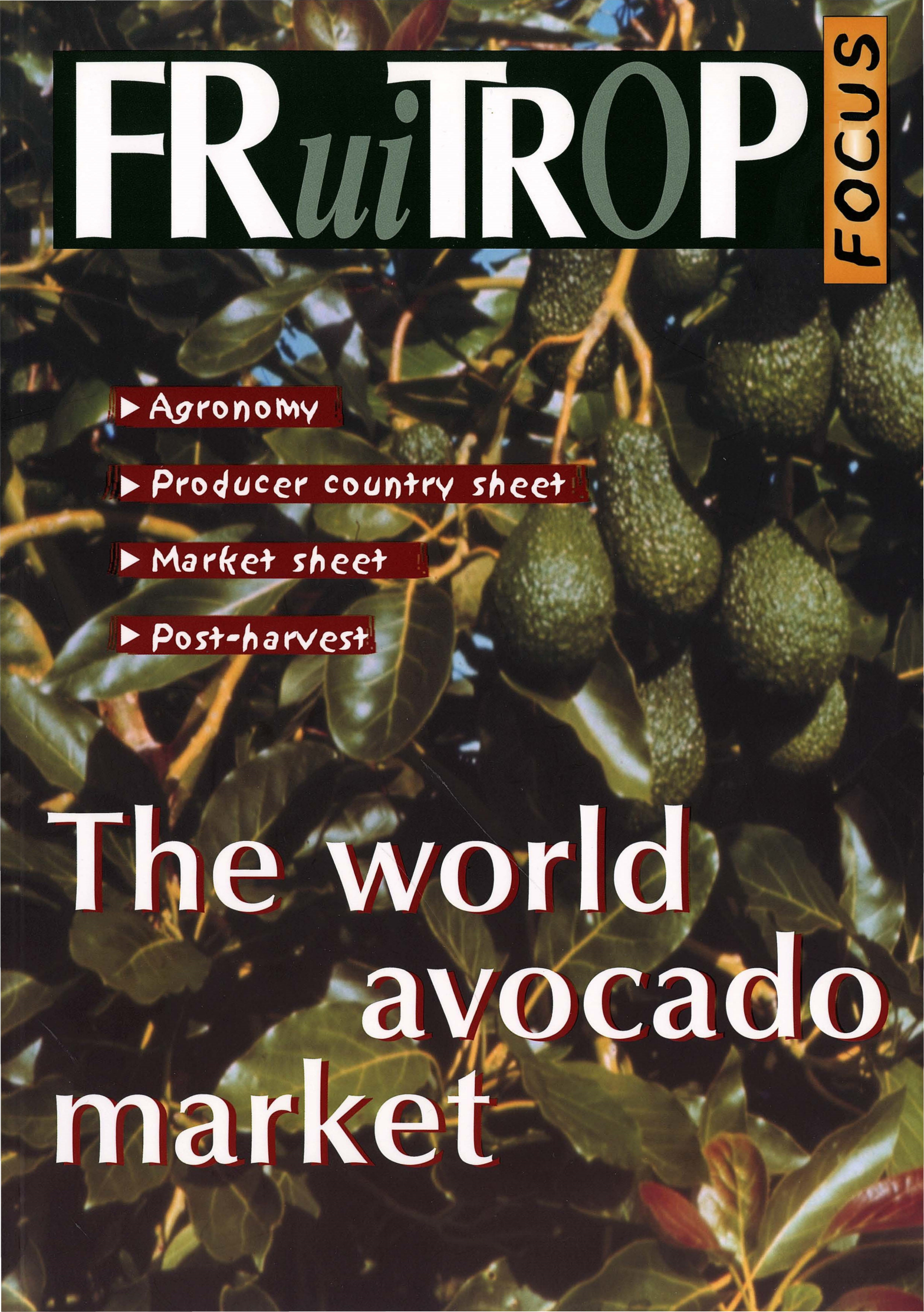
FRuiTROP
FOCUS



- Agronomy
- Producer country sheet
- Market sheet
- Post-harvest

The world avocado market

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FruiTrop is launching a new series: FOCUS. This first issue is devoted to avocado

Production and world markets are at the heart of the series. Information about growing and postharvest operations complete the economic panorama. Articles written by specialists are richly illustrated with graphs, tables, maps and photos.

The purpose of the FOCUS series is to shed light on the main issues of changing sectors and to provide professionals upstream and downstream with tools to give rational backing to their strategic choices.

With a dozen years of experience in the economics of tropical fruits and vegetables and known for the seriousness of its analyses, the journal FruiTrop is distributed in some forty countries and has a large readership that includes public and private decision makers in the sector.
Like FruiTrop, FOCUS is published in separate French and English editions.

Avocado, an ancestral food for the first inhabitants of Central America, was described by mid-sixteenth century botanists. However; industrial production and the avocado trade have developed only recently. Less than forty years ago the fruit was practically unknown in Europe.

FruiTrop FOCUS reviews a world market that appears to be at a turning-point today. Production is developing rapidly in certain countries, especially in Latin America, and the rules for access to certain key markets have changed recently. The chapters on producer countries and those on markets provide better understanding of these crucial developments and make it possible to measure their consequences for the world market of tomorrow.

Numerous professionals have contributed to making FOCUS as complete and as accurate as possible and thanks go to them all. Reviewing such a rich and varied sector is a challenge. Readers should not hesitate to send us their remarks, that we shall be pleased to take into account in the next edition.

The CIRAD team that produced this supplement: Eric Imbert, Clio Delanoue, Christian Didier, Martine Duportal and Catherine Sanchez, aided by Simon and Catherine Barnard.

Photos: University of California. Thanks to Dr. Mary Lu Arpaia / David Sottlemyer, Delmas photo library, Fred Meintjes, Rungis photo library, California Avocado Commission photo library, Bob Platt, Calavo photo library, INRA-Corsica photo library, CIRAD photo library, Danielle Sanchez. Thanks go to all the operators who provided us with photographs from their personal collections.

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Avocado growing


© Fred Meintjes

Requirements

Climate

Avocado can be grown in very different climates—from the equator to latitude 43° (that of Corsica in the northern hemisphere) and from sea level to an elevation of 2 500 metres in Mexico, Guatemala and Rwanda. However, two climatic requirements must be taken into account:

- a marked dry period during which floral induction takes place;
- minimum temperatures no lower than 7°C and maximums reaching at least 19° and 20°C during flowering (necessary for the dichogamy phenomenon described in the section on varieties).

Varieties of Mexican and Guatemalan origin and certain hybrids have good resistance to cold. In contrast, the West Indian varieties of Colombian origin are typically varieties requiring a tropical climate with a marked dry season.

Avocado requires large amounts of sunshine—at least 2 300 to 2 500 hours per year. As a whole, regions with more than 2 000 hours of sunshine per year are favourable.

In general, growth and the production cycle are shorter when temperatures are high. The optimum is an average of 25°C during the hot months and 15°C during the cool months. Among commercial varieties, 'Bacon', 'Duke', 'Fuerte', 'Topa Topa' and 'Zutano' have good resistance to cold whereas 'Edranol', 'Hass', 'Nabal' and 'Taylor' are sensitive to low temperatures (from - 2°C) and 'Anaheim', 'Booth 7' 'Booth 8', 'Choquette', 'Hickson', 'Lula', 'Peterson', 'Pollock' and 'Waldin' are very sensitive (from - 1°C). Temperature also plays a role in the maturation of the fruits on the tree and on their quality. When fully developed, the fruits can stay on the tree for longer when the temperature is moderate.

Avocado requires a well-distributed supply of water totalling some 1 200 to 1 600 mm per year. Requirements are small during the floral induction and resting periods and higher from setting to harvest. Avocado also requires sufficiently high relative humidity during flowering (70 to 80 %) and then a more moderate level when the fruits grow. Relative humidity that is too high increases risk of the development of pests and diseases on both leaves and fruits (in particular *Cercospora,* scab, anthracnose, thrips and scales). A short water deficit (2 months) enhances floral initiation, especially in certain tropical climates where the temperature does not fall low enough to cause the complete stoppage of vegetation.

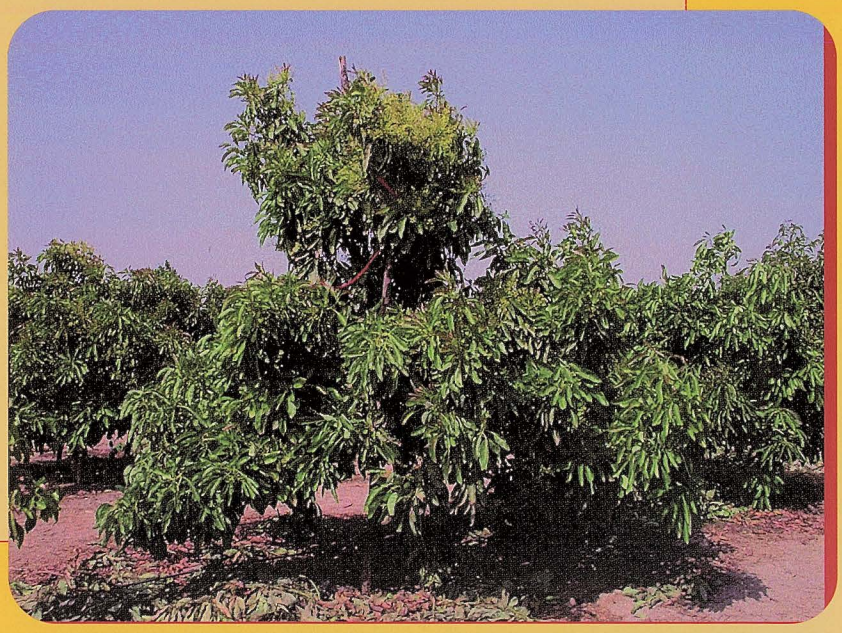
Avocado is sensitive to wind. The mechanical action of all winds can indirectly cause the wounding of fruits by rubbing or by blown sand grains. Dry winds like the sirocco and the harmattan are harmful for the plant overall (with a strong increase in evapotranspiration), especially during the flowering period. Finally, avocado trees are sensitive to salt spray as this causes leaf edge necrosis.

Soil

Internal and surface drainage of the land is important. Avocado is extremely sensitive to hydromorphic soils (that strongly retain water), even when this is not strongly marked and temporary. This sensitivity is associated with the presence of a fungus of the genus *Phytophthora* that attacks roots and the base of the trunk. In tropical regions, soils with a sandy texture are the most suitable for growing avocado. Furthermore, these soils generally display high permeability and drain rapidly after rainfall (good natural drainage). The topographical position affects soil moisture and drainage. Indeed, the land at the top of a slope or in mid-slope dries more quickly. Water from upstream (oblique drainage and possibly runoff) flows to land at the base of the slope and bottomland.

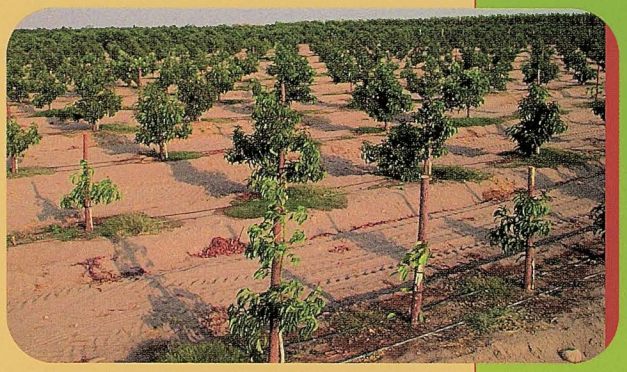
The soil must be at least 1 metre deep and preferably 1.50 metre to enable the roots—especially taproots—to exploit a maximum soil volume.

Soil rich in fertilising elements is best for avocado. However, when fertilisation is possible, and hence the correction of deficiencies, only certain elements at toxic doses for the plant are a limiting factor for the crop. Aluminium and manganese toxicity can be eliminated by increasing the pH to over 4.5 to 5.0 by application of calcium or calcium-magnesium soil amendment and of tricalcium phosphate. Toxicity resulting from excesses of various salts, and especially sodium chloride, is much more difficult to master.



Cultural techniques

Avocado seedlings are grown in containers in nurseries and can be planted out all the year round. However, to ensure that the plantlets take well, it is better to plant them at the beginning of the period that is favourable for vegetation, that is to say at the beginning of the rainy season in the tropics; this coincides with their availability at the nurseries. If the land has been prepared with machines, make a slight cavity at the top of the right, cut out the bottom of the bag and pull out the ends of the taproot/s folded at 90° against the bottom of the bag and cut them with secateurs at the elbow.



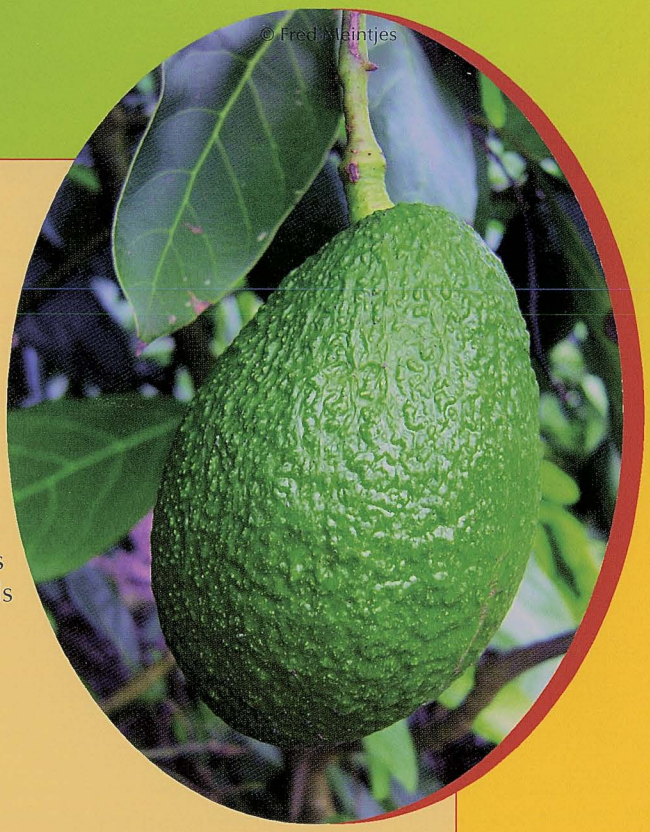
Care after planting

It may be necessary to water the plantlets (20 to 40 l water per week) or irrigate them during the recovery period. The susceptibility of an avocado plantlet to sun and drying winds must not be underestimated. It is therefore recommended that light shading should be provided for several months in some climates, consisting of palm leaves, grasses attached to stakes, whitewashing the trunk or protecting it with a cylinder of pale cardboard. The young trees often also require staking. Finally, it is recommended that the base of the trunk of young plants should be protected by polyethylene cylinders or wire netting in regions where the risk of attack by rodents is high.

In most ecological situations, the need for plant cover to protect the soil from erosion and that for good aeration of roots must be reconciled. An intermediate solution consists of maintaining vegetation in the interrows and weeding on either side of the rows of avocado trees or around the trees, going slightly beyond the radius of the foliage. Weeding can be performed chemically, manually, by mulching or by combining several of these techniques. The width of the cover crop strips depends on the development of the trees and the level of risk of soil erosion. The strips must follow the contours.

Water requirements

Drip irrigation is the only rational method in an orchard, but total cover can be envisaged if companion crops are grown. In both cases, irrigation must be managed according to the requirements of the trees, appraised by examination of the appearance of the foliage. Watering is required slightly before the tree displays signs of wilting that continue after the night. Dull-coloured leaves and a slight curling of the laminae observed at the beginning of the morning indicates a need for water. In practice, the quantities of water applied should moisten the soil to a depth of 1 to 1.20 m. The soil should have drained completely 24 hours after irrigation.



Fertilisation

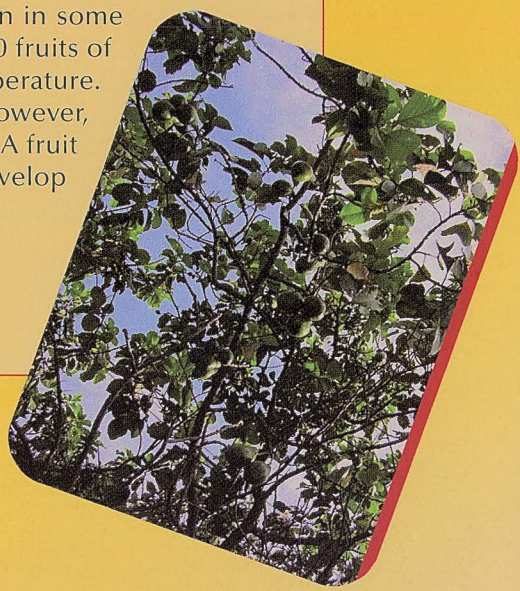
With the exception of planting, when various organic compounds can be mixed with soil from the ridge or the planting hole, inorganic fertiliser is applied to avocado. The differences in fertilisation are considerable from one country to another. In most producer countries, nitrogen fertilisation is adjusted according to the results of leaf diagnosis, although it is not always possible to establish a relationship between yields and leaf nitrogen contents.

Pruning

Preliminary pruning should be applied to avocado but this is rarely performed as it causes a delay in fruiting. Maintenance pruning consists of removing badly positioned branches and those that are too low in order to form a trunk about 0.50 m high. Pruning is then kept to a strict minimum, with mainly the removal of dead branches, those that are too low, with the fruits touching the ground, and crossed branches in the foliage. The trees are topped when they become too tall (more than 4 or 5 metres) to make picking easier. Topping can be repeated during the life of the tree. Wounds must be dressed after all cuts to prevent penetration by fungi and insects. It is often necessary to remove shoots from the rootstock in the early years.

Harvesting

The harvesting of grafted trees starts 3 or 4 years after planting. The yield per tree can reach 130 kg or more. A well-tended orchard gives yields ranging from 9 to 20 tonnes per year. Avocado should always be picked by cutting the stalks with secateurs. The picking stage is determined according to the oil content of the fruits. Sales norms are set according to this criterion in some countries. In other places the test consists of picking 5 to 10 fruits of different sizes and observing their ripening at ambient temperature. The harvest can begin if they ripen normally in a week. However, they are not ready to pick if they wrinkle when they soften. A fruit picked when immature will not ripen properly and can develop parasite infections.



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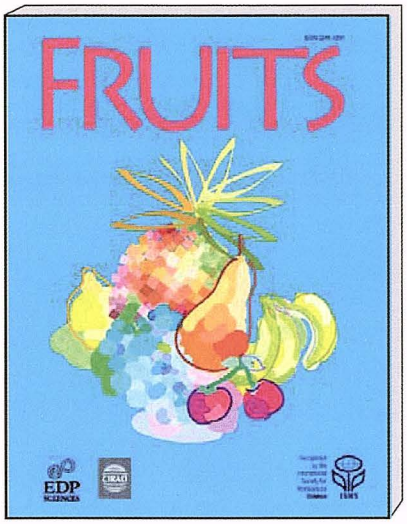

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Aims and Scope

FRUITS is a scientific journal for original articles and reviews on fruit crops in temperate, Mediterranean, subtropical and tropical regions. ***FRUITS*** covers a wide range of subjects (agronomy, physiology, genetics, crop protection, postharvest storage, product processing and marketing). In each issue, ***FRUITS*** presents a list of forthcoming meetings and new books published on the fruit topic.

Fruits species concerned by the last year:
Ananas comosus, Annona muricata, Averrhoa carambola, Carica pentagona, Citrus sp., *Eriobotrya japonica, Fragaria ananassa, Hancornia speciosa, Malus* sp., *Mangifera indica, Musa* sp., *Olea europaea, Persea americana, Phoenix dactylifera, Prunus* sp., *Pyrus communis, Vitex doniana, Ximenia americana.*

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Avocado... ...diseases

Name	Phytophthora *Phytophthora cinnamomi*	Armillaria *Armillaria mellea* Fr.	Verticillium Wilt *Verticillium albo-atrum*	Anthracnose *Colletotrichum gloeosporioides*	Cercospora spot *Cercospora purpurea*	Avocado Scab *Sphaceloma perseae* Jenkins.
Symptoms	Small, pale yellowish leaves. They wilt, fall and are not replaced. The foliage becomes thin. Small withered branches at the top of the tree, death of the tree. The trees wither; roots and base of trunk attacked affecting trees of all sizes and all ages.	The leaves turn yellow or red and then wilt and fall. Fungus present at the base of the trunk. The tree loses vigour more or less rapidly and then dies.	Leaves wither rapidly on part or all of the tree, turn brown and fall. Trees infected by *Verticillium* often grow new shoots and die several months later.	Round brown necrotic spots on leaves and early fall. Shoots wither. Young fruits blacken and fall. The pathogen can infect young fruits as soon as they have set by conidia carried by rain water from leaf necroses or stem cankers.	Pale yellow spotting of the epidermis of fruits, then turning black.	On young leaves, scab causes well-defined spots 2 to 3 mm in diameter. Young spots on petioles and shoots that are still green resemble scales. The same raised oval patches as on shoots are observed on fruits. These lesions join and can give the fruit a partially or totally rough, corky appearance.
Attacked part	Root system, but early symptoms on foliage.	Root system.	Leaves and mainly roots.	Leaves, branches and fruits.	Fruits and leaves.	Leaves, shoots, petioles and fruits.
Cause	Heavy soil and poor drainage.	Present in the soil and colonises roots.	The pathogen penetrates roots, reducing sap translocation, affecting plant irrigation and nutrition.	Rainy season disease.	Rainy season disease.	Development of the disease is enhanced by moist, hot weather.
Spread	Nursery or poorly cultivated soil.	Propagation is generally via the vegetative pathway.		Spores carried by rain.	Fruit necroses caused by *Cercospora* form entry points for Colletotrichum.	Rain and wind can be vectors.
Measures to be taken	Good cultural practices.	Control is very difficult. Only soil disinfection is effective.	Some Guatemalan rootstocks are reported to be tolerant. Do not plant avocado where Solanaceae have been grown. Use only disease-free budding material in the nursery.	Avoid areas that are too moist and prune the trees. Spraying will be found to be essential in case of attack.	A programme of fungicide treatments is essential for susceptible varieties during periods propitious for the development of the disease.	A programme of fungicide treatments is essential for susceptible varieties during periods propitious for the development of the disease.
Prevention	Use well-drained soils.	Use healthy soils that have not been used for perennial crops.	No treatment can eradicate the disease. Lop affected branches. Fumigation of the zone to be planted is the only solution in case of serious attacks.	Prune for good aeration of the canopy.	Rain, dew and moist winds play an important role in spreading the disease. Insects (thrips) and mites can carry spores from the spots to healthy parts of the leaves and fruits.	Varietal resistance.
Economic impacts	The most serious problem in orchards.	When symptoms of Armillaria root rot appear (leaf wilt), no control method can save the tree.	Death of the trees.	The most important post-harvest problem as the fruits unsaleable.	Fruits unsaleable.	Although necrotic spots are limited to the epidermis and never invade the pulp, spotted fruits are of much smaller commercial value.

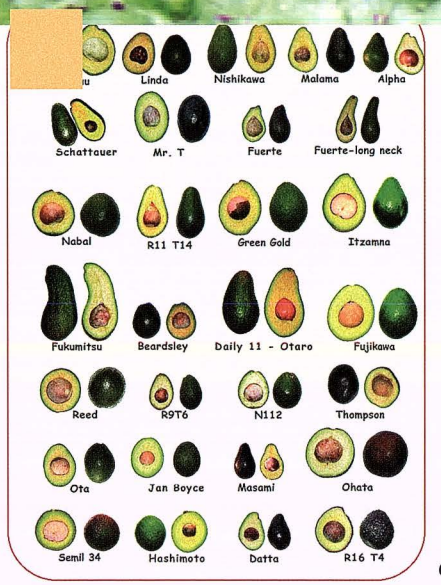
Avocado...

© Didier Vincenot

Name	Giant whitefly *Aleurodicus dugesii*	Leaf-roller *Homona spargotis*	Red spider mite *Oligonychus* spp.
Symptoms	Whitefly suck sap from the leaves. The honeydew secreted by the nymphs collects dust and sooty mould develops, attracting ants that can reduce the effectiveness of biological control.	The caterpillars roll the leaves in a web and then enclose the fruit. Fruits are scarred when damage to leaves is severe.	Circular, yellowish necrotic patches form, covered by a dense web, often running along leaf veins. These attacks can cause defoliation.
Attacked part	Leaves.	Leaves and fruits.	Leaves.
Measures to be taken	Natural enemies attack whitefly at the immature stage and provide biological control if they are not disturbed by spiders.	Natural enemies exist and considerably reduce the damage caused by the caterpillars.	These mites are often controlled by natural predators and parasites. Washing the leaves of young trees with a high pressure water jet destroys spider mites.
Prevention		Most attacks take place between spring and autumn when young shoots grow.	Spider mites are spread by the wind for great distances; they can also travel for short distances.
Economic impacts	Reduction or exchanges via leaves and decrease in tree vigour.	Fruit epidermis may be damaged and then infected by anthracnose. The caterpillars may also defoliate the trees.	Premature leaf fall. Spider mites are thought to cause more damage to the 'Hass' variety whereas the Mexican varieties such as 'Fuerte' are less seriously affected.

...pests

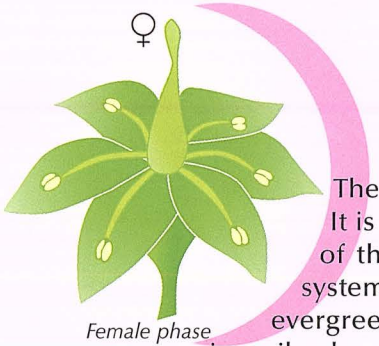
	Scales *Aonidiella aurantii* *Ferrisia virgata* Cock.	Thrips *Selenothrips rubrocinctus* Giard *Scirtothrips perseae*	Fruitfly *Dacus dorsalis* Hend.
Symptoms	Foliage and fruits are covered by sticky honeydew in which a black fungus grows (sooty mould), reducing the photosynthetic function of the tree.	Mature leaves suffer the most serious attacks once their tissues have started to harden. Pricking causes discoloured chlorotic spots and leaf tip browning and rolling. Nutritional pricking of fruits starts near the calyx and gradually spreads over the whole fruit, whose skin becomes 'tanned' and brown.	Females pierce the skin of fruits approaching maturity to lay eggs at a depth of a few millimetres. Hatched grubs feed on the fruit pulp, often causing rot.
Attacked part	Leaves and fruits.	Leaves and fruits.	Fruits.
Measures to be taken	Strongly infested branches are cut and burned at the start of the attack. Scales are often controlled by predators (ladybirds, etc.) and by natural parasites.	If necessary, applications of insecticides such as abamectin, spinosad and thiamethoxam.	Laying by adult flies is influenced by the degree of fruit maturity. Eggs are laid in fruits approaching maturity. Collection and destruction of attacked and fallen fruits that harbour mature grubs.
Prevention	Development is enhanced by dry weather.	A slightly damp climate favours the development of thrips.	Small attacked fruits are deformed and fall prematurely. The pricks can form entry for secondary pathogens.
Economic impacts	Scale on fruit skins can reduce the commercial value or make them unsaleable even if there is no internal damage.	Pricking causes scarification, suberisation and the discolouring of fruit epidermis. This reduces the commercial value of the fruit.	Fruitflies are in the 'quarantine insect' category. No pricked fruit containing a larva can be exported, on pain of rejection and total destruction of the batch of avocados by European phytosanitary services.



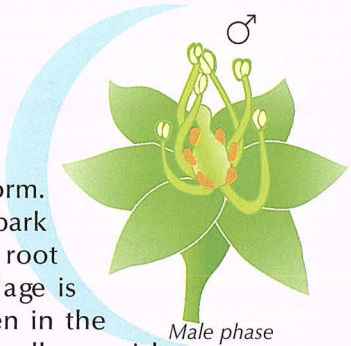
Varieties

The precise geographic origin of avocado is not known with any clarity. However, with a few rare exceptions, all the cultivated species are from Central America and Mexico. Indeed, the word avocado comes from its Aztec name 'ahuacatl'. *After the discovery of the Americas in 1492, Europeans observed cultivated avocado from northern Mexico to Peru. The plant was described for the first time in 1510 by the Spanish geographer Martin Fernandez de Encisco in his book* Suma de geografia *on the basis of observations probably made in the Santa Marta region of Colombia. Using avocado from areas populated by the Mayas and the Aztecs, the Spaniards took the plant to Venezuela, the West Indies (spontaneous examples of the West Indian race have never been found in the West Indies), Chile, Madeira and the Canary Islands in the sixteenth and seventeenth centuries. The French planted it in Réunion, Madagascar and Martinique in the eighteenth century. The plant was also introduced in the United States (Hawaii, Florida and California) from Mexico in the first half of the eighteenth century. Dissemination in Africa took place much later; it was planted at the end of the nineteenth century by the Portuguese, the Spaniards, the Germans, the British and the French. Likewise, the first plants in Malaysia and the Philippines were not reported until about 1900.*

Main characteristics of the plant



Female phase



Male phase

The avocado can grow to a height of 10 to 15 m in its free form. It is naturally straight and grafted trees spread more. The bark of the trunk is generally smooth and ash-coloured. The root system runs horizontally in industrial orchards. The foliage is evergreen and the oval leaves are single. They are pale green in the juvenile phase and become dark green and shiny when adult. The small, greenish flowers are grouped in terminal panicles. They have the special feature of being hermaphrodite (possessing both male and female organs) but are dichogamous, that is to say the male and female organs are not functional simultaneously. Distinction is made between two types, as shown in the diagram below. Good pollination of a type A requires the presence of type B.

Type A	♀ morning	♂ afternoon following day
Type B	♀ afternoon	♂ morning following day

Avocado varieties

Avocado is a dicotyledon of the genus *Persea* of the Lauraceae family. More than 200 varieties are divided between three races. The Mexican race is of little commercial interest as most of the fruits are too small. However, its agronomic qualities mean that it is widely used as rootstock or as a parent. Practically all sales of fruits of the West Indian race are on domestic markets. International trade handles mainly varieties belonging to the Guatemalan race or crosses between the Guatemalan and Mexican races.

The Mexican race: *Persea americana* Miller var. drymifolia Schlecht and Cham.

This fairly hardy race that is adapted to low temperatures originated in the Mexican highlands. It differs from the two other races in several botanical characters:
– the leaves are generally small and release a characteristic anise odour when crumpled;
– flowering is earlier than in the other races and the flowering to harvest time is 7 to 9 months;
– the fruits are small and elongated and rarely weigh more than 250 g. The skin is very thin and smooth. The pulp is often fibrous and has a high oil content (> 15%). The seed is generally large and sometimes free. This race is very sensitive to salinity. In contrast, it tolerates high temperatures and comparatively low relative humidity. Furthermore, it has greater tolerance to *Phytophthora cinnamomi* than the other races. It thus forms good rootstock and its genetic potential is well exploited in hybridisation breeding programmes. Finally, its high lipid content is an interesting feature when the fruits are used for oil production. About 20% of varieties belong to this race. The best known include 'Duke', 'Gottfried', 'Mexicolo', 'Topa Topa' and 'Zutano'.

The West Indian race: *Persea americana* Miller var. *americana*

In spite of its name, this race probably originated in Colombia. It is well suited to humid tropical regions where it is used to supply local markets. The tree has large green leaves. The fruits are elongated, usually large and weigh 400 to 900 g. The epidermis is fairly thin (0.8 to 1.5 mm) and is smooth and shiny, soft green or greenish yellow or reddish when mature. The pulp is watery with a low oil content (< 10%). The seed—often free—is large and has a more or less corrugated surface. All these characteristics make the fruits delicate. They often display pulp browning (caused by chilling injury) at the temperatures generally used for the storage and refrigerated transport of fruits of the other races (+ 6°C, + 8°C). The race is the most sensitive one to cold and aridity but the most tolerant to salinity. The flowering to harvest time is only 5 to 7 months. The West Indian race groups about 15% of avocado varieties and the best known among them are 'Peterson', 'Pollock' and 'Waldin'.

The Guatemalan race: *Persea nubigena* L. Wins var. *guatemalensis*

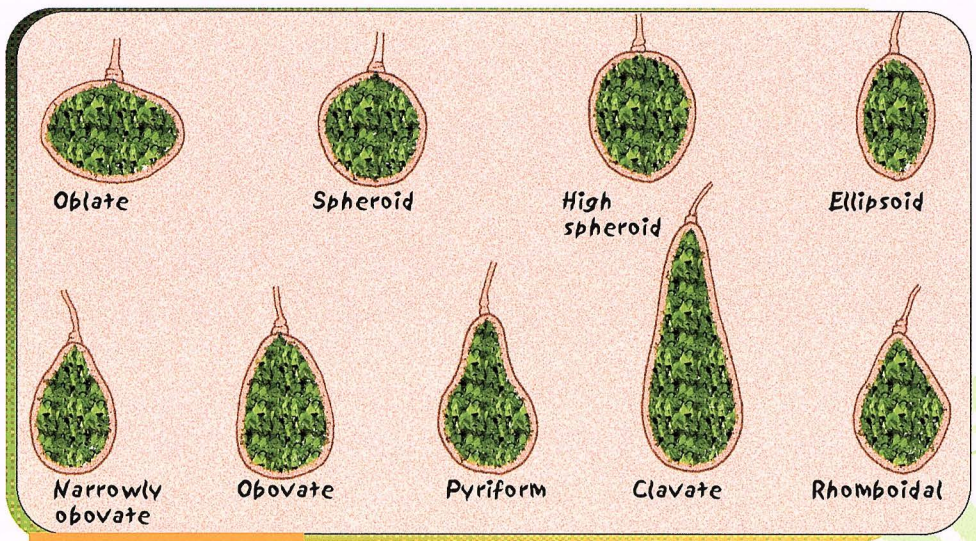
This race probably originated not only in the highlands of Guatemala but also in the Chiapas in Mexico. The leaves are large and uniformly dark green on both faces. Although it is not as tolerant to cold as the Mexican race, it is useful for marginal cultivation zones. The fruits are roundish and have thick, very hard warty skin. The size may vary considerably but they are generally larger than fruits of the Mexican race. The seed is fairly small and almost always clings. Pulp oil content is medium at 10 to 20%. Flowering to harvest time is 8 to 10 months. It can be longer in the cold parts of California (12 to 14 months). The race is a good parent for crosses (contributing genes for small seeds). Nearly 40% of avocados belong to this race, including 'Anaheim', 'Corona', 'Sharwil' and the major commercial varieties such as 'Edranol', 'Gwen', 'Hass', 'Nabal' and 'Reed'.

Hybrids

A large proportion of the varieties of interest for international trade are hybrids. These are generally natural crosses and in rarer cases are the result of breeding exploiting the inter-fertility of the three races. The main selection criteria are agronomic (resistance to pests and diseases, especially *Phytophthora,* tolerance to salinity and cold, productivity, etc.) and those related to fruit quality (size, high pulp percentage, flavour, absence of fibres, oil content, etc.). 'Bacon', 'Ettinger', 'Fuerte' and 'Lula' in particular are natural Mexican x Guatemalan hybrids. Guatemalan x West Indian hybrids, mainly from Florida, include the varieties 'Ajax', 'Booth', 'Choquette', 'Collinson' and 'Simpson'. Mexican x West Indian hybrids such as 'Indian River' are very rare. Other varieties resulting from inter-race crosses are possible.

The main commercial varieties

Some of the main varieties sold internationally are described in detail below. Several descriptive criteria should be explained. The term used to describe shape is that of the International Plant Genetic Resources Institute's 'Descriptors for avocado'. The heading for the flowering type shows whether it is an A or B type as defined in the part on 'dichogamy' in the paragraph on 'Main characteristics of the plant'. Fruit mass distribution between seed, skin and pulp is calculated by UC Riverside. The pulp content is an average of 60 to 70%. The comments concerning the organoleptic qualities are subjective.



Avocado shape

Ardith

Mexican x Guatemalan hybrid
Flowering type: A
Fruit shape: very spheroid to obovate
Skin: dark green, medium thickness
Average weight: 340 to 430 g
Seed:skin:pulp ratio: 14:10:76 (small seed)

Observations

A variety resulting from hybridisation work at UC Riverside and planted mainly in Israel. The fruit is fairly difficult to peel. The pulp is smooth and buttery with a marked flavour. Its organoleptic qualities are excellent.

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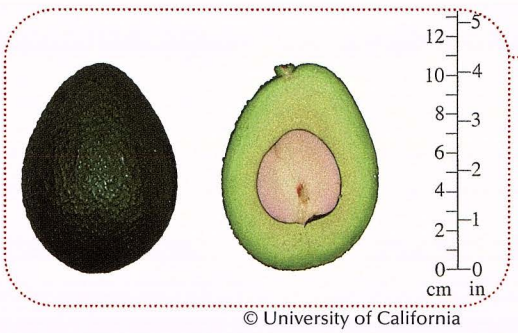
Gwen

Mexican x Guatemalan hybrid, bred from Hass
Flowering type: A
Fruit shape: obovate
Skin: green, fairly thick and warty by fairly pliable, peduncle not centred
Oil content: 18%
Average weight: 270 to 375 g
Seed:skin:pulp ratio: 18:13:69

Observations

Bred by the University of California and available since 1982. Its organoleptic qualities are excellent. In addition, the trees are small, frost-resistant and have a high yield. In contrast, the variety is susceptible to sun scorch and certain pests such as the Persea Mite. The fruits are fairly difficult to peel.



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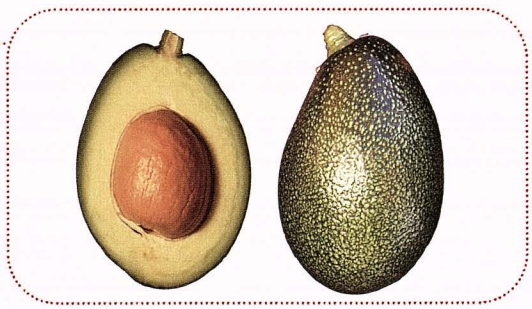
Bacon

Mexican x Guatemalan hybrid
Flowering type: B
Fruit shape: obovate
Skin: strong gloss, fine and smooth
Oil content: 16 to 18%
Average weight: 250 to 300 g
Seed:skin:pulp ratio: 18:7:75 (large seed)

Observations

The variety was bred in California by James Bacon for its cold resistance. It also displays high productivity. The trees are large and sometimes planted as windbreaks. However, the fruit tends to become detached from the tree easily when mature and is fairly difficult to peel. In addition, its organoleptic qualities are mediocre. The taste is little marked.

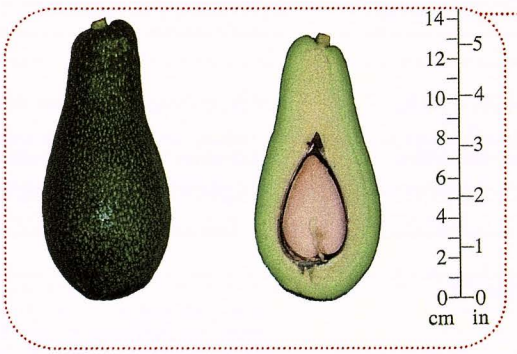


Ettinger

Mexican x Guatemalan hybrid
Flowering type: B
Fruit shape: narrowly obovate
Skin: bright green, fine, fairly smooth
Oil content: 18 to 22%
Average weight: 250 to 350 g
Seed:skin:pulp ratio: fairly large seed

Observations

This variety was bred from 'Fuerte' in Kefar Malal in Israel, where it is mainly grown. The tree is very fertile and vigorous with an erect habit. The fruits are similar to those of 'Fuerte'. The skin is susceptible to problems of corky areas and tends to adhere to the pulp. The pulp is buttery and fibre-less and has good organoleptic qualities.

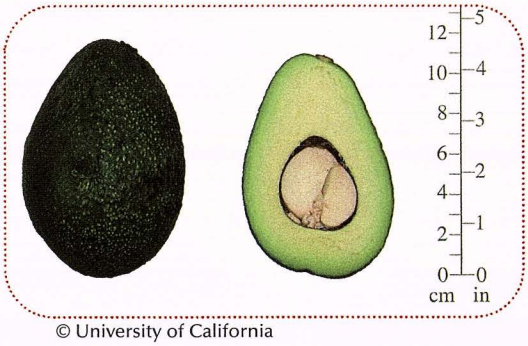


Fuerte

Mexican x Guatemalan hybrid
Flowering type: B
Fruit shape: obovate
Skin: green, matt, smooth, medium thickness. Pliable and tough, it is easy to remove.
Oil content: 16 to 18%
Average weight: 250 to 400 g
Seed:skin:pulp ratio: 15:10:75 (large seed)

Observations

This variety was long the most commonly planted in the world and originated in Mexico (Atlixco). The tree is vigorous with fairly good resistance to frost (to 4°C), but is particularly temperature-sensitive during the flowering period. Productivity is generally good in temperate zones but it displays strong alternate bearing. The fruits are easy to peel and have excellent organoleptic qualities (buttery pulp).

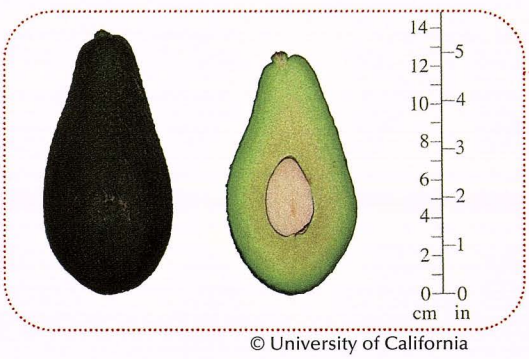


Pinkerton

Mexican x Guatemalan hybrid
Flowering type: A
Fruit shape: pyriform
Skin: dark green, rough, tough and pliable, medium thick, easy to peel
Oil content: 18 to 25%
Average weight: 270 to 400 g
Seed:skin:pulp ratio: 10:13:77 (small seed)

Observations

A recent variety bred in California by John Pinkerton and registered in 1975. It is probably the result of a Hass x Rincon cross. The tree is very vigorous and tolerates temperatures of -1/-2°C to 30°C. Production is good and alternate bearing is little marked. The fruits may suffer from ring-neck if the tree is under conditions of stress. The organoleptic qualities of this variety are excellent (nutty taste). The pulp is smooth, buttery and fibre-less.

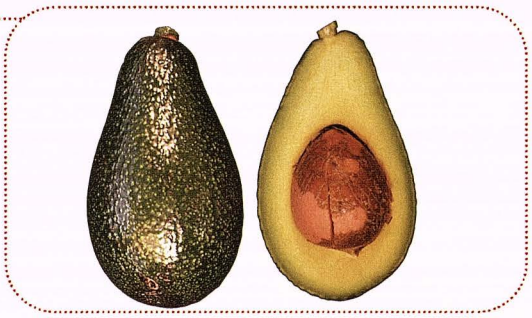


Ryan

Mexican x Guatemalan hybrid
Flowering type: B
Fruit shape: pyriform
Skin: green, tough, medium thick and fairly rough
Oil content: 25%
Average weight: 250 to 400 g
Seed:skin:pulp ratio: large seed

Observations

Bred in California by Edward Ryan at the end of the 1930s, the tree is vigorous but with medium productivity. It is very resistant to cold. The organoleptic qualities are medium (the pulp is sometimes fibrous with fairly poor taste).

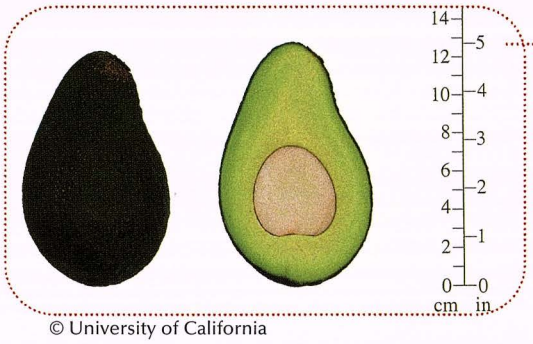


Edranol

Guatemalan race
Flowering type: B
Fruit shape: pyriform
Skin: olive green, strong gloss, black flecks, fine for a Guatemalan variety and slightly rough
Oil content: 22%
Average weight: 250 to 350 g
Seed:skin:pulp ratio: 16:15:69 (very small seed)

Observations

A variety originating in California. The tree is erect, fairly vigorous and resistant to cold (to - 2°C). The organoleptic qualities of the fruit are excellent (slight nutty taste) and it is easy to peel. However, it tends to become detached from the tree easily at maturity, especially in hot climates. It is widely grown in South Africa and Australia.

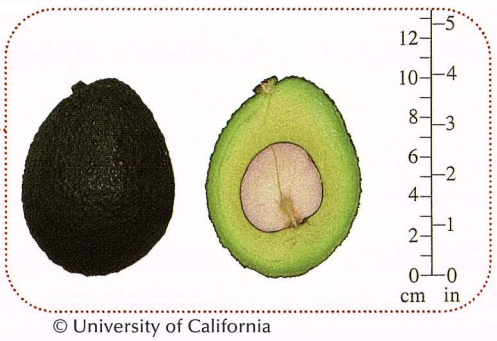


Hass

Guatemalan race
Flowering type: A
Fruit shape: pyriform
Skin: dark green and then brown at maturity, not very thick, warty.
Oil content: 18 to 20%
Average weight: 250 to 350 g
Seed:skin:pulp ratio: 16:12:72 (small seed)

Observations

'Hass' has replaced 'Fuerte' as the sector standard. It is currently the most commonly planted avocado in the world. It was selected by Rudolph Hass in California in the early 1920s and registered in 1935. The tree is vigorous and highly productive. The fruits vary in shape in some production regions, ranging from pyriform to ovoid. Average fruits size is fairly small in hot regions. Good capability for conservation on the tree. The skin turns from dark green to purplish brown at maturity. It is easy to remove from the pulp. The organoleptic qualities are excellent. Rich flavour (nutty taste) and buttery non-fibrous pulp.

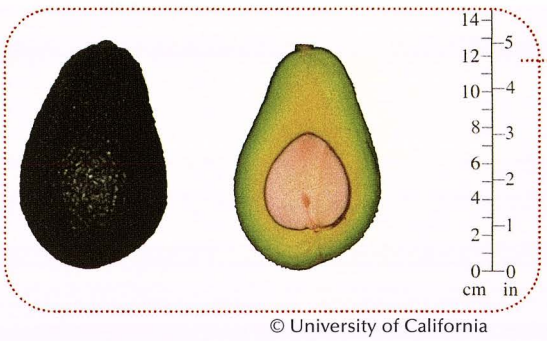


Lamb Hass

Hybrid
Flowering type: A
Fruit shape: obovate
Skin: brown, fairly thick and warty
Oil content: 18%
Average weight: 250 to 350 g
Seed:skin:pulp ratio: 15:14:71

Observations

This variety is a 'Gwen' x 'Thille' cross resulting from hybridisation work at the University of California aimed at selecting an improved alternative to 'Hass'. It was registered in 1996. The shape of the fruit is similar to that of 'Hass' (with a slightly more marked shoulder). The skin is less warty but also changes from dark green to brown. The fruits are larger and productivity is higher. The organoleptic characteristics are also excellent. However, it matures later than 'Hass'.

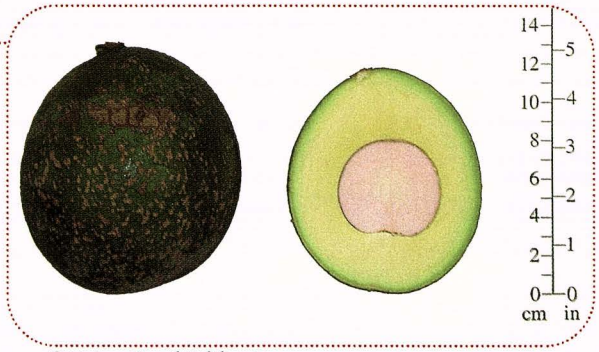


Nabal

Guatemalan race
Flowering type: B
Fruit shape: spheroid
Skin: dark green, very thick and fairly smooth
Oil content: 15%
Average weight: 300 to 500 g
Seed:skin:pulp ratio: 10:10:80

Observations

A variety from Guatemala introduced in the United States (Florida) in 1927. Production is high but with marked alternate bearing. The fruit is easy to peel. The organoleptic qualities are good and the pulp is buttery.

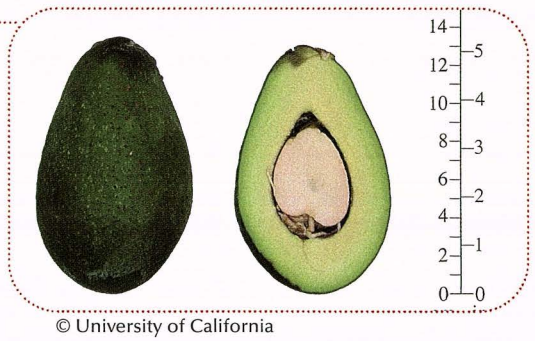


Zutano

Mexican race
Flowering type: B
Fruit shape: obovate
Skin: pale green and yellow-green, fine and smooth
Oil content: 15 to 18%
Average weight: 200 to 400 g
Seed:skin:pulp ratio: 26:7:67

Observations

Originated in California and was registered in 1932. A vigorous tree with an erect habit and fairly good resistance to cold. It bears well with little alternation. However, peeling the fruit is fairly difficult and its organoleptic qualities are mediocre, in particular because of its fairly poor flavour.

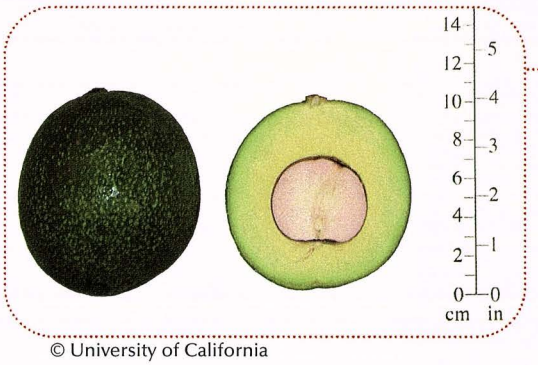


Ree

Guatemalan race
Flowering type: A
Fruit shape: spheroid
Skin: medium thickness, slightly rough, pliable
Oil content: 19 to 20%
Average weight: 400 to 500 g
Seed:skin:pulp ratio: 17:11:72

Observations

This variety of Californian origin was selected by James Reed. Registered in 1960, the patent expired in 1977. It has succeeded in conserving the qualities of its parents 'Nabal' and 'Anaheim' without their negative features. It is fairly productive and alternate bearing is not marked. Its resistance to cold is comparable to that of 'Hass'. The fruits are large and a singular round shape. They keep well on the tree. The organoleptic qualities are excellent and the buttery pulp has a slight nutty taste and does not blacken after slicing. Peeling is also easy.

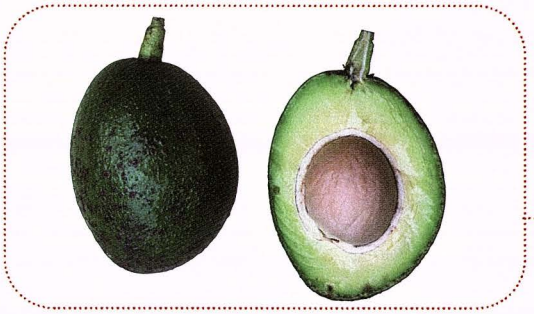


Choquette

Guatemalan x West Indian hybrid
Flowering type: A
Fruit shape: oval
Skin: dark green, practically smooth, strong gloss, tough
Oil content: 13%
Average weight: 860 to 1 150 g

Observations

The variety is from Florida (R. Choquette's orchard in Miami). The tree is very productive and fairly resistant to diseases. Excellent organoleptic qualities. The pulp has a slight nutty taste. It is one of the main varieties marketed in Florida.



Avocado varieties in short

	Race	Flower type	Weight (g)	Oil content (%)	Shape	Skin	
						Colour	Appearance
ARDITH	G x M	A	340-430		Spheroid to obovate	Dark green	
BACON	G x M	B	250-300	16-18	Obovate	Shiny green	Smooth
CHOQUETTE	G x A	A	860-1 150	13	Oval	Shiny dark green	Smooth
EDRANOL	G	B	250-350	22	Pyriform	Shiny olive green speckled with black	Slightly rough
ETTINGER	G x M	B	250-350	18-22	Narrow obovate	Shiny pale green	Smoothish
FUERTE	G x M	B	250-400	16-18	Obovate	Mat dark green	Smooth
GWEN	G x M	A	270-375	18	Obovate	Green	Warty
HASS	G	A	250-350	18-20	Pyriform	Dark green to brown when ripe	Warty
LAMB HASS		A	250-350	18	Obovate	Brown	Warty
NABAL	G	B	300-500	15	Spheroid	Dark green	
PINKERTON	G x M	A	270-400	18-25	Pyriform	Dark green	Warty, tough
REED	G	A	400-500	19-20	Spheroid	Green	Slightly warty
RYAN	G x M	B	250-400	25	Pyriform	Green	Fairly warty
ZUTANO	M	B	200-400	15-18	Obovate	Pale green with yellow flecks	Smooth

Thickness	Pulp: seed ratio	Ease of peeling	Organoleptic quality	
			Flavour	Observations
Medium	14:10:76	-	+++	The smooth pulp is appreciated
Thin	18:7:75	-	+	Taste not strong
				Slight nutty taste
Thin for a Guatemalan variety	16:15:69	+	+++	Slight nutty taste
Thin	Large seed	-	++	
Medium	15:10:75	+	+++	
Fairly thick	18:13:69	+	+++	
Thin	16:12:72	+	+++	Marked nutty taste
Fairly thick	15:14:71	+	+++	
Very thick	10:10:80	+	++	
Medium	10:13:77	+	+++	Nutty taste
Medium	17:11:72	+	+++	Slight nutty taste
Medium	Large seed		+	Fibres may be present
Thin	26:7:67	-	+	

Avocado varieties in short

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Dunkerque	33(0)3 28 28 91 70	Cavaillon	33(0)4 90 73 41 19
Chateaurenard	33(0)4 91 09 16 28	Fos	33(0)4 42 48 96 30

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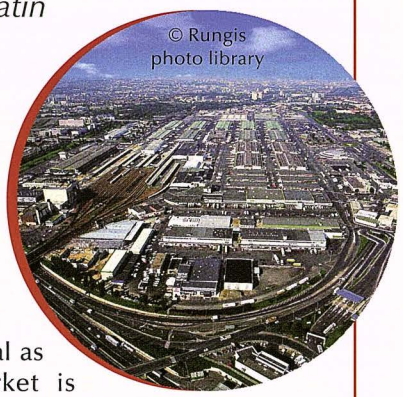
The world avocado market

Towards a new geographical pattern for the world avocado trade?

THE world market seems to be at a turning point. The changes that have occurred recently in the rules for access to the US market, one of the main world markets, will probably lead producer countries in Latin America, and especially Chile and Mexico, to change or diversify their export outlets. FruiTrop FOCUS provides a number of points for consideration that make it possible to have an idea of the new pattern of the international avocado trade in the coming years.



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World trade with two centres

The world avocado trade is centred on two vigorous markets that are both strong importers, the European Union (150 000 to 160 000 t per year including shipments from Spain) and the United States (approximately 140 000 t). The quantities taken by the other major consumer regions are much smaller. The Caribbean-Colombia zone, the third largest importer, totals only 40 000 t. It is followed by Japan and Canada with 30 000 t and 15 000 t respectively. The other markets around the world (Asia, the Middle East and Eastern Europe) take less than 2 000 t.

This preliminary analysis gives better understanding of the inevitable effects that a change in the way one of the two leading centres functions will have on world trade.

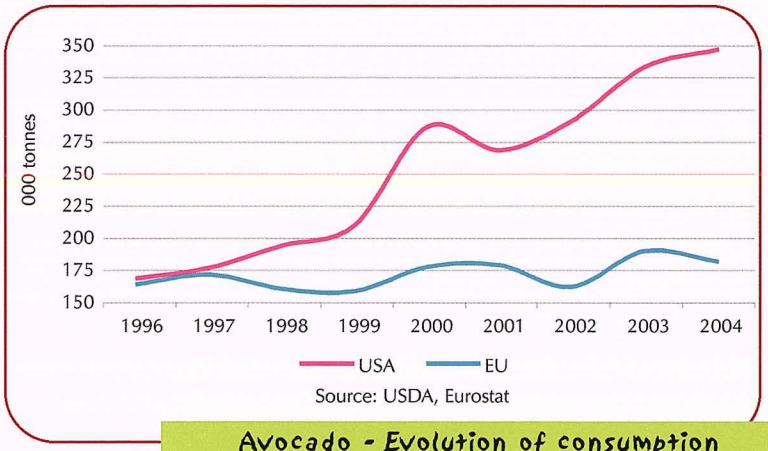
An epic battle in view in the United States?

Chile plays a key role in supplying the United States with imported avocado. However, the position is reciprocal as this market is essential for Chile, which shipped 120 000 t to the US in 2004, that is to say 90% of total exports. The increasing quantities of avocado from Michoacan (Mexico) arriving in the United States thanks to a series of increasing favourable regulations since 1997 has not led to any problems. But the door was only slightly ajar until 31 January 2005. Exports of Michoacan avocado are now authorised to 47 out of 50 states and without any limit on periods. This can radically change the US market supply structure.

There is no doubt about the Mexican challenger being a heavyweight. It is true that its colossal production totalling about a million tonnes is first and foremost devoted to an extraordinarily local market and is both well-developed (per capita consumption of about 8 kg per year is the highest in the world) and astonishingly profitable (the wholesale price was between EUR 0.70 and 1.10 per kg in 2004). However, the scale of the planting

performed in recent years, as income from the crop has been particularly good, is a demonstration of growers' desire to export. Furthermore, Mexico has the logistic advantages of being a neighbour and no customs charges are made within the framework of NAFTA.

This is food for thought for Chilean operators and even all skilled professionals at world level as there is no plethora of alternative markets, as has been seen above.



Avocado - Evolution of consumption in the USA and Europe

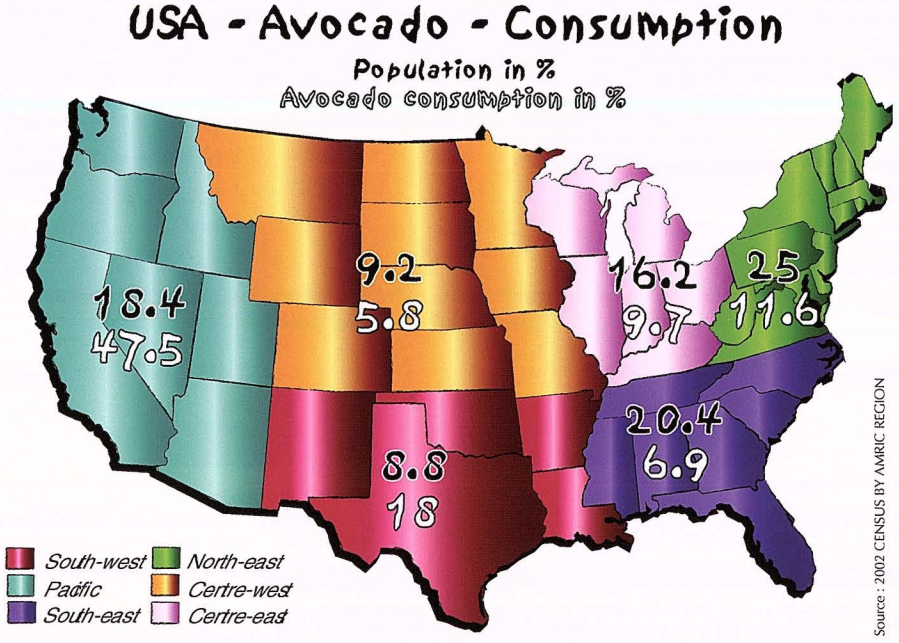
Will there be a head-on collision?

The problem has been set. Trying to find an answer today would be a challenge. The change dates back for only six months or so. Nevertheless, Mexico has clearly made progress. According to the most recent USDA statistics, imports from February to May increased from about 21 000 t in 2004 to nearly 47 000 t in 2005. It is only possible to construct scenarios. And the pessimistic once of a head-on collision is not the most plausible of them.

Strong growth as protection

First, and this is a fundamental point, the avocado market is growing strongly in the United States. The figures speak for themselves. Consumption increased from about 170 000 t in 1996 to 345 000 t in 2004. In comparison, it increased by less than 20 000 t in the EU during the same period! US growers became organised very early on and began basic promotion work in 1961. The keystone of the system is a levy on every box of Californian 'Hass' to fund marketing. This system had resulted in the collection of $ 300 million since it was started and was then strengthened in 2003 in such a way as to indicate that the Californians have a substantial advance on the field. Since 2004, the import sector has been involved not only in the funding of marketing by the extension of the tax to all boxes of avocado sold in the USA, whatever the origin, but also in the management of the budget and market regulation via the Hass Association Board (HAB). This vision in which increased consumption is a joint challenge that outweighs competition between origins is amazing when it remembered that professionals in other producer countries have still not managed to launch discussion with each other.

The promotion angles used are effective. The 'ready to eat' concept has already proved its worth and the potential for market growth is extremely large. On the one hand, the Hispanic population is a large avocado consumer and is increasing (35 million people in 2000 rising to a forecast 55 million in 2020). On the other hand, 150 years later, avocado should be able to go back along the pioneer routes and conquer the consumer deserts formed by the eastern states (see map). The eastern US is home for over 70% of the US population but takes only a third of the volumes of avocado available. Per capita consumption is only some 400 g per year in the south-east (Florida, Louisiana, etc.) and there is thus considerable room for progress. HAB has set the target of increasing market quantities by about 100 000 t by 2010.



Strong protection maintained until 2007

Another important point that is also in favour of limiting confrontation is that sales of Mexican avocado are still forbidden in the three producer states California, Florida and Hawaii. And Chile sells a very large proportion of its shipments in California (80% for California, Arizona and Texas). A guacamole war is therefore not on the agenda before the beginning 2007 when all the US states will be accessible for Mexican fruits.

A further protection mechanism upstream of the sector

The Californian avocado sector has high costs and is fragile and Americans are prudent. The system set up by HAB is therefore intended 'to exchange crop and marketing information in an effort to achieve an orderly flow of fruit to the U.S. market.' The section of the website (www.avocadocentral.com) for the general public contains a wealth of recipes and cooking advice and this at least is without a doubt in the consumer's interest.

The necessary search for diversification markets

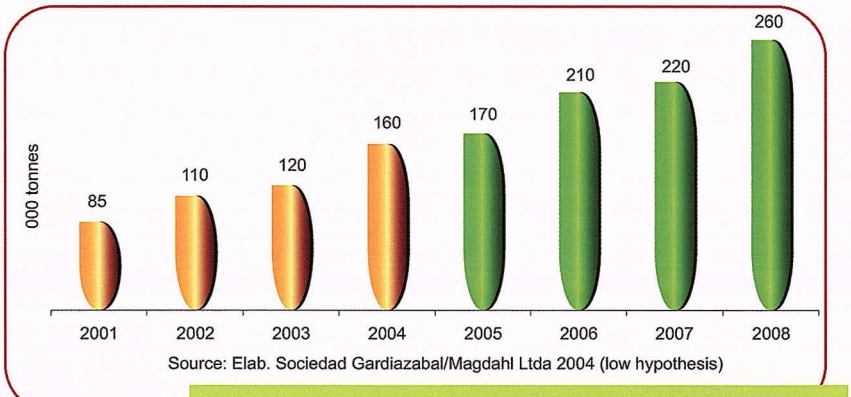
All the factors described above are reassuring for Chile. However, it is clear that the US market is going to become much more competitive, especially after its full opening to avocado from Michoacan in January 2007. Furthermore, Chilean production rose to 170 000 t in 2004 and is still increasing strongly. It should exceed 200 000 t very soon. A recent study by the very serious Catholic University of Valparaiso even forecasts 260 000 to 315 000 t in 2008. Chilean operators thus have an urgent need to intensify the diversification approach begun several seasons ago. The domestic market with a population of 15 million is already well developed with consumption at 3.5 kg per person per year but there is still room for improvement. The dynamic Comité de la Palta has launched a targeted promotion campaign for this purpose. Neighbouring markets have true growth potential but in the longer term. Avocado is still comparatively expensive in Argentina, hard-hit by a slump. Brazil has considerable potential but promotion efforts aimed at making 'Hass' avocado known are colossal in a country where consumers are used to the West Indian varieties. Japan appears to be an interesting alternative. The market is growing but its potential should not be overestimated as total volume was only about 30 000 t in 2004. In addition, it has a deserved reputation for very difficult access and Mexico has a near monopoly (shipping over 95% of total imports). Finally, it seems that other origins have their eye on the Japanese market. New Zealand is facing increasing competition from domestic production in Australia and is also looking for alternative destinations. There remains Europe...

Two major factors for change in the EU

Chile is not the only origin to try to establish a position in the EU. Peru has also gone for the community market since the end of the 1990s. This considerably changes the trading landscape. In 2004, nearly 25 000 t arrived from these two origins over and above the volumes shipped by traditional suppliers, that is to say an increase of more than 15% in total supplies.

What might be the impact of successful Chilean arrival in the EU?

Chile possesses advantages that lead to thinking that it could gain a position on the EU market. Firstly, Chilean operators are deploying means to match their ambitions (the 2005 export programme is 50% up on that of 2004) by funding medium-term promotion operations. A campaign is to start in the United Kingdom in 2005 and then be extended to cover France and Spain in 2006. Secondly, operators display considerable commercial aggression and this is seen in relations between exporters and importers. Chilean operators generally work with a guaranteed minimum price while their Mexican counterparts insist on a firm price. A large proportion of European importers therefore consider that Chile should gain market shares at Mexico's expense in the medium term. The broadened customer portfolio that Michoacan operators now possess in the United States should not encourage them to make their commercial contract system more flexible. Some operators therefore believe that Mexican avocado will only be present on the



Avocado - Future Chilean production

community market for occasional periods, serving as a complementary supply.

But Mexican operators have not said their last word. They have the unique advantage of being able to ship 'Hass' from August to June. In addition, the promotion campaign that they too are launching in 2005 (in France) shows that withdrawal from the community market is not at all on the agenda.

Chile's penetration of the EU market would also result in changes in the supply calendar. It could lead Spanish and Israeli operators to delay the start of their 'Hass' season until January. Nevertheless, the two latter origins have a distinct advantage over Chile—that of transit time measured in days and not in weeks. The problem of sea transport to the EU is a major challenge to be faced by the Chilean avocado industry. As shipping time is 22 to 28 days, controlled atmosphere must be mastered perfectly, co-ordination between harvesting and loading optimised and costs kept down.

And what about Peru?

Peru's calendar differs to that of Chile and runs from May to September. Peru thus faces South Africa—among others. The period is also that of peak EU production of local fruits such as melon and tomato and these are very competitive. Avocado consumption is therefore somewhat slow in most EU countries at this time of year. Only one market differs and this might perhaps be a signpost. This is the UK where consumption is higher in spring and summer thanks to retail promotion operations. This is something for Peruvian exporters to think about and is discussed again below.

Peru's market in the EU is not the easiest but Peruvian exporters do not have the choice at the moment. Production of 'Hass', totalling about 15 000 t in 2004, is rising strongly (with an annual 22 000 to 25 000 t forecast by 2010) and the EU is the only sizeable market currently accessible to them. As Peruvian cultivation zones have not been recognised as being free of fruitfly, the entry of Peruvian avocado to Japan and the USA is forbidden. However, the search for diversification markets that began at the end of the 1990s could begin to show results. The opening of the Chilean frontier seems imminent. This is a strong consumer market, as has been mentioned above, but is not supplied with 'Hass' at the beginning of the Peruvian season, displaying strong potential. The United States could also open the door to Peruvian fruits in two or three years time.

Inevitable crises?

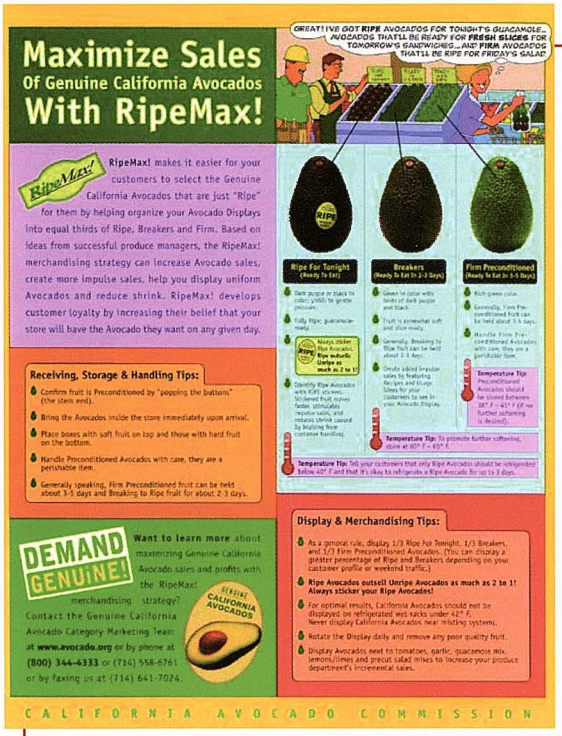
The EU market does not display the same growth dynamics as that of the USA. The massive arrival of Peruvian and Chilean fruits therefore caused serious over-supply of the community market in October 2004 and May 2005. Prices slumped to below EUR 5 per box during these two periods both for the two above-mentioned origins and for those from the origins that usually supply the market at these times. Are these crises inevitable? No, because they are economically unbearable for all sector players and will therefore settle themselves. A worst case scenario can be envisaged in which fierce competition forces certain players or even certain origins out of the game. However, an alternative probably exists.

'Ready to eat'—another approach!

Without giving way to vacuous optimism, it is reasonable to think that the European Union possesses a very large capacity for sales development. The 'ready to eat' concept is certainly the best way of exploiting this vast potential and pushing consumption above the some 500 g per capita mark at which it has been stuck for years. The technique has proved its effectiveness and not only in the USA (see first part). Promoted in the United Kingdom since the mid-1990s, it has gradually spread to all retailers and is one of the main features that explain the doubling of consumption in 10 years. It is true that the volumes sold are still modest (about 30 000 t), but the increase has been continuous and strong in recent years.

Motivate the large retail chains

However, the 'ready to eat' concept requires another ingredient to become a powerful tool for increasing sales—support and participation in the downstream part of the sector. It requires great vigilance in the import sector, especially in distribution logistics. But above all the retail trade must be strongly mobilised. In practical terms this means that department managers must perform more rigorous management of produce whose shelf life is obviously shortened and be ready to devote more space to it. These efforts are rewarded. The marked increase in the return per square metre of shelf, as shown by numerous studies conducted by the California Avocado Commission, is truly an argument that can motivate retailers who are obviously very concerned with profitability. British chains have agreed to do this for avocado as they had already made the gamble by partici-



pating in operations run by the Banana Group. Shelf returns increased strongly and banana consumption increased from 450 000 t to 700 000 t in about a decade.

French retailers are still a little timid with regard to involvement in this approach. Nevertheless, the buying policy of some chains increasingly in favour of 'Hass' leads to considering that they might display stronger interest in 'ready to eat' fruits in the medium term. In contrast, more time will probably be needed to win over German retail chains. The market has an enormous development potential (population of over 80 million buying less than 200 g avocado per person per year). However, it is necessary to exit a vicious circle in which the extremely limited degrees of maturity required by retailers because of slow sales tend to slow releases even more.

Unite to finance large-scale promotion

This type of fundamental approach based on strong targeting of consumers in the medium and long term requires substantial resources. Exporters should therefore unite to a certain extent, at least at producer country scale in order to be able to agree on objectives and also (above all) to assemble the budget required to fund them. This prerequisite is already a difficulty to be overcome in certain fragmented sectors with no representation. Unfortunately, generic promotion is probably not for tomorrow in the EU.

The establishment of a tax on all boxes of avocados exported in order to finance promotion is apparently the most effective collection method. This has already been set up successfully in numerous producer countries (United States, Chile, Australia, New Zealand, etc.).

Structural changes related to 'ready to eat' fruits

Tests show that Hass is by far the most suitable variety for the ripening process. Promoting 'ready to eat' fruits therefore means giving a larger proportion of the community market to this variety.

Does this not lead to a risk of the marginalisation of the smooth varieties? Probably not for high-quality cultivars. On the one hand, it would be difficult for the small to medium-sized 'Hass' to replace 'Fuerte', 'Ettinger' and other cultivars on the markets that favour large fruits (countries such as Germany and regions like Alsace in France for example). A recent study shows that consumer preference for size outweighs preference for varieties. Furthermore, the segmented range sold by most distributors includes an attractively priced reference that may be a smooth variety. Finally, emerging countries—especially in Eastern Europe—are also potential markets for these cultivars.

Waking up Sleeping Beauty

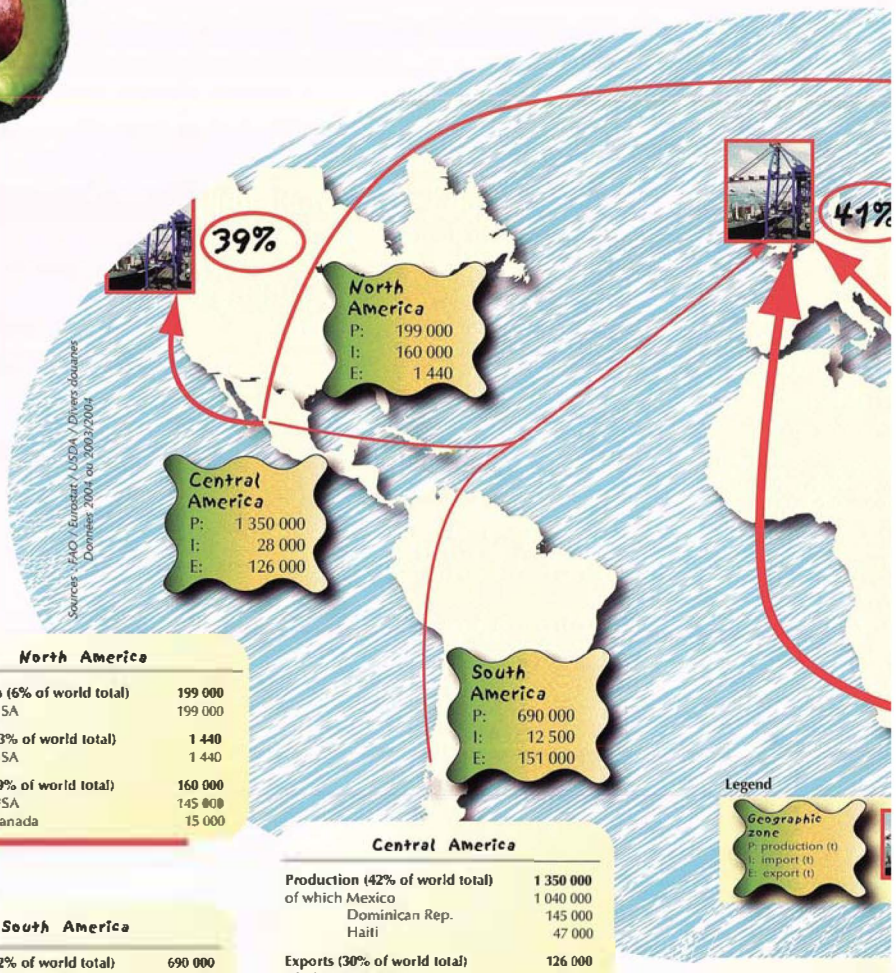
World trade is at a turning-point. Whereas the US market has acquired numerous features for changing under good conditions, the European Union does not seem to be so well prepared. Resuming the debate on promotion and perfect ripeness in Europe would give fresh impetus to the community market and hence to the world market while waiting for other emerging countries (China for example) to take their turn. This is essential for the South American sectors whose production should increase strongly in the coming years. It's time to wake up Sleeping Beauty.

Eric Imbert, Cirad
eric.imbert@cirad.fr

... Avocado ...

production: 3 200 000 t

world trade: 420 000 t



North America

Production (6% of world total)	**199 000**
of which USA	199 000
Exports (0.3% of world total)	**1 440**
of which USA	1 440
Imports (39% of world total)	**160 000**
of which USA	145 000
Canada	15 000

Central America

Production (42% of world total)	**1 350 000**
of which Mexico	1 040 000
Dominican Rep.	145 000
Haiti	47 000
Exports (30% of world total)	**126 000**
of which Mexico	105 000
Dominican Rep	15 400
Guatemala	4 300
Imports (7% of world total)	**28 000**
of which El Salvador	11 000
Costa Rica	6 500
Honduras	6 200

South America

Production (22% of world total)	**690 000**
of which Brazil	173 000
Colombia	160 000
Chile	170 000
Exports (36% of world total)	**151 000**
of which Chile	130 000
Peru	14 500
Ecuador	6 700
Imports (3% of world total)	**12 500**
of which Colombia	10 500
Argentina	1 000

Africa

Production (12% of world total	**389 000**
of which Ethiopia	81 400
South Africa	77 000
Kenya	60 000
Exports (12% of world total)	**53 000**
of which South Africa	34 000
Kenya	18 000
Imports (0.5% of world total)	**1 970**
of which Morocco	740
South Africa	470

EU-25 / Switzerland / Norway

Production (2% of world total)	**72 000**
of which Spain	56 000
Portugal	13 000
Exports (10% of world total)	**41 000**
of which Spain	41 000
Imports (41% of world total)	**170 000**
of which France	96 000
Netherlands	24 000
UK	25 500

Middle East

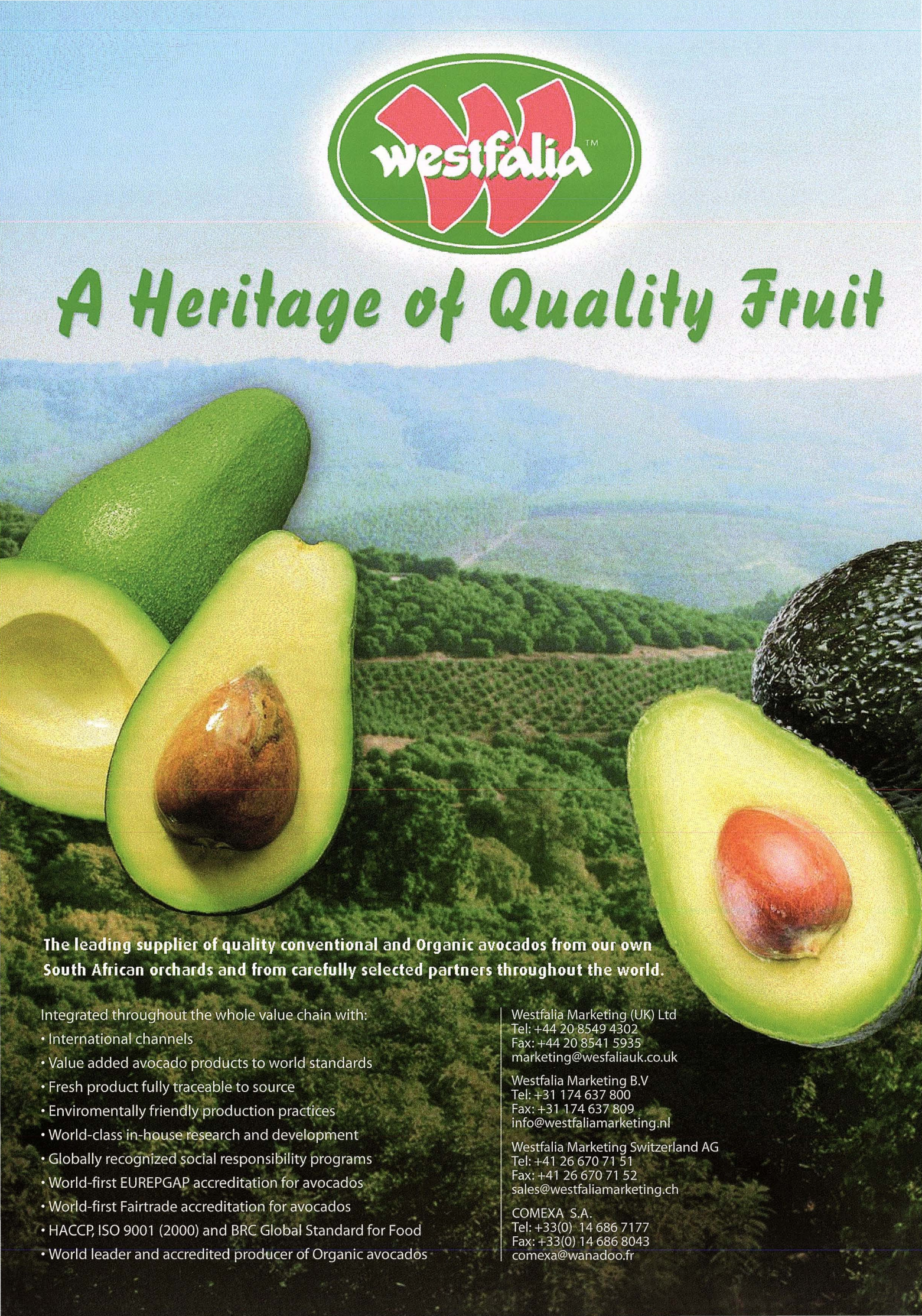
Production (2% of world total)	**70 000**
of which Israel	65 000
Lebanon	4 000
Exports (10% of world total)	**41 000**
of which Israel	40 000
Imports (0.5% of world total)	**2 000**
of which Saudi Arabia	1 000

Asia

Production (12% of world total)	**385 000**
of which Indonesia	263 000
China	82 500
Philippines	39 000
Exports (0% of world total)	**125**
of which Indonesia	125
Imports (8% of world total)	**32 000**
of which Japan	30 000
Hong Kong	1 400
Singapore	300

Oceania

Production (2% of world total)	**55 500**
of which Australia	40 500
New Zealand	14 000
Exports (1% of world total)	**6 250**
of which New Zealand	5 800
Australia	400
Imports (1% of world total)	**4 800**
of which Australia	4 500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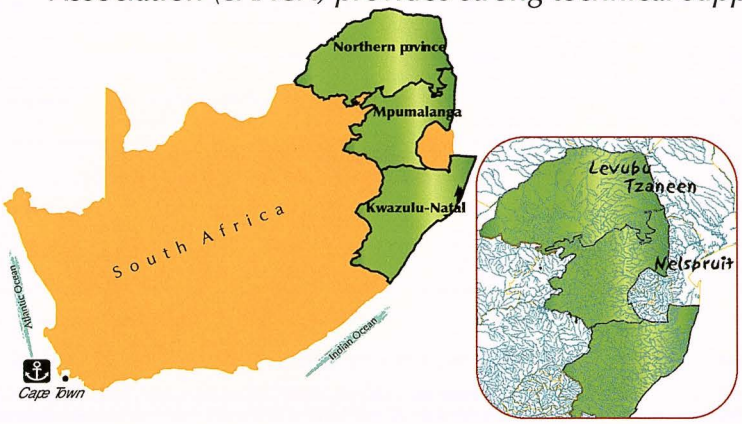
Producer country sheet

South Africa


© Fred Meintjes

South Africa is the 12th largest producer in the world with some 65 000 to 70 000 t. In spite of this comparatively modest position, the origin is the pillar of supplies to the European market during the summer season. The export vocation of the sector remains marked but the domestic market is growing noticeably. The South African Avocado Growers' Association (SAAGA) provides strong technical support, both upstream and downstream.

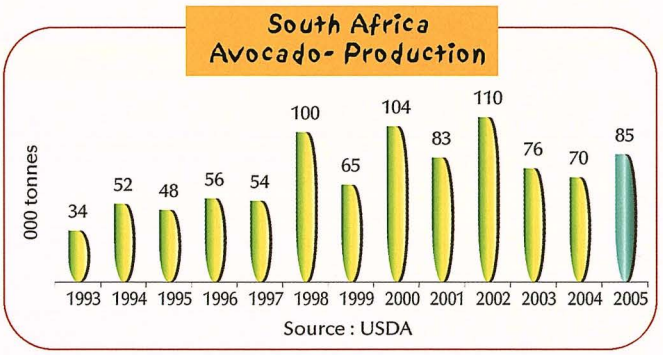


Production zone

The orchards total 12 000 hectares and are mainly in the north-eastern part of the country where summers are hot and wet (precipitation in excess of 1 000 mm) and winters mild and dry. Most of the crop is grown in Limpopo Province in the extreme north of South Africa along the border with Zimbabwe, centred on Tzaneen (38% of the total area) and Levubu (21%). Mpumalanga Province is also an important area, with 33% of the area under avocado centred on Nelspruit. The rest of production is further south in the cooler Kwazulu-Natal region (8% of the area). The plantations are generally irrigated and have an average area of 20 to 30 ha. Six percent of the area under avocado has organic farming accreditation. The main limiting factors are *Phytophthora* root rot (resistant rootstocks and chemical control methods have been developed) and fungal problems in humid zones.

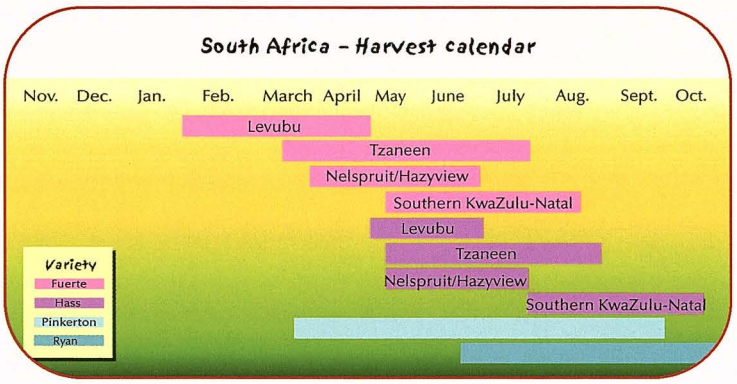
Volumes

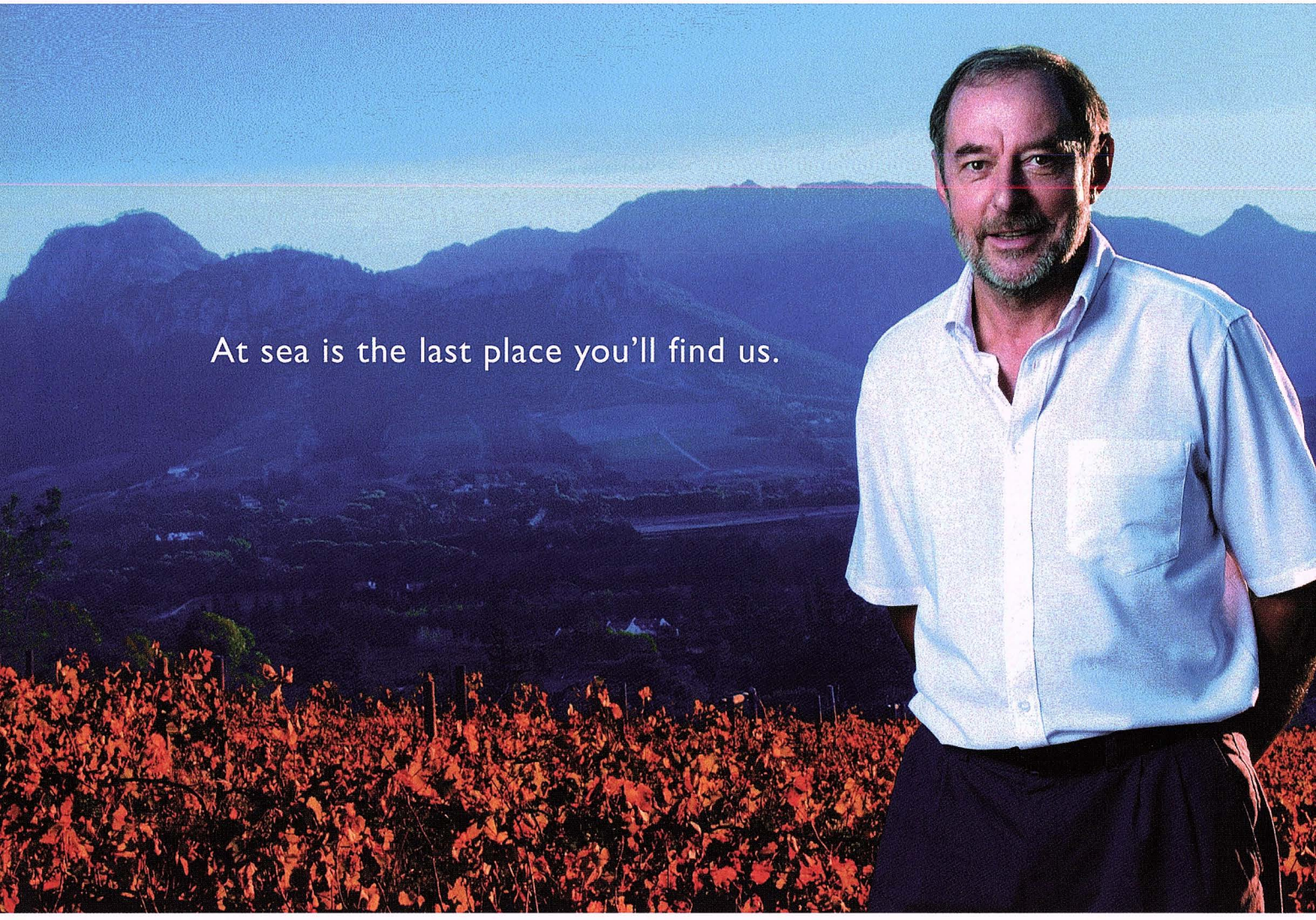
Avocado was introduced a long time ago—probably by colonists towards the end of the seventeenth century—and the first large-scale plantings were performed in the 1930s. However, the crop only really gained momentum in the 1960s, in particular to replace citrus plantations affected by greening. Production gradually increased from some 10 000 tonnes at the beginning of the 1970s to nearly 30 000 t in the mid-1980s. The increase was much faster from 1985 onwards, with more than 50 000 t grown in 1989. A long, marked period of drought at the beginning of the 1990s resulted in a decrease in production (less than 40 000 t in 1993). Development resumed in the mid-1990s but alternated bearing was very marked. The quantities currently oscillate between 65 000 and 70 000 t and should increase by about 2% per year for the next five years, especially for 'Hass'. SAAGA, an association grouping most exporting growers, has provided technical support since it was founded in 1967.



Production calendar and varieties

The great diversity of climates resulting from the spread of plantings over several degrees of latitude means that the season can be lengthened considerably. The very first fruits are generally picked at the end of February (Northern Province) and the season usually lasts until the beginning of November (Kwazulu Natal). 'Hass' has developed strongly since the 1990s and now dominates with about 41% of the planted area. Its share should continue to increase and reach 60% towards 2010/2015 as it is practically the only variety to have been planted since 2001. 'Fuerte', the leader until recently, is tending to decrease but is still grown on 34% of the area under avocado. 'Ryan', widely distributed on the domestic market, follows with 12% and then 'Pinkerton' with 9%. The range is completed by 'Edranol'. The new varieties bred using 'Hass', such as 'Lamb', 'Harvest' and 'Gem', are very little represented.





This is Jan Kruger. He heads up the reefer division in our South African office. Only, you won't find him there very much. You see, Jan spends most of his time in the field - learning all there is to know about his customers' cargo. It's dedication like his that ensures your precious cargo arrives as you would expect. Perfectly. So next time you need a shipping company, think of the one that does business personally.

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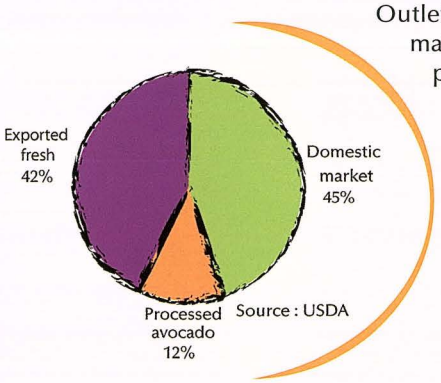
Outlets

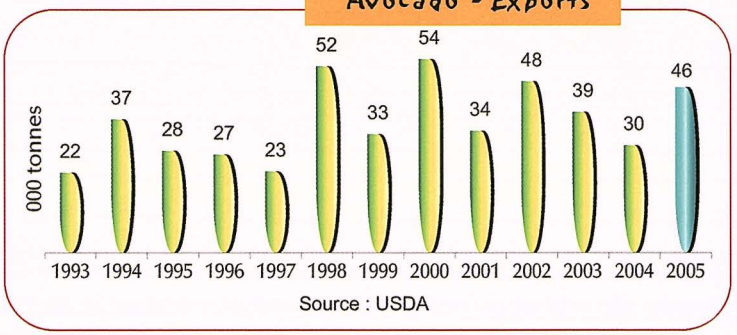


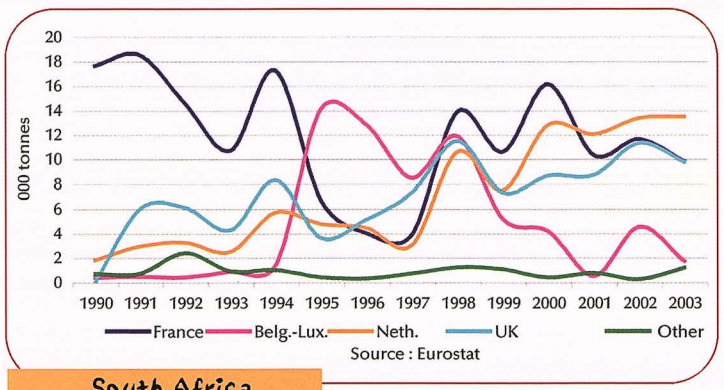
Outlets have become much more varied since the mid-1990s. The sector is still mainly export-oriented. However, the domestic market has become stronger in particular thanks to the promotion operations initiated by SAAGA and that mainly target low-income shoppers. The domestic market takes practically all the green variety fruits grown, especially at the end of the season when these are difficult to sell on the export market. There is room for substantial growth as present consumption is less than 800 g per person. The oil production industry and pulp production to a lesser extent purchase a fairly stable 12 000 to 13 000 t per year, except in years of under or over-production.

Total exports

The export sector comprises about 15 companies, 7 of which ship 80% of the fruits exported. SAAGA provides its members with solid technical support (setting up EUREP-GAP, quality control on arrival), commercial coordination and marketing. In addition, obligatory quality control is performed by the Perishable Products Export Control Board (PPECB). Exports have oscillated between 8.5 and 10 million boxes since 1999. The fruits are shipped mainly to the EU, where South Africa is the leading summer supplier. Holland is an important hub for reasons of logistics. France is the main market but followed closely by the United Kingdom where SAAGA has been active in marketing since 1996, running promotion operations (press, radio and the website www.summeravocados.com) and developing a segmented range (ripe and ready to eat, budget packs in nets). A few batches are shipped sporadically to the Middle East and Canada. South African exporters are interested in Japan and, even more, the United States, but the sanitary restrictions in force currently rule out shipments to these destinations.

South Africa
Avocado - Exports





South Africa
Avocado - Exports
to the EU

Logistics

The fruits are packed and then loaded in refrigerated trucks or containers under controlled or modified atmosphere (a less costly alternative technique—application of 1-methylcyclopropene—is being tested). The some 2 000 km journey from the production zones to the port in Cape Town takes 24 to 48 hours. The railway line that has run between Tzaneen and Cape Town for some years is also used to carry about 10% of production. The fruits are then loaded on to ships after rigorous quality control by PPECB. Air freight was used for about half of the export quantity in 1985 but is now only used for special market situations.

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Market	Main shipping lines		Shipping time	Observations	Customs tariff
	Port of departure	Port of arrival			
EU	Cape Town	Rotterdam	12 to 13 days	Several companies	Tariff preference

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de HORACIO FRÍAS

QUI SOMMES-NOUS ET QUE FAISONS-NOUS ?

LOCALISATION : Tucumán, nord de l'Argentine

SUPERFICIE: 200 hectares de plantation propre uniquement d'avocatiers

VARIÉTÉS : Hass et Torres

HASS: se récolte entre le 15 avril et le 15 juillet

TORRES: se récolte entre le 15 août et le 30 octobre
Variété de grande taille, bien adaptée pour la réalisation de salade et la restauration. Tout comme le Hass, sa peau noircit à maturité. Bonne durée de conservation. Excellente sur le plan gustatif. Noyau plus petit que celui du Hass.

CONDITIONNEMENT : sur le lieu même de production

CONTENEURS : "Door to door", sous atmosphère contrôlée

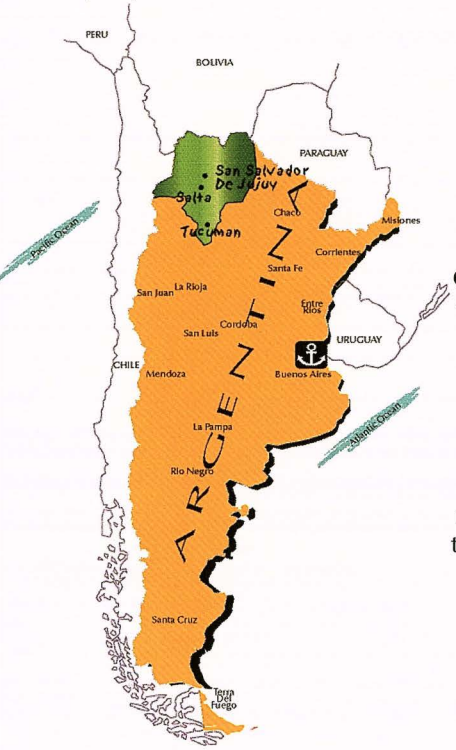
DURÉE DU TRANSPORT
Buenos Aires / Algeciras : 15 jours
Rotterdam 18 jours, Thamesport 21 jours

SYNTHÈSE : une entreprise fiable

Producer country sheet

Argentina

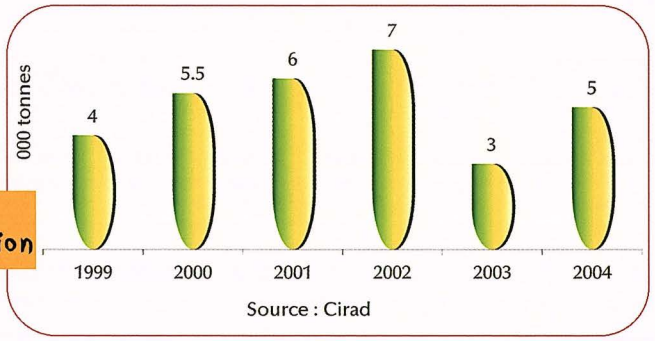
ARGENTINA is a modest producer country but its production developed markedly in the early 2000s. It is mainly oriented towards the domestic market where consumption is increasing. It should continue to develop in the years to come but in relatively moderate proportions.



Production zone

Only certain areas in north-eastern Argentina at elevations of between 450 and 900 m in the foothills of the Andes are suitable for growing avocado, thanks to a microclimate in which high temperatures and excessive humidity are limited. Three-quarters of Argentina's estimated 1 600 to 2 000 ha of avocado is in Tucuman Province, where the crop was first introduced. The rest of the plantations are divided equally between the more northern provinces of Salta and Jujuy. Production structure is uneven, as is the level of knowledge of this recent crop. Two large integrated industrial plantations operate alongside non-specialised small and medium-sized farms that have been developed recently (sometimes financed by investors outside the farming sector). The soil and climate conditions mean that growers must have perfect technical mastery of the crop (*Phytophthora,* etc.).

Argentina
Avocado - Production

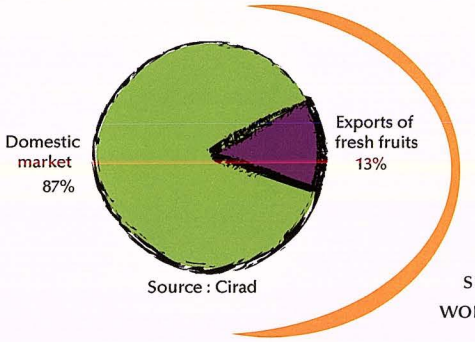


Volumes

Avocado was introduced in 1911 but has only really developed in recent years. The good prices paid on the domestic market resulted in a distinct development of plantations in the 1990s. As the sector is comparatively recent, it is difficult to measure present production levels (the statistics vary considerably according to the source). It can nevertheless be considered that quantities increased considerably until 2002 (with production probably between 5 000 and 10 000 t). The harvest was less than 5 000 t in the following years because of abnormally hot weather during the critical fruit setting period. Production could increase in the coming years but in limited proportions. The disappointing results of the past seasons and the specific requirements of the crop have affected the motivation of certain non-specialised operators.

Production calendar and varieties

'Hass' dominates Argentinian production, planted on three-quarters of the area under avocado. Nevertheless, the local variety 'Torres' is well established (with about 15% of the area). This cultivar from Tucuman (in Yierbabuena) gives large fruits (500 to 770 g). Its green skin browns at maturity. It is much appreciated locally. The range is completed by 'Lula' and other green varieties.

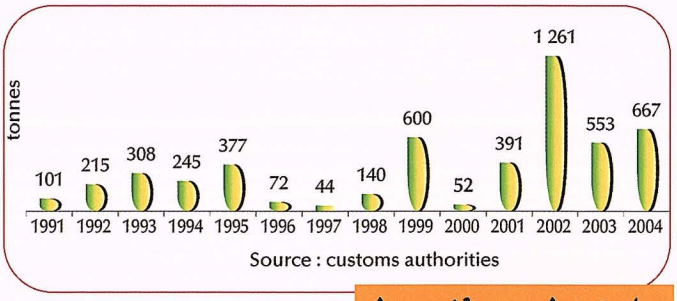


Outlets

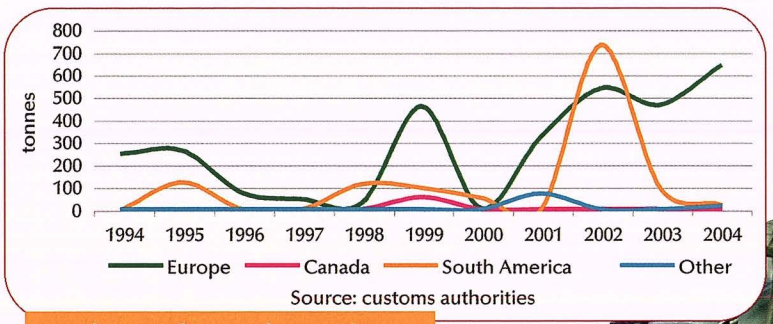
Production is mainly for the local market (Buenos Aires province, in particular via the central market, and Mendoza Province). Per capita consumption is only 130 g per year. However, it has increased distinctly in recent years, in particular thanks to the efforts made in promotion by a leading entrepreneur (with information on the nutritional qualities of avocado and on how to eat it, advertising operations in supermarkets and promotion targeting young children, sportsmen and women and old people). Export trade is still limited.

Total exports

Exports are still very small and only two companies operate here (national imports exceed exports in most years). After starting in the early 1990s, exports fluctuate strongly between 40 and 600 tonnes according to the economic situation. Fruits are shipped mainly to the European market (sanitary barriers in the United States and Japan). Spain replaced France as the main outlet in 2003 and 2004. Slightly more than 100 t was exported to the very fussy British market in 2004. One company is approved for exports to Chile after prior treatment of the fruits.



Argentina - Avocado
Total exports



Argentina - Avocado
Exports by destination

Logistics

Markets	Main shipping lines		Shipping time	Observations	Customs tariffs
	Port of departure	Port of arrival			
EU	Buenos Aires	Algeciras	15 to 16 days		Tariff-free
		Thamesport	20 to 21 days		
Chile	By road (lorries)		4 days	Produce must be free of *Ceratitis capitata* and *Anastrefa fraterculus*	Permitted from May to August only. Tariff-free quota.

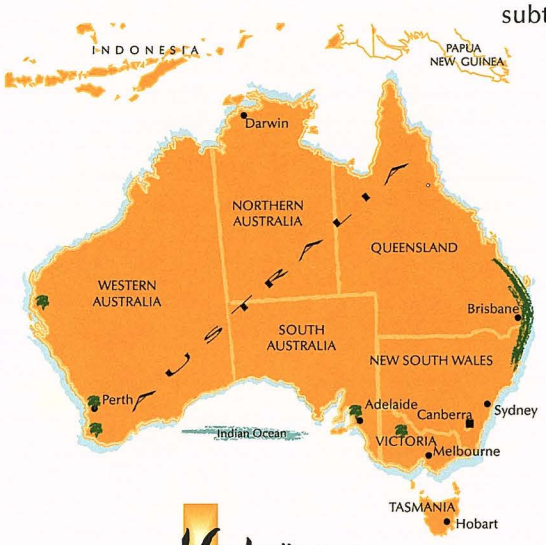
Producer country sheet

Australia

PRODUCTION developed strongly in the 1990s and has recently exceeded 40 000 t. The crop is sold almost entirely on the domestic market, which has become much more dynamic thanks to efforts on promotion managed and financed by the sector. However, the continued increase in production is making it necessary to seek new outlets, especially on export markets.

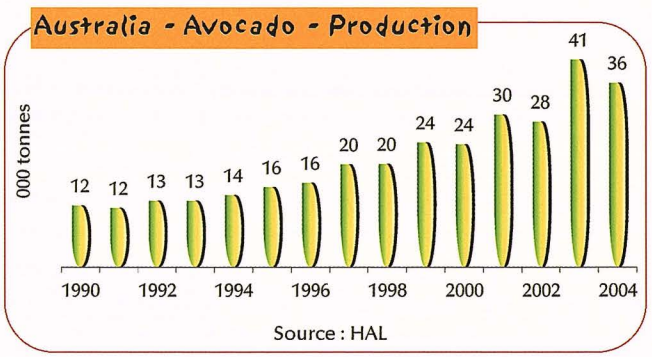
Production zone

Australia's continental size means that it possesses a great variety of geoclimatic zones, ranging from hot desert to humid tropical forest. The centre of the coastal strip in eastern Australia has a subtropical climate with mild winters and hot, humid summers that is well suited to avocado growing. Over 80% of the 4 000 ha of avocado orchards are therefore in Queensland and New South Wales, mainly between the towns of Bundaberg and Somersby. The rest of the plantations are in three other regions: Western Australia, the south-east (Southern Australia/Victoria) and the north-east (north of Queensland). This geographical dispersion means that the harvest calendar can be staggered. Production is mainly on small and medium-sized holdings (1 300 growers who generally grow 5 to 15 ha of avocado). Soil and climate conditions require strict management of control of *Phytophthora*, anthracnose and scales. The sector receives technical and marketing support from the association Avocado Australian Limited (AAL – formerly the Australian Avocado Growers' Federation), Horticulture Australian Limited (HAL) and various public research centres, especially in Queensland. An original computer program (AVOMAN) has been developed to help growers to gain better mastery of agronomic aspects.



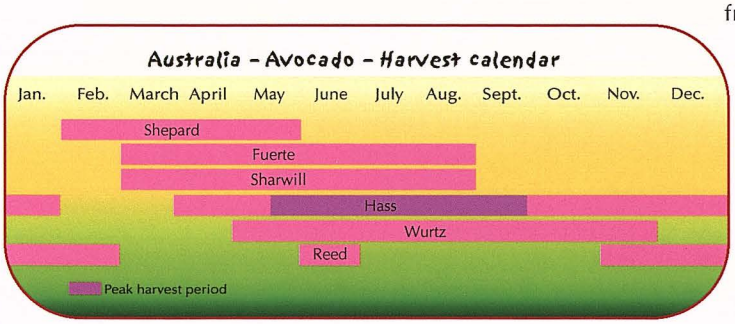
Volumes

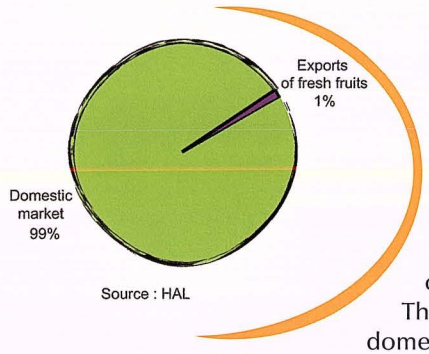
Avocado was introduced in the mid-eighteenth century but the first commercial plantations were only set out in Queensland after the introduction of Californian varieties at the end of the 1920s. The crop had its first boost with demand from American troops stationed in Australia in World War 2. However, development remained very limited especially because of serious problems with *Phytophthora* that destroyed half of the plantations in 1974. The efforts made to control the disease by the Avocado Growers' Federation, founded after the 1974 crisis, made it possible to re-launch this profitable crop in the 1980s. Production was less than 1 000 t per year until the end of the 1970s and then exceeded 10 000 t in 1988. Planting slowed strongly from the end of the 1980s until the mid 1990s when the amply supplied market became less profitable. The organisation of information campaigns, centred in particular on the health aspects, generated a strong increase in demand in the second half of the 1990s. Planting was resumed and production increased steadily, reaching 41 000 t in 2003/2004. Further development is expected in the coming years.



Production calendar and varieties

The geographic dispersion of the orchards means that production can be staggered to a considerable degree. Thus 'Hass', forming nearly 75% of production, is picked from mid-April to mid-February. The season starts in northern Queensland and volumes peak from mid-May to September with production from the plantations in southern Queensland and northern New South Wales. The season finishes in mid-February with harvests in the western provinces. The range is completed by more than 70 varieties. The main fruits are 'Reed', 'Sharwill' (bred in Australia and suitable for hot regions), 'Shepard' (an early variety also suitable for the hottest regions) and 'Wurtz'. 'Fuerte' still has a significant share but this is tending to dwindle because it has less resistance to pests and diseases (anthracnose and insects). 'Lamb Hass' and an early version, 'Llanos', bred by Australian researchers, are being tested.



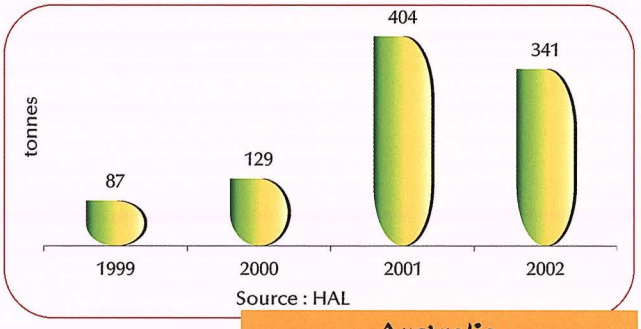


Outlets

Production is practically only for the domestic market. The promotion operations run jointly by HAL and AAL have resulted in a strong increase in domestic production, now about 2 kg per person per year. Advertising is centred on knowledge of the produce, the features of the different varieties ('Ave an avo today'), advice on preparation and the nutritional aspects. The aim is that of moving from still fairly occasional and festive consumption to more regular serving of avocado. The campaign is funded by a levy on each Australian avocado sold on the domestic market or for export (AUS$ 0.23 per 6 kg box, of which AUS$0.18 is used for marketing). The budget enables access to all the important media, including television. About 60% of the fruits are sold in supermarkets. The main wholesale markets are those of Sydney, Brisbane and Melbourne. The processing sector is comparatively little developed but very diversified (pulp, oil for cosmetics and human consumption). Exports are still negligible but would seem to be a strategic axis.

Total exports

Australian exports are still negligible (nearly 400 tonnes in 2003/2004). Avocado is shipped mainly to New Zealand, south-east Asia (Hong Kong and Singapore) and the Middle East (United Arab Emirates and Saudi Arabia). The quantities are nevertheless tending to increase. Exports form a strategic axis as increasing production encourages the finding of alternatives to the domestic market. However, access to certain markets is forbidden or subject to quarantine measures because of the presence of fruitfly (New Zealand, Japan and the United States). A request for access to the United States was made in 2002. Australia has a tariff-free quota of 4 000 t that increases annually by 10% (1 500 for the period running from 1 February to 15 September and 2 500 tonnes from 16 September to 31 January).



Australia
Avocado - Exports

Producer country sheet

Chile

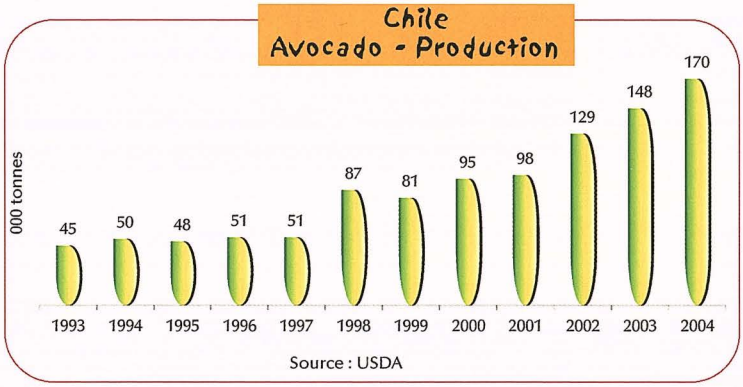
CHILE recently joined the leading producer countries that, with harvests of close of 200 000 t, follow Mexico. The strong, rapid growth of the sector has been centred on a strategy of developing exports of 'Hass' to the United States, in particular via an association with the Californian producers' association that is both original and successful. Chile has thus risen to the position of second larger exporter in the world. Increased competition from Mexico on the US market has recently lead Chilean operators to seek new outlets.

Production zone

Chile has advantages for fruit growing thanks to the natural sanitary protection formed by the sea, the Andes and the Atacama desert. Yields and earliness depend on the distance from the sea (the cold Humboldt current). Region V accounts for about 70% of 'Hass' production, divided equally between two zones. The Petorca and La Ligua river valleys in the north are a comparatively recent extension but water supplies can be limited there. The avocado orchards in Aconcagua valley, a traditional zone in the heart of the region (where the towns are La Cruz, Quillota, Hijuelas and San Felipe) have been extended into the foothills of the mountains. The recently established plantations in the Metropolitan Region (Maipo, Mapocho and Cachapoal river valleys) account for about 10% of 'Hass' production. The main limiting factors are the salinity of the irrigation water and the risk of frost.

Volumes

Production began to develop strongly at the end of the 1980s to meet demand from the US market. Growth has accelerated in recent years with an annual planting rate of over 1 000 ha from 1997 to 2004. The area under avocado has thus tripled in less than 15 years and reached some 24 000 ha in 2004. The recent decrease in the economic profitability of the crop as a result of increased competition from Mexico on the US market has resulted very recently in a slowing of the increase in plantations from an average of 8 to 10% per year to 4% in 2004. The increase in volumes should remain very strong as a proportion of the plantings has not yet attained full crop potential and some trees are not producing yet. The 200 000 t mark should be reached soon, making the Chilean harvest similar in volume to that of the United States.



Production calendar and varieties

In line with North American market demand, Chilean growers have switched to 'Hass', reported to form 85% of the harvest in 2004. The rest of the harvest consists of a broad range of varieties. Numerous Chilean varieties that were dominant in the 1970s are now in a markedly minority position and sold on the domestic market. 'Negra de La Cruz', the main variety of this kind, remains a much appreciated late cultivar. The proportion of 'Fuerte' has decreased strongly. Other varieties are grown such as 'Edranol', 'Bacon' and 'Zutano' but are used mainly for the pollination of 'Hass'.

The production calendar is long thanks to the distribution of plantations in latitude and distance from the sea. The bulk of the harvest in picked from September to December.

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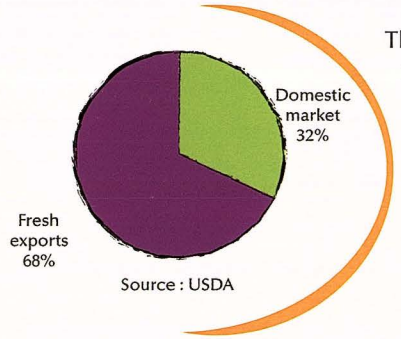
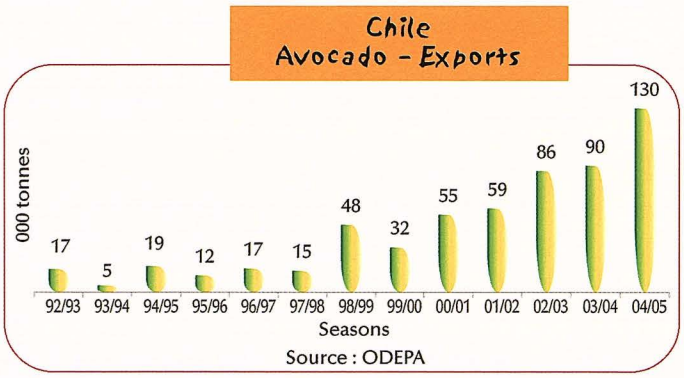
Outlets

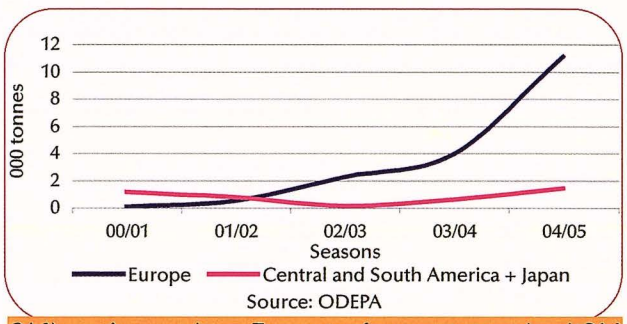


The export orientation of the Chilean avocado sector is obvious. However, the strong increase in production in recent years and the simultaneous increase in competition from Mexico in the United States are leading producers to diversify their outlets. Numerous promotion operations have thus been run in recent years to develop domestic consumption; this is currently about 3.5 kg per person per year. These campaigns organised at the initiative of the Comité de la Palta highlight the nutritional and health aspects (dia de la Palta, etc.). The first processing unit (producing extra virgin oil) was only started up in 2004 and the quantities processed are marginal.

Total exports

The explosive growth of exports since the end of the 1990s is exemplary. This should be ascribed to a considerable extent to the work of the Comité de Palta, an organisation for the domestic and international promotion of the sector financed by professionals. This body has developed an original collaboration strategy with the California Avocado Commission (CAC) so that both can benefit from US market potential (exploitation of complementary features in the production calendars, regulation of supply and advertising operations). Volumes therefore increased from less than 20 000 t in 1997/1998 to nearly 100 000 t in 2003/2004. However, the sector relies on a 95% share of its sales to a US market that is becoming increasingly competitive with the broader opening to Michoacan fruits. Chilean exporters are therefore trying to diversify their outlets. There is a tendency for shipments to the EU to increase (especially to the United Kingdom, France and Spain). The enormous potential of the EU market is attractive but its remoteness makes it financially and technically risky (controlled atmosphere is necessary to extend fruit life to 45 days). The situation is similar for Japan—a very profitable market—but the potential is smaller. Shipments to Argentina, a country where avocado consumption is small, are limited because of the fragile Argentinian economy.





Chile - Avocado - Exports (except to the USA)

Logistics

Most of the produce is taken by road to the port of Valparaiso; this is close to the production zones and has a USDA inspection post. In the United States, Chilean exporters benefit from the efficient Californian distribution network. Controlled atmosphere is always used for shipments to Japan and for some two-thirds of shipments to the EU.

Market	Main shipping lines		Shipping time	Observations	Customs tariffs
	Port of departure	Port of arrival			
United States	Valparaiso	West coast: Los Angeles Long Beach San Diego	12/17 days	The bulk of US imports	45 000 t tariff free circa EUR350 per tonne, degressive until full liberalisation in 2015
		Florida: Miami	10/12 days	Limited quantities	
		East coast: New York Philadelphia	15/22 days	Limited quantities	
Japan		Tokyo	25 days		
EU	Valparaiso	Dunkirk Rotterdam Algeciras Felixstowe	21 days 20 days 17 days 22 days		Tariff free since 1 January 2003

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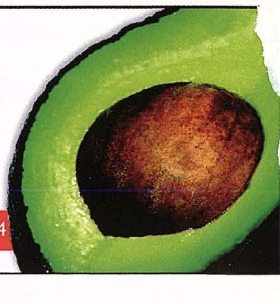

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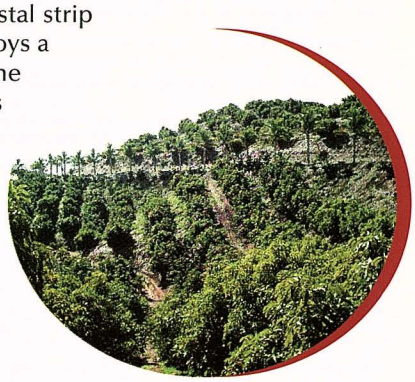
Producer country sheet

Spain

AVOCADO growing started in the early 1970s and developed rapidly. Spain is now one of the 15 leading producer countries with production of approximately 60 000 tonnes. Spain is the only EU country to produce significant quantities of avocado in continental Europe, thanks to the special climatic conditions on the Andalusian coast. The origin is a major player on the community market, where it concentrates shipments making use of its comparative advantages in logistics and customs rules.

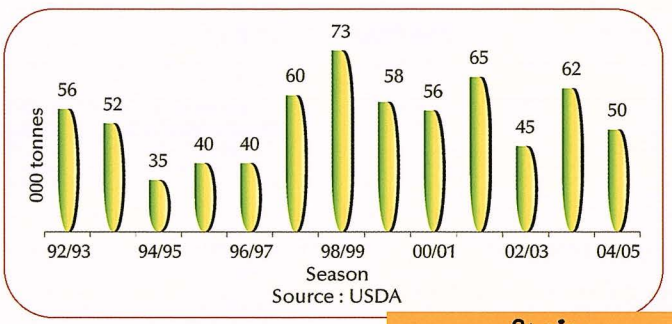
Production zone

About 9 000 ha is planted with avocado, 90% of which is on the Andalusian coast between the sea and the foothills of the Sierra Nevada (Costa Tropical). This coastal strip some 80 km long and 10 km wide between the west of Malaga and Motril enjoys a special climate. Winters are mild and the small rainfall is compensated by the availability of fairly large quantities of good quality water impounded by dams in the Sierra Nevada. Sanitary problems are limited to fungal root diseases. Population and tourist pressure means that the areas west of Malaga are tending to stabilise or diminish and plantations are developing strongly in the Axarquia and to a lesser degree in the Granada region, where the crop is more difficult to handle. A few pioneer orchards totalling about a hundred hectares have been planted recently in the Alicante region. Most of the remaining plantations are at Las Palmas and Tenerife in the Canary Islands.



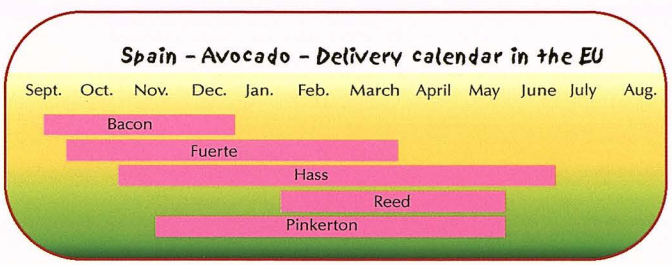
Volumes

The crop was introduced long ago in the Canaries (in the sixteenth century) but only recently in mainland Spain. The first large plantations were started in the early 1970s. The 1 000-hectare mark was reached only at the beginning of the 1980s, but the area then increased seven-fold in a decade (with the development of the water infrastructure and open field vegetable crops faced with competition from the emerging agriculture in the Almeria area). In recent years, production has oscillated between 55 000 and 65 000 t. It can dip more markedly during seasons in which the climatic conditions are particularly serious (drought, wind or frost). Production should exceed 75 000 to 80 000 tonnes in 2010 thanks to active planting in the Axarquia since 2000. Nearly 80% of farms are of the traditional kind and cover less than 5 ha. These coexist with modern large-scale plantations.



Spain
Avocado - Production

Production calendar and varieties



'Hass' forms more than three-quarters of production and is tending to increase. The main smooth varieties grown are 'Fuerte' and 'Bacon', the latter also serving as pollinator and wind-break. The range is completed by a few plantations of 'Reed'.

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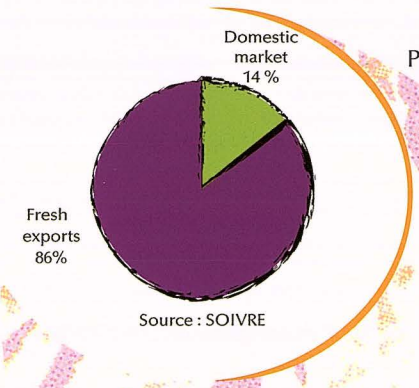
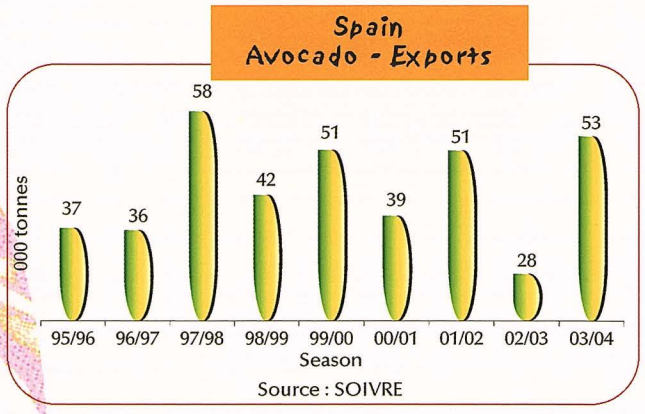
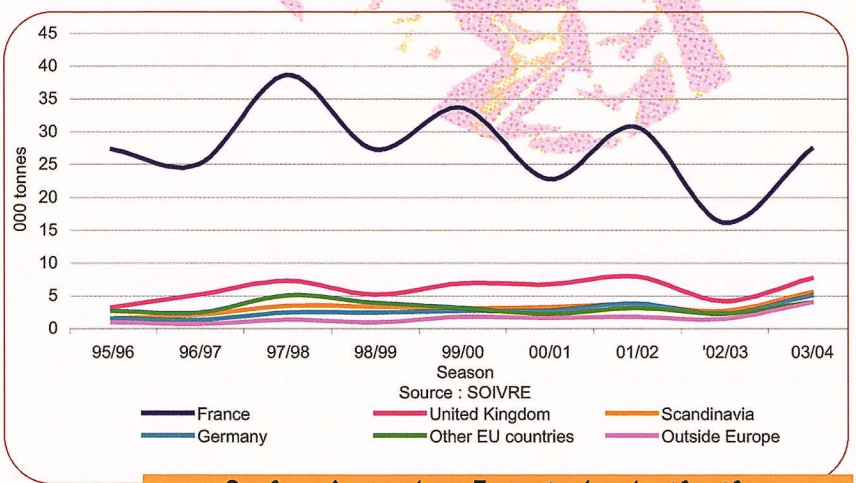


Priority is awarded to shipments to the other EU countries, given Spain's logistic advantages. However, the domestic market—curiously almost non-existent in the early 1980s—is growing. Consumption is some 550 g per person per year and is among the smallest observed in producer countries but it has been growing in recent years. Development should speed up in the years to come as there is a wave of immigration from large consumer countries in Latin America, Spanish consumers now know avocado better, etc. A few processing units exist (producing oil and pulp), including a large recent one.

Exports



Exports cleared the 10 000-tonne mark in the 1980s and increased strongly between the beginning and end of the 1990s. Exports total some 50 000 t in a normal production year but can fall to 30 000 t (2002/2003 season). The European Union is practically the only market targeted by Spanish exporters. Road transport is economical and fast, especially for consignments for France, the leading EU consumer country. Furthermore, Spain has the advantages of the common market, especially with regard to the customs status—in contrast with all its competitors. France is the main market for Spanish avocado but exporters are diversifying their outlets. Shipments to the United Kingdom and, more recently, to Germany, are increasing distinctly. Scandinavia (especially Sweden) is receiving increasing quantities as is Morocco, outside the EU (taking the cheapest fruits). Shipments to eastern European countries have still not developed much. A few batches are also shipped to distant destinations. Most of the crop is marketed by a cooperative and a small number of traders, some of whom are also producers. There is no interprofessional body.



Spain - Avocado - Exports by destination

Logistics

Transport is by road only for the supply of the EU markets. Most of the shipments travel via deconsolidation platforms at the Saint-Charles wholesale market in Perpignan to which deliveries take about 16 hours. The United Kingdom and Scandinavia are supplied within 72 hours. Shipments to distant markets are by air from Malaga airport.

United States

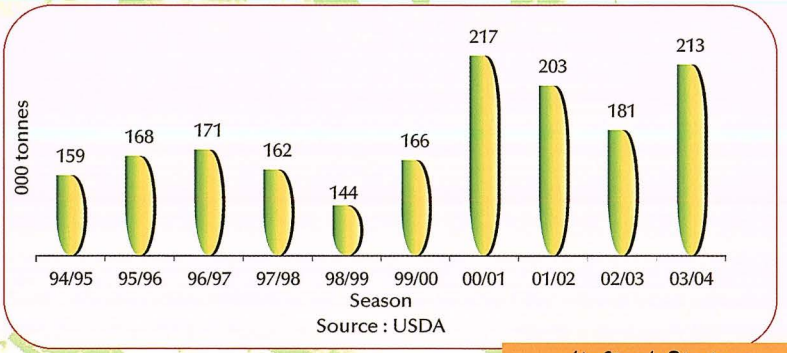
THE position of the United States is special, not only because it is the third largest producer in the world with a crop of some 200 000 t. Indeed, Californian growers have long experience in the crop and, after joining forces very early on, have been a driving force in the development of the world avocado industry. This applies both to the agronomic level (in particular with the launching of 'Hass' and 'Fuerte') and to the promotion of sales. The domestic market takes practically all Californian production and is growing strongly. However, development of the sector is affected by high production costs.

Production zone

California is the only part of the country where the conditions are suitable for growing varieties bred from the Guatemalan race (mainly 'Hass') thanks to the coastal microclimate. Approximately 90% of national avocado production is grown there. Plantations are concentrated on the hills in the south-west part of the state. Two-thirds of Californian avocado production is from the zone between Los Angeles and the Mexican border (52% in San Diego County, 13% in Riverside County and 2% in Orange County). The rest of the orchards are between Los Angeles and Monterey (19% in Ventura County and 2% in San Luis Obispo County). A large number of small farms with less than two hectares of land and low technical facilities coexist with large industrial structures. The main agronomic problems are *Phytophthora* and thrips. However, high production costs (water and labour are concerned in particular) form the main obstacle in the sector. For reasons of climate, the other producer states concentrate on West Indian varieties. Florida accounts for 10% of national production and practically all the orchards are in Dade County south of Miami. Hawaii produces some avocado, mainly for its local market.

Volumes

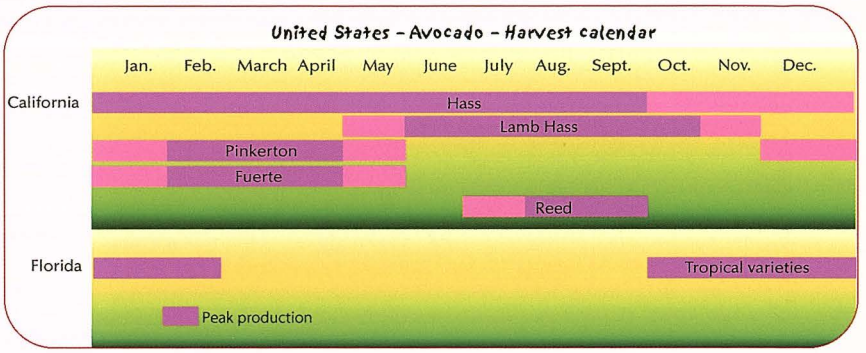
Although avocado was introduced in the mid-nineteenth century, the first commercial plantation was set out in California in 1906. Growers joined forces in 1915 to improve production techniques (the California Avocado Society was founded in 1941) and also from the beginning of the 1970s to step up sales promotion (with the institution of a levy to provide funds for advertising). The subsequent boom in demand led to a strong increase in the areas under avocado with an increase from about 10 000 ha in 1973 to 35 000 ha in the mid-1980s. This golden age was followed by a period of decline (the market was less profitable and land and water prices increased). The total area had stabilised at about 26 000 ha and is now increasing again (some 2% per year is forecast until 2010, mainly in the Ventura region) thanks to the good economic performances of recent years. Furthermore, the fairly low average yields resulting from the heterogeneity of the production structure are rising as small growers are using better cultural practices and the orchards with low production are being replaced. Research support is provided mainly by Californian universities (UC Riverside and UC Davis in particular).

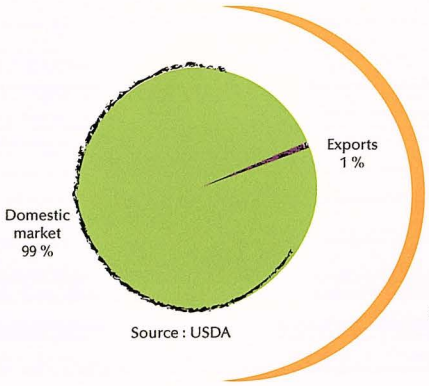


United States
Avocado - Production

Production calendar and varieties

Hass is clearly dominant in US production, forming some 90% of California avocado orchards. The other significant varieties grown in the state are 'Bacon' (3%), 'Lamb' (2.5% but increasing markedly) and Fuerte (1.7%). There are also several plantations of 'Zutano', 'Gwen', 'Reed' and 'Pinkerton'. For reasons of climate, the range grown in Florida is very different and based on West Indian varieties ('Pollock', 'Simmonds') and hybrids ('Lula', 'Booth', 'Choquette').



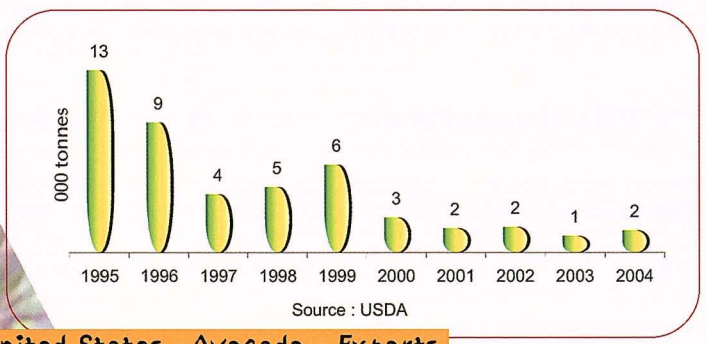


Outlets

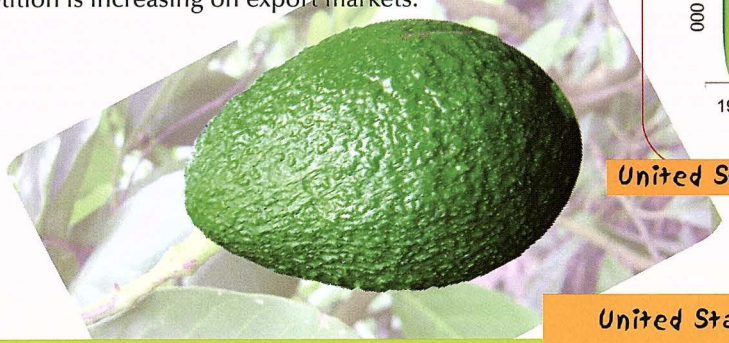
The sector is practically exclusively devoted to the strongly expanding domestic market thanks to the exemplary promotion activities performed by the California Avocado Commission (see the chapter on US markets). Exports are extremely limited, as are the quantities processed.

Total exports

Exports have always formed a minor outlet. Nonetheless, the volumes shipped reached a significant level at the beginning of the 1990s (some 10 000 to 15 000 t exported annually between 1993 and 1996). The main markets were Europe (France, the Netherlands and the United Kingdom), Asia (Japan and, to a lesser degree, South Korea) and Canada. The quantities have been marginal in recent seasons (less than 2 000 t since 2001). On the one hand the domestic market is very profitable and on the other hand competition is increasing on export markets.



United States - Avocado - Exports



United States - Avocado - Exports by destination

Tonnes	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Canada	1 894	1 098	1 292	976	1 000	790	1 130	768	670	692
Other	233	187	321	196	321	296	285	245	185	630
Japan	2 017	2 693	1 779	881	883	1 127	341	832	336	273
Europe	8 942	5 347	794	2 635	4 105	305	5	3	7	6
TOTAL	13 086	9 325	4 186	4 688	6 308	2 518	1 760	1 849	1 199	1 600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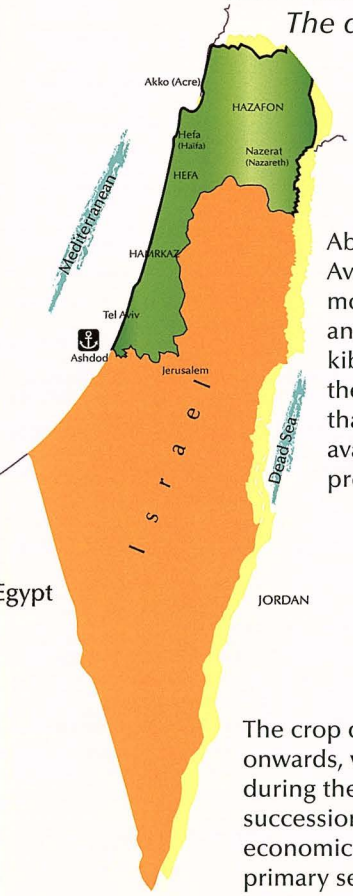
Producer country sheet

Israel

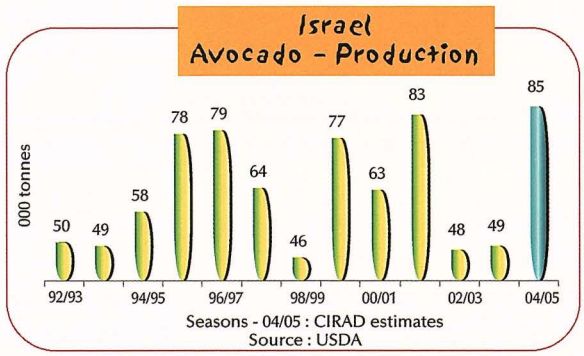
A PIONEER and major origin in the Mediterranean area, Israel is among the ten to twelve leading producer countries, with production of some 80 000 tonnes—increasing. Export-oriented, it covers a significant proportion of EU market supplies during the winter season and has contributed substantially to making avocado known. Still concentrated in spite of the end of the state monopoly, the export sector historically aimed at the French market is diversifying its outlets (United Kingdom, Eastern Europe, etc.). The domestic market plays a major role.



Production zones

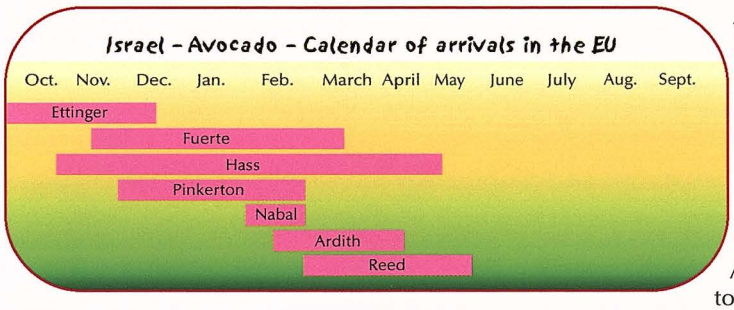
About 70 % of avocado production is in a coastal strip barely 15 km wide running from the north of Tel Aviv to the Lebanese frontier. The plantations north of the town of Acre in western Galilee are along the most reputed. About 20% of the area under avocado is in Upper and Lower Galilee and the Jordan Valley and the remaining 10% is south and east of Tel Aviv. Nearly three-quarters of production is from kibbutzim, co-operative farming organisations. The country has about ten packing stations and two of these alone pack about half of production. Sanitary problems are limited (no *Phytophthora)*, in particular thanks to the climate. Rational farming is therefore very widespread and average yields are high. The availability of irrigation water is one of the main limiting factors and water forms a large proportion of production costs.

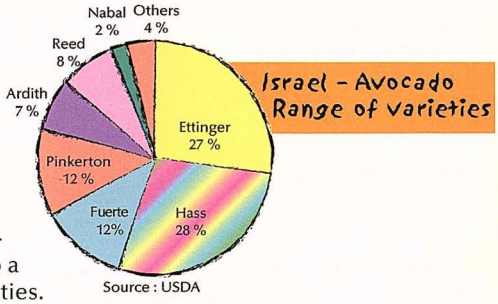
Volumes



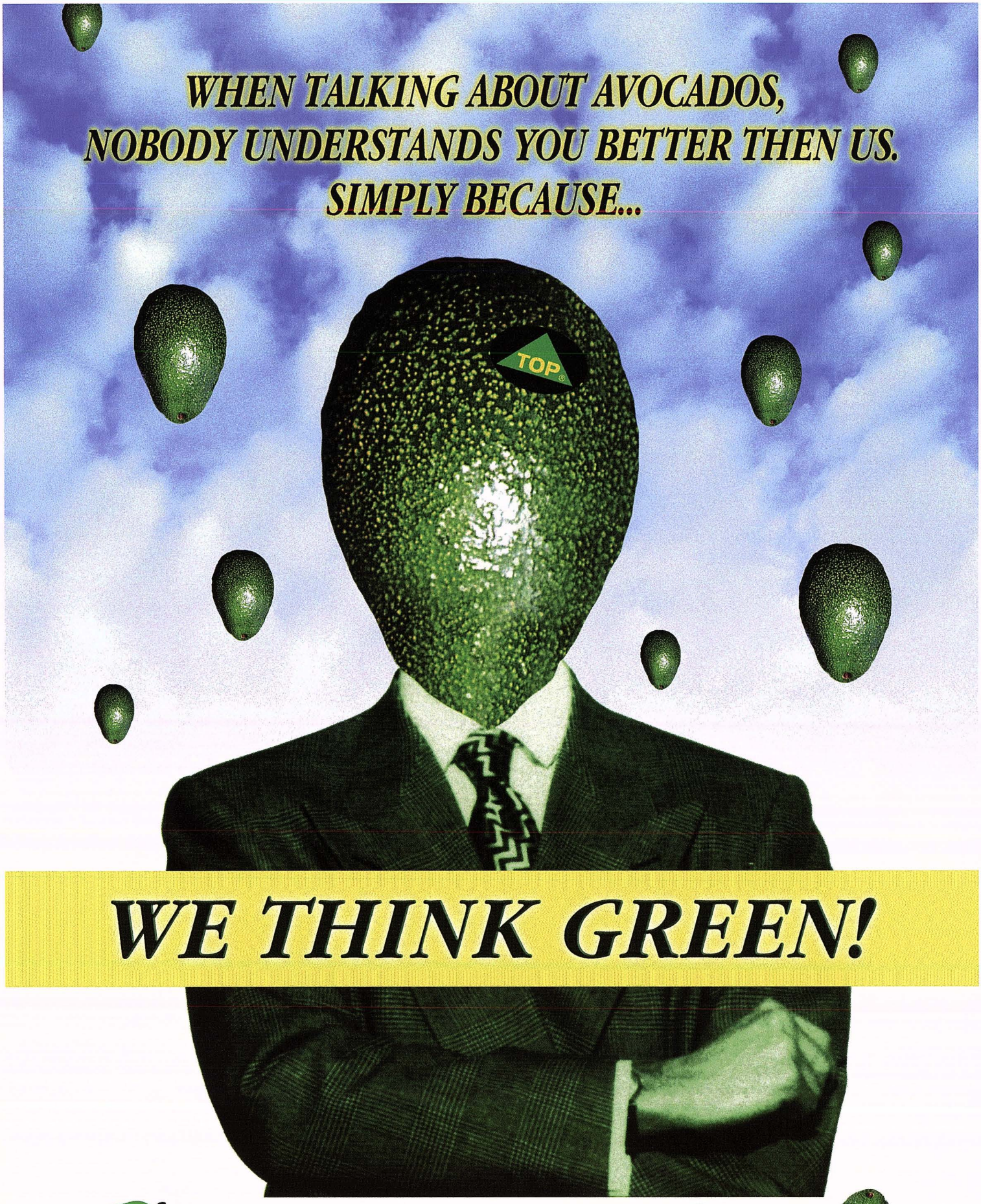
The crop developed rapidly from the end of the 1950s onwards, with plantations culminating at 11 000 ha during the 1980s. The area then halved after a succession of difficult seasons and the setting up of an economic policy that was less favourable for the primary sector. Avocado has been grown on about 4 500 ha since the end of the 1990s and production is about 70 000 to 80 000 t in normal seasons (the Hamsin, a hot wind that sometimes blows from April to June, can cause a strong decrease in production). The area has increased recently (+ 100 ha per year) and yields have also increased. Production should therefore increase noticeably in the coming years and could reach 100 000 t between 2010 and 2015. The Volcani Center provides considerable research support.

Production calendar and varieties





The season is comparatively long thanks to a broad range of varieties. This has changed considerably. 'Ettinger', a locally bred cultivar, and 'Hass' have developed strongly at the expense of 'Nabal' and 'Fuerte', although the latter is well represented. Emphasis is currently laid on 'Hass' and this forms more than 60% of new plantings (it should cover 35% of the total area under avocado in 2010). Among green varieties, 'Pinkerton', and 'Ardith' and 'Arad' to a lesser degree, should develop at the expense of 'Ettinger'.

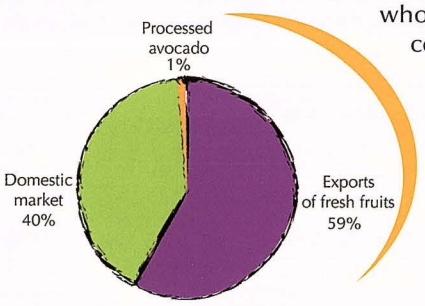


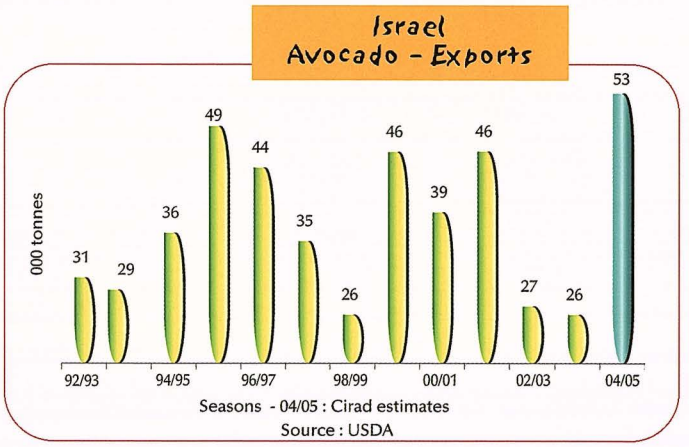
Mehadrin Tnuport Export (L.P.)

Mehadrin International
5, rue de la Corderie
Centra 315
94586 Rungis cedex
Tel: 01 46 86 8713
Fax: 01 46 86 8711
E-mail: contact@mehadrin-inter.com

Outlets

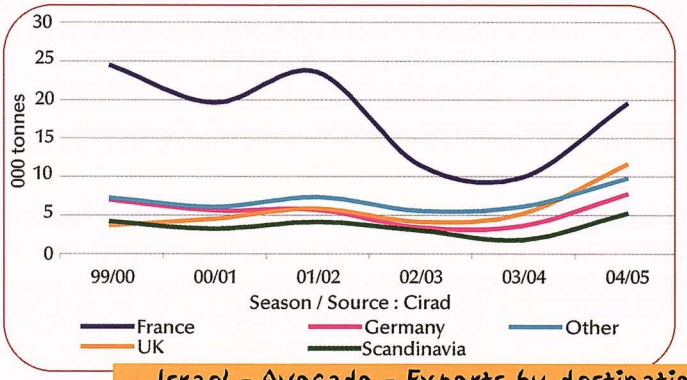
The sector is export-oriented. However, the domestic market plays a key role as it is very profitable even for produce that does not meet export quality standards. Today, the some 6.4 million people who live in Israel purchase about 35 to 40% of the quantity grown. Per capita consumption is therefore among the highest in the world, oscillating between 3 and 5 kg per year according to production volume and prices. Large fruits are preferred (sizes 10 to 14) especially for 'Ettinger'. The quantities available for processing are therefore very limited. The oil mill has closed and the pulp factory is operating at low output.



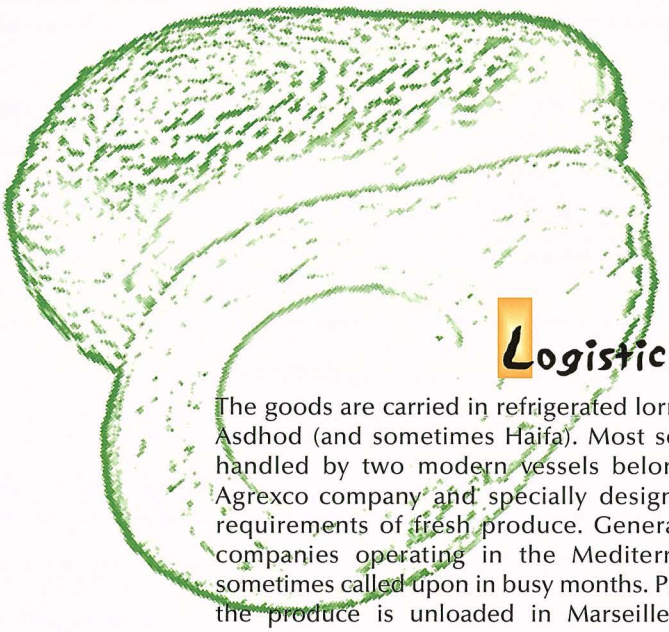


Total export

Exports follow the markedly cyclic production and have increased very slightly since the 1980s recession. Quantities currently vary from 45 000 to 53 000 t in seasons with normal weather conditions. Practically all the fruits exported are shipped to the European Union, where Israel has contributed strongly to making avocado known and developing consumption. France is still the main outlet but its market share has decreased to approximately 40% today. For a number of seasons, exporters have used a diversification strategy based on shipments targeting the expectations of each market as regards size and variety. Shipments of 'Hass' to the United Kingdom have thus increased strongly. Germany and Scandinavia are still key markets for green varieties. Shipments to the eastern EU (especially to Poland) have development strongly in recent seasons and are now significant. The Agrexco company was the only sector player for a long time and is still the main exporter but today shares the market with the companies Mehadrin, Kedem-Hadarim and Bachan-Development.



Israel - Avocado - Exports by destination



Logistics

The goods are carried in refrigerated lorries to the port of Asdhod (and sometimes Haifa). Most sea transport is handled by two modern vessels belonging to the Agrexco company and specially designed for the requirements of fresh produce. General shipping companies operating in the Mediterranean are sometimes called upon in busy months. Practically all the produce is unloaded in Marseilles and then carried by road to the various consumer countries.

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Market	Main shipping lines		Shipping time	Observations	Customs tariffs
	Port of departure	Port of arrival			
EU	Ashdod	Marseilles	3 days	Vessels specific for the purpose	

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2, rue de Provence,
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Succursale
Entrepôts 712/714
MIN des Arnavaux
13323 Marseille
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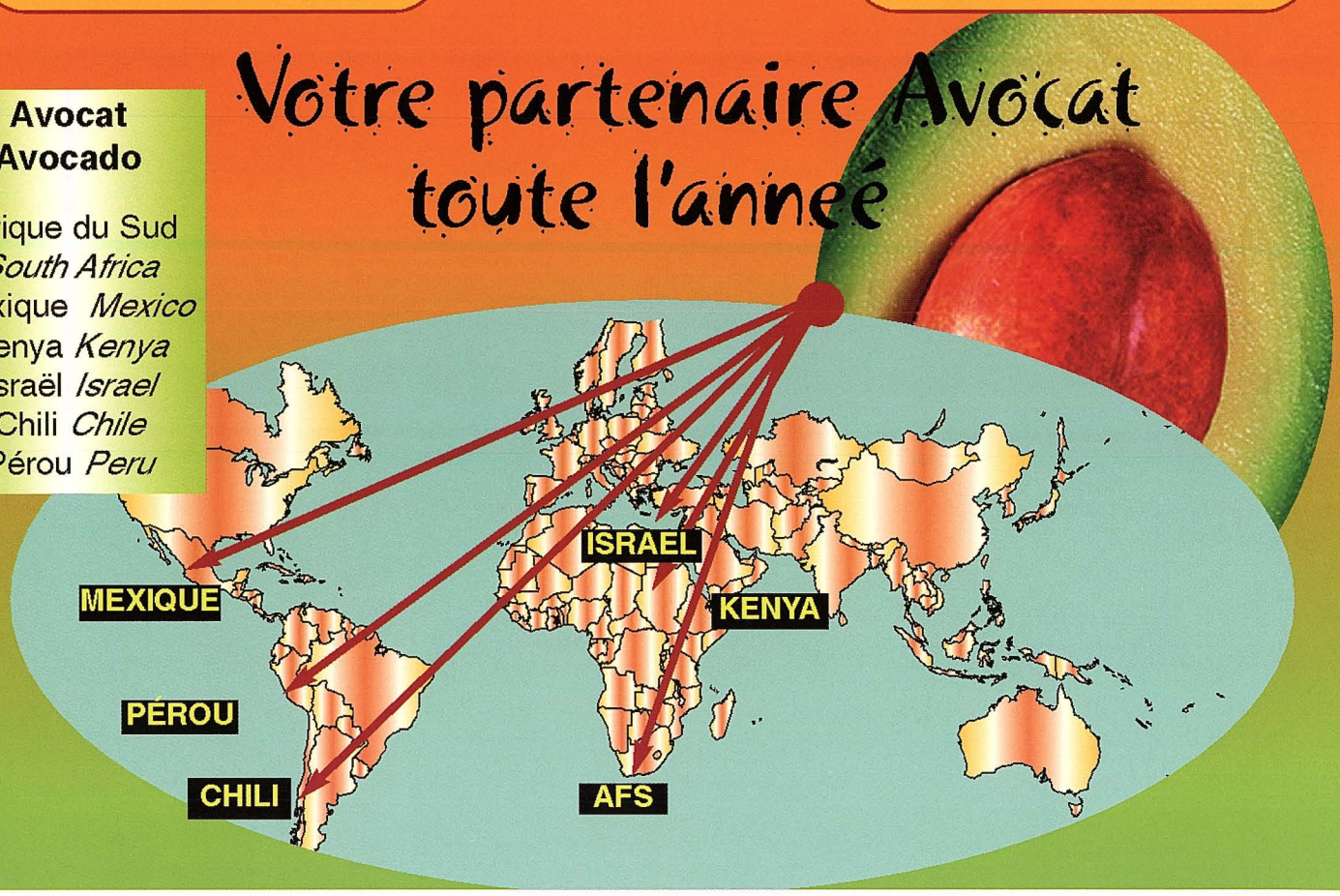
Votre partenaire Avocat toute l'année

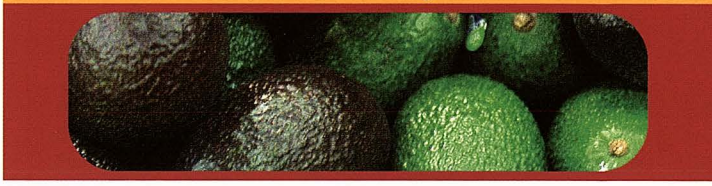
Avocat
Avocado

Afrique du Sud
South Africa
Mexique *Mexico*
Kenya *Kenya*
Israël *Israel*
Chili *Chile*
Pérou *Peru*

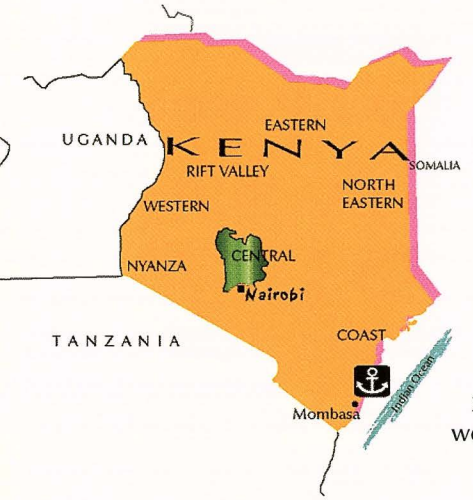


Producer country sheet

Kenya

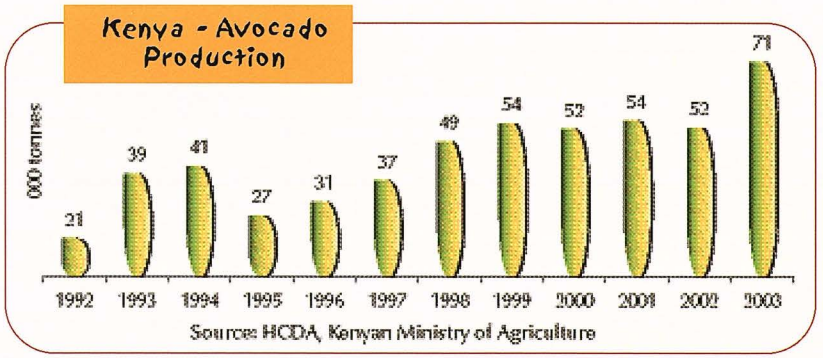


AVOCADO is one of the pillars of the Kenyan horticultural sector that earns about a quarter of the country's wealth. The greater part of production is on very small holdings with limited technical resources. These coexist with a large industrial type plantation. Kenya plays an important role in out-of-season supply of the European market, in particular shipping smooth varieties to France. Support programmes for small growers have been set up to develop production (in particular of 'Hass') and to address the uneven quality of fruits.



Production zone

Kenya consists mainly of savannah and desert, with only 15% of the area usable for agriculture. Almost all the farm land is on the plateaux in the south-west quarter of the country (Midlands and Highlands). Avocado is grown mainly in the zone between Nairobi and Mount Kenya. Rainfall is sufficiently plentiful (average 1 200 mm per year) and well distributed, limiting the need for watering. The volcanic soils drain well, avoiding the *Phytophthora* problems that are serious in the Western province. Temperatures are mild at between 16 and 24°C as the elevation ranges between 1 200 and 2 200 m and avocado can be produced for much of the year. Areas are being developed west of Nairobi in the central and southern part of the Rift Valley.

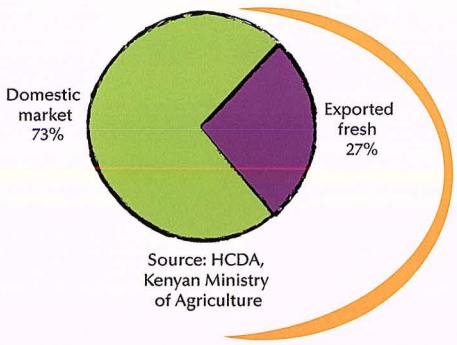


Volumes

Avocado was introduced a long time ago but cultivation began only in the mid-1970s. With state support and encouragement, small growers turned more significantly to horticulture, especially after the fall in world coffee and tea prices. In parallel, private companies became involved in collection, packing and export. Today, three-quarters of production is still in the hands of small growers who have only a few trees. Programmes to provide technical support for small farms have been set up in particular by NGOs. These are aimed at reducing the unevenness of fruit quality and involve selection according to maturity, treatment to prevent anthracnose in very wet years, traceability, etc. and at improving the organisation of this part of the sector. These structures coexist with a very large industrial plantation of 'Hass'. Production—especially of 'Hass'—should increase considerably over the next five years.

Production calendar and varieties

'Fuerte' is the main variety and produced for most of the year. The tropical climate means that up to three flowerings a year are possible. Furthermore, the season is extended by the great range of elevations of the plantations. Production peaks between the end of February and the end of August. Availability is reduced from November to January. Some 20% of exports consisted of 'Hass' in 2004. The variety is tending to develop strongly, especially among small growers. Planted mainly at between 1 800 and 2 200 m, 'Hass' has a more concentrated season than 'Fuerte'. It starts in June and generally finishes in September. Other green varieties ('Reed', 'Booth 8', 'Pinkerton', etc.) are grown but not exported.



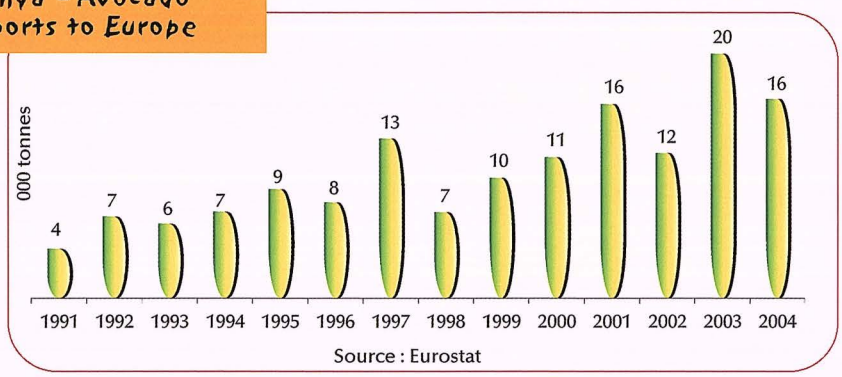
Outlets

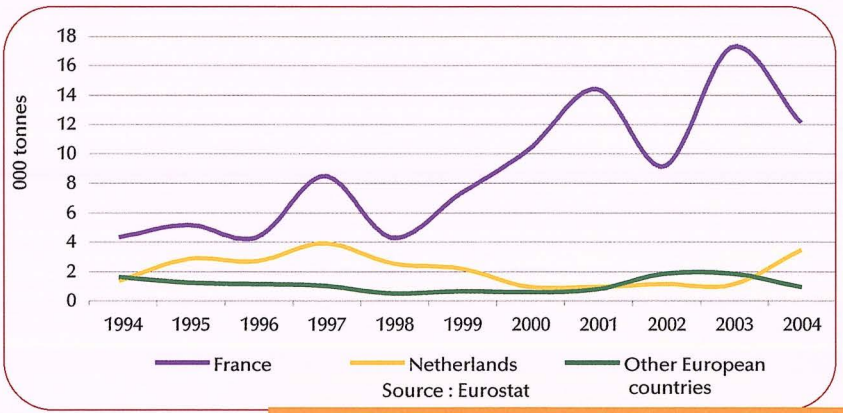
Approximately a third of production is exported. Most is consumed on the farm or sold on the local market at very low prices. Hotels and restaurants are very present in this country specialising in tourism and form more lucrative market segments. Numerous small processing units (small oil mills and soap manufacturing facilities) use sorting rejects and fruits that cannot be sold for lack of transport facilities.

Total exports

Exports were small until the early 1990s. They then increased markedly and steadily and exceeded 10 000 t in 1997 as production was larger and sea freight replaced air freight. Growth accelerated from the beginning of the 2000s. On the one hand, a number of importers developed a new market segment centred on Kenyan 'Fuerte' (low-price avocado, generally small and packed in nets containing three or four fruits). On the other hand, supplies diversified as the production of 'Hass' increased. The six exporters target practically only the European market, with a few batches sold in the Middle East and South Africa. French importers are the European leaders for the origin, with the fruits being unloaded mainly in Marseilles (some importers only handle avocado sporadically). The fruits are sold mainly in France but an increasing proportion is re-exported, to Germany in particular. The Rotterdam hub has lost ground in recent years.

Kenya - Avocado
Exports to Europe





Kenya - Avocado
Exports to Europe by destination

Logistics

The fruits from smallholdings are collected, often by middlemen, and transported by road to the packing stations in Nairobi, a journey that takes about two hours. The boxes are loaded directly into reefer containers, trucked in eight to ten hours to the port of Mombasa 500 km away.

Markets	Main shipping lines		Shipping time	Observations	Customs tariffs
	Port of departure	Port of arrival			
EU	Mombasa	Marseilles Rotterdam/Amsterdam	12 to 15 days 21 days		
Middle East	Mombasa	Dubai	8 days		

Producer country sheet

Mexico

Mexico exerts very strong, historical domination of world production with a crop oscillating between 900 000 and 1 000 000 t in recent seasons (about a third of total world production). In contrast, its position as the world's leading exporter is very recent. Shipments were still limited at the end of the 1990s and have increased strongly in recent years, in particular thanks to the gradual opening of the United States frontier within the framework of the North American Free Trade Agreement (NAFTA). However, the very profitable domestic market is still by far the main outlet and consumption is a record 8 kg avocado per person per year. The state of Michoacan is the site of nearly 90% of production.

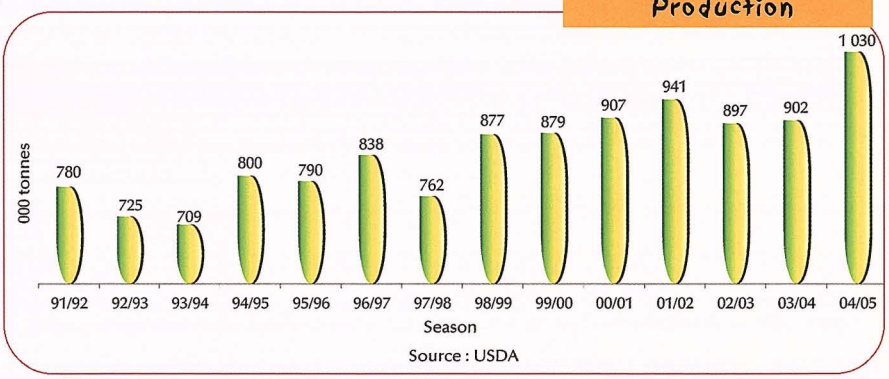
Production zone

Nearly 90% of the 100 000 ha under avocado is in Michoacan, a province in the south-west of the country. The advantage of this mountainous region is that production is possible for much of the year as the plantations range in elevation from 1 600 to 2 400 m. In addition, plentiful rainfall from June to September covers half the annual water requirements. More than 70% of production is in five districts, in the centre of the state: Uruapan, Tancitaro, Periban, Ario de Rosales and Tacambaro. Production is completed by plantations in the states of Nayarit, Morelos, Pueblas, Mexico, Sinaloa, Guanajuato and Jalisco. Average farm size is 10 ha. Yields vary according to the zone from 6 to 12 t per ha (average 10 t) for trees that are an average of 20 years old.

Volumes

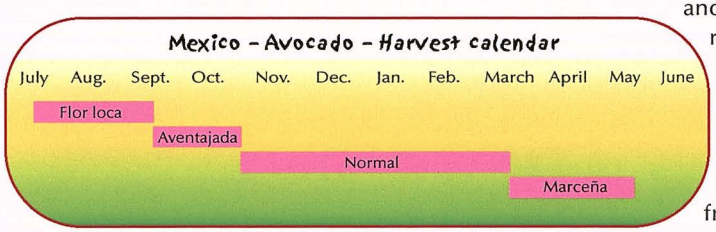
Still modest in the 1970s, production increased strongly in the 1980s when a great number of farmers in Michoacan replaced their traditional crops (coffee, etc.). In recent seasons the harvest has ranged from 900 000 to 1 000 000 t. Production should continue to increase slightly, in particular as young orchards are reaching maturity and yields are increasing steadily with the improvement of the technical skills on farms.

Mexico - Avocado Production



Production calendar and varieties

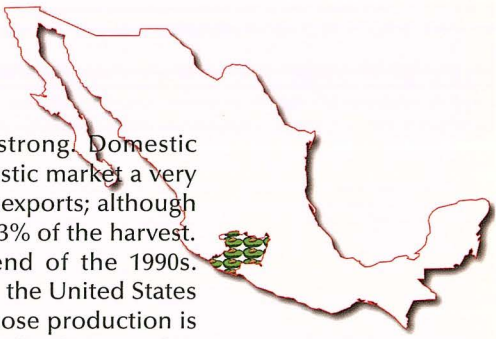
Introduced from California in the 1950s, 'Hass' is by far the most commonly grown variety in Mexico. Some plantations of indigenous cultivars are also found ('Sinaloa', 'Perfecto', etc.) and also 'Fuerte' and 'Nabal'. The special cultural conditions of 'Hass' in Mexico mean that several flowerings are possible during the year. Each gives fruits with different characteristics. These multiple flowerings and the range of different elevations ensure production all the year round, with smaller harvests from May to July.



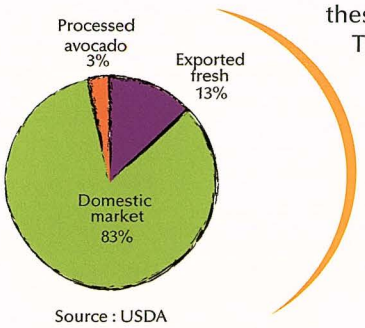
Observations

- Flor loca: the fruits are small as they are the first to be harvested. Round and smooth, they are the Mexicans' favourite.
- Aventajada: pear-shaped, granular fruits.
- Normal: the main flowering; the fruits are similar to the aventajada fruits.
- Marceña: late flowering and fruits of varied appearance, small size, pear-shaped with a thick skin. However, they taste good as the oil content is high as a result of strong sunshine.

Outlets



Avocado is a staple in the Mexican diet and the domestic market is extremely strong. Domestic consumption is a record 8 kg per person per year. The high prices also made the domestic market a very attractive outlet, accounting for the relatively small volumes of exports; although these have increased in recent years they account for only 13% of the harvest. The volumes intended for industry increased at the end of the 1990s. Growing demand for fresh or frozen pulp in Europe and the United States was a driving force. There are also several oil mills, whose production is mainly for the pharmaceutical industry. The 3% of the harvest that Mexico devotes to the processing sector is sufficient to make it the world leader.

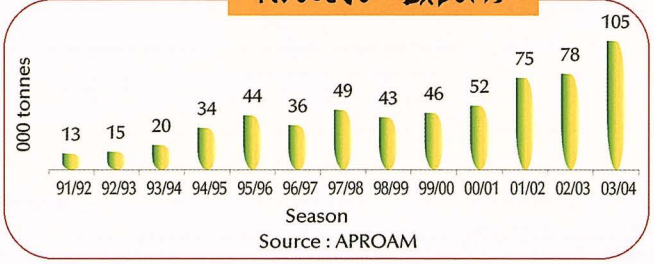


Source : USDA

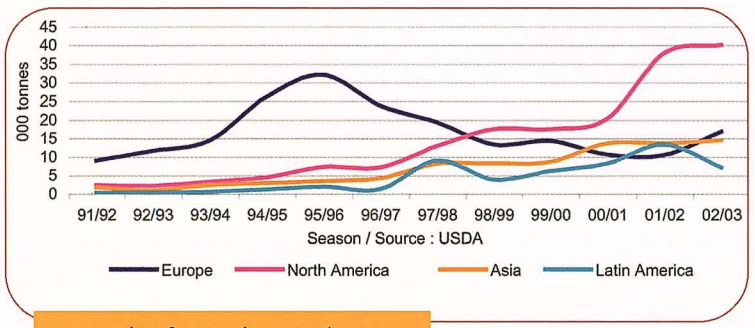
Total exports

Exports developed markedly in the early 1990s thanks to increasing interest from European and especially French customers. Shipments peaked at nearly 35 000 t in 1995/1996 and then the quantities decreased rapidly in the following seasons because of a more competitive community market and a strong dollar. The partial lifting in January 1997 of the US sanitary protection measures concerning fruitfly caused a complete change in trend because of the closeness and profitability of the market. Avocado exports from Michoacan, the only approved production region, increased steadily as US regulations eased progressively: 19 states were authorised in 1997 for a period running from November to December, and then from 1 November 2001 onwards avocado could be shipped to 31 states from 15 October to 15 April and, since 1 February 2005, 47 states with no date restrictions. Access will be totally free in 2007 within the framework of NAFTA. Shipments to the EU gained momentum from 2003 onwards thanks to a favourable euro:dollar exchange rate and an increase in demand for 'Hass' in France. Exports to neighbouring markets in Central America (Salvador, Costa Rica, etc.) are also tending to develop. The ASEAM coordinates shipments to the United States and collects the budget to cover promotion operations. Six or seven companies (mainly with US capital) export 80% of the volumes.

Mexico Avocado - Exports



Source : APROAM



Mexico - Avocado Exports by destination

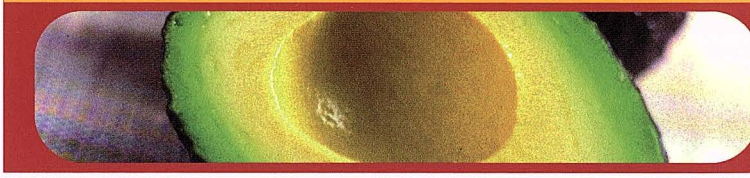
Logistics

Containers are loaded at the packing station. The produce to be shipped to the EU is hauled by road from the production zone to Altamira, the Tamaulipas state port on the Gulf of Mexico (east coast), more than 900 km away. The journey takes about 24 hours. The fruits to be shipped to Japan leave from Lazaro Cardenas port on the west coast about 250 km from the production zone. The United States market is supplied by road (about 1 400 km to the frontier, a some 20-hour journey). US imports are duty-free.

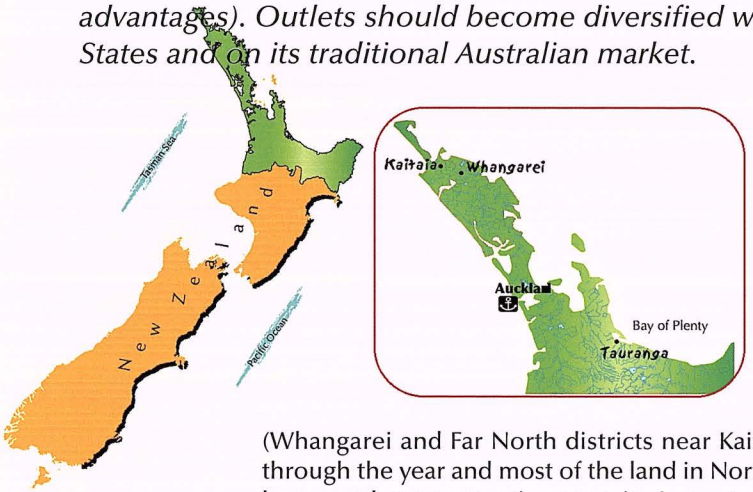
Market	Main shipping lines		Shipping time	Observations	Customs tariff
	Port of departure	Port of arrival			
EU	Altamira	Antwerp	14 to 18 days	Timetable on www.tmm.com CMA/CGM	01/06 to 30/11: 0% with Eur 1 (2.2% if quota exceeded) 1.6% with Form A
	Lazaro-Cardenas	Rotterdam	14 to 15 days	Maersk line planned	01/12 to 31/05: 0% with Form A 1.2% with Eur 1
Japan	Lazaro-Cardenas	Yokohama/Kobe	14 to 15 days	Opening possible in spring 2005	0% since 01/04/05

Producer country sheet

New-Zealand



AVOCADO production is still modest at some 12 000 t but is increasing rapidly in the northern part of North Island. In the past decade avocado has become the third largest fruit crop in the country, way behind kiwi and apple. New Zealand should be among the world's twenty leading producer countries by the beginning of the next decade. The sector is well organised around active producers' (AGA) and exporters' associations (AICL) and is above all export-oriented (the country has recognised experience and sanitary advantages). Outlets should become diversified with the increase in competition in the United States and on its traditional Australian market.

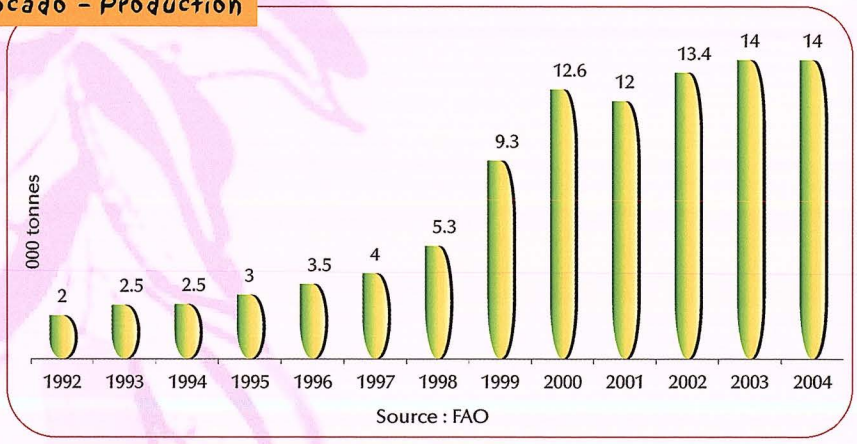


Production zone

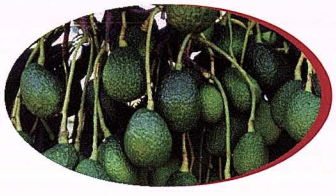
The location of production depends on climate features. Only the most northerly parts of North Island are suited to this crop that needs sufficiently high temperatures. Seventy percent of the 4 300 ha of New Zealand avocado plantations are in the Bay of Plenty, in particular around the city of Tauranga. Most other commercial avocado plantations are in the Northland region (Whangarei and Far North districts near Kaitaia). Irrigation is often unnecessary. Rainfall is well distributed through the year and most of the land in North Island (also called 'Smoking Island') are volcanic (andosol) and have good water retention capacity. In contrast, the plantations in Far North District are mainly on sand dunes and require considerable irrigation. The high price of land is also a limiting factor.

Volumes

New Zealand
Avocado - Production



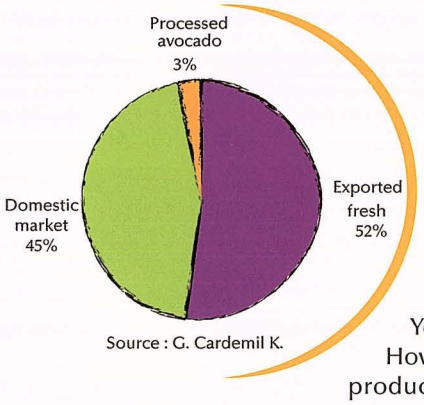
Avocado has been grown for a comparatively long time (the first plants were introduced in 1919) but it only really started to develop in the mid-1990s. Production was still less than 5 000 t in 1993/1994 and has doubled in a decade. The orchards are extremely young (more than 40% of the plantations have not yet started to produce) and so average yields are small. The growth prospects are considerable and production of 40 000 t should be attained in about 2012. Forty percent of farmers use rational agriculture (AvoGreen programme). No less than 26 packing stations—often specialised in kiwi—are equipped to handle avocado. The AGA (Avocado Growers Association) provides technical support for its members (research & development, domestic sales promotion). It has established close international collaboration with its counterparts, especially in Australia.



Production calendar and varieties

Production consists almost only of Hass (97% of production volume). The green varieties are grown mainly as pollinators. The traditional cultivars 'Bacon' and 'Zutano' have been completed for a few years now by 'Ettinger' and 'Edranol'. A few plantations of 'Reed' have been established to supply the domestic market. The Far North produces the earliest fruits.

New Zealand - Avocado - Harvest calendar



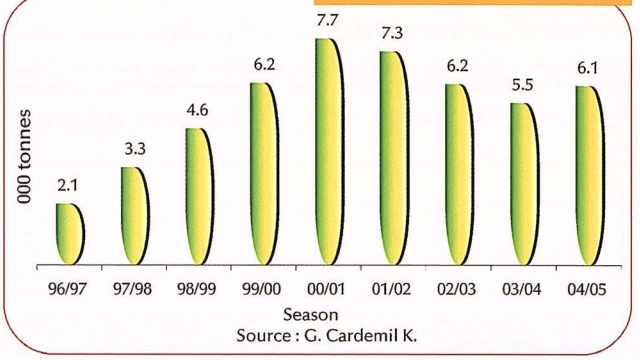
Outlets

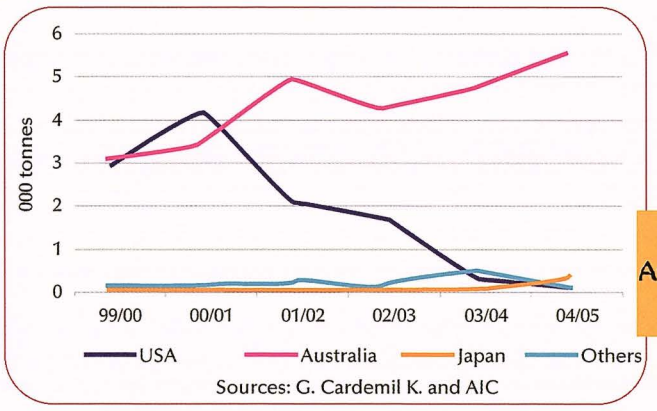
The domestic market has developed strongly in recent years, in particular thanks to the promotion campaigns run by the AGA. Consumption per person has increased from 250 g at the beginning of the 1990s to a recent 1.6 kg. Growth prospects are even larger (the target is 3 kg), but the country has a population of less than 4 million. Advertising campaigns (in particular on television) mainly use the health theme (cholesterol-free) and environmental arguments (the original AvoGreen programme). Avocado has recently entered the Yess fruits range (perfectly ripe fruits sold in protective packaging). However, exports are still the main outlet. A significant proportion of production is processed, thus using the substantial quantities of sorting rejects that result from drastic quality selection of export fruits. The processing industry is also in the quality segment, producing high quality edible oil by cold pressing (using modified olive presses) of sound raw material. It is supported by active research work.

Total exports

New Zealand's phytosanitary assets (no sun blotch virus or Mediterranean fruitfly) has enabled it to first enter the Australian market and then that of the United States and Japan. The export sector has been built up on the basis of the Australian market since the 1980s and Australia is still by far the largest customer. However, the situation is becoming increasingly competitive, especially with the development of domestic production in Australia. Marketing operations are thus conducted jointly with large Australian retail chains. Under the aegis of the Avocado Industry Council (AIC), exporters also seek to diversify their outlets. The United States has taken significant quantities since the end of the 1990s, especially thanks to promotion programmes run jointly with the California Avocado Commission. The quantities exported to Japan since the 2001/2002 season are still limited but growing. Other destinations like Korea, Singapore, Taiwan and the Pacific islands are among new client countries. Thirteen companies that are in conformity with the strict specifications laid down by the AIC possess export licences. The four leading companies handle nearly 75% of exports

New Zealand Avocado - Exports





New Zealand Avocado - Exports by destination

Logistics

Practically all the fruits are exported by sea in containers.

Market	Main shipping lines		Shipping time	Observations	Customs tariffs
	Port of departure	Port of arrival			
Australia	Auckland Tauranga Whangarei	Melbourne Sidney Brisbane Perth	Approx. 4/7 days		
USA	Auckland				
Japan	Tauranga		Approx. 10 days		

Peru

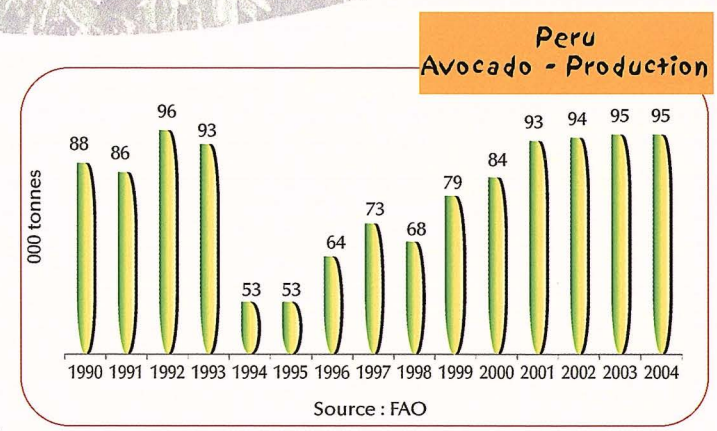
AVOCADO is a traditional crop in Peru where annual production of around 100 000 t puts it among the 10 leading producer countries in the world. However, it only appeared on the world market at the end of the 1990s, driven in particular by 'ProHass', the association of 'Hass' producers. In five years, Peru has become an important supplier of 'Hass' to the European market in the summer. Cultural conditions are very original—almost hydroponic—because of the country's very special climate. Production of 'Hass' should continue to increase strongly in the coming years. Negotiations are in progress for lifting the phytosanitary barriers that forbid entry to certain markets (the United States, Japan and Chile).

Production zones

Avocado is grown in the three main climatic zones of the country. Most of production is concentrated in the coastal strip with a desert climate that is atypical for an equatorial region because of the Andes and the cold Humboldt current. All the 'Hass' fruits are grown in this zone (in Ica, Lima, La Libertad and Piura provinces) mainly in industrial plantations at elevations of 300 to 1 000 m. Cultivation is managed under quasi-hydroponic conditions in these arid zones where sanitary pressure is practically nil. There is no rainfall but good water is abundant thanks to underground rivers fed by the Andes. The rest of production is grown on more modestly sized farms on the Sierra (the highland Andean zone) and in the tropical provinces in the west of the country.

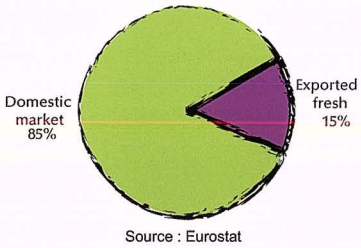
Volumes

Avocado was introduced in the fifteenth century and is an important traditional crop. Production, totalling some 100 000 t, was sold only on the domestic market until the mid-1990s. It was then based on mediocre quality local varieties and 'Fuerte' to a lesser extent. Since then, investors have developed industrial plantations of 'Hass' for export, drawing inspiration from the Chilean model. The areas under 'Hass' have increased in exceptional proportions from less than 100 ha in 1994 to some 2 700 ha in 2004. Plantings are continuing at about 250 ha per year. 'Hass' production is currently close to 15 000 tonnes and should continue to increase and reach 22 000 to 24 000 tonnes by 2010. More than 80% of growers belong to the ProHass association that provides both technical support and aid for marketing.



Production calendar and varieties

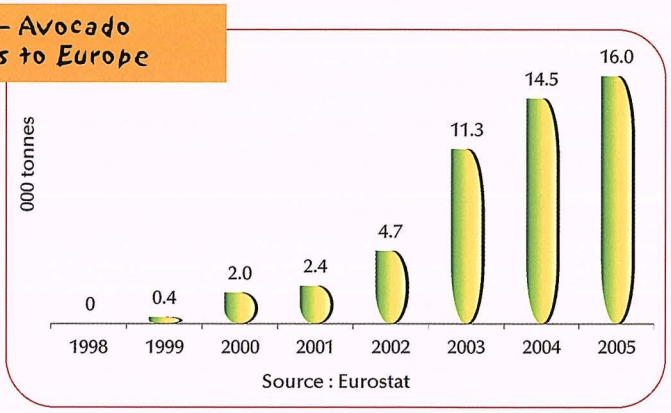
The range of varieties grown is very large. 'Topa Topa', derived from the Mexican race, is still common in highland zones as it is tolerant to cold. The black-skinned fruits have a high oil content and are of mediocre quality. Hybrids bred by crossing Guatemalan and West Indian varieties ('Choquette', 'Collinred', etc.) are grown in the tropical zones in the eastern part of the country. 'Hass' is clearly dominant among the varieties exported. It is grown on about 25% of the area under avocado and its share is tending to increase. 'Fuerte' is still widely planted, mainly to supply the domestic market. The range is completed by 'Ettinger', 'Zutano' and 'Bacon'.



Outlets

Outlets are extremely segmented according to the variety. The domestic market, taking over 80% of the volumes produced, is supplied mainly with native varieties, Guatemala x West Indian hybrids and 'Fuerte'. Consumption per person is about 3 kg per year. Some 15% of production is exported, but the proportion is tending to increase with the development of 'Hass' production.

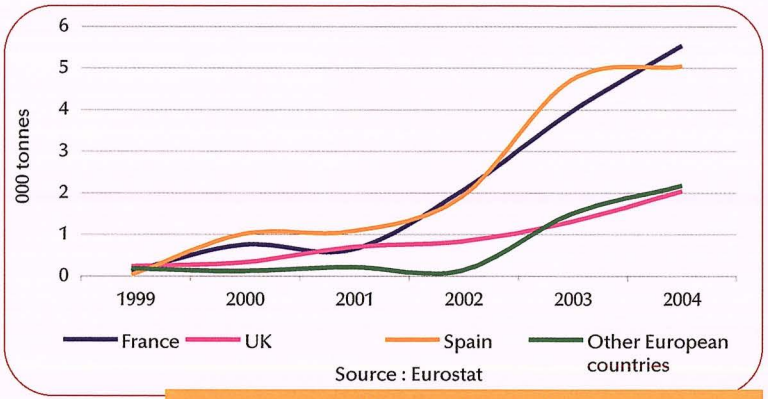
Peru - Avocado
Exports to Europe



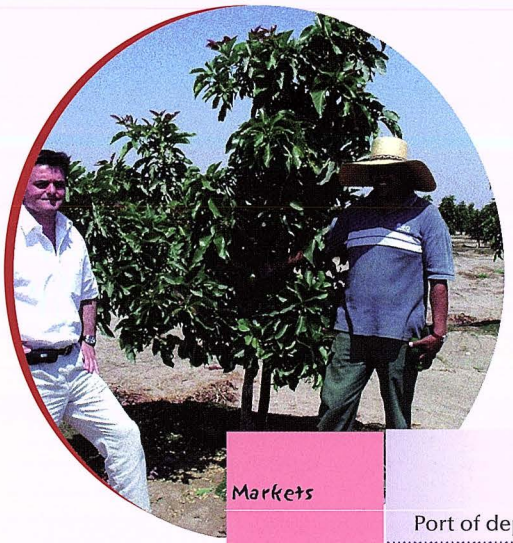
Total exports

The export sector dates back only to the end of the 1990s but has developed very rapidly. The volume exported was some 1 000 t in 1999 and reached 15 000 t in 2004. 'Hass' is the most exported variety but a few batches of smooth varieties such as 'Ettinger' and 'Fuerte' are exported at the beginning of the season.

As Peruvian cultivation zones are not recognised as being free of fruitfly, the fruits are not allowed to enter Japan, the United States or Chile. The European Union thus takes practically the entire quantity. The main destinations are Spain and France and the United Kingdom is also an important market. Chile has strong potential and may open its frontiers soon. Negotiations are also in progress for access to the United States. The sector has been represented by the ProHass association since 1998. Two businesses handle nearly three-quarters of total exports.



Peru - Avocado
Exports to Europe by destination



Logistics

The fruits are shipped in containers by sea, partly on a door-to-door basis. The transport time requires the systematic use of controlled atmosphere. Most fruits transit via the port of Callao.

Markets	Main shipping lines		Shipping time	Observations	Customs tariffs
	Port of departure	Port of arrival			
EU	Callao	Rotterdam	21 to 24 days		Duty-free
		Algeciras	18 days		
	Paita	Rotterdam	19 days		
		Algeciras	16 days		

Producer country sheet

Dominican Republic

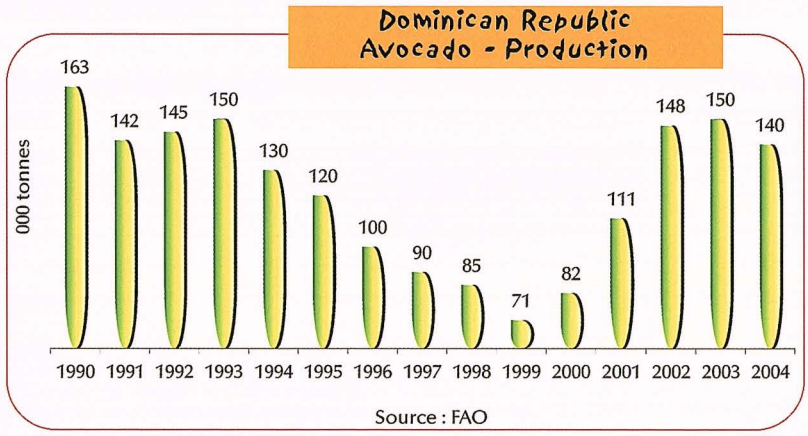
Avocado, a traditional crop, is one of the pillars of Dominican fruit growing, together with banana. Production, consisting essentially of West Indian varieties, is among the largest in the world. It supplies a very well developed domestic market with avocado being a basic component of the diet. The position of the origin on the world market is still modest but is tending to develop. The comparatively recent planting of industrial orchards of 'Hass' has made it possible to broaden export outlets that have mainly consisted of ethnic markets up to now.

Production zone

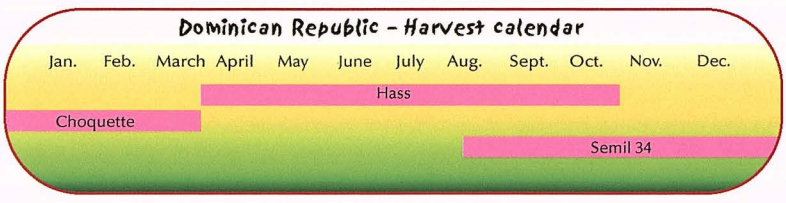
Avocado is grown in most parts of the country, which enjoys favourable agro-climatic conditions (the yields are among the largest in the world). However, most orchards are grouped in three distinct regions with regard to production structure. A quarter of the plantations are in Espaillat province on the Atlantic coast in the north; these are small family farms. Holdings are generally larger in the south-west and the centre, with 20% to 30% of the area under avocado. Production is increasing strongly in the provinces Elias Piña on the Haitian frontier and San José de Ocoa thanks to the development of industrial plantations of 'Hass'.

Volumes

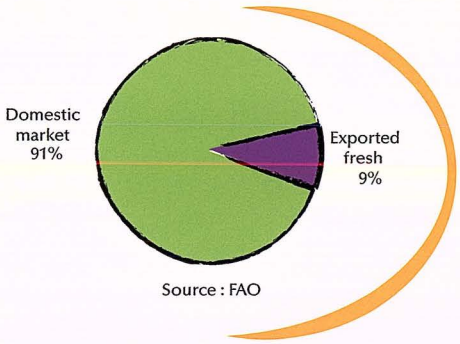
Avocado was present well before colonisation by Spain and is one of the country's main crops. Production has always been large as the fruit is a staple foodstuff. It developed markedly at the end of the 1960s with the introduction of commercial varieties for export. According to FAO, volumes were already in excess of 100 000 tonnes in 1960 and reached 150 000 tonnes at the beginning of the 1990s. Production then dwindled (because of economic and agronomic problems, drought, several hurricanes etc.). Growth has tended to resume in recent years, especially through a planting incentive programme launched by PRODEFRUD and the planting of industrial plantations of 'Hass'. Some 3 000 to 3 500 hectares of avocado is reported to be dedicated to export production. Sources difficult to verify report that the area under 'Hass' increased by slightly more than 1 000 ha in 2003.



Production calendar and varieties



Most of the crop consists of West Indian varieties present in the wild state or selected. There are no less than about twenty grafted varieties grown for export fruits. The main cultivar is 'Semil 34'. 'Semil 43', 'Simmonds', 'Popenoe', 'Melendez' and 'Choquette' are also well represented. 'Hass' is developing but is still a minor variety.

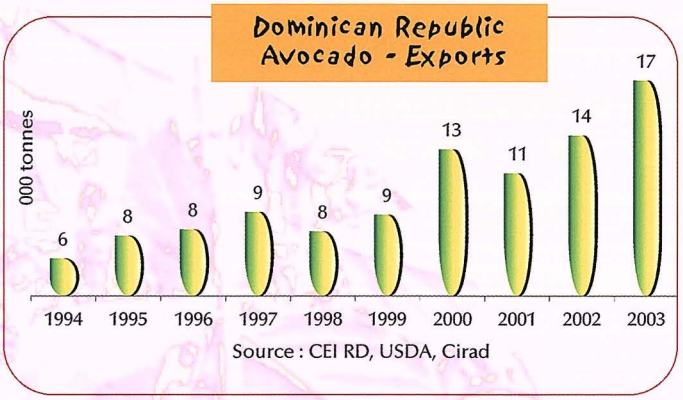


Outlets

Avocado is a staple foodstuff in the Dominican diet. The local market is therefore the main outlet, taking the entire crop of 'creole' varieties and the rest of non-exported production. The export share is still comparatively limited. A few processing facilities handle sorting rejects (exporting oil for the pharmaceutical industry). However, a significant proportion of production is lost for lack of means of transport.

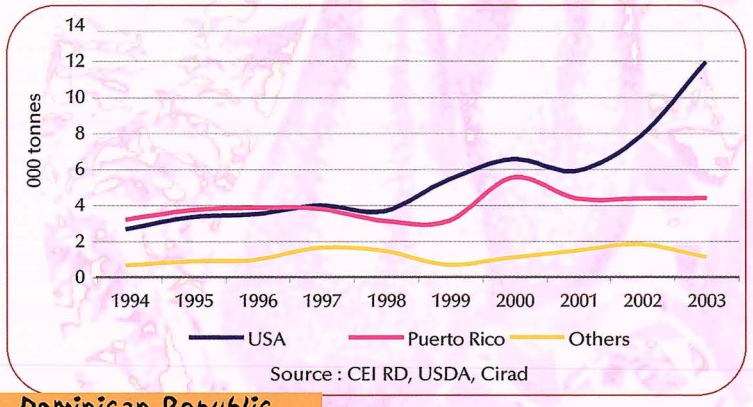
Total exports

Exports started at the end of the 1960s. The shipments consisted mainly of West Indian varieties for Dominican immigrants in Puerto Rico and the east coast of the United States. The quantities were very limited (less than 3 000 t) until the early 1990s. Exports did not exceed 7 000 to 8 000 t until 2000 when growth resumed. Development has speeded up in recent years with an increase in supplies of 'Hass'. The volume reached 17 000 t in 2003 and then decreased in 2004 because conditions of access to the United States are more restrictive for certain varieties. The Dominican Republic also ships a certain amount of organic avocado.



Main markets

Most exports are shipped to the United States (New York and Miami) and Puerto Rico. However, although shipments to Puerto Rico have remained stable, those to the United States developed markedly until 2003. The increase in supplies of 'Hass' resulted in the diversification of a clientele previously limited to Dominican immigrants who like the West Indian varieties. The more restrictive regulations applied by USDA in 2004 to 'Semil 34' (sales limited to the period running from 11 November to 15 March and a compulsory DNA identification test) resulted in a distinct downturn in shipments. The rest of volumes are very limited and shipped to the niche market for West Indian avocado in the EU.



Dominican Republic
Avocado - Exports
by destination

Logistics

Transport to the United States is mainly by sea. Several lines are possible as the island has several ports. Shipments to Europe can be handled via the USA or directly to Belgium and Italy.

Markets	Main shipping lines		Shipping time	Observations	Customs tariffs
	Port of departure	Port of arrival			
USA	Rio Haina (Santo Domingo) Puerto Plata Barahona (SO) Boca Chica Haina	Miami Puerto Rico New York	2 to 3 days 1 day 5 to 6 days	Export calendar for 'Semil 34' limited to 11 November to 15 March	
Europe	Rio Haina (Santo Domingo)	Zeebrugge Genoa	9 days 11 days		

Market sheet

European Union

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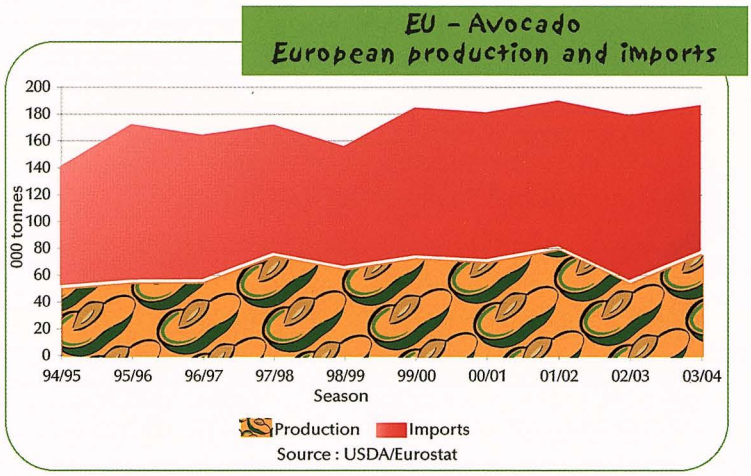
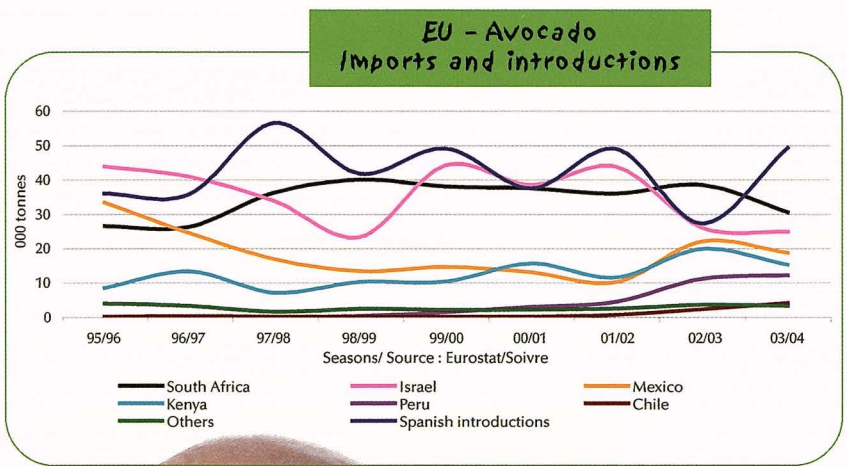
Sold all the year round, avocado is one of the most popular exotic fruits in the European Union, together with pineapple and mango. Community production is mainly located in Spain and covers only about 40% of requirements. The EU is thus the second largest import market in the world after the United States, taking an annual quantity of some 120 000 t in recent years. The new rise of Chile and Peru is tending to change market supply structure from June to November. Consumption varies considerably from one country to another and is stagnant (unlike the US market) at about 500 g per person per year for lack of large promotion operations.

Supply



Avocado was launched on the market in Europe at the end of the 1960s at the initiative of Israeli operators, who then had what approached a monopoly, with only a few complementary batches from West Africa. Avocado was backed up by large promotion operations and was soon available to everybody at the beginning of the 1970s. In particular, it was sold by supermarkets in France thanks to the fall in the cost price with the increase in Israeli production and a switch to sea transport. Market development then accelerated, enhanced by the arrival of new supplier countries (South Africa, the USA, etc.) and then the first community production in 1980s when Spain joined the EEC. Consumption increased from 20 000 t in 1975 to 150 000 t in 1995 thanks to strong, fairly steady growth. Development then slowed in the second half of the 1990s. Quantities have been stable since 2000. Imports total 110 000 to 120 000 t. Community production, mainly in Spain (completed by Portugal and a few shipments from Cyprus and Greece), is 55 000 to 65 000 t. Of this quantity, 35 000 to 45 000 t from Spain is not destined for domestic consumption and is shipped to other EU markets.



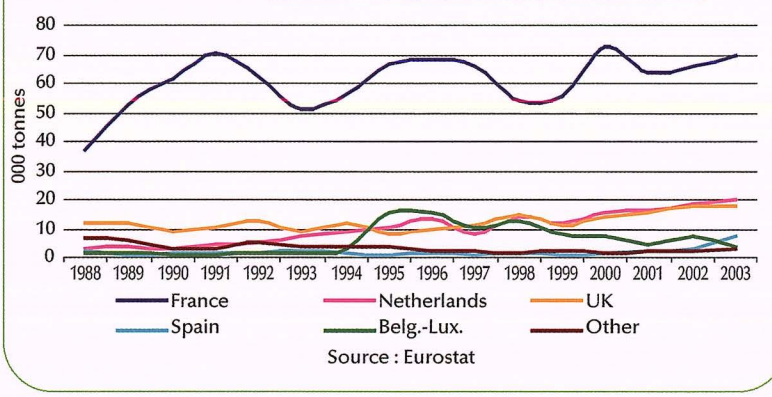
Main origins

The main origins supplying the EU market during the so-called 'winter' season (September/October to May/June) are Israel, Spain and Mexico. Volumes were very cyclical until 2003/2004 as alternate bearing coincided in Israel and Spain. Mexico had concentrated on shipping to the United States from the end of the 1990s and then returned strongly from 2002/2003 onwards as the euro:dollar exchange rate was more favourable and customers, especially in France, showed increasing interest in 'Hass'. South Africa and Kenya continue to dominate the out-of-season market (the so-called summer season). Kenyan supplies have broadened, in particular through the exploitation of an original market segment (the cheapest avocados, often sold in nets) and the development of supplies of 'Hass'. However, certain emerging South American origins are tending to change the picture. Chile has played a significant role in supplying the market at the beginning of the winter season since 2003. Present on the market since the end of the 1990s, Peru has also been a major player in the out-of-season 'Hass' market since 2003. Supplies are therefore swelling considerably from June to November. Supplies are completed by a few batches from Brazil, Zimbabwe, Morocco and Argentina.

Main importing countries

France is still by far the leading EU importer in spite of a decrease in its presence in recent years (it handles 40% of imports/introductions against over 50% in the mid-1990s). It is the leading avocado consumer country and also serves as a hub. Some 15 to 20% of the quantities received are re-exported, in particular by most of the Israeli operators who supply the whole of the EU via Marseilles. The Netherlands also plays the role of redistribution centre for Germany, Scandinavia, Poland and Russia. Imports, more than 80% of which are re-exported or re-shipped, increased from less than 5 000 t at the beginning of the 1990s to more than 25 000 t in 2004, especially as part of the traffic previously destined for Belgium now goes to the Netherlands. Likewise, Spanish operators are making increasing use of the marketing network set up for their production to handle a significant proportion of the avocado imported from Chile and Peru as a category management operation. Imports have thus quadrupled in the last five seasons and reached about 12 000 t in 2004. The United Kingdom also displays strong growth, the purpose being supply of the domestic market. Imports nearly doubled from 1995 to 2003 thanks to demand stimulated by promotion operations run by Israeli and then South African operators.

EU - Avocado - Import entry points (goods from outside the EU)

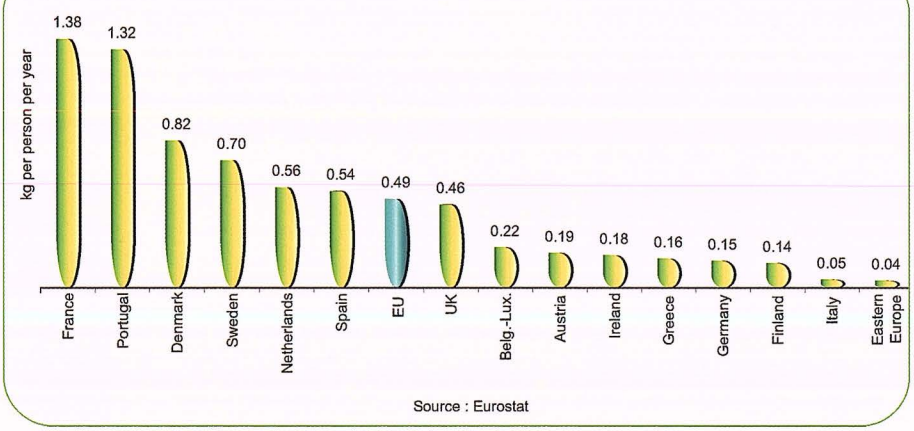


Source : Eurostat

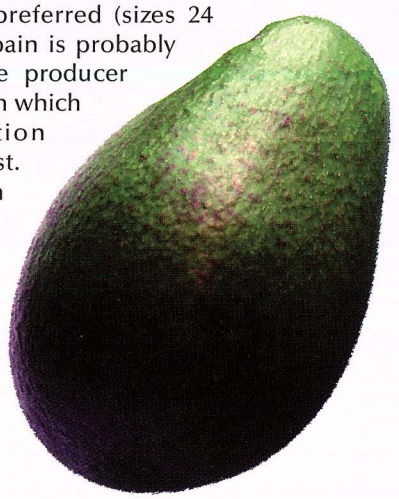
Consumption

Average consumption is some 0.5 kg (that is to say 2.5 medium-sized fruits) per person per year. In comparison, the figure is 1.2 kg in the United States, which also has certain production zones and comparable climate and level of development. For lack of generic promotion operations, the level of consumption has changed very little since the mid-1990s, increasing by hardly 10 000 t (in comparison with a 180 000 t increase in the United States during the same period). Per capita consumption varies considerably from one country to another. France clearly heads the list with some 1.3 to 1.4 kg per person per year. Consumption in most of the Scandinavian countries is above average (0.7 to 0.8 kg per person per year in Sweden and Denmark) and small fruits are preferred (sizes 24 and 26). Spain is probably one of the producer countries in which consumption is lowest. Although this has increased in recent years it is hardly greater than the EU average. The steady increase in the quantities eaten by British consumers shows that promotion operations do pay off. The enormous German market takes very little avocado and the quantities have even tended to decrease in recent seasons. The market formed by the ten new member states takes hardly any avocado.

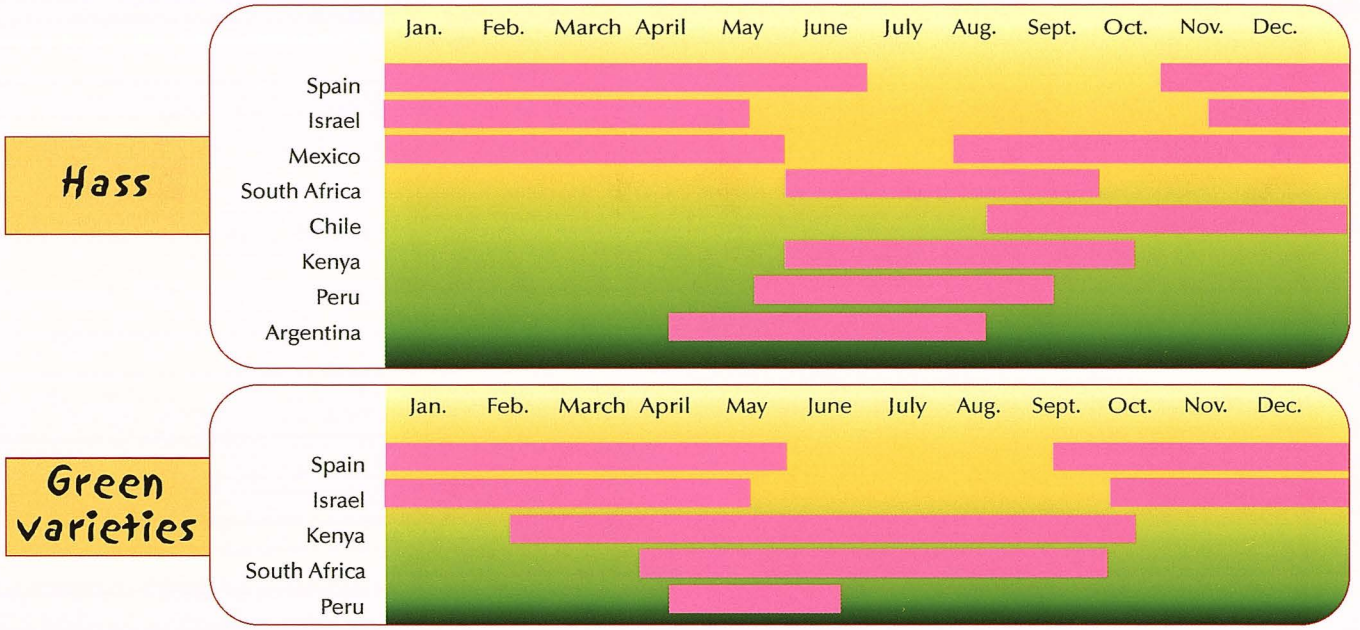
EU - Avocado - Consumption



Source : Eurostat



Supply calendars



Market access conditions

Only fruits complying with the standard laid down by the European Commission in 1997 can be sold in the European Union (text on following page). They must also comply with the regulations concerning pesticide maximum residue limits. Provisions concerning traceability came into force on 1 January 2005. The respect of numerous private specifications is frequently required. The major European distributors increasingly require their suppliers to possess Eurep-GAP certification.

STANDARDS FOR AVOCADOS

After the consolidated text CONSLEG: 1997R0831 — 20/05/2004
Commission Regulation (EC) No 831/97 of 7 May 1997 laying down marketing standards applicable to avocados (OJ L 119, 8.5.1997, p. 13), amended by Commission Regulation (EC) No 1167/1999 of 3 June 1999 (OJ L 141, 4.6.1999, p. 4), Commission Regulation (EC) No 46/2003 of 10 January 2003 (OJ L 7, 11.1.2003, p. 61), Commission Regulation (EC) No 907/2004 of 29 April 2004 (OJ L 163, 30.4.2004, p. 50)

The standards shall apply to all marketing stages under the conditions laid down in Regulation (EC) No 2200/96. However, at stages following consignment the following tolerances shall be allowed:
(a) a slight loss of freshness and turgidity;
(b) for products other than 'Extra' class, slight deterioration due to biological development and perishability.

DEFINITION OF PRODUCE
This standard applies to avocados of varieties (cultivars) grown from Persea americana Mill. to be supplied fresh to the consumer, parthenocarpic fruit and avocados for industrial processing being excluded.

PROVISIONS CONCERNING SIZING
Size is determined by the weight of the fruit. The minimum weight of avocados must not be less than 125 g. The size scale is as follows:

Weight scale in grams	Code size
781 to 1 220	4
576 to 780	6
461 to 575	8
366 to 460	10
306 to 365	12
266 to 305	14
236 to 265	16
211 to 235	18
191 to 210	20
171 to 190	22
156 to 170	24
146 to 155	26
136 to 145	28
125 to 135	30

PROVISIONS CONCERNING QUALITY

The purpose of the standard is to define the quality requirements of avocados after preparation and packaging.

Minimum requirements

In all classes, subject to the special provisions for each class and the tolerances allowed, the avocados must be:
- intact,
- sound, produce affected by rotting or deterioration such as to make it unfit for consumption is excluded,
- clean, practically free of any visible foreign matter,
- practically free from damage caused by pests,
- free of damage caused by low temperature,
- having a stalk not more than 10 mm in length which must be cut off cleanly. However, its absence is not considered a defect on condition that the place of the stalk attachment is dry and intact,
- free of abnormal external moisture,
- free of any foreign smell and/or taste.

Avocados must be firm at the point of dispatch, and carefully picked. Their development should have reached a physiological stage which will ensure a continuation of the ripening process to completion. The ripe fruit should be free from bitterness.
The development and condition of the avocados must be such as to enable them:
- to withstand transport and handling, and
- to arrive in satisfactory condition at the place of destination.

Classification

	Extra Class	*Class I*	*Class II*
Quality, shape and colouring	Avocados in this class must be of superior quality. In shape and colouring they must be characteristic of the variety.	Avocados in this class must be of good quality and show the typical colour and shape of the variety.	This class includes avocados which do not qualify for inclusion in the higher classes but satisfy the minimum requirements specified above.
Shape and skin defects	They must be free from defects, with the exception of very slight superficial defects of the skin provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package.	The following slight defects, however, may be allowed provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package: •slight defects of shape and colour, •slight skin defects (corkiness, healed lenticels) and sunburn; the maximum total area should not exceed 4 cm^2.	The following defects may be allowed provided the avocados retain their essential characteristics as regards the quality, the keeping quality and presentation: •defects in shape and colouring, •skin defects (corkiness, healed lenticels) and sunburn: the maximum total area should not exceed 6 cm^2.
Flesh defects		In no case may the defects affect the fruit flesh.	In no case may the defects affect the fruit flesh.
Stalk	If present, the stalk must be intact.	The stalk, if present, may be slightly damaged.	The stalk, if present, may be damaged.

	Extra Class	Class I	Class II

PROVISIONS CONCERNING TOLERANCES

Tolerances in respect of quality and size shall be allowed in each package for produce not satisfying the requirements for the class indicated.

Quality tolerances	5 per cent by number or weight of avocados not satisfying the requirements of avocados but meeting those of class I or, exceptionally, coming within the tolerances of that class.	10 per cent by number or weight of avocados not satisfying the requirements of the class but meeting those of Class II or, exceptionally, coming within the tolerance of that class.	10 per cent by number or weight of avocados satisfying neither the requirements of the class nor the minimum requirements, with the exception of fruit affected by rotting, marked bruising or any other deterioration rendering it unfit for consumption.
Size tolerances	10 % by number or weight of avocados conforming to the size range immediately below and/or above that mentioned in the marking.		

PROVISIONS CONCERNING PRESENTATION

Uniformity

The contents of each package must be uniform and contain only avocados of the same origin, variety, quality, coloration and size (a change in the colour of the dark-skinned varieties is not considered as a defect, but the colouring of the fruit in each package must be uniform at the point of dispatch).

The visible part of the contents of the package must be representative of the entire contents.

Notwithstanding the preceding provisions in this point, products covered by this Regulation may be mixed, in sales packages of a net weight of less than three kilograms, with different types of fresh fruit and vegetables on the conditions laid down by Commission Regulation (EC) No 48/2003 (1).

Packaging

The avocados must be packed in such a way as to protect the produce properly.
The materials used inside the package must be new, clean and of a quality such as to avoid causing any external or internal damage to the fruit. The use of materials, particularly of paper or stamps bearing trade specifications is allowed provided the printing or labelling has been done with non-toxic ink or glue.
Packages must be free of all foreign matter.
Stickers individually affixed on product shall be such as, when removed, neither to leave visible traces of glue, nor to lead to skin defects.

PROVISIONS CONCERNING MARKING

Each package must bear the following particulars, in letters grouped on the same side, legibly and indelibly marked, and visible from the outside:

Identification

The name and the address of the packer and/or the dispatcher
This mention may be replaced:
- for all packages with the exception of pre-packages, by the officially issued or accepted code mark representing the packer and/or the dispatcher, indicated in close connection with the reference 'Packer and/or Dispatcher' (or equivalent abbreviations);
- for pre-packages only, by the name and the address of a seller established within the Community indicated in close connection with the mention 'Packed for:' or an equivalent mention. In this case, the labelling shall also include a code representing the packer and/or the dispatcher. The seller shall give all information deemed necessary by the inspection body as to the meaning of this code.

Nature of produce

- 'Avocados', if the contents are not visible from the outside,
- name of the variety.

Origin of produce

Country of origin and, optionally, district where grown, or national, regional or local place name.

Commercial specifications

- Class,
- size expressed in minimum and maximum weight,
- code number of the size scale and number of fruits when it is different from code number or, optionally, code number of the size scale and the net weight of the package.

Official control mark (optional)

Packages need not to bear the particulars mentioned in the first subparagraph, when they contain sales packages, clearly visible from the outside, and all bearing these particulars. These packages shall be free from any indications such as could mislead. When these packages are palletised, the particulars shall be given on a notice placed in an obvious position on at least two sides of the pallet.

IMPORTATION

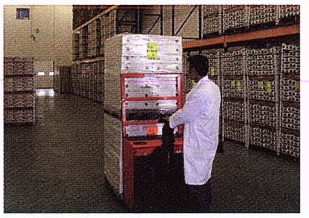
EXPORTATION

Fruits et légumes exotiques, contre-saison

Une gamme de produits qualitatifs :
avocats, mangues, limes, ananas, litchis, haricots verts, pois gourmands, fruits de la passion, papayes, raisins, cerises, pommes...

Des partenariats dans plus de 25 pays :
en Amérique centrale, en Amérique du Sud, en Afrique, au Moyen-Orient et en Asie.

Sworld s'est équipée de 9 chambres froides, de 2 mûrisseries industrielles et d'une chambre "High Humidity Cooler"
Avec cette infrastructure, Sworld a la capacité de proposer une gamme complète de services à ses clients telle que la commercialisation de produits conditionnés spécifiquement, la préparation de fruits à maturité (mûrs à point...)



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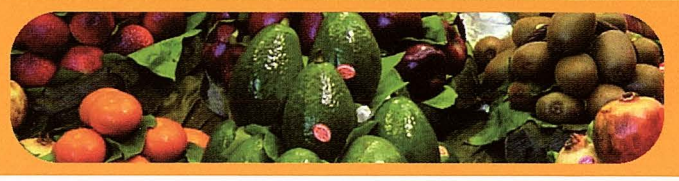
Sworld®

Market sheet

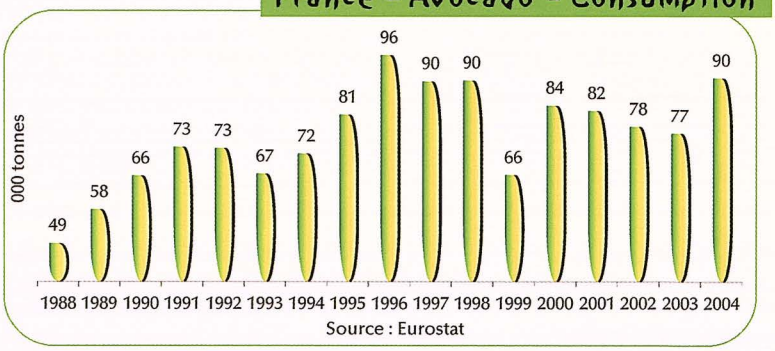
France



France is the European Union's leading market, taking delivery of two-thirds of the volumes imported or shipped directly from producer countries by the 25 member countries, making an annual total of 90 000 to 100 000 t. A pioneer in the selling of avocado, its domestic market is strongly developed and highly competitive (no less than seven important supplier countries are present). However, although per capita consumption is the highest in Europe, it seems to have been running out of steam in recent years, in particular for lack of promotion operations. France also plays a major role in European trade (as a hub and price leader).

Trend in consumption

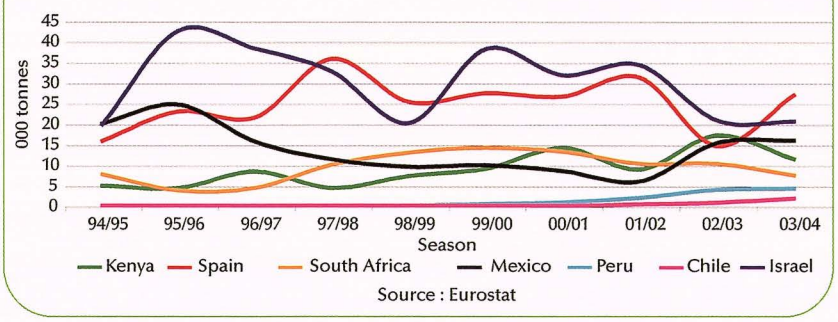
France - Avocado - Consumption



France is the pioneer market for avocado in the EU. Launched in delicatessens and luxury restaurants at the end of the 1960s by Israeli operators, avocado soon became more commonplace in the early 1970s when it became available in supermarkets (Monoprix and Prisunic in particular). Its original taste and easy incorporation in French style menus drew a favourable reaction from the public. Consumption increased rapidly until the mid-1990s when it exceeded 95 000 t. It dwindled and then fell more markedly in the early 2000s. Consumption was less than 80 000 t in 2003. On the one hand, supplies decreased considerably (with a series of poor production seasons for certain key origins and/or an outlet diversification strategy). On the other hand, the new regulations applied to promotion operations ('NRE' – new economic regulations) weighed on demand by reducing the intensity of promotion operations and causing a disproportionate rise in retail prices (with an increase in the annual average from EUR 2.0-2.3 per kg from 1997 to 2000 to EUR 2.30-2.70 from 2001 to 2004). A recovery of consumption has been observed in 2004/2005.

Main origins

France - Avocado - Main origins



France is a leading market as avocado is available on retailers' shelves all the year round and consumption is high. Thus all the origins present in the EU are found in France, sometimes at the cost of fierce competition. Winter season supplies are based on Israel, Spain and Mexico, which has returned to France since 2002/2003 as the euro:dollar exchange rate is favourable and French distributors have displayed increasing interest in 'Hass'. Most Israeli avocado is still unloaded in France but an increasing proportion is re-shipped and sold on neighbouring markets. The structure of supply tends to evolve from spring to autumn. South Africa is still the main out-of-season origin. Kenyan presence is tending to increase. Peru and Chile are trying to become major players.

Market characteristics

Avocado is the subject of impulse buying. Promotion operations thus play a key role in sales dynamics. Large distributors concentrate on avocado during three main periods: Christmas (as for all exotic fruits), Easter and November (with the switch to the 'winter range' and various supermarket theme periods and anniversaries). Sales operations with batches at an attractive price (3 fruits for EUR 1.50 for example) result in the shifting of large quantities. The French market responds well to these marketing operations and sizeable quantities are sold in years of large production. The range available in supermarkets generally consists of loose avocados (mainly sizes 16 or 18 depending on the region) and a fairly recently introduced low-price pack (a net of three or four size 20, 22 or 24 fruits). An increasing number of retailers supply ripe avocados, generally available in pairs in rigid transparent plastic packaging.

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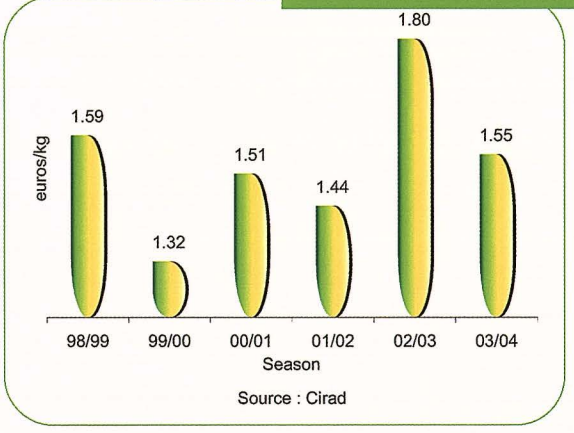
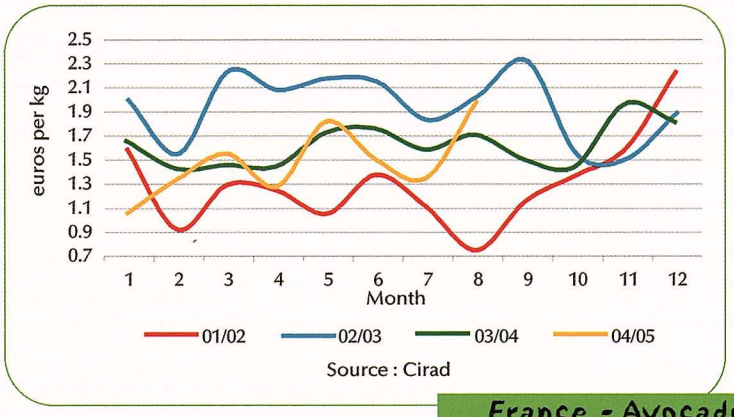
Prices (on quay)

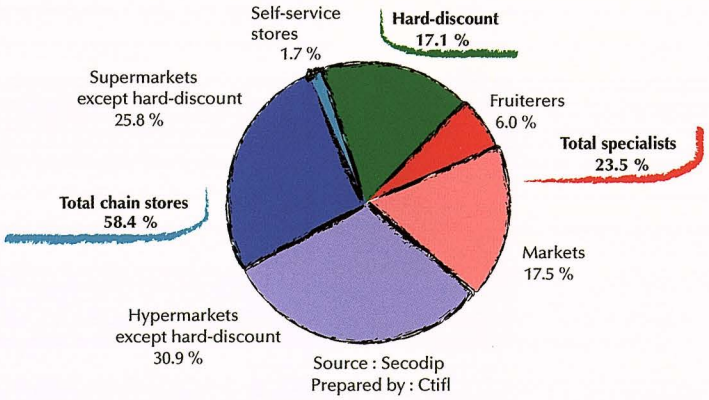
France is often considered to be the price leader in the EU. Certain features of the country tend to heighten the volatile, cyclic nature of prices—common to all highly perishable produce. Demand is subject to strong seasonal variation (see preceding paragraph). Periods of increasing prices often precede large-scale promotion operations. Many sensitive periods when the rate of supply is affected with the start of the season for the various origins involved are observed as France has no less than seven large suppliers. The number has increased this year with the arrival of Peru and Chile (with a marked decrease in prices in June and October in recent last seasons). The large number of origins present also tends to make the market highly competitive especially as some origins are handled by a large number of trade operators who sometimes only trade sporadically in avocado (the case of Kenya). Another factor—the combined presence of 'Hass' and green varieties—is less important and limited to certain parts of France. The two markets interact rather than operate in parallel. All these features partly explain the great variability in average annual prices. The supply level was very irregular during the winter seasons until 2004 (alternate bearing coincided in Spain and Israel) and also had a strong effect.

France - Avocado
Average price for all varieties and origins





France - Avocado
Average monthly price



Type of retail distribution

Avocado is sold mainly in hypermarkets and supermarkets. However, avocado is less present than the other exotics, 66% of which are sold in such stores. In addition, the large chains lost nearly 5% of their market share between 2001 and 2004. The decrease is explained by an equivalent increase in the share gained by discount stores during the same period. These sold 17% of avocados by volume in 2004. The need of advice, especially with regard to the maturity of the fruits, is shown by the large share and good resistance of traditional shops. These accounted for more than 23% of avocado sales in 2004 (including more than 17% in street markets), down by only 1% in comparison with 2001. In comparison, they sold only 15% of the quantities of exotics in 2004, a 2% fall in comparison with 2001.

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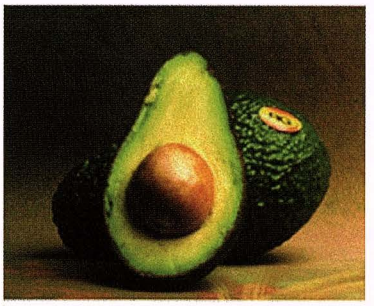

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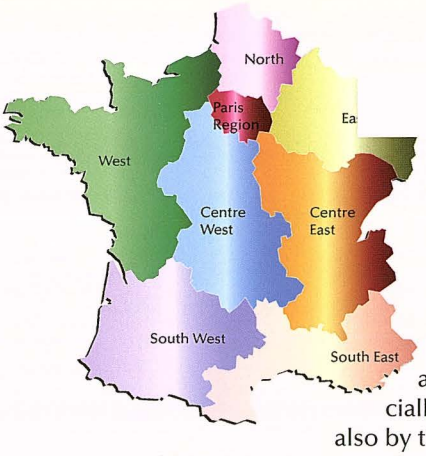


Consumer profiles

Purchasing power seems to have a strong effect on consumption. The proportion of the population with higher-than-average incomes purchase distinctly more avocado while the less affluent categories purchase distinctly less. The main purchasers of avocado are thus executives and, to a lesser degree, retired people, in contrast with working class and unemployed categories. This economic determinant only partially accounts for the geographic disparities observed. People in the Paris area, with high incomes, purchase higher than average amounts of avocado (the Île de France region, with more than a fifth of the population of France, is the main avocado consumption area). Distinctly larger quantities of avocado are purchased in southern France and especially the south-west. This high level is probably explained not only by purchasing power but also by the closeness to Spain, a large supplier country, and by a climate suitable for cold starters to meals. Although incomes are higher in central western and eastern France, the quantities of avocado sold are well below average. Although it is easy to prepare, avocado consumption by young people is markedly small. In contrast, most buyers are 50 years old or more. The most common way of eating it—halved—make it a fruit much eaten by households and little eaten by single people. Children eat less avocado than average but this is less marked than for other fruits. The portions served to them are identical to those for adults, raising the score!

France - Avocado
Consumption by region
index (mean: 100)

North	91
Paris region	110
East	68
West	98
Centre-east	88
Centre-west	78
South-east	110
South-west	141

Source: Secodip
Prepared by: Ctifl

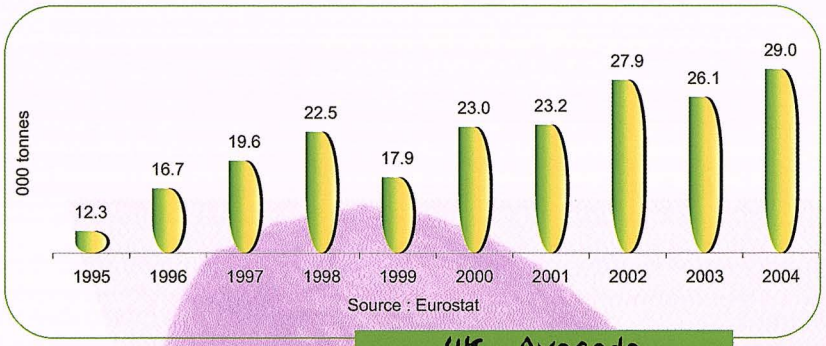
Market sheet

United Kingdom

THE distinct, steady increase in avocado consumption in the United Kingdom is exemplary and contrasts with the lifelessness of practically all the markets in the EU. This dynamism results mainly from the work on segmentation performed by distributors, especially in the supplying of 'ready to eat' fruits and promotion operations run by South African operators. The potential for the development of consumption is still substantial.

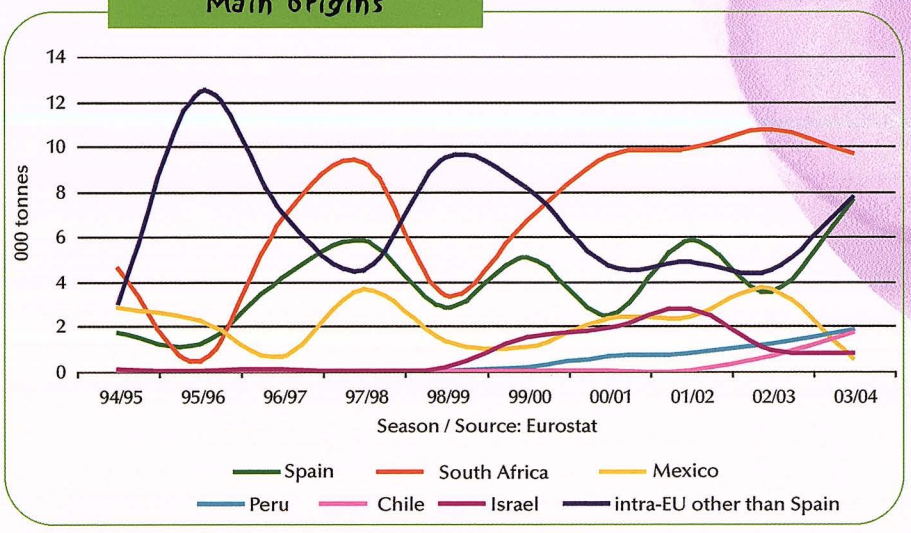
Development of consumption

Avocado has gained in popularity thanks to the efforts made in promotion (in particular on TV) by the Israeli sector in the mid-1980s. The evolution of consumption in recent years has been exemplary. It is the only EU market to display growth, and furthermore strong, steady growth. Volumes have more than doubled from some 12 000 t in the mid-1990s to nearly 30 000 t in 2004. This fine progress in a context of limp EU markets has not been achieved by chance. It is mainly the result of the generalisation of 'ready to eat' fruits in supermarkets and the promotion conducted since the end of the 1990s by SAAGA (South African Avocado Growers Association). The still modest per capita consumption of some 500 g per year seems to indicate that there is still considerable room for progress on this market.



UK - Avocado
Market supply

UK - Avocado
Main origins

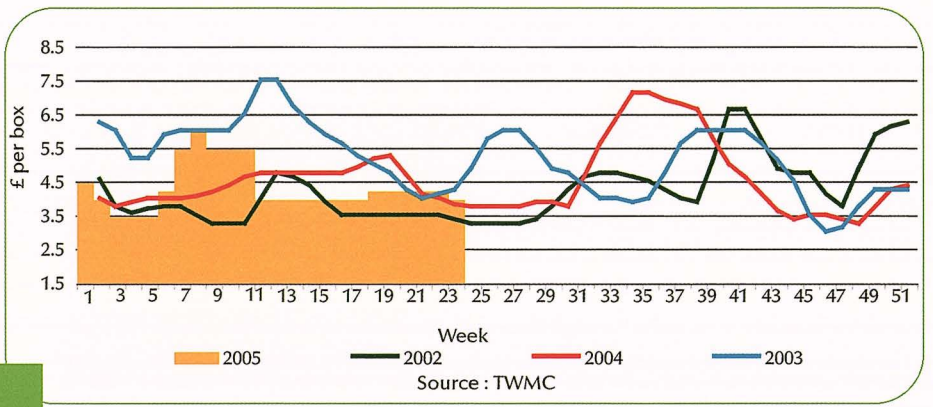


Main origins

Supplies are shipped mainly from Israel during the winter season. This origin is extremely well-placed with the large supermarket chains thanks to supply agreements concluded with them and that cover a large proportion of the season. Most of the fruits are re-shipped from France. Spain is in second position. Mexico has been more a complementary source of supply in recent years and is tending to lose ground. Benefiting from the promotion operations run in recent years, South Africa is the leading spring and summer origin. Peru has increased its share of the market in the spring since the end of the 1990s. Chile has gained an increasingly significant position in the autumn since 2002 and has started an adve rtising campaign in 2005.

Price trends

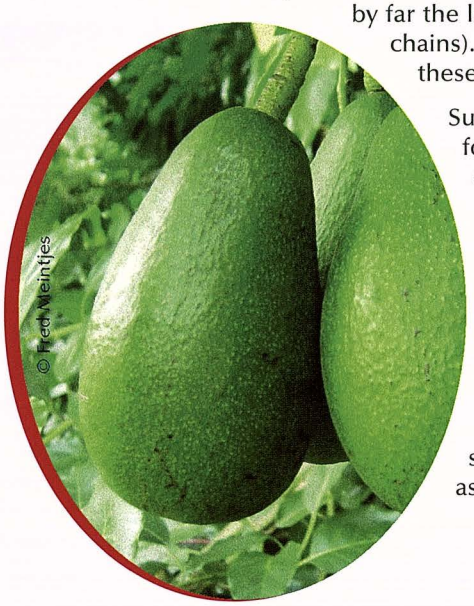
It is difficult to obtain representative prices. There is no source capable of supplying price information concerning supply agreements with supermarket chains, which handle a large proportion of sales. The wholesale stage follows the evolution of the quantities available overall. The increase in supplies from Israel and Spain generates a downward price trend that lasts until the end of November. The Christmas promotion campaigns cause the prices to rise. They then tend to rise during the first quarter with the decrease in supplies from the winter origins. When more ample supplies resume, with the development of shipments from the southern hemisphere, prices decrease once again. They rise at the end of the summer as supplies from South Africa dwindle.



UK - Avocado Wholesale prices

Market characteristics

The British market displays a clear preference for 'Hass', with this variety forming about three-quarters of the volumes sold. The percentage is even higher at 85% in supermarkets, which sell by far the largest proportion of fresh fruits ('Hass' is the only variety accepted by some chains). The smooth varieties go mainly to wholesalers and the catering industry, but these nonetheless also favour 'Hass'.

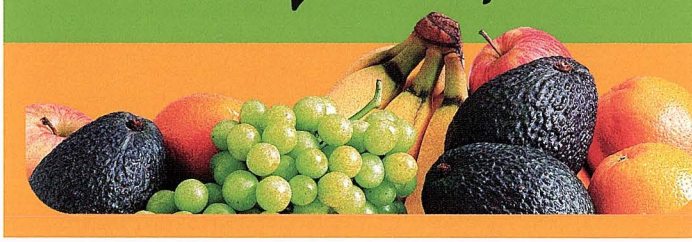


Supplies are markedly segmented in supermarkets. There can be two references for loose fruits: large (especially sizes 14 and 16) and medium, forming the heart of the range (mainly sizes 18 to 22). Packages of 'baby' avocados (mainly sizes 22 to 26) are always on display as a traffic builder. The great majority of the avocados sold in supermarkets are 'ready to eat' or have at least spent time in a ripening facility (for eating within 3 or 4 days). There are also 'twin packs' consisting of one fruit ready to eat and the second for eating fairly soon.

The consumption calendar differs from those of the other EU countries. More fruits are sold in spring and summer than during the rest of the year (the result of the South African promotion operation). Another original feature of the market is that a large proportion of the purchases by supermarket chains are the subject of contracts with suppliers that can cover as much as the entire season.

Market sheet

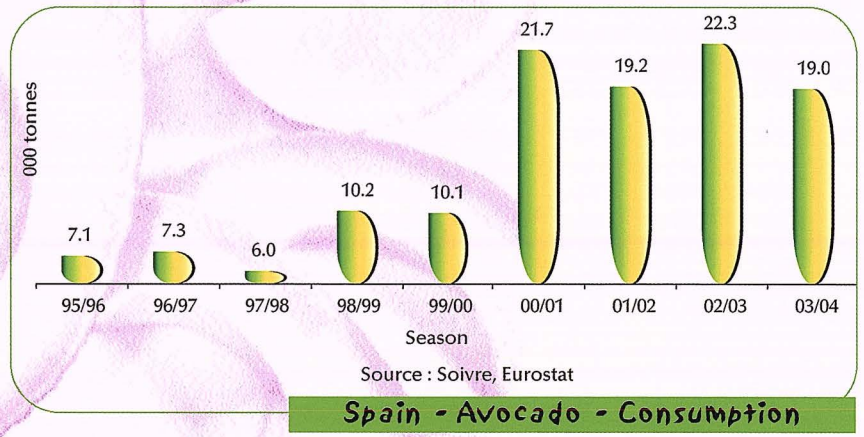
Spain



The Spanish avocado market is very new. The fruit has been grown in Andalusia for 35 years but the general public has only been properly acquainted with it since the beginning of the 2000s. Consumption is therefore limited, in particular in comparison with that of the other producer countries. However, the large development potential of the Spanish market, with fruit and vegetables being an important component of the national diet, is starting to be visible. Supply consists almost only of sizes 10 to 14 'Hass' and is based essentially on domestic production from November to April-May. Imports are increasing noticeably for out-of-season supplies.

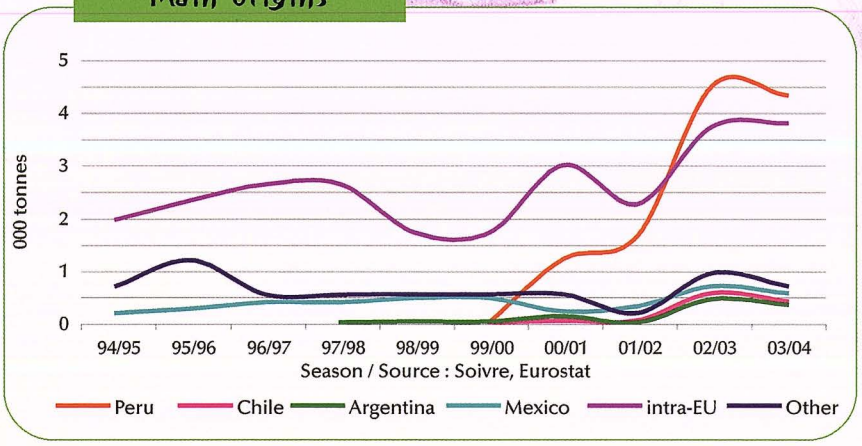
Evolution of consumption

Consumption remained extremely small until the end of the 1990s. Even though it is widely grown in the Malaga region (see production sheet), it was still little known by the Spanish, for lack of promotion, and was considered to be a luxury. The fruit has only recently become generally visible, in particular thanks to distribution by supermarkets. Consumption has increased distinctly since the beginning of the 2000s but is still modest (averaging about 540 g per person per year in recent years). This is hardly greater than the European average.



Spain - Avocado - Consumption

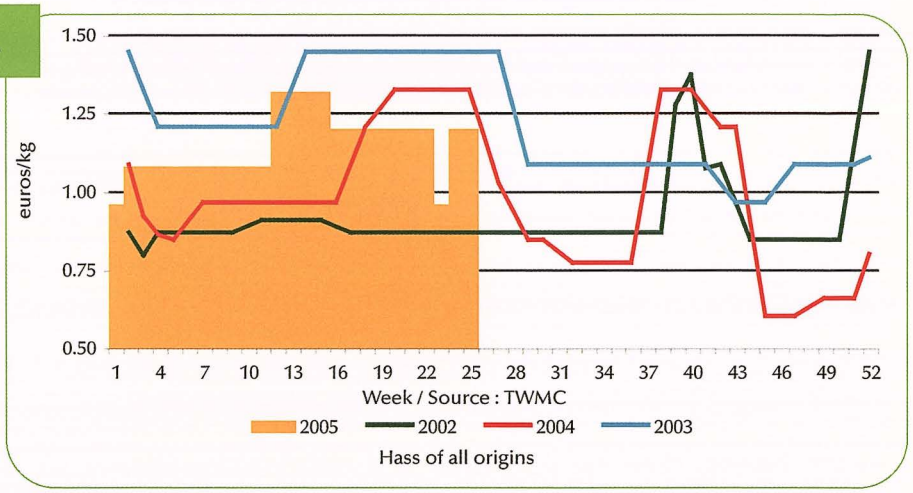
Spain - Avocado
Main origins



Main origins

Supply consists mainly of domestic production from November to April-May. The Spanish market has become one of capital importance for cooperatives and traders in Granada and Malaga provinces for selling large fruits. As a result, imports from the northern hemisphere are limited but have increased somewhat in recent years. The imported fruits are shipped mainly from Mexico and, to a lesser degree, from Israel and generally transit via France. Most imports are from the southern hemisphere and ensure continuous out-of-season supply. The volumes shipped from Peru have increased exponentially since 2000, making the country the leading origin. The Peruvian production calendar completes that of Spain well. Although direct imports are small, South African fruits are also present thanks to EU re-shipping. Chile and Argentina supply increasingly large complementary volumes.

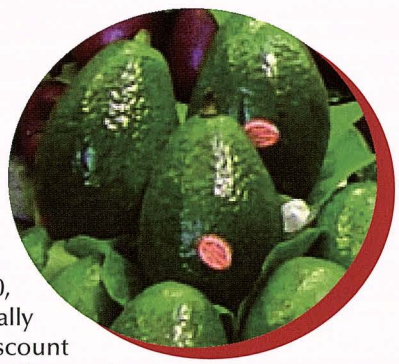
Spain - Avocado
Wholesale prices



Price trends
(analysis of Mercamadrid wholesale prices)

The size of the Spanish 'Hass' harvest is the main factor governing the annual average price and the movement of prices during the season. Prices are fairly linear at the beginning of the year and tend to rise at the end of the first quarter or the beginning of the second quarter as domestic production decreases. It falls noticeably in June with the increase in out-of-season imports. Prices are generally rock-bottom during the summer months. They increase strongly in September and October as the southern hemisphere seasons tail off and then fall in November with the development of the domestic crop. A peak is usually observed before Christmas when the fruit is promoted in supermarkets.

Market characteristics



Consumer preference goes to 'Hass' sizes 10, 12 and 14. Green varieties are sold very rarely in particular regions. Most distribution is handled by greengrocers (estimated 60% market share). The packaging used for supplying this market share is original, as the fruits are presented in trays in which each fruit is placed in a cavity. Supermarket chains are gaining market shares but are still not the major retail outlet. Their produce is segmented, with avocados sold loose and in nets containing several fruits (sizes 20, 22, 24 and 26) introduced recently but developing rapidly. The major chains generally purchase supplies grown locally directly from Andalusian growers or traders. Hard discount supermarkets still only sell very small amounts of fresh fruit and vegetables. The main consumption zones are the regional capitals (Madrid, Barcelona and Valencia to a lesser degree). The catering market segment is growing and has considerable potential. Consumption is fairly seasonal. Christmas and then—on a smaller scale—Easter are important promotion periods in supermarkets. Consumption is increasing markedly in summer in coastal areas because of the inflow of tourists.

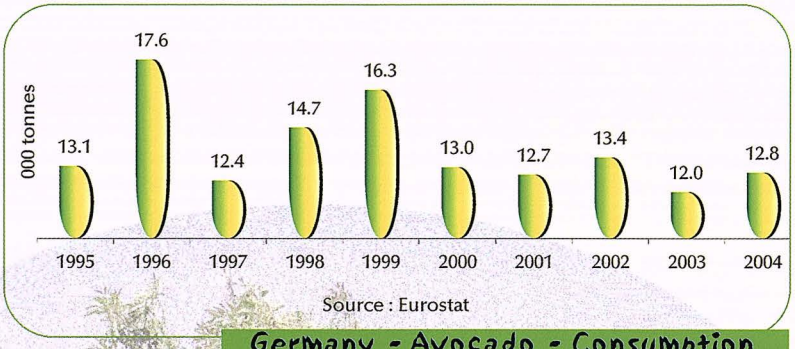
Market sheet

Germany

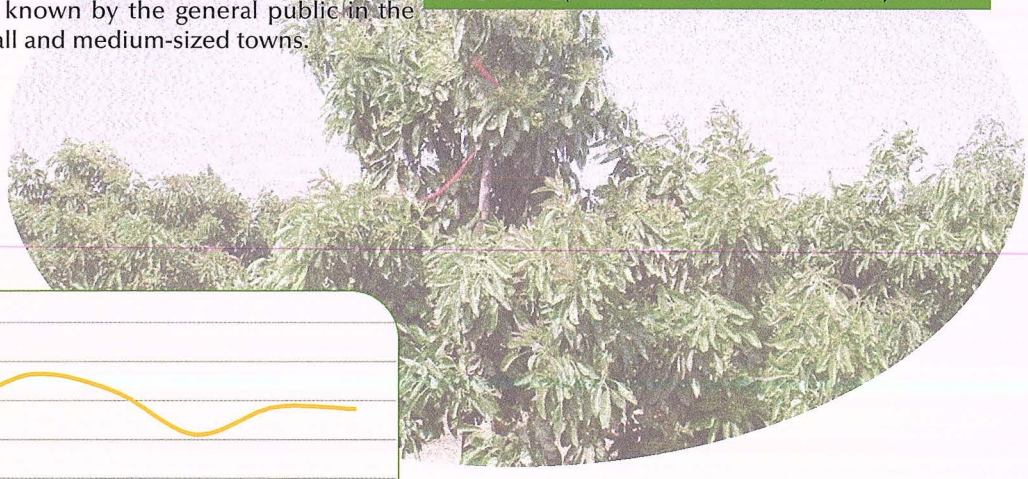
With about 80 million inhabitants, Germany has the largest population of the EU countries but, paradoxically, is only a comparatively moderate avocado market. The fruit is rarely highlighted by distributors and is still not very popular in most parts of the country. Supplies consist almost only of smooth varieties, mainly sizes 10 to 14. Quantities have tended to stagnate in recent years.

Development of consumption

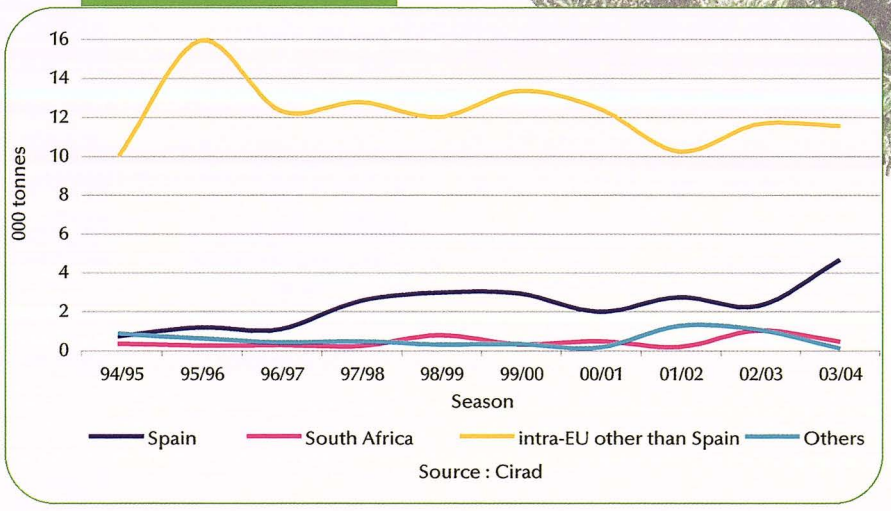
Germany is only a minor avocado market in spite of its population of 80 million. The whole sector agrees that consumption is very limited, even if some professionals consider that the figure calculated using Eurostat data (average 13 000 t in recent years, that is to say 150 to 160 g per person per year, the equivalent of half a size 12 avocado), underestimated the quantities. The total is tending to stagnate or even decrease. On the one hand, the typical daily menu does not include a starter, excluding avocado from the consumption dynamics that have been observed for the other exotics eaten as dessert, such as mango, pineapple and, more recently, papaya. On the other hand, distributors have a very cautious approach to this fruit that has a risk of substantial loss, especially as their margins are smaller than those applied in the other EU countries. As a corollary, the inadequate maturity of the fruits displayed (a minimum shelf life of 4 days is often required) does not encourage impulse buying and this is fundamental for avocado. Finally, avocado is not well known by the general public in the eastern part of the country and in small and medium-sized towns.



Germany - Avocado - Consumption



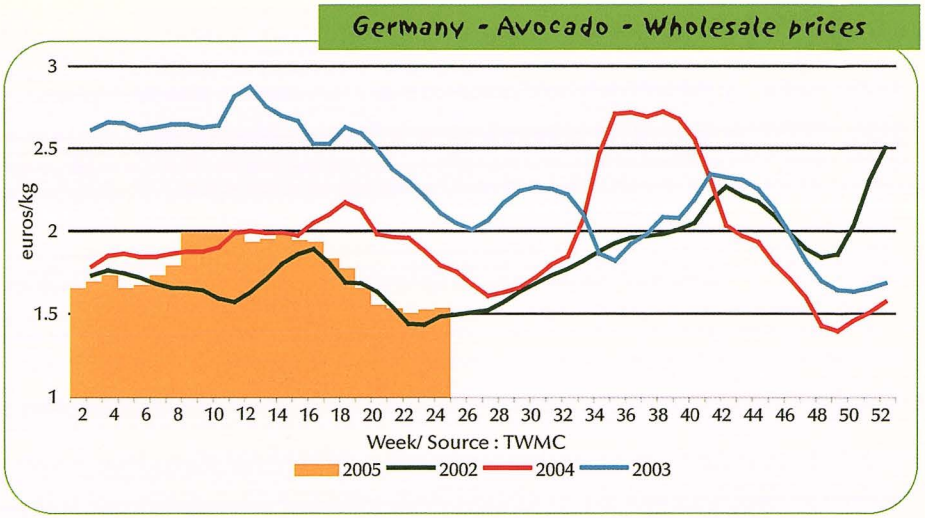
Germany - Avocado
Main origins



Main origins

The range, consisting almost only of smooth varieties, affects the choice of supplier countries. Israel is the main origin during the winter season, together with Spain. South Africa provides the bulk of supplies during the summer season. A few importers take fairly measured quantities of 'Fuerte' or 'Ettinger' from Peru and certain high-quality brands from Kenya. The avocados sold in Germany are not usually imported directly but arrive via neighbouring EU countries (the Netherlands and France).

Price trends
(analysis of wholesale prices)

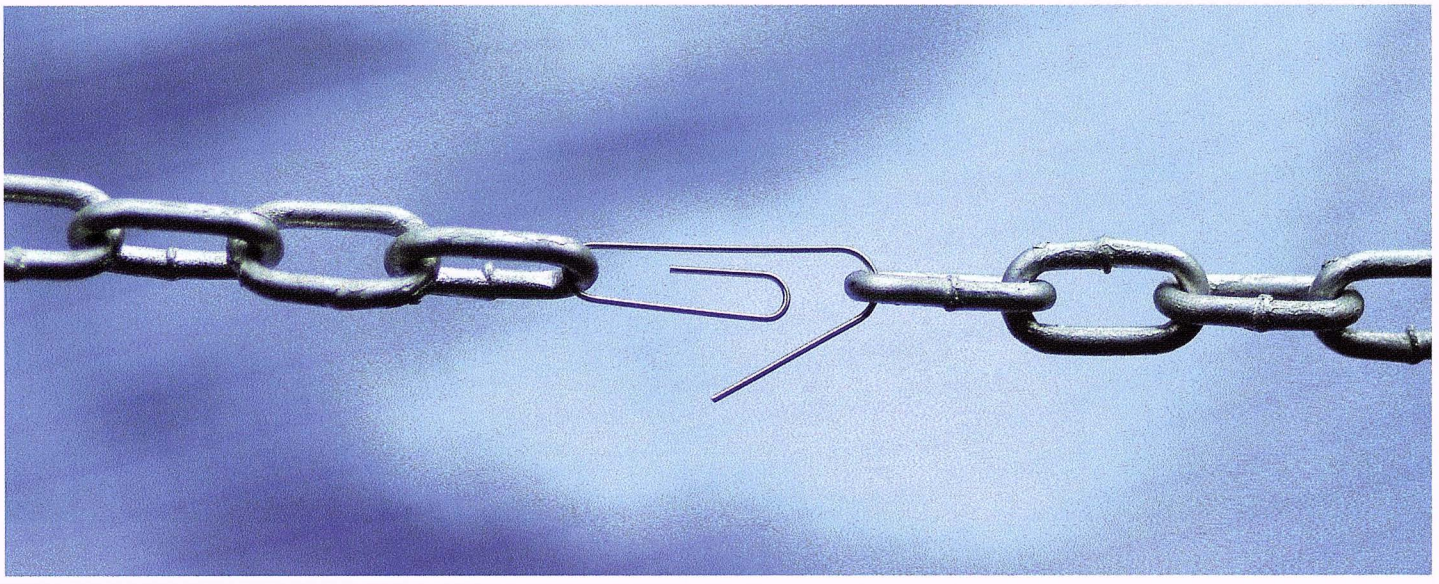


Prices follow the pattern of availability of smooth varieties. They fall after the start of the winter season as supplies from Israel and Spain increase. They then rise slightly with the Christmas marketing operations. They remain stable at the beginning of the year and then rise towards the end of the Israeli and Spanish seasons. The increase in supplies after Kenya and then South Africa start shipping causes another downward movement. This generally stops in June when the quantities from the two latter origins decrease. Prices then rise until the beginning of the winter season.

Market characteristics

More than 90% of the volumes supplied are smooth varieties. Clearly pear-shaped cultivars with shiny skin such as 'Pinkerton' are the most appreciated (rounder fruits like 'Nabal' are more difficult to sell). 'Hass' is a marginal variety reserved for a specialised clientele. It is nonetheless tending to develop. Large fruits (sizes 10, 12 and 14) are the most appreciated as avocado is generally sold individually. The heart of the range available from distributors consists of bulk fruits. However, nets of three or four fruits are tending to develop. Supermarkets, hypermarkets and hard discount stores distribute most of the quantity sold. However, the share of sales of fresh fruit and vegetables in hard discount stores in Germany is about 50% but the score is smaller for avocado. Some chains only stock avocado from time to time when the market situation enables them to run low price operations.

Information... your weak link?



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Market sheet

Eastern Europe
Import statistics

AVOCADO is still little known by consumers in the countries of Eastern Europe. The enormous Russian market of more than 140 million people takes hardly 1 000 tonnes of the fruit. The eight new member-states (NMS) in the east of the EU (Estonia, Hungary, Latvia, Lithuania, Poland, the Czech Republic, Slovakia and Slovenia) account for 3 000 t between them. The growth potential of these markets is therefore substantial in the medium term, especially as economic growth should continue to be fairly strong in the coming years (forecasts of more than 5.5% per year in most cases). Nevertheless, reaching this important potential consumption requires considerable efforts in communication.

Eastern Europe - Avocado
Year-to-year volumes imported (tonnes)

	1999	2000	2001	2002	2003	2004
Poland	521.1	740.7	779.2	921.9	753.8	974.0
Czech Rep.	124.1	152.3	167.0	281.6	284.1	630.0
Latvia	145.6	207.1	195.9	265.9	233.0	685.0
Lithuania	83.9	131.2	139.3	216.4	196.7	282.0
Slovenia	61.3	85.8	108.7	150.7	109.5	201.0
Hungary	64.2	74.5	77.2	88.6	95.6	171.0
Slovakia	32.6	42.3	52.8	69.7	57.1	96.0
Estonia	24.5	33.7	28.0	39.3	39.2	75.0
Total 8 NMS	**1057.3**	**1467.6**	**1548.1**	**2034.1**	**1769.0**	**3114.0**
Russia	**948.0**	**820.0**	**381.0**	**690.0**	**1057.0**	**1106.0**

Source: Eurostat, FAO

Eastern Europe
Avocado
Consumption per person

	Population (million)	Consumption (g per year)
Latvia	2 307	297
Slovenia	1 984	101
Lithunia	3 444	82
Czech Rep.	10 236	62
Estonia	1 323	57
Poland	38 587	25
Slovakia	5 402	18
Hungary	9 877	17
8 NMS	**73 160**	**43**
Russia	**143 246**	**8**

Source: Eurostat, FAO

8 NMS - Avocado
Main supplier countries

Tonnes	1999	2000	2001	2002	2003	2004
Israel	297	495	596	878	495	373
Spain	352	380	424	249	374	515
South Africa	178	315	299	550	401	18
Netherlands	134	175	115	200	175	1364
Kenya	35	29	34	78	172	63
Greece	4	24	22	22	76	35
Dominican Rep.	28	6	7	5	14	0
Italy	6	16	16	7	7	50
France	8	18	5	3	3	78
Brazil	2	1	5	16	4	1
Germany	0	0	2	0	23	486
Others	15	9	22	27	23	133
Total extra-EU	**548**	**854**	**964**	**1 552**	**1 109**	**483**
Total intra-EU	**509**	**613**	**584**	**483**	**660**	**2633**
Grand total	**1 057**	**1 467**	**1 548**	**2 034**	**1 769**	**3115**

Source: Eurostat

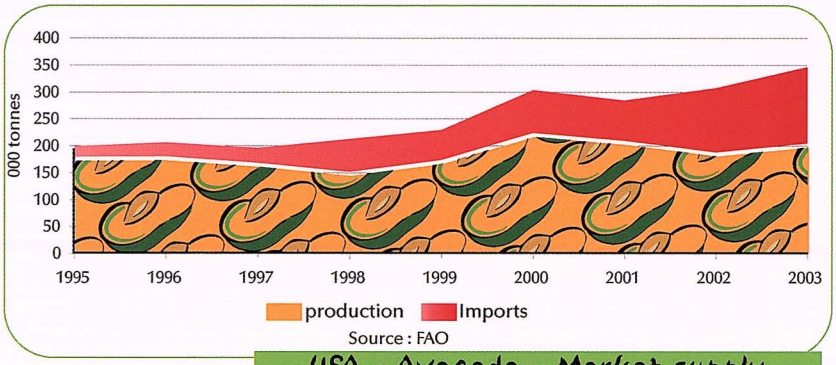
Market sheet

United States

With some 350 000 t in 2003, the United States is in second position behind Mexico in terms of volumes consumed by virtue its position as the second-largest producer and importer in the world. Demand has increased strongly since the end of the 1990s thanks to an exemplary marketing policy initiated by Californian producers and the strong growth of the Hispanic market. Consumption has thus nearly doubled in 10 years to 1 kg per person per year. Domestic production is still the main source of supply but the proportion of imports is increasing. Sanitary protection measures are a condition for access to the market. Chile is still the largest supplier but its supremacy is being challenged by Mexico, which has increasingly broad market access thanks to NAFTA (North American Free Trade Agreement).

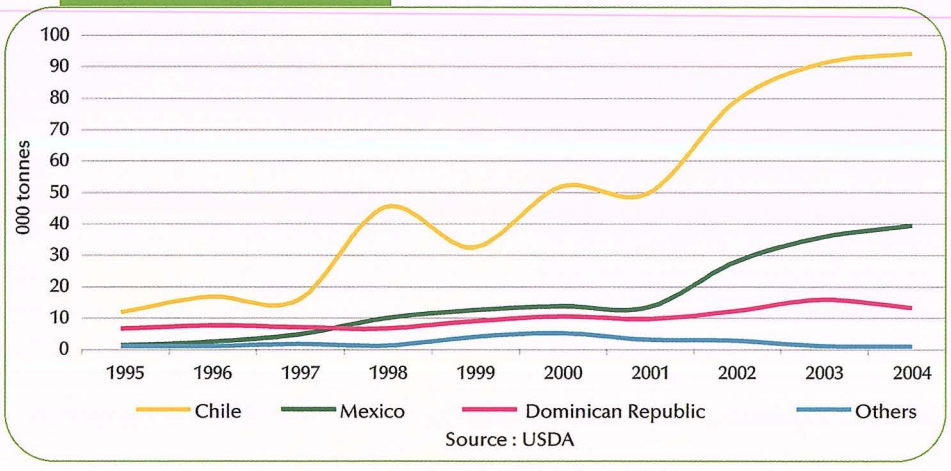
Development of consumption

The volumes sold have tripled in 10 years. This dynamism is explained by two main features. Firstly, the quantities purchased by the increasingly large Hispanic population have increased strongly. Secondly, Californian producers' determination to invest in strong marketing has paid off, especially with the original segmentation by ripeness concept called Ripemax™. Domestic production of 200 000 t covers slightly more than half of requirements. Imports have more than doubled in 10 years to close to 140 000 t to handle this growth. The market should continue to grow in the years to come for the two reasons given above.



USA - Avocado - Market supply

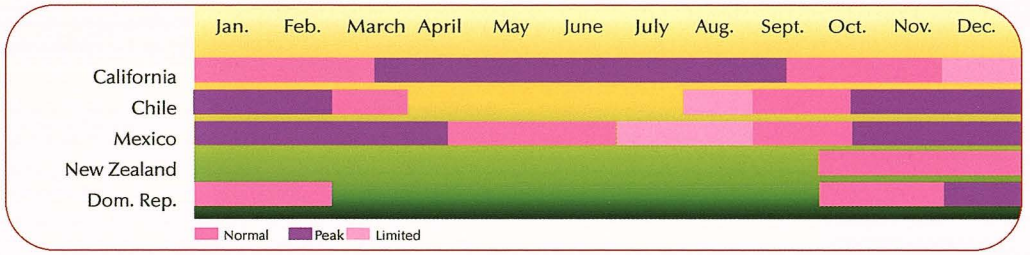
USA - Avocado
Main origins



Main origins

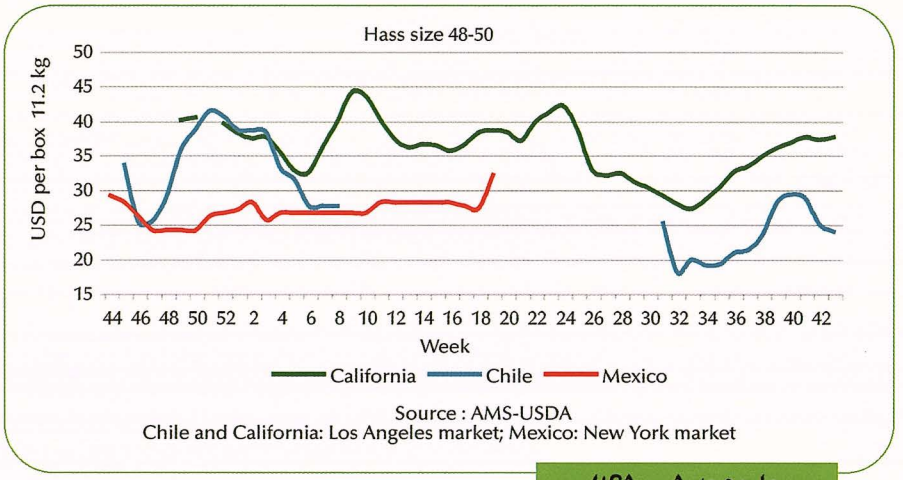
Drastic sanitary protection measures officially aimed at protecting domestic production from fruitfly govern access to the market. Thus only the origins with APHIS (Animal and Health Administration Service) accreditation have access to the US market. Chile has been shipping avocado since the mid-1980s and supplies two-thirds of imports. Mexico's share has tended to increase strongly in recent years at the expense of the other origins. The opening of the market to avocado from Michoacan within the framework of NAFTA has broadened considerably in recent years, with regard to both the sales calendar (all the year round since February 2005) and the number of destination states (19 in 1997, 31 in 2001 and then extension to the 47 non-producer states in February 2005). A large proportion of imports is handled by businesses marketing or producing Californian avocado.

Supply calendar - Hass avocado



Prices

Prices obviously follow trends in overall supply (mainly from California, Chile and Mexico). Peak supply periods for imported avocado (from mid-January to mid-February and from mid-October to mid-November) and for domestic production (August) cause significant price decreases. Prices tend to increase during periods of smaller supplies (in December, with the ending of the Chilean season at the beginning of March and that of the Californian season in September) and during periods of intense promotion (the Superbowl at the beginning of February and the Cinco de Mayo celebrations in particular). US authorisation for Mexico to market avocado all the year round from the beginning of February 2005 onwards could have an impact on the annual price profile. Income per hectare has tended to increase markedly, especially since the end of the 1990s.

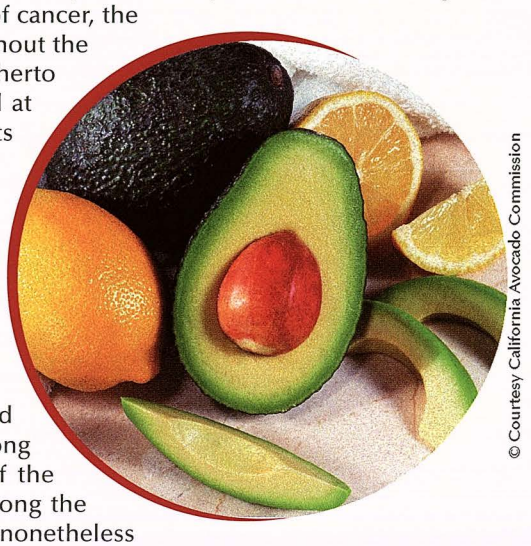


Source : AMS-USDA
Chile and California: Los Angeles market; Mexico: New York market

USA - Avocado Wholesale prices (2003/2004)

Promotion

The promotion policy set up by Californian growers is exemplary in several respects. Firstly it has been running for over 40 years (more than USD300 million was invested from 1961 to 2003, funded solely by Californian growers). Since 2003, it has also involved import stakeholders with the setting up of the Hass Avocado Board that levies 2.5 cents per pound of avocado sold in the USA, whatever the origin. The funds collected are used by the California Avocado Commission (CAC) and importers to finance coordinated promotion operations. Advertising aimed at consumers concentrates on the health aspects (prevention of cancer, the '5-a-day' campaign). It is also aimed at developing festive sales throughout the year (the Superbowl, the Cinco de Mayo and above all periods not hitherto covered such as St Patrick's Day, Christmas, etc.). Operations aimed at professionals concern marketing in particular ('pre-conditioned' fruits whose maturation process has been initiated and the Ripemax™ range with three different levels of maturity) and promotion of awareness among the catering trade clientele.



© Courtesy California Avocado Commission

Consumption profile

The consumption level is strongly conditioned by the ethnic background (product penetration of 47% among Hispanics in comparison with 17% among Afro-Americans). This factor accounts for the very uneven distribution of the volumes sold. About two-thirds of sales are in the West coast states and along the frontier with Mexico (mainly California, New Mexico and Texas), that nonetheless represent only about a quarter of the population of the United States. Less than 20% is sold in Florida and the East coast states, which are nevertheless home for 50% of the population and the growth potential is very large (as in the states in the centre of the US). Avocado tends to be eaten most by college-educated city-dwellers with high incomes.

Market sheet

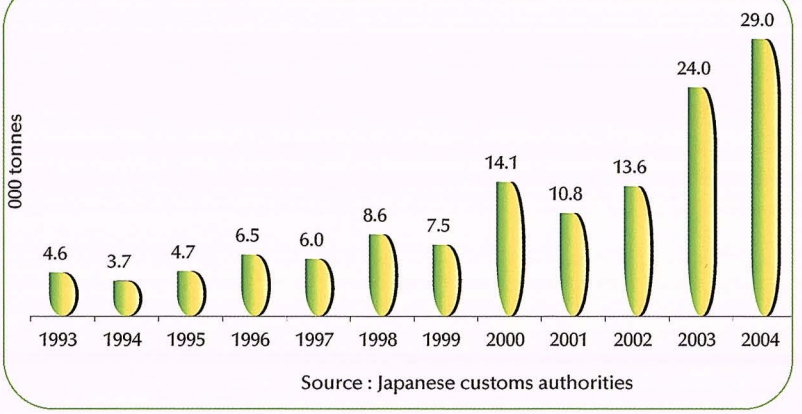
Japan

With 120 million high-income consumers, the Japanese market appears to be very attractive. However, fruits are not part of the basic Japanese diet, which is developing but is still very traditional. Fruit consumption is therefore fairly modest. Avocado is a minor imported fruit in comparison with banana and grapefruit, but quantities have increased strongly since the end of the 1990s even though the economic situation has been difficult.

Development of consumption

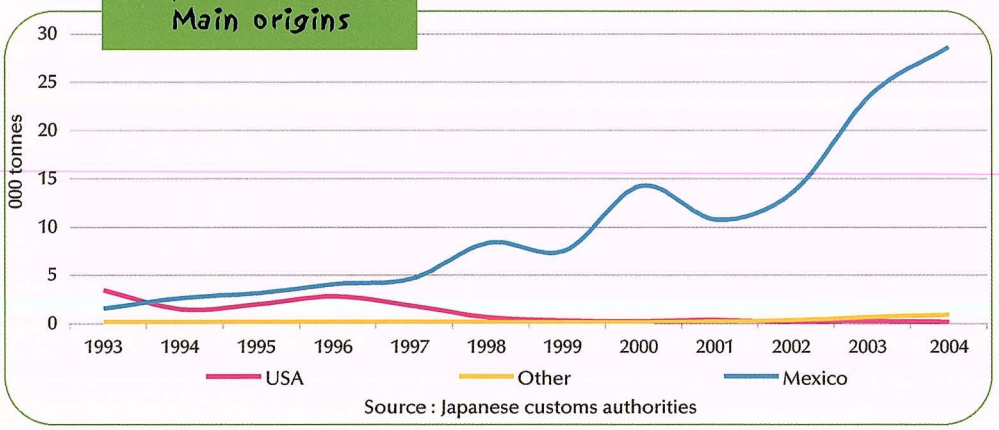
Japan has no avocado production. The climate is not suitable on the four main islands, located north of the 32nd parallel. Significant quantities of pineapple are grown in Okinawa province where the climate is tropical but there is no avocado. The fruit was not known in Japan until the beginning of the 1980s and supplies consist solely of imports whose volume was controlled until 1990. Real interest in avocado has been displayed only recently, at the end of the 1990s. However, volumes increased rapidly, especially thanks to promotion operations by American operators in spite of a general recession in fruit imports because of the very difficult economic situation. Nevertheless, they did not reach 30 000 t in 2004. Per capita consumption is currently some 250 g per year (i.e. one size 16 fruit).

Japan - Avocado - Consumption



Source : Japanese customs authorities

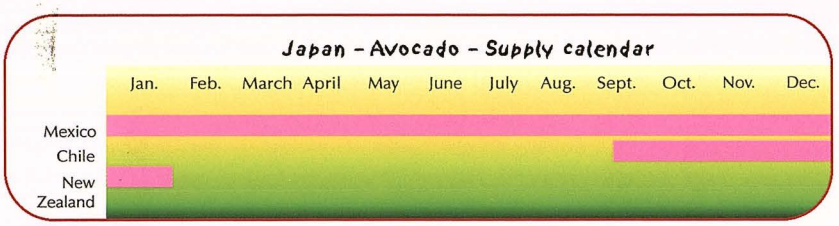
Japan - Avocado Main origins



Source : Japanese customs authorities

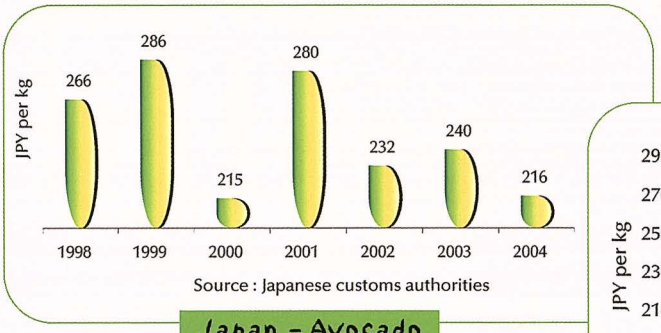
Main origins

Access to the market is subject to sanitary protection measures reputed to be the strictest in the world. Drastic controls are performed in a limited number of empowered ports in order to check that the fruits meet the requirements of the Plant Protection Law (phytosanitary protection measures, especially with regard to fruitfly) and the Food Sanitation Law (sanitary protection measures). The market for avocado, like that of most imported fruits, is centred on a markedly dominant supplier. Mexico ships more than 95% of supplies. The United States, the historic origin that made a substantial contribution to market development, has practically disappeared from the scene (under pressure from Mexican competition and increasing demand on the home market). New Zealand has shipped a significant proportion of fourth-quarter supplies since 2002. Exporters have grouped to penetrate the market under the Avanza brand. Chile has also been noticeably present during the same period since 2003. American companies (fruit multinationals or operators specialising in avocado) handle practically all imports.

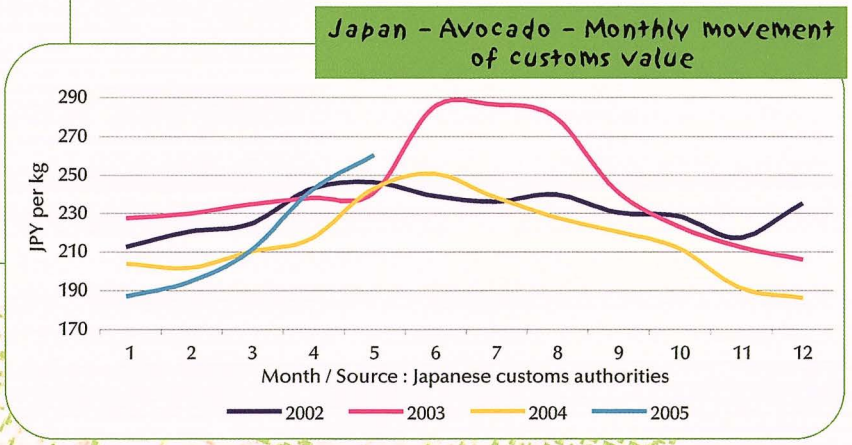


Price trend

The increase in the quantities imported has resulted in a distinct decrease in the average annual price (estimated from customs values). Prices are still nevertheless distinctly higher than those in the USA for Mexican operators, even though the gap is closing (about 20% in 2004). Monthly price movements follow the cost price of Mexican goods. Prices increase from January to June and peak until July-August. The arrival of the new harvest causes a decrease in August-September that continues until December. The decrease in the fourth quarter tends to be increasingly marked with the increasing arrival of fruits from Chile and New Zealand. Retail prices are some JPY 200 per European standard size 16 fruit (i.e. about EUR 1.50).

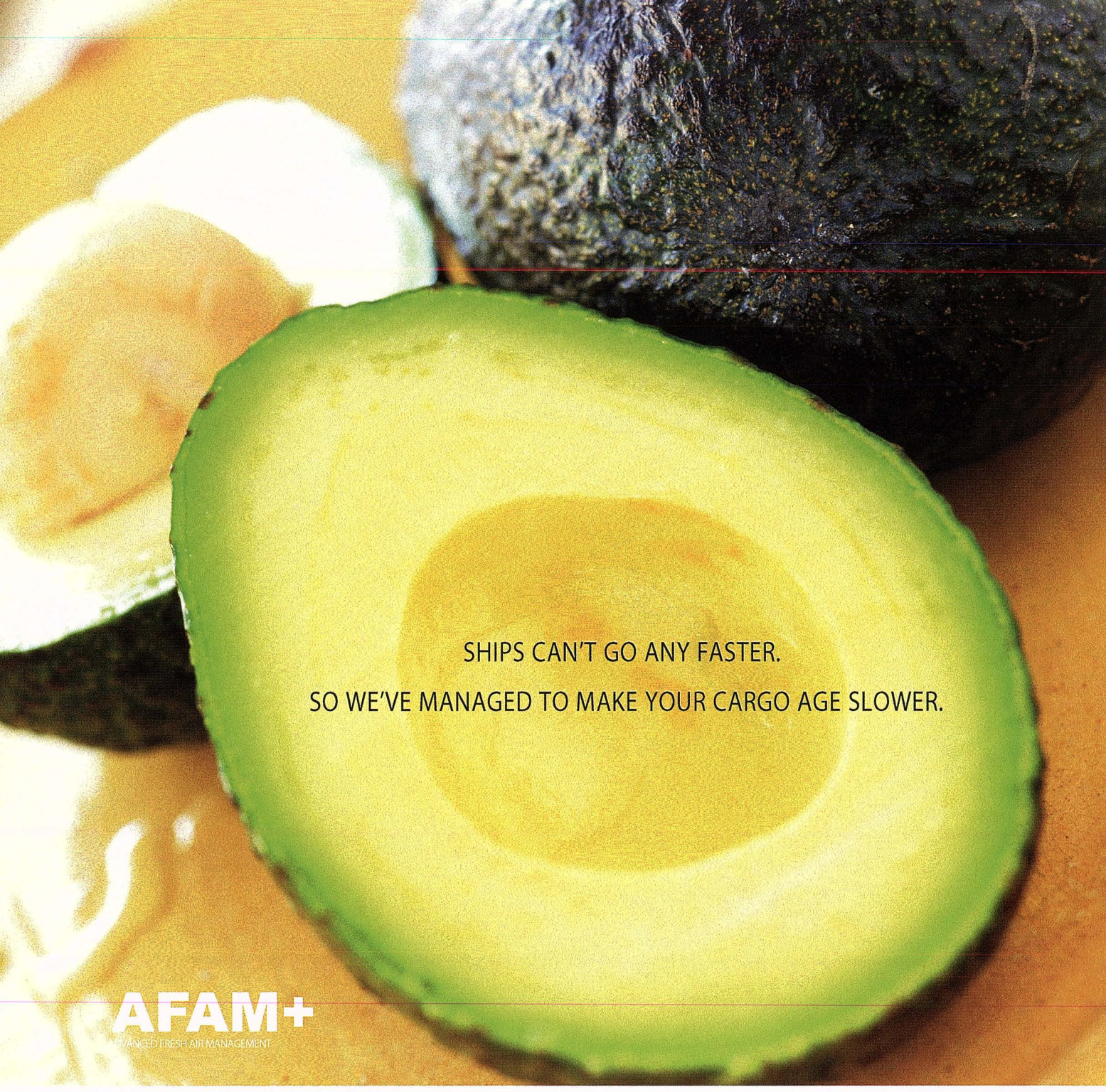


Japan - Avocado
Customs value



Market characteristics

The very traditional nature of Japanese society makes the market very special and difficult to enter. Trade channels are evolving but are still long. The functioning of the wholesale sector is fairly complex (it is frequent to observe two different levels selling goods by auction), and in 2001 it still marketed 50% of volumes via no less than 86 central markets and more than 1 300 regional markets. It is still very present even though it has lost market shares in recent years (a 2004 regulation is aimed at revitalising it). Large supermarkets (chains such as Ito Yokado, Aeon/Jusco, a subsidiary of Wal Mart Seiyu) handle about two-thirds of food retailing; they are concentrating but are still very fragmented. Small outlets (supermarkets and self-service stores) are very much in evidence (90 per 100 000 people against 56 in the United States) because the Japanese favour frequent purchases in the neighbourhood. Fruit consumption is comparatively small (about 40 kg per person per year in contrast with some 75 kg in France), unlike that of vegetables. Fruits do not form part of the firmly anchored traditional diet and are considered as luxury produce and often purchased to be given as presents. Consumer quality requirements are very strict in particular with regard to the sanitary, freshness and visual aspects. Large fruits are preferred (size 16 avocados). Imported fruits have an advantage in the present difficult economic context as they are less costly than local production. However, only fairly young, urban consumers display real interest in tropical fruits.



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Post-harvest

Post-harvest management of fruits is of prime importance. It affects both quality and yield as losses can range from 5 to 50%.

The special features of climacteric fruits

Climacteric fruits have special physiological characteristics. They must be harvested after reaching a sufficiently advanced stage of development and hence of maturity. It is only then that they are capable of synthesising sufficient amounts of ethylene to be able to start ripening (a strong increase in respiration that physiologists refer to as the 'climacteric' marks the start of deep-seated physiological changes). Only mature fruits will display satisfactory organoleptic characteristics once they have ripened.

Avocado is a singular climacteric fruit. It can only start the ripening process after it has been picked. One of the best ways of storing the fruit is therefore to leave it on the tree. Some varieties can remain on the branch for several months, depending on the season. Suitability for 'tree storage' is generally very small or non-existent for West Indian cultivars but marked for hybrids, especially for Guatemalan x Mexican crosses. Nevertheless, prolonged storage can have a negative effect on production in the following season.

These physiological considerations highlight the importance of the harvest date. Several variables that depend on the variety and the producer country concerned are to be taken into consideration to judge the optimum stage of maturity. Visual appraisal, fruit weight and diameter and the number of days after flowering give useful information but this is not accurate enough. Determining the matter content—strongly correlated with the oil content—is the most commonly used method. Appraisal of the stage of maturity is completed by analysis of enzymatic activity, electrical conductivity, aromatic compounds or precursors or by tasting tests when the fruits have ripened.

Packing

Fruits with the desired maturity index are sorted, washed and graded before packing. Each market has its own packing requirements.

Europe - Avocado - 4-kg box 35 x 28.5 x 9 cm

Weight (g)	Size
461-475	8
366-400	10
306-365	12
266-305	14
236-265	16
211-235	18
190-210	20
176-189	22
156-170	24
146-155	26

Japan - Avocado - 6-kg box 43.9 x 33.1 x 11 cm

Weight (g)	Size
340	18
298	20
241	24
196	30
156	35

USA - Avocado 5.67-kg box

Weight (g)	Size
422	14
377	16
340	18
298	20
241	24
196	30
156	35

USA - Avocado 11.34-kg box 43 x 32.6 x 17.5 cm

Weight (g)	Size
422	28
377	32
340	36
298	40
241	48
196	60
156	70
122	84
102	96

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Storage

Cooling

The temperature is lowered to slow the metabolism of the fruit so that it can be stored. This slows ethylene synthesis and its effects. It is therefore sought to bring the fruits to the best temperature for storage as rapidly as possible after harvesting (ideally in less than 6 hours). The duration of cooling depends on the initial and final temperature of the fruit and on the ambient air conditions (temperature, wind velocity and relative humidity). The time necessary varies from 8 to 10 hours. It is important to halt the cooling phase 2°C before the final temperature desired to be sure not to reach temperatures that are too low and that might damage the produce.

Refrigeration

Optimum storage temperatures vary according to the variety, the period of the season (maturity) and the storage period desired. In general, the temperature for mature avocado ranges from 5 to 12°C with atmospheric relative humidity of 85 to 95%. The more delicate end-of-season fruits are stored in the lower part of the temperature range.

For 'Hass', physiologists advise the maintaining of fruits at 5 to 7°C at the beginning of the season and 4.5 to 5.5°C at the end. More than four weeks of storage at these temperatures is not recommended. The optimum temperature range for 'Fuerte' is 6 to 8°C but not for more than three weeks. In practice, professionals keep all the classic commercial varieties at between 5 and 6°C.

Temperatures must be strictly controlled to prevent any fluctuation. Movement of air is also regulated. Heat is released during the starting of the ripening process and this must be taken into account. Respect of the cold chain is of crucial importance.

Controlled atmosphere

Controlled atmosphere is widely used for long transport and can lengthen the duration of storage. Low O2 levels combined with high CO2 reduce respiration and ethylene production. An O2 content of 2 to 5% and CO2 at 3 to 10% are generally used. The main classic commercial varieties can thus be stored for 5 to 6 weeks and even longer for 'Hass'. The effects of unsuitable O2 and CO2 levels are described in the paragraph entitled 'Main types of post-harvest physiological deterioration' below.

Alternative technologies for long storage

Treatment with 1-MCP. Application of 1-MCP (1-methylcyclopropene) is reported to limit the internal symptoms of chilling injury (dulling of the pulp, vascular browning) in fruits stored for more than four weeks. The technique is said to give good results especially for the green varieties that are less suitable than 'Hass' for long storage (with respect of the standards in force). It has been used on a proportion of the South African harvest for three years.

Step-down temperature

This technique has been used in the South African avocado sector for several years to conserve fruit quality and reduce internal symptoms of chilling injury. The storage temperature is lowered in steps (1 to 2°C each week) during transport, with care taken not to descend lower than 3.5°C. There are procedures (temperature and duration) for the different cultivars and regions of South Africa.

Ripening

The ideal temperature for ripening is 15 to 20°C. Above 25°C, ripening is irregular, unpleasant flavours appear and the risk of rot increases. This natural process can also be controlled. Treatment with ethylene (100 ppm at 20°C for 12 to 72 hours depending on the maturity of the fruit) speeds up ripening by 3 to 6 days. It is possible to obtain fruits at an even stage of ripeness in chambers in which temperature, relative humidity and ethylene content are the main parameters controlled. Nevertheless, ripening still depends on the initial stage of maturity of the fruit.

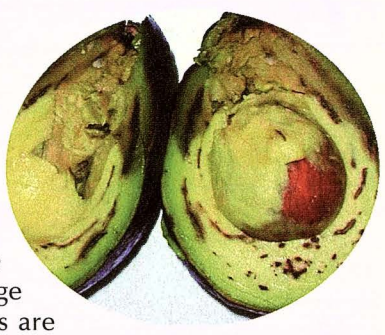
The main precautions to be taken in shops

Avocado fruits are very sensitive to impacts and to pressing by consumers. Ripe and nearly ripe fruits must be stored at lower temperatures (1 to 6°C). Misting is not recommended.

Main types of post-harvest physiological deterioration of avocado

Storage-related damage

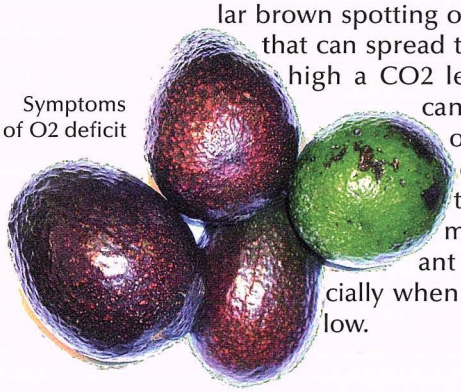
Chilling injury. This damage is caused by low temperatures—generally lower than 3°C—or by prolonged storage. The symptoms may appear three days after packing during storage and more often when the fruits are removed from the cold room.



Symptoms of chilling injury

Two forms of chilling injury are observed. The symptom of internal chilling injury is a browning of the pulp starting at the base of the fruit and sometimes vascular browning in the same area. In 'Fuerte', this disorder takes the form of small dark spots in the pulp. The symptoms of external chilling injury are irregular black spots on the epidermis. They may appear during storage and most frequently when the fruits are removed from cold storage.

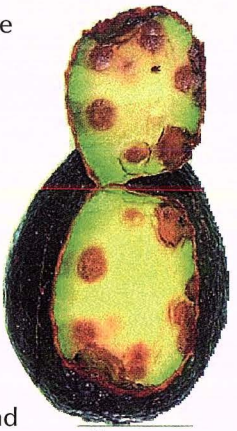
O2 deficit and excessive CO2. Too great a decrease in the O2 level (in particular to less than 1%) can cause irregular brown spotting of the epidermis that can spread to the pulp. Too high a CO2 level (over 10%) can cause discoloration of the epidermis and the development of unpleasant flavours, especially when the O2 level is low.



Symptoms of O2 deficit

Fungal infection in the field revealed during or after storage

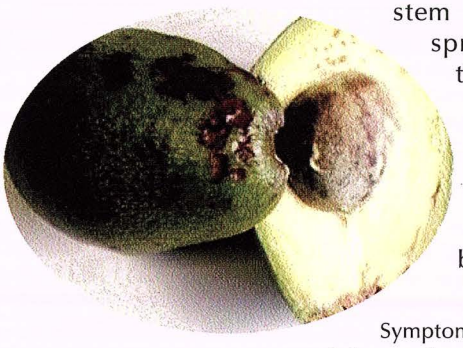
The control of fungal diseases requires effective orchard management and appropriate treatments before the harvest. All bruising of the fruits must be avoided at the post-harvest stage, they must be refrigerated rapidly and the cold chain maintained.



Damage caused by anthracnose

Anthracnose. This is the most frequent disease during storage and is caused by infection of the fruit by *Colletotrichum gloeosporioides* in the orchard and appears only during ripening. It causes serious necrosis. Ordinary small, scattered injuries develop into large circular brown spots on the epidermis. The underlying pulp blackens and the rot reaches the stone. The rate of development of this rot depends on the transport and storage temperature and above all the state of maturity of the fruits.

Stem-end rot. This disease is also caused by infection by a fungus, *Botryodiplodia theobromae*. Small pale brown spots appear initially in the stem zone. The rot spreads rapidly to the rest of the fruit. The pulp is then infected to the stone. Any injury in the epidermis favours infection by the pathogen.



Symptoms of stem-end rot

Avocado - Post-harvest diseases caused by pathogenic fungi

Pathogen	Disease
Alternaria spp.	Black rot
Botryodiplodia theobromae	Stem-end rot
Botryosphaeria ribis (Dithiorella gregaria)	Stem-end rot
Colletotrichum gloeosporioides	Anthracnose : black rot
Fusarium spp.	Stem-end rot
Penicillium expansum	Blue mould
Pestalotiopsis perseae	Brown spots
Phomopsis perseae	Brown rot
Phytophthora citricola	Small surface injuries
Pseudocercospora purpurea	Soft rot
Rhizopus stolonifer	Corky patches on epidermis
Trichothecium roseum	Pink rot

Nutrition

Avocado is recommended by numerous health advisory bodies everywhere ('5 a day' programme, recommended diets, etc.) and can even be considered as a functional foodstuff, that is to say one whose nutrients have a beneficial effect on health. It is an excellent energy source, with some 167 calories per 100 g. More than three-quarters of the fat content consists of unsaturated fatty acids (mainly oleic acid) whose properties are sought for their effect in lowering blood cholesterol. Avocado contains numerous essential vitamins and minerals, sometimes in substantial quantities (especially potassium and magnesium). Vitamins E and C and other natural antioxidants such as glutathione and lutein are found in avocado; these help to slow ageing and may help to prevent cancer and heart disease.

Avocado - Nutritive value per 100 g (equivalent of half of a size 20 avocado) Mainly 'Hass' from California

Nutrient		Value	Properties
Energy		167 kcal (697 kJ)	
Water (g)		72	
Protein (g)		2	Including glutathione, that has antioxidant properties
Carbohydrate (g)		9	
Lipids (g)		15	
	of which saturated	2	
	of which polyunsaturated	2	Helps to lower blood cholesterol levels
	on which mono-unsaturated	10	Oleic acid plays a role in maintaining an optimum level of 'good cholesterol' (HDL) in the blood
	Cholesterol	0	
	Beta sitosterol (mg)	76	Helps to decrease blood cholesterol levels
Fibre		6.8	
Minerals			
	Calcium (mg)	13	Important for bones
	Phosphorus (mg)	54	Essential for healthy bones and teeth
	Sodium (mg)	8	
	Potassium (mg)	507	Important for nerves and muscles
	Iron (mg	0.6	Important for the transport of oxygen in the blood
	Zinc (mg)	0.7	Important for skin
	Copper (mg)	0.2	Enhances cell growth
	Manganese (mg)	0.1	Important for the good functioning of metabolic reactions
	Selenium (µg)	0.4	Important for cells
	Magnesium (mg)	29	Excellent for muscles and nerves
Vitamins			
	Vitamin C (mg)	8.8	Stimulates natural immune responses
	Thiamin (mg)	0.1	Important for nerves
	Riboflavin (mg)	0.1	Important for energy, nerves and skin
	Niacin (mg)	1.9	Excellent for the skin and brain activity
	Pantothenic acid (mg)	1.5	Important for the metabolism as a whole and for healthy hair
	Vitamin B6 (mg)	0.3	Nerves and blood
	Folate (µg)	89	Important for the nervous system; helps to prevent congenital malformation
	Vitamin A (IU)	147	Important for eyes and skin
	Vitamin E (mg)	2	Antioxidant, slows cell ageing
	Vitamin K (µg)	21	
Other			
	Beta-carotene (µg)	63	
	Alpha-carotene (µg)	24	
	Beta-cryptoxanthin (µg)	27	
	Lutein + zeaxanthin (µg)	271	Anti-oxidant; slows cell degeneration

Source: US Department of Agriculture, Agricultural Research Service, 2003. USDA Nutrient Database for Standard Reference, Nutrient Data Laboratory Home Page, http://www.nal.usda.gov/fnic/foodcomp

For further information . . .

Australia
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Avocados Australia Limited, http://www.avocado.org.au/
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Le Cirad,
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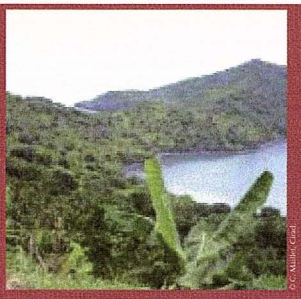
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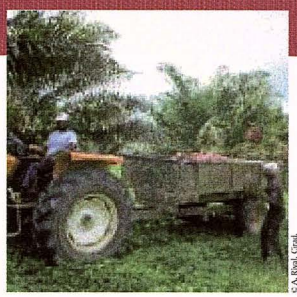
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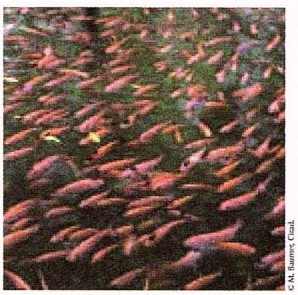
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- Le Cirad est l'Institut français de recherche agronomique au service du développement des pays du Sud et de l'outre-mer français. Il privilégie la recherche en partenariat.
- Il intervient par des recherches et des expérimentations, des actions de formation, d'information et d'innovation, et des expertises.
- Ses compétences relèvent des sciences du vivant, des sciences humaines et des sciences de l'ingénieur, appliquées à l'agriculture et l'alimentation, à la gestion des ressources naturelles, et aux sociétés.

Données-clés

1850 agents, dont 950 cadres ; 270 doctorants, 600 stagiaires accueillis chaque année

Un budget opérationnel de 190 millions d'euros

Une présence permanente dans l'outre-mer français et dans une quarantaine de pays étrangers sur 3 continents : Afrique, Amérique latine, Asie

Une coopération régulière avec plus de 90 pays

Une organisation en 7 départements et 60 unités de recherche

Départements

Cultures annuelles

Cultures pérennes

Productions fruitières et horticoles

Elevage et médecine vétérinaire

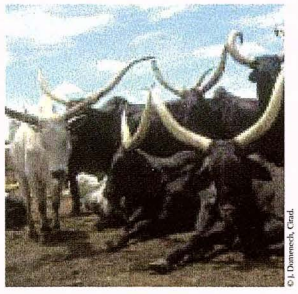
Forêts

Territoires, environnement et acteurs

Amélioration des méthodes pour l'innovation scientifique

La biodiversité au Cirad

- L'objectif du Cirad est d'associer gestion de la biodiversité et production agricole dans les pays en développement. Il s'agit d'aider les sociétés du Sud à produire pour leurs besoins et à préserver les espaces ruraux et naturels, en prenant en compte la pluralité des usages et des intérêts liés à la gestion de cette biodiversité.
- Afin d'élargir la diversité génétique des espèces utiles, une partie des recherches du Cirad portent sur la gestion des ressources génétiques.
- Le champ d'investigation est celui de l'agrobiodiversité, c'est à dire les espèces cultivées ou utilisées par l'homme, les écosystèmes naturels ou cultivés dans lesquels on les trouve, ainsi que les espèces sauvages associées qui contribuent au fonctionnement de ces systèmes. Le Cirad s'intéresse également aux méthodes de gestion des forêts tropicales, aux « fronts pionniers » où la diversité biologique est menacée et aux zones d'interface entre les aires protégées et les territoires agricoles. Enfin, des travaux sont menés sur l'impact environnemental des espèces envahissantes et les interactions entre écosystèmes insulaires et activités humaines.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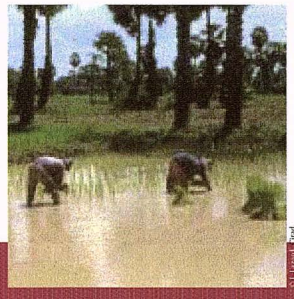
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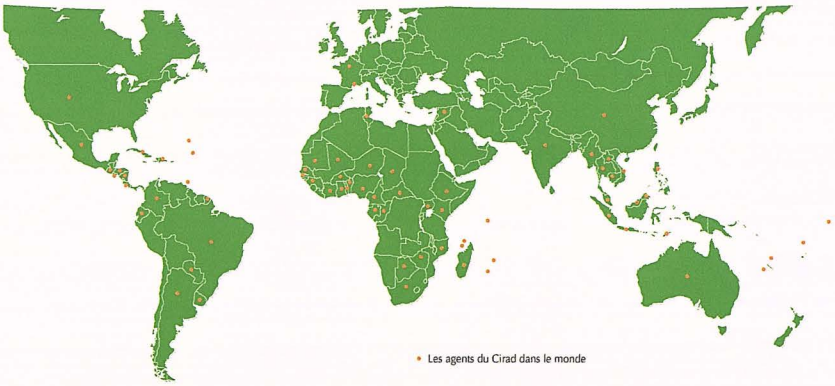
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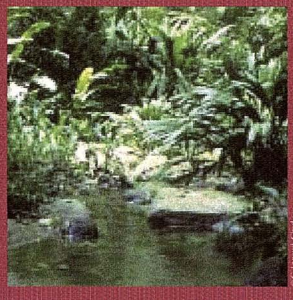
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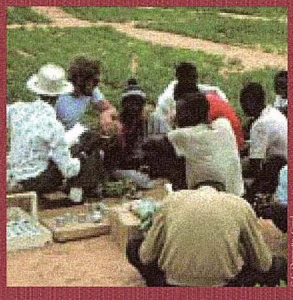
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The Market News Service for fruits and Vegetables

The Market News Service (ODM – Observatoire des marchés) is a decision-support instrument. As part of CIRAD's Fruit and Horticultural Crops Department, the ODM backs different research and development activities and serves public authorities, international institutions and commercial stakeholders from both developing and industrialized countries. It conducts leading-edge research in economic intelligence and modelling.

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This economic intelligence unit disseminates information and studies via many different specialized media that target different audiences, ie magazines and newsletters (FruiTrop, Info Banane, weekly market trends reports, etc.) and annual statistical directories. The ODM organizes and coordinates professional meetings, which provide an ideal setting to foster dialogue between professional stakeholders and scientists. Finally, part of its activity is to provide counselling to companies and public authorities on drawing up effective policies.

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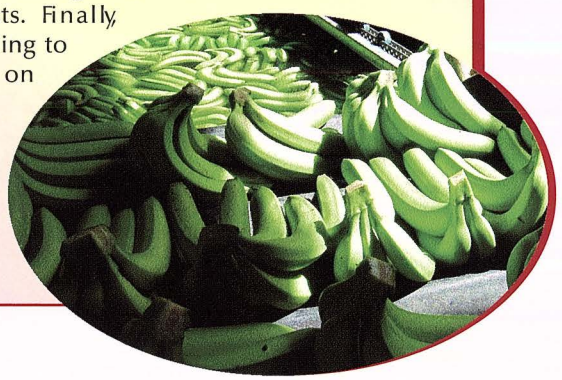

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