20) for pineapple juice	min 1.045
Brix degree for pineapple juice	min 11.2 %
Relative density (20/20) for Banana pulp	min 1.083
Brix degree for Banana pulp	min 20.0 %
Relative density (20/20) for Mango pulp	min 1.057
Brix degree for Mango pulp	min 14.0 %
Ethanol	max 3.0 g/kg
Volatile acids, evaluated as acetic acid	max 0.4 g/kg
Lactic acid	max 0.5 g/kg
D-Malic acid	Not measurable
Sulphuric acid	Not measurable
Hydroxymethylfurfural (HMF)	max 20 mg/kg
Heavy metals	
Arsenic (As)	max 0.1 mg/kg
Lead (Pb)	max 0.2 mg/kg
Copper (Cu)	max 5.0 mg/kg
Zinc (Zn)	max 5.0 mg/kg
Iron (Fe)	max 5.0 mg/kg
Tin (Sn)	max 1.0 mg/kg
Mercury (Hg)	max 0.01 mg/kg
Cadmium (Cd)	max 0.02 mg/kg

Residues	
Pesticide	Not measurable
Sulphur oxide	Not measurable
Bromide	Not measurable
Ethylene oxide	Not measurable
Mycotoxins	
Aflatoxin B1	max 2 µg/kg
Total aflatoxins B1, B2, G1, G2	max 4 µg/kg
Patulin	max 50 µg/kg

In order to conform to the quality requirements, and to prevent the fruit becoming contaminated, all preparations must be carried out under clean, hygienic and acceptable conditions. The following aspects must be heeded:

- ◆ Equipment (tubs, knives etc.), as well as working surfaces (tables etc.) and preparing and storage rooms, should be cleaned regularly.
- ◆ Personnel should be healthy, and have the possibility to wash themselves, or at least their hands (washrooms, toilets) and wear clean, washable garments.
- ◆ Water used for cleansing purposes must be free from faeces and other contaminants.
- ◆ Animals or animal faeces must not come into contact with the processed fruit

3.5.3. Packaging and storage

Packaging type and material

In order to be exported to Europe, the pulp/juices can be packed into single or wholesale packages (bulk) consisting of glass jars, tin cans or polyethylene or polypropylene bags, and also filled antiseptically into 'bag-in-boxes'.

Details given on packaging

The label on the jar must display the following:

- ◆ Product name ('Trade name')

The name of the product, e.g.: Mango pulp, grown organically¹¹

- ◆ Manufacturer

Name and address of the manufacturer, importer, exporter or product trader, plus country of origin.

- ◆ List of contents

A list of ingredients and additives, beginning with the heaviest proportion of total weight at the time of packaging, e.g.: Mangoes, citric acid...

- ◆ Weight

¹¹ compare footnote No. 5

Total weight

The numbers describing the weight of the contents must be of the following sizes

Weight of contents	Letter size
Less than 50 g	2 mm
More than 50 g to 200 g	3 mm
More than 200 g to 1000 g	4 mm
More than 1000 g	6 mm

Best before date

The 'Best before ...' details must include day, month and year; e.g.. best before 30.11.2001

- ◆ Batch number

Transport packaging

A form of transport packaging is required to ship the sales packages. In choosing them, the following aspects should be heeded:

- ◆ Transport packaging made, for example, out of cardboard, should be strong enough to protect the contents against being damaged by outside pressure.
- ◆ The packaging should be dimensioned to allow the contents to be held firmly, but not too tightly in place.
- ◆ The dimensions should be compatible with standard pallet and container dimensions.

Information printed on transport packaging

The transport packaging should display details of the following:

- ◆ Name and address of the manufacturer/packer and country of origin
- ◆ Description of the product and its quality class
- ◆ Year harvested
- ◆ Net weight, number
- ◆ Batch number
- ◆ Destination, with the trader's/importer's address
- ◆ Visible notice of the organic origin of the product¹²

Storage

Pasteurised pineapple juice, as well as pasteurised banana, mango and papaya pulp can be stored as follows:

¹² compare footnote No.6

Packaging material/ storage temperature	Pineapple juice	Banana pulp	Mango pulp	Papaya pulp
Tin cans/glass jars storage temperature below 15°C	1 year	1 year	1 year	9-12 months
Polyethylene bags/ Deep frozen at -18°C	-	18 months	18 months	12 months
Filled antiseptically, bag-in-box/ Room temperature	1 year	1 year	1 year	6-9 months

If the organic product is being stored in a single warehouse together with conventional mango pulp mixing of the different qualities must be avoided. This is best achieved using the following methods:

- ◆ Training and informing of warehouse personnel
- ◆ Explicit signs in the warehouse (silos, pallets, tanks etc.)
- ◆ Colour differentiation (e.g. green for the organic product)
- ◆ Incoming/dispatched goods separately documented (warehouse logbook)

It is prohibited to carry out chemical storage measures (e.g. gassing with methyl bromide) in mixed storage spaces. Wherever possible, storing both organic and conventional products together in the same warehouse should be avoided.

Annex: Quality Requirements

The 'UN/ECE standard FFV – 45' defines the quality requirements for trading with fresh mangoes. These do not necessarily have to be adhered to, yet they supply recommended guidelines. Mangoes intended for export are not included here. Different minimum and maximum values can be agreed between importers and exporters, providing they do not clash with official regulations.

The following is an excerpt from 'UN/ECE standard FFV – 45 for mangoes':

I. Defining terms

These standards apply to mangoes *Mangifera indica L.*, that are delivered fresh to consumers.

II. Quality characteristics regulations

a. Minimum requirements

The mangoes must be as follows:

- ◆ Fresh and healthy
- ◆ Clean, practically free of visible foreign substances
- ◆ Practically free of pests and damage caused by them
- ◆ Free of fungus
- ◆ Free of bruising and frost-damage
- ◆ Free of strange taste or smell
- ◆ Well developed, ripe

b. Classifications

Mangoes are sold in three categories:

◆ Class extra

Mangoes in this class must be of the highest quality. They must possess the characteristics typical of their variety and/or trading type. The fruits must be unblemished, with the exception of very light surface flaws that do not detract from the fruit's general appearance, quality, the time it will keep.

◆ Class I

Mangoes in this class must be of good quality. They must possess the characteristics typical of their variety and/or trading type. The following blemishes are permissible, providing they do not detract from the fruit's general appearance, quality, the time it will keep and the presentation of the bunch or cluster in their packaging:

- ◆ Slightly misshapen
- ◆ Light flaws in the skin caused by friction or by other means, providing the area does not exceed 3, 4 or 5 cm² of the total surface area of the appropriate size class A, B, or C.

◆ **Class II**

This class is composed of those mangoes that cannot be placed in the upper classes, yet which fulfil the definitions of minimum requirements. The following faults are allowed, providing the mangoes retain their essential characteristics in terms of quality, preservation and presentation:

- ◆ Shape defects,
- ◆ Skin flaws, caused by scratches, friction or other means, providing the area does not exceed 5, 6 or 7 cm² of the total surface area of the appropriate size class A, B, or C.

III. Size classification regulations

Mangoes are sorted according to their weight. The fruits must weigh at least 200 grams.

Size classes	weight	Maximum differences in weight within a class
A	200 - 350 g	75 g
B	351 - 550 g	100 g
C	551 - 800 g	125 g

IV. Tolerance regulations

Not dealt with here.

V. Presentation regulations

a. Uniformity

- ◆ The contents of a carton must be uniform, and may only contain mangoes of identical origin, variety and/or trade type, and quality.
- ◆ The visible part of the carton must be representative of the entire contents.

b. Packaging

- ◆ The mangoes must be packed in a way that ensures they are sufficiently protected
- ◆ Packing material used inside the carton must be new, clean, and so shaped that it cannot cause any damage to either the inside or outside of the fruit. The usage of materials such as papers and stickers with company details on them is permitted providing the no toxic inks, dyes or glues have been used.
- ◆ The packaging must be free of all other materials.

VI. Regulations of carton labelling

Each carton must display the following details in unbroken, legible, permanent letters visible from the outside:

a. Identification

- ◆ Name and address of the exporter and packer

b. Type of product

- ◆ "Mangoes", when the contents are not visible
- ◆ Name of the variety

c. Origin of product

- ◆ Country of origin, and optionally, national, regional or local description

d. Commercial characteristics

- ◆ Class
- ◆ Size (expressed in min. and max. weight)
- ◆ Size code (optional)
- ◆ Number of fruits

Although the following values are not laid down in the 'UN/ECE standard FFV – 45 for mangoes' they should nevertheless be adhered to:

Quality characteristics	Minimum and maximum values
Heavy metals	
lead (Pb)	max. 0.50 mg/kg
Cadmium (Cd)	max. 0.05 mg/kg
Mercury (Hg)	max. 0.03 mg/kg
Residues	
Pesticides	not measurable
Sulphur oxide	not measurable
Bromide	not measurable
Ethylene oxide	not measurable