A report by Eric Imbert

Grapefruit

International trade in grapefruit was marked in 2004-2005 and 2005-2006 by the direct and indirect consequences of the hurricanes that hit Florida in autumn 2004 and autumn 2005. The harvest in this region—the world's leading production and export zone—plummeted, drastically reducing the volumes traded internationally. This shrinking of supplies resulted in an unprecedented increase in prices on the two main import markets—the European Union and Japan. The 2006-2007 season was characterised by a recovery of world supplies to a better level that is probably fairly close to the quantities in the coming seasons. This increase results to a considerable extent from distinctly larger production in Florida, although it is still much smaller than it was before the hurricanes. However, supply levels to the main consumption centres in the world were very varied. Supplies were astonishingly large in the EU-25 market as complementary sources had considerably increased their shipments. Thus, the expansion of shaddock from China on the international scene is one of the main features of the season. The near-saturation of the low and mid-market range in Western Europe led to larger shipments to Eastern Europe. Conversely, the supply deficit remained marked in Japan. This market is always less permeable to complementary sources of supply than the EU market because of the very strict entry constraints (especially sanitary aspects). Paradoxically, Florida supplies displayed least growth on the United States market as a result of a slump in consumption whose severity was amplified by the increase in retail prices.

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The European grapefruit market

Review of the 2006-07 season

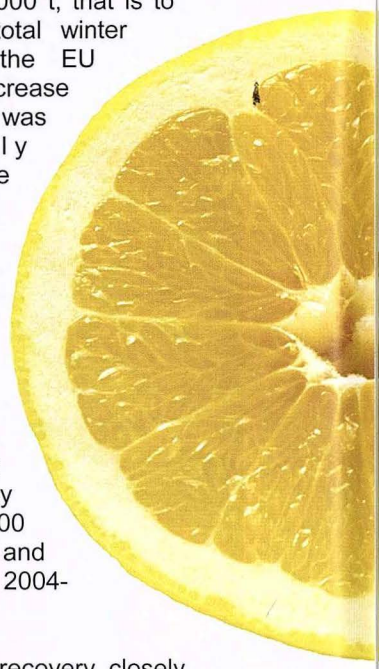
All professionals expected another winter season with a strong deficit in fruits. However, it must now be admitted that supplies of the EU market were much larger than expected, with a return to a normal level. Although arrivals from Florida were still distinctly short, the improvement was greater than initially thought. In parallel, the more marked presence or even the appearance of 'small sources' caused an increase in overall supplies that was less perceptible but real nonetheless. Price performances were satisfactory for Florida but disappointing for the other origins and gave some interesting information about market mechanisms.

A probably average supply volume when supplies from all sources are counted

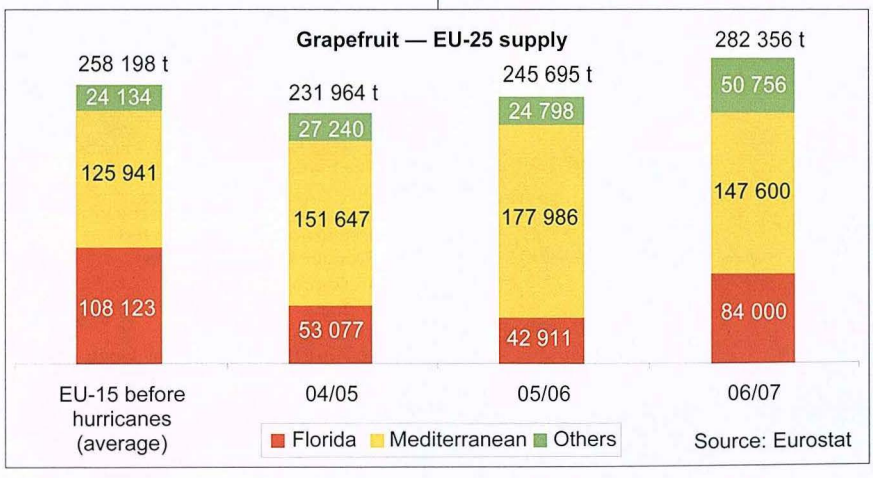
The most noteworthy feature of the season was the return to distinctly stronger supplies than in 2004-2005 and 2005-2006. Final customs statistics have not yet been released but the figures gathered by CIRAD Market News Service give a fairly accurate idea of the volumes marketed. May to September arrivals in EU-25 probably exceeded 280 000 tonnes after oscillating between 230 000 and 245 000 in the two previous seasons. Comparison over a longer period using deliveries to EU-15 shows that shipments were equivalent to those before the hurricanes in Florida.

A partial but distinct return of Florida

The most distinct increase was no doubt in arrivals from Florida, with a rise to 4.3 million boxes after 2.1 million during the 2006-2007 season and 2.8 million during that of 2005-2006. It is true that these volumes are still far from the 6.5 million boxes shipped regularly until 2004. However, the 2.2-million-box increase in comparison with the previous season represents 37 000 t, that is to say 15% of total winter supplies for the EU market. The increase in supplies was particularly marked at the beginning and especially the end of the season with more than 1.1 million boxes arriving between the beginning of April and the end of May against 260 000 in 2005-2006 and 400 000 in 2004-2005.

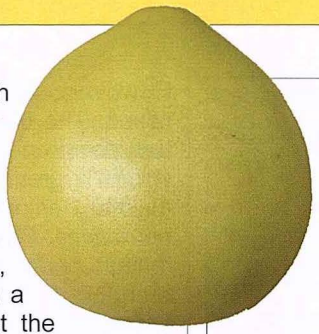


However, this recovery closely analysed by European importers on the look-out for the smallest clue to trends in production in Florida in the coming years should not be over-interpreted (see box).



Large inter-season volumes with a staggered calendar

Inter-season sources played a structuring role during the first part of the season. Firstly, large volumes were shipped. As shipments from South Africa and Argentina were small, the very high price levels attained during the summer obviously generated much attraction (see box). Secondly, the delivery calendars often ran very late and some-



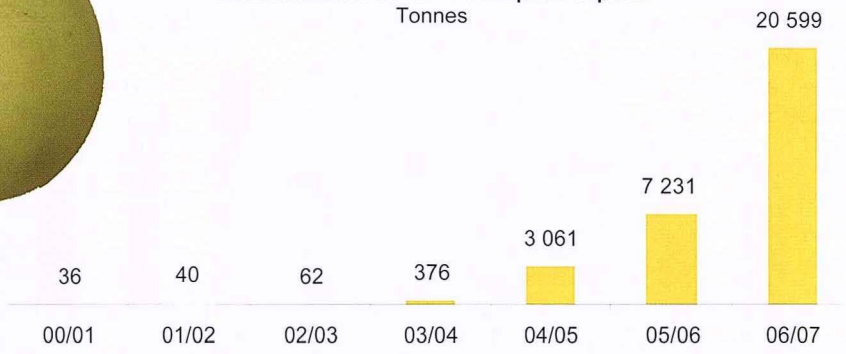
times overlapped with those of the winter origins. This was the case of Cuba which, after minor presence in 2005 and almost total absence in 2006, returned strongly with a first ship unloaded at the beginning of October, that is to say at the same time as the first shipments from Turkey and Israel. Likewise, the Honduran season, with comparatively large amounts of fruits, continued until the end of November. The example of Mexico is even more eloquent.

Mexico more present and less seasonal with the development of supplies from Michoacán

The volumes imported increased to nearly 10 000 tonnes. Michoacán, a hitherto absent production region, has now swollen Mexican supplies that previously came only from Yucatan. Furthermore, the season is now much longer as the production calendar is much extended than in Yucatan. Mexican fruits were thus noticeably present until the end of November.

Shaddock from China — European imports

Tonnes



Source: Eurostat

Mexico seems to have strong points that will enable it to gain a larger position in the EU market, especially in spring and summer. The fruits are of tropical quality, supplies are organised around a limited number of exporters and importers and the production period is long. It is true that the result for the 2006-2007 season were mixed, especially as the end of the season was very difficult. However, some operators such as Dole and Fruidor opted clearly for the origin and applied a few technical adjustments that still proved necessary. Mexico could become the source to fill the inter-season gap for these companies.

Chinese shaddock more than confirmed its arrival on the market

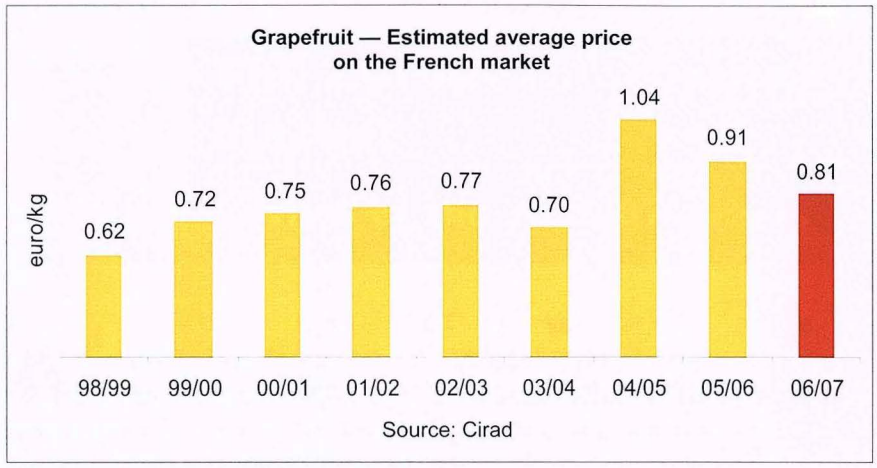
The final component of this distinct increase in supplies is less clearly perceived by operators and more diffuse. Imports of shaddock from China exceeded 20 000 t in 2006-2007, making this source the fifth largest supplier of the EU market, just after Spain but well ahead of Cyprus. This is an amazing increase as very few of these fruits were delivered in 2003-2004—just one container imported by AZ France for the Carrefour group for sales during the Chinese New Year. The importers handling these fruits are very confident and consider that the market for this produce should continue to grow strongly in the seasons to come.

Business was difficult for the Mediterranean origins in this context of strong competition from the beginning of the season onwards and they lost market shares. Sales volumes had approached 180 000 t and now slipped below 150 000 t. Nevertheless, this decrease should be seen in relative terms as the quantities sold were still distinctly larger than those of the seasons preceding the 2004 hurricanes when the average was about 125 000 t.

Grapefruit and shaddock — European imports from the northern hemisphere

Tonnes	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005		2005-2006		2006-2007	
	UE-15	UE-15	UE-15	UE-15	UE-15	UE-25	UE-15	UE-25	UE-15	UE-25
USA	108 330	109 033	101 119	114 010	51 320	53 077	42 522	42 911	83 000	84 000
Israel	54 474	43 369	42 878	44 536	54 543	62 612	48 078	54 453	45 000	50 500
Turkey	45 107	49 066	38 918	43 017	31 854	42 709	55 935	80 893	34 000	52 600
Spain	16 453	20 463	23 848	20 936	23 348	29 358	22 436	27 808	24 000	30 000
Cyprus	14 932	14 275	15 070	16 425	12 796	16 967	12 660	14 832	13 000	14 500
Mexico	1 715	5 929	3 939	5 728	7 560	7 594	4 527	4 527	20 367	20 599
Cuba	8 923	11 275	5 727	9 823	2 013	3 415	700	700	9 595	9 595
Honduras	10 643	8 912	9 862	13 547	12 340	13 169	12 340	12 340	5 275	5 275
China	36	40	62	376	3 032	3 061	7 231	7 231	15 287	15 287
Total	**260 610**	**262 362**	**241 423**	**268 397**	**198 804**	**231 963**	**206 430**	**245 695**	**249 524**	**282 356**

Source : Eurostat, except 2006-2007 Eurostat and Cirad



Grapefruit — Estimated market price on the French market

euro/kg	Florida	Israel	Turkey	Average
1998-1999	0.60	0.70	0.55	0.62
1999-2000	0.75	0.72	0.52	0.72
2000-2001	0.77	0.74	0.62	0.75
2001-2002	0.80	0.68	0.54	0.76
2002-2003	0.79	0.73	0.65	0.77
2003-2004	0.73	0.68	0.56	0.70
2004-2005	1.12	0.91	0.86	1.04
2005-2006	1.13	0.79	0.67	0.91
2006-2007	0.89	0.66	0.65	0.81
2006-07/2005-06	- 21%	- 16%	- 3%	- 11%
2006-07/2000-04	+ 15%	- 7%	+ 10%	+ 9%

Source: Cirad

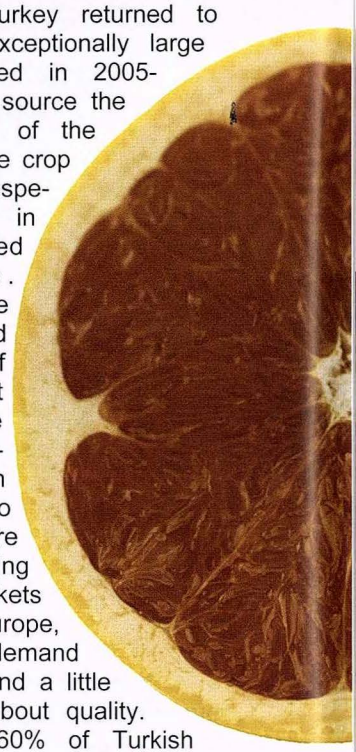
The EU and Japanese markets were less open to Israeli importers than in 2004-2005 and 2005-2006

After getting off to a decent start, Israeli operators came up against a problem of positioning in France and, to a lesser degree, on the rest of the EU market. It was difficult for them to gain a position on the high quality segment as supplies from Florida were more plentiful than during the two preceding seasons. The end of season market (April-May) was not as buoyant for the Israeli operators as in 2004-2005 and 2005-2006 because of the prolonging of the Florida season. Competition with the other origins was very fierce on the other market segments and price was the determinant factor.

Likewise, but just for the record in the light of the volumes taken, Japan, which had begun to open the door to white grapefruit from Israel in recent seasons, was very disappointing. Israeli exporters therefore targeted Eastern Europe (Sunrise 20%) more than in recent years.

However, the performance was mixed. The 50 000 t sold in the EU was down on preceding seasons but still 10% greater than the 43 000 to 45 000 t shipped before the Florida hurricanes. Producers' confidence in market performance in the medium term was not shaken. Plantation intensified in 2006, reaching 440 ha according to USDA, which also estimates that some 700 ha will be planted in 2007.

Turkey back to average volumes



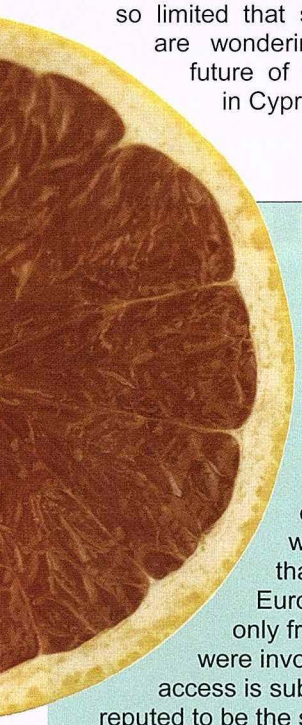
Arrivals from Turkey returned to average. The exceptionally large quantities shipped in 2005-2006 made this source the leading supplier of the EU. But firstly the crop was smaller, especially as frost in January caused some loss. Secondly, the large fruits and some problems of keeping quality at the end of the season encouraged Turkish exporters to concentrate more than in preceding years on the markets in Eastern Europe, where there is demand for large fruits and a little less fussiness about quality. Indeed, about 60% of Turkish exports were shipped there, with the main destinations being Russia, followed by Romania, Ukraine and Bulgaria. The volumes delivered to EU-25 were therefore moderate and the season ended early. The decrease in arrivals of Turkish grapefruit was particularly marked in the markets in the western part of EU-25 as Turkish exporters concentrated on the new member-states and especially Poland.

Laborious sales for Spain and Cyprus

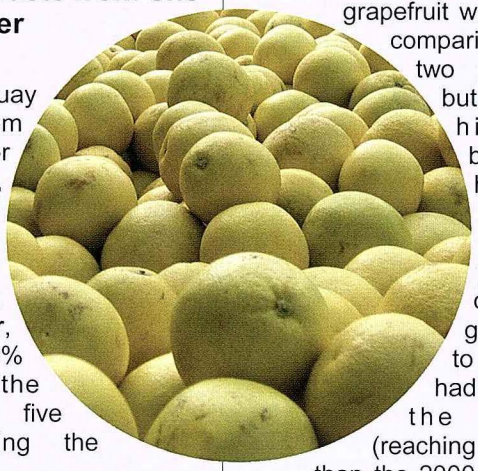
The other Mediterranean origins also had to face a more difficult market

situation. Spanish producers managed to sell slightly larger volumes than during the preceding season but sales were difficult even though prices were lower. In this context, lemon growers in Murcia—where the sector is affected by a serious slump—are more reserved about the plan to replace part of the lemon orchards by grapefruit plantations.

The season was also disappointing in Cyprus. Sales were difficult even though the volumes were smaller than forecast. Another winter of serious drought affected the harvest and fruit size. The amounts of water available for farming are becoming so limited that some growers are wondering about the future of citrus growing in Cyprus.



Average overall, the seasons displayed contrasts from one origin to another

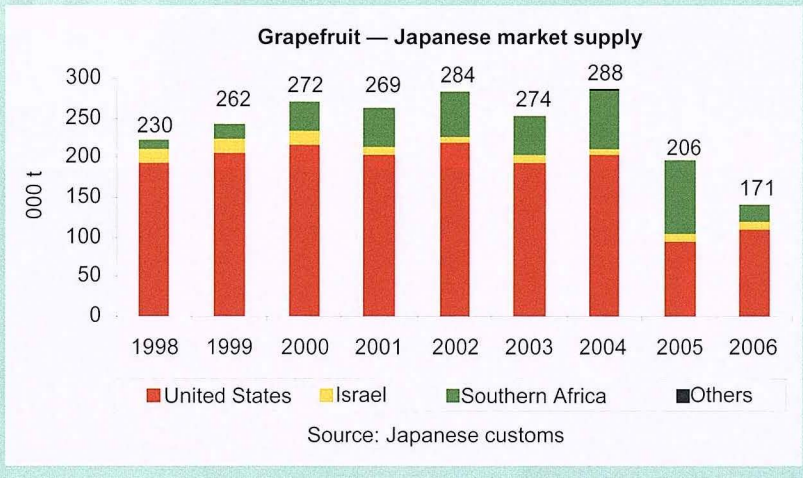


The average quay price calculated from the performance for fruits from Florida, Turkey and Israel was distinctly lower than in the two preceding seasons. However, it was about 9% higher than the average for the five seasons preceding the hurricanes.

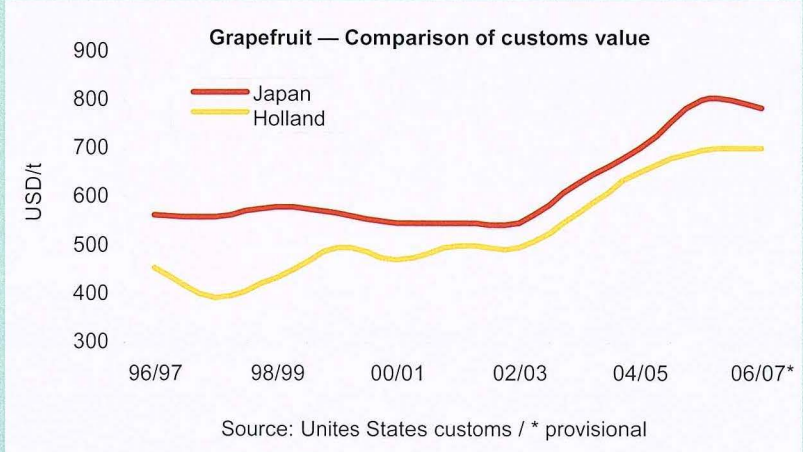
Detailed analysis of this overall performance reveals interesting differences between sources. On the one hand, the price of Florida grapefruit was well down in comparison with the two previous years but still distinctly higher than before the hurricanes. Conversely, the prices of Israeli produce lost considerable ground, sinking to lower than they had been before the hurricanes (reaching about 5% less than the 2000-2004 average). The trend was similar for Turkey but the price decrease was more contained as smaller volumes were imported.

The Japanese market

Supplies to the Japanese market increased markedly in 2006-2007. However, the increase in overall supplies was smaller than that seen on the European market as only fruits from Florida were involved. Market access is subject to what are reputed to be the strictest sanitary and phytosanitary protection measures in the world and Japan remained closed to the other world suppliers. Only Israel succeeded in shipping some fruits, in very marginal quantities, thanks to an easing of the export control protocol in force between the two countries. Japan is still the leading market for grapefruit from Florida and the leading priority for exporters. It is true that the difference between selling prices in the EU and in Japan, which had shrunk to 8% between early 2000 and 2004-2005, increased to 15% in 2005-2006 and 12% in 2006-2007 (provisional figure). Sales were supported during the last season by a large advertising campaign (point of sale and even TV advertising). Arrivals therefore increased more strongly than those on the EU market (3.3 million boxes against 2.3), with deliveries attaining 7.9 million boxes in comparison with 4.7 during the two preceding seasons. The figure had been 10 to 12 million just before the hurricanes.



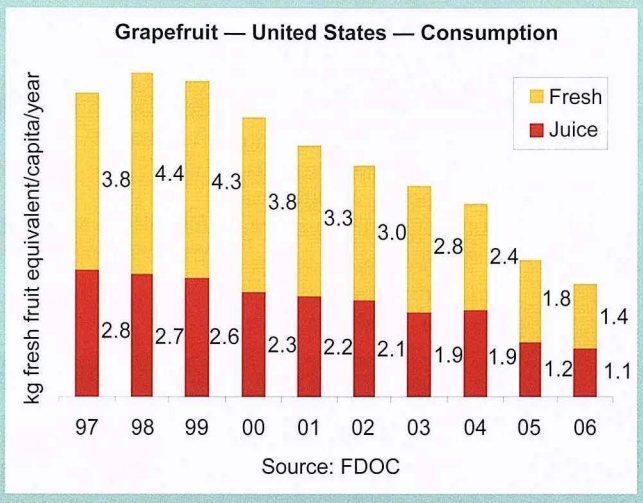
Source: Japanese customs



Source: Unites States customs / * provisional

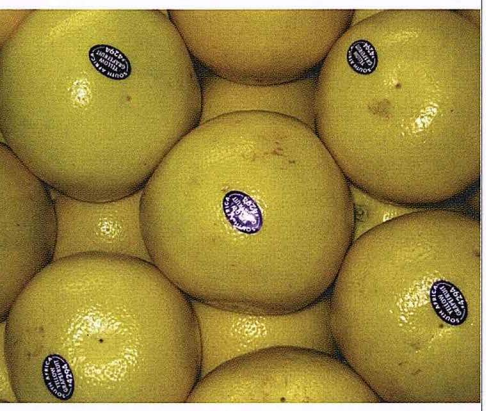
Consumption is still in trouble on the US market but FDOC is keeping watch

Although production recovered substantially in Florida in the last season, consumption of both juice and fresh grapefruit continued to decrease on the American market for the eighth year running. According to the Florida Department of Citrus, per capita consumption was only 2.5 kg fresh grapefruit equivalent in 2006 whereas it had been more than 7 kg in 1998. Analysis by market segment shows that fresh grapefruit consumption halved during the period (from 2.7 to a little less than 1.1 kg per person per year) and that of juice fell by two-thirds (from 4.4 to 1.4 kg per person per year in fresh fruit equivalent). The same survey showed that this large decrease resulted mainly from the collapse of the household penetration rate of grapefruit. The proportion of households purchasing fresh grapefruit decreased from 23% in 2001 to less than 6% in 2006 while the figure for juice fell from 17% to less than 8%. FDOC decided to react by returning to promotion—the last major national campaign had been in 2001. The situation is all the more serious as the increase in price since 2004 may well aggravate the situation. The price of grapefruit juice varied between USD 4.80 and 5.00 from 2001 to 2004 and was about USD 6.10 in 2006. A large-scale national advertising campaign is therefore being prepared. Unsurprisingly, the theme is reported to be the virtues of grapefruit for health with the watchwords being 'taste-health-vitality-style-beauty'. The campaign will probably be focused strongly on the public in the southern US where consumption is very small. However, this strong medicine requires a 30 to 40-cent increase in the parafiscal tax on each box of fruits and this was refused by growers at the end of June. The latter are aware of the seriousness of the consumption slump but are in a difficult financial situation. FDOC will therefore have less room for manoeuvre than planned. The marketing programme also includes the continuation of efforts outside the US—in Japan, the European Union and Canada.



A bipolar, strongly compartmentalised market

This observation provides much information about the fine mechanisms that govern the working of the French and EU markets.



Firstly, the segmentation used by distributors is clearly bipolar. Fruits from Florida, and more precisely the best brands, are in the high quality segment for most purchase centres. It is difficult for mid-range fruits to stand out from the cheapest range even though objective qualitative differences exist between the two types of produce.

Secondly, the two main market segments, that is to say the top and the bottom, appear to be closely compartmentalised. The high-quality segment was under-supplied, with more ample arrivals from Central America or the Mediterranean and the return to a cumulated average level that did not make up for the shortage in the supply of fruits from Florida. Conversely, the other market segments were fairly sluggish as a result of a degree of under-supply.

Attention should be paid to this compartmentalisation feature in the coming seasons. The shortage of supplies from Florida will be at least as marked as during the last season. Maximum production will be 25 million field boxes and the proportion sold for processing can only grow as sorting rejects may increase a s a result of citrus canker. However, the high-quality market share left vacant will only be accessible to the sources where hard work has been carried out on quality, supported by promotion efforts at the distribution stage.

Exporting more fruits without making these efforts with regard to quality means a risk of over-supplying the bottom and mid-range market sectors ■

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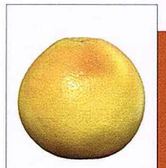
Summer in the sun for southern hemisphere sources

Excellent prices were obtained at the import stage during the 2006 season. Firstly, supplies were particularly limited at 25% less than in 2005. The South African harvest displayed a distinct deficit as heavy rainfall in the northern part of the country caused production losses. Furthermore, high juice market prices encouraged producers to sell a larger proportion of the crop for processing than in previous years, especially as the performance on the fresh fruit market had been bad in 2005 (the end of the season was catastrophic in Japan). In parallel, the tightening up of export phytosanitary control measures performed by SENASA resulted in a strong decrease in the arrival of shipments from Argentina. Secondly, the market window was particularly large. The early ending of the winter season combined with a historical deficit in Florida allowed Argentinian and South African operators to benefit from a dynamic sales current from June onwards. The new market context featuring a serious deficit in shipments from Florida during the winter season favoured the appearance of new suppliers for the summer season. The emergence of Chile is to be noted. The volumes shipped to Europe were insignificant in 2005 and exceeded 2 500 t in 2006. Grapefruit growing is limited to 280 ha but this is tending to grow. The orchards are within a radius of about 100 kilometres around Santiago (Hijuelas, Cabildo and Quillota in the south of region 5, Melipilla in the metropolitan region, Las Cabras and Peumo in the north of region 6). Production totals some 7 000 t and is exported from September to January. Shipments were less than 1 000 t in 2004 and approached 4 000 t in 2006. The main destinations are the EU, Argentina, Canada and Japan.

Grapefruit — European imports from the southern hemisphere

Tonnes	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Southern Africa	68 097	110 423	87 897	108 231	76 752	96 653	85 355	84 062	109 368	81 077
Argentina	27 453	24 863	19 943	14 456	19 084	18 882	24 504	19 583	26 869	17 388
Uruguay	1 784	1 580	539	300	1 325	483	665	401	576	2 063
Chile	-	-	-	-	-	-	-	200	474	2 513
Total	**97 334**	**136 866**	**108 379**	**122 987**	**97 161**	**116 018**	**110 524**	**104 246**	**137 287**	**103 041**

Source: Eurostat - EU-15, then EU-25 from 2004 - code HS 08054000 / Southern Africa figure estimated for 2004



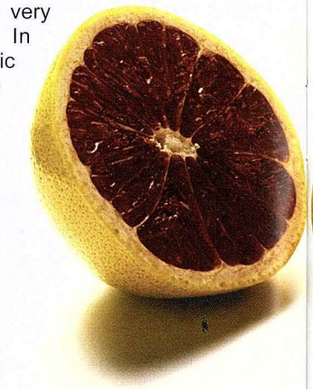
Florida grapefruit

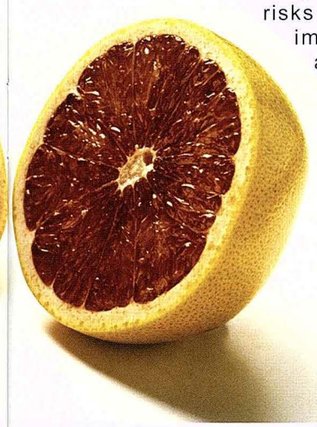
Increased production should not be overestimated

Florida is back on the international scene although at some 13 million boxes (42.5 lbs) for all destinations, the quantities are still far from the 18 to 20 million boxes before the hurricanes of autumn 2004. However, this is a distinct increase in comparison with the two preceding seasons (7.8 million boxes in 2004-2005 and 8.9 million in 2005-2006) and Florida can more firmly affirm its position as the world's leading exporter.

The increase in production to 26 million field boxes (85 lbs) partly accounts for the increase. The deficit in comparison with the usual 40 to 46 million boxes until 2004 is still substantial but less marked than during the two lean seasons in 2004-2005 and 2005-2006. There was no production loss as a result of hurricanes—in contrast with the two preceding seasons—and the impact of sanitary problems remained moderate.

Furthermore, the decisions taken by growers were favourable for the international fresh grapefruit market. The proportion of production delivered for processing was smaller than last year, returning to 60%, that is to say the average observed before the hurricanes. Indeed, the juice market is saturated again and the quantities of sorting rejects have been moderate thanks in particular to a very dry winter. In parallel, domestic demand has decreased further (see box), especially as fruits from Florida have been forbidden in 10 citrus producer states (including California and Texas with their large populations) to prevent the spread of sanitary problems and frost drastically reduced production in California. In contrast, the international markets have tended to be buying. The weakness of the dollar against the yen and the euro has played a stimulating role by reducing the financial risks taken by importers. In addition, the FDOC-funded advertising campaign in the EU and Japan was a driving force in sales. The volumes shipped to the two destinations increased considerably.





But can we envisage a gradual return of arrivals of fruit from Florida to the average pre-hurricane levels, that is to say 6.5 and 11.5 million boxes for Europe and Japan respectively.

This is not a possible scenario in the medium term. Firstly, plantations now total only 7 million trees after the strong decrease in recent years as a result of the direct—and above all indirect—results of the hurricanes. Production cannot therefore exceed 25 million field boxes (roughly the figure seen this season) with average yields. The shortage of seedlings will still be acute in 2007-2008 and marked in 2008-2009, making a rapid change of trend impossible. In addition, very probable worsening of the factors forming the equation used to extrapolate production may well aggravate the decrease (sanitary problems starting with canker, greening, urban development, etc.). Thus in *Florida Citrus Production Trend 2007-08 Through 2016-17*, the FDOC annual projection report, production levels of between 18 and 22 million boxes are forecast for the next five seasons in the most probable scenarios (http://www.floridajuice.com/user_upload/files/trends20_457f02e59f97d.pdf). It should also be borne in mind that the impact of canker on fruit appearance may well reduce the proportion of production sold on the fresh fruit market.

With these volumes, nonetheless worth 700 000 to 850 000 tonnes, Florida has the capacity to hold on to its position as world leader, but its domination will not be as strong as it used to be ■

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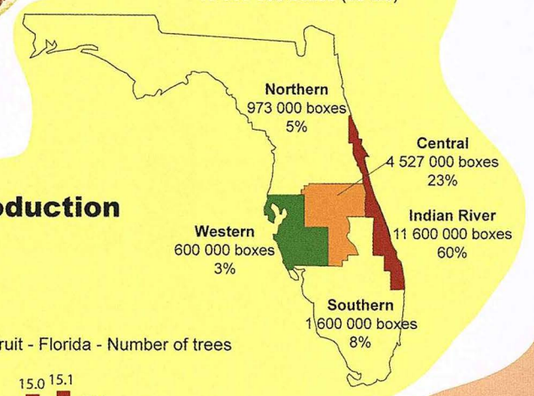
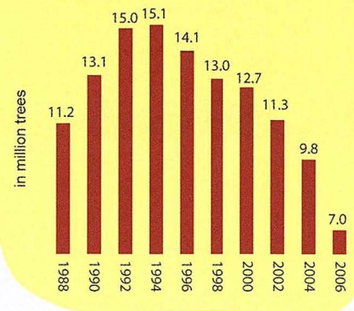
FLORIDA GRAPEFRUIT

Grapefruit
2006 Florida production
19 300 000 boxes (85 lbs)

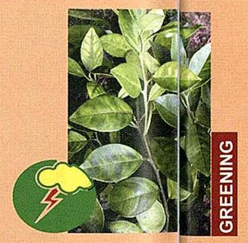


Production

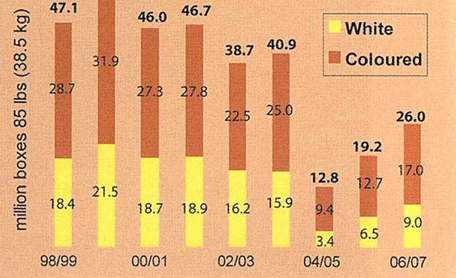
Grapefruit - Florida - Number of trees



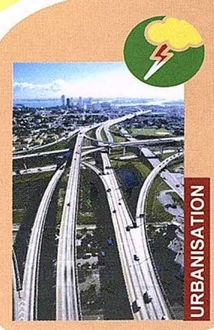
Major constraints



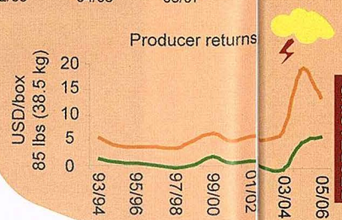
Grapefruit - Florida - Production



World production in tonnes		
World, incl.	5 900 000	100%
China	2 020 000	34%
USA	1 555 000	26%
Mexico	350 199	6%
Israel	263 540	4%
South Africa	212 348	4%



Producer returns



Fresh market

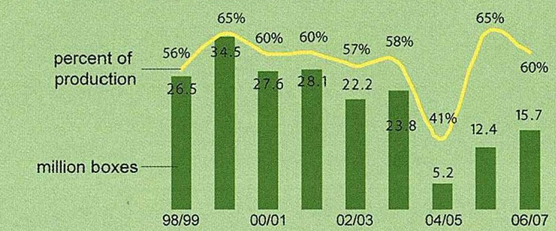
World exports tonnes		
World, incl.	935 536	100%
USA	384 246	41%
South Africa	144 000	15%
Turkey	135 000	14%
Israel	78 000	8%
Spain	37 000	4%

FRESH

Fresh grapefruit - Exports (million boxes 42.5 lbs / 19.25 kg)

Saison	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07
Total, incl.	33.9	31.9	31.8	28.3	30.1	13.4	12.5	20.3
Japan	10.9	10.7	11.2	10.2	12.1	4.8	4.6	7.9
USA	13.2	11.6	11.1	9.9	9.0	4.9	4.8	6.5
EU	6.4	6.6	6.6	6.2	6.9	2.8	2.1	4.4
Canada	2.3	2.2	2.2	1.6	1.8	0.8	0.8	1.3
Others	1.1	0.7	0.7	0.3	0.6	0.1	0.2	0.3

Processed



Processed volumes tonnes		
World, incl.	1 340 000	100%
USA	739 000	55%
Israel	154 500	12%
Mexico	113 000	8%
Argentina	110 000	8%
South Africa	60 000	4%

INDUSTRY

Processed grapefruit - Exports (million gallons SSE)

Year	1999	2000	2001	2002	2003	2004	2005	2006
Total, incl.	26.2	35.9	36.8	36.9	41.3	40.5	19.6	18.9
Europe	16.1	18.8	21.9	21.2	22.2	18.4	7.1	10.4
Japan	5.6	11.3	10.1	11.0	13.4	17.1	7.2	4.3
Canada	2.7	3.1	3.0	3.4	3.1	3.5	3.2	2.8
Others	1.8	2.7	1.8	1.3	2.5	1.6	2.1	1.4

Source: FDOC, FASS

Graphics: Chez Vincent

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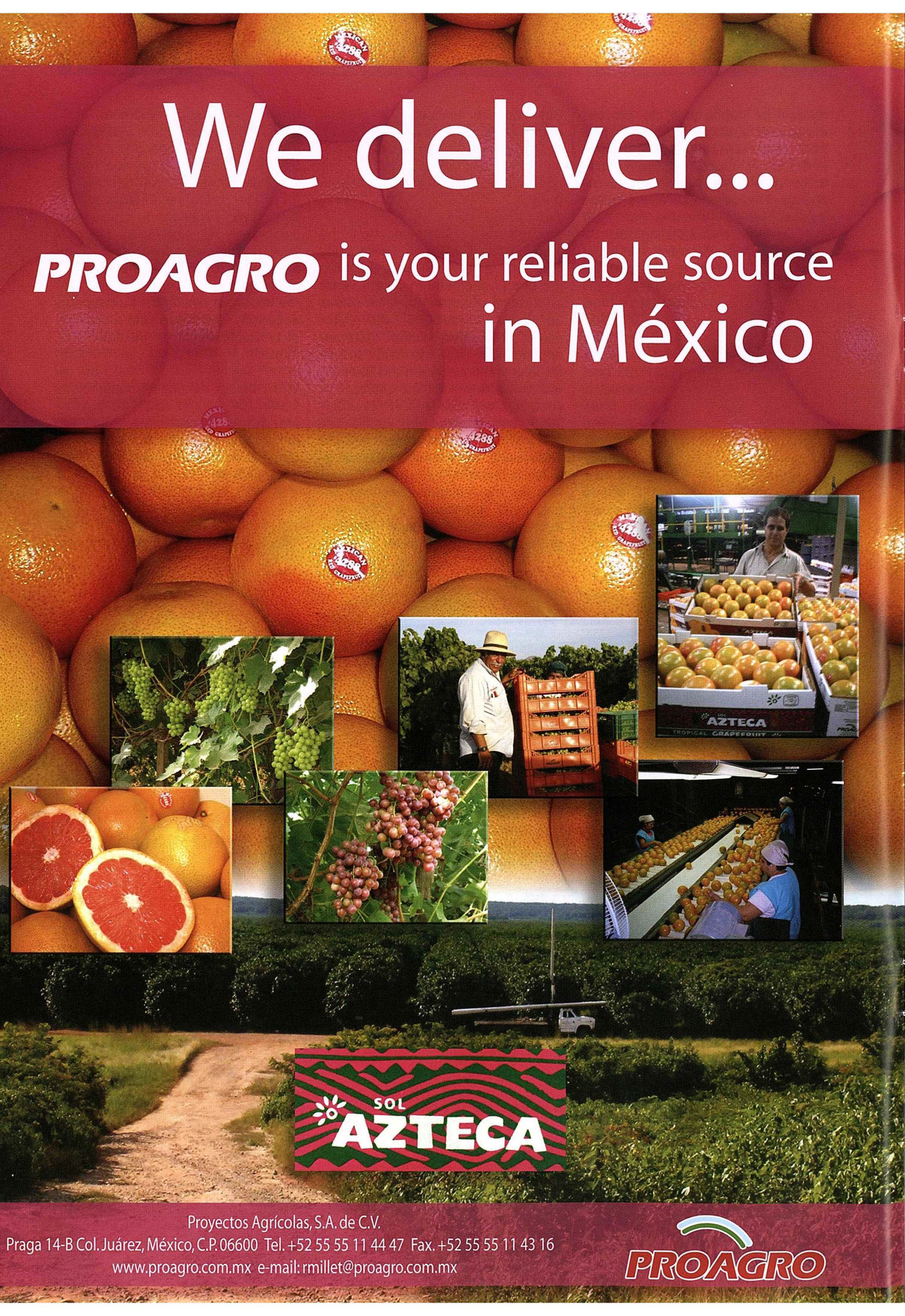

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PROAGRO

Producer country sheet

Grapefruit in Mexico

Mexico is not one of the leading exporting countries in spite of its position as the third largest producer of grapefruit and orange in the world. The fruits are sold mainly on the domestic market with its 100 million consumers and to industry. However, certain production zones could become major exporters of high-quality tropical grapefruit, given their large production and the new situation on the international market.

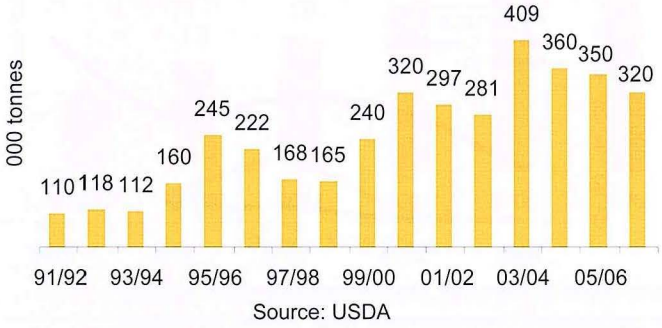
Production zones

Recently introduced in the state of Oaxaca (1940), grapefruit has been grown in much of tropical Mexico since the 1960s. More than 80% of the 13 800 ha under grapefruit is found in three main production centres. Very schematically, about 55% of the orchard area is in the coastal strip in the east facing the Gulf of Mexico between the state of Vera Cruz and the Yucatan. The main plantations in this zone are in the state of Vera Cruz (about 5 800 ha), especially in the north around Martinez de la Torre and Gutiérrez Zamora. The climate is hot and very humid. The second large production region is in the north-east and further inland in the states of Tamaulipas (1 300 ha, especially around Ciudad Victoria) and Nuevo León (1 400 ha, in particular around Montemorelos). This zone has less rainfall and, above all, the winters are much cooler, with occasional frosts in Tamaulipas). The third centre is much more recent and is in Michoacán state in the west of the country (approximately 1 800 ha). Plantations are sited in a plateau zone with a fairly dry semi-tropical climate at an elevation of some 400 metres, mainly around Nueva Italia. The areas under grapefruits have increased strongly in recent years. A few orchards of very limited size are to be found in north-eastern Mexico, especially in the very dry Sonora state.

Grapefruit - Mexico - Production zones

Source: Anuario Estadistico de la Produccion Agricola 2002

Grapefruit — Mexico — Production



Source: USDA

Volumes

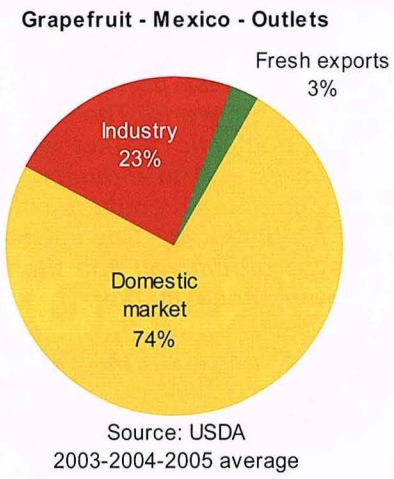
Replacing orange growing that showed little profit, the grapefruit boom of the 1960s and 1970s was followed by a strong recession in the 1980s. Production has increased again since the mid-1990s but is fairly irregular from one year to the next as a result of occasional flood problems, especially in the Vera Cruz zone, and drought or frost in Tamaulipas and Nuevo León. Different farming systems are used according to the specific constraints of each region. Growers in the state of Vera Cruz, often with small to medium-sized holdings and limited investment capacity, generally deliver their production to industry, especially via supply contracts, or to the large urban centres nearby that are not particularly fussy about quality. The plantations in Tamaulipas and Nuevo León—generally larger—and the industrial type plantations in the Yucatan are more focused on export but also supply the processing industry and the domestic market (especially with out-of-season fruits from Vera Cruz). Farms in the Michoacán are small but tending to concentrate and have made a partial switch to export sales in 2006.

Production calendar and varieties

Mexico — Grapefruit — Production calendar

	A	M	J	J	A	S	O	N	D	J	F	M
Michoacán												
Vera Cruz												
Nuevo León-Tamaulipas												
Yucatan-Campeche												

The range of climatic conditions means that production can be spread extensively in time. The Michoacán region can cover the period running from April to January with peak volumes from May to October. Growers used to prefer to pick the fruits from April to August but are now seeking to use the full amplitude of this calendar, given the new international situation. The orchards in the coastal fringe from Nuevo León to the state of Vera Cruz supply the market from the end of October to the end of March. The harvest in the Yucatan-Campeche region is from August to November. The range of varieties varies from one region to another. However, coloured varieties are dominant, led by 'Rio Red', referred to locally as 'Rio Star'. Production is completed by 'Star Ruby' and 'Ruby Red', whose production area is decreasing. 'White Marsh' now forms only 15 to 20% of production.

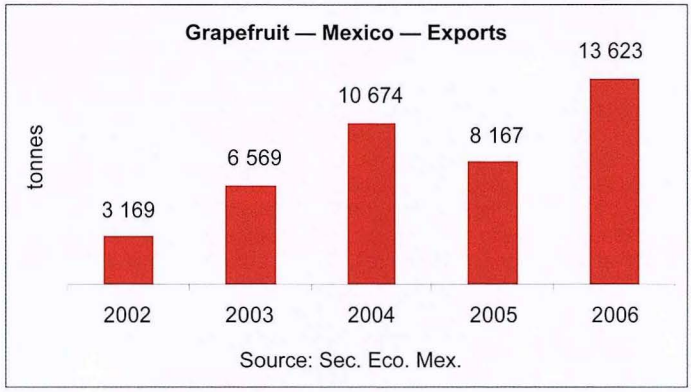


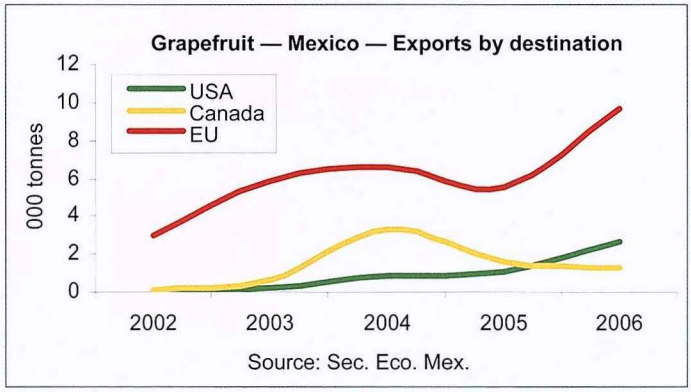
Outlets

The domestic market is by far the main outlet. Per capita consumption is substantial at some 2.5 kg per year. Price is a determinant criterion in purchasing decisions and quality requirements are generally fairly basic. Consumers prefer fruits that still have green lights, indicating freshness. The processing industry handles large, increasing volumes. The juice industry is very developed, especially for processing the third largest quantity of oranges in the world (approximately 4 million tonnes). Large volumes are also used in the preparation of fresh-cut products. Del Monte's 'Sunfresh' range sold in the United States and Japan is produced in Mexico.

Total exports

Exports have tended to increase in recent years but remain at a limited level. The fruits are shipped mainly to the European Union (with fruits from the Yucatan and also from Michoacán since 2006). The market window was hitherto very narrow and limited to September and October because of competition from the United States and Mediterranean countries but is now tending to broaden. Canada (with mainly produce from Tamaulipas and Nuevo León) is in second position. Exports to the United States are very limited in spite of NAFTA but have increased significantly since 2006, especially with fruit from Michoacán. Phytosanitary protection measures are still restrictive. Only the states in north-western Mexico that are free of fruitfly but that produce little grapefruit are allowed to export without restriction. However, a significant number of growers in other states—who are obliged to perform disinsectisation by fumigation or a heat method—have acquired hot air treatment systems because of the decrease in production in Florida. Shipments to Japan are very limited as only fruits from the states free of fruitfly are allowed entry. However, shipments to this destination could increase in the medium term. A disinsectisation protocol is at the approval stage and a free trade agreement with duty-free entry has recently been set up.



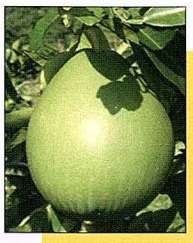


Grapefruit — Mexico — Sea freight

Markets	Main shipping lines		Shipping time	Observations
	Port of departure	Port of arrival		
EU	Puerto Progresso	Vlissingen	12 days	
	Altamira	Anvers	14 to 18 days	TMM/CMA-CGM

Logistics

Fruits are shipped to Canada by road, generally leaving from Nuevo León and Tamaulipas, a journey of 5 to 6 days, or the Yucatan, requiring 7 to 8 days. Fruits from the Yucatan for the European market are loaded at Puerto Progresso near Mérida. Conventional ships were chartered specially in 2006 to supply the northern European ports. Fruits from the Michoacán are first carried by road to the port of Altamira where they are loaded for shipping to the EU. This port is also used by Vera Cruz exporters.



Producer country sheet

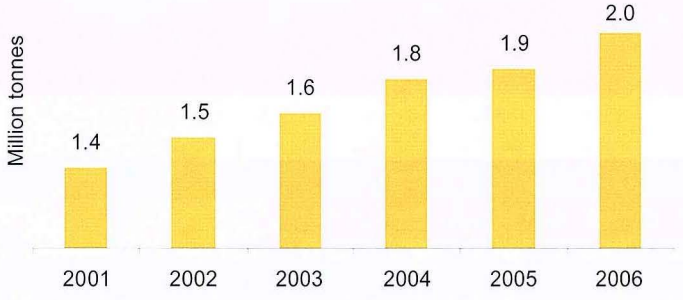
Shaddock in China

China, one of the leading citrus growing countries, does not grow grapefruit, in particular because endemic sanitary problems such as citrus canker and tristeza are very limiting for the species. However, the country is the world's leading producer of shaddock. Exports of this fruit are tending to increase, especially to the European Union where the drastic decrease in arrivals from Florida is tending to open a marketing window for China.

Production zones

Most shaddock plantations are in the coastal region of the south-east quarter of China. The region is at a subtropical latitude and has a low elevation. The hot climate and rainfall are suitable for the crop. Fujian province, the origin of a large proportion of the varieties grown is the leading production zone with about 30% of the crop. Most exported fruits are from there and particularly the Pinghe zone in the south where hills that cannot be used for rice growing are extensively planted with shaddock. 'Guangdong', 'Guangxi' and 'Zhejiang', other coastal provinces in this part of China, produce about 50% of the crop. Grapefruit is practically non-existent in China because of the sanitary problems mentioned above and the taste preferences of Chinese consumers.

Shaddock — China — Production



Source: MOA China

Volumes

Shaddock, and citrus in general, is a traditional crop in southern China, which is close to the geographic origin of the species. China is thus by far the world's leading producer even though it is difficult to give precise production figures (the various estimates available do not match). Practically all shaddock is grown on very small family holdings that are divided and have a low technical level. Land is owned by the state, that favours labour and lacks capital. The emergence of 'market socialism' in the 1980s and 1990s allowed the development of private businesses specialising in exports. With government aid, they group small production units and provide technical support in the form of supply of inputs, crop management sequences, etc. They ensure that specifications are met, enabling production to meet the requirements of international markets and local supermarkets. Production is increasing considerably. Regional and national plans encourage the increase in the area under citrus and the use of agricultural practices that improve quality and yields.

Production calendar and varieties

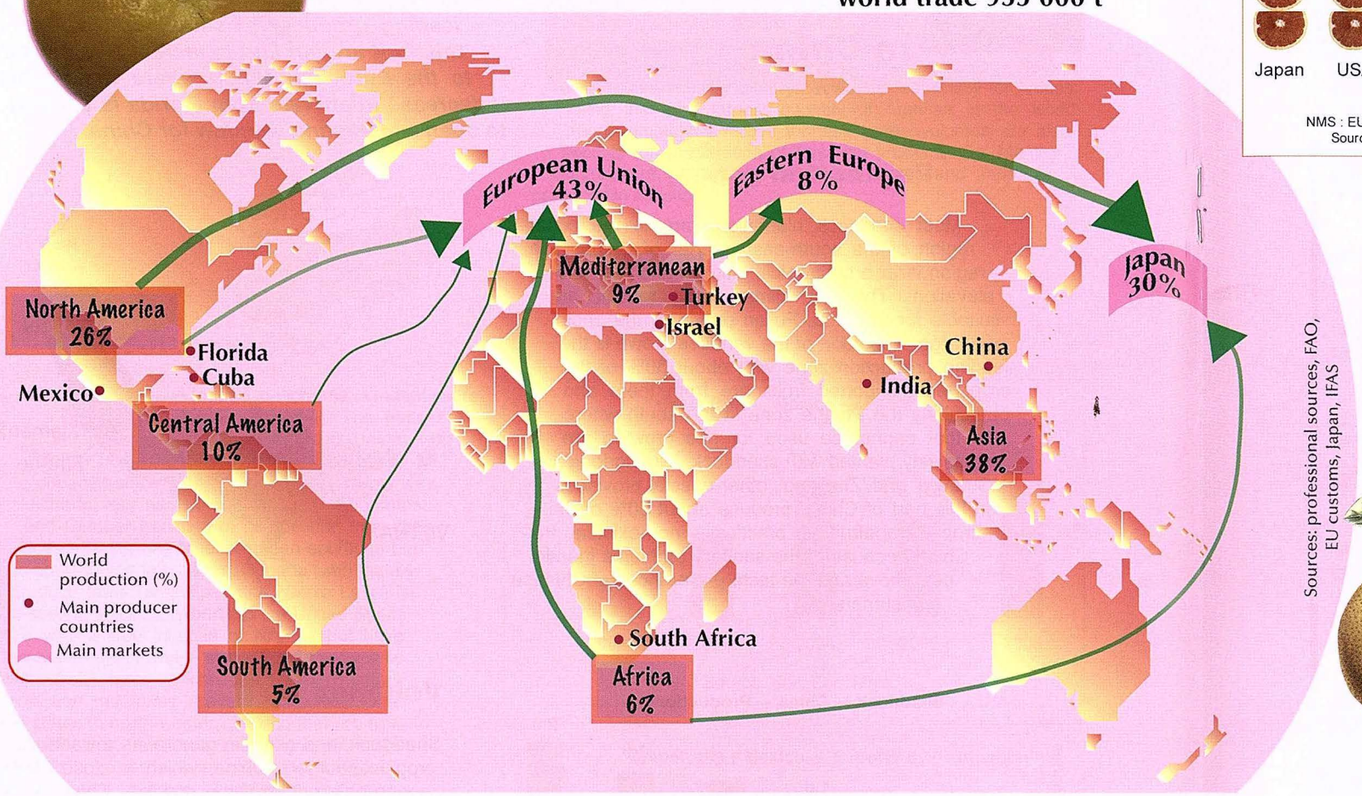
Shaddock — China — Calendar of availability in the EU

	J	A	S	O	N	D	J	F	M	A	M	J
Guangximi				■	■	■	■	■				

China is the genetic reserve of the species *Citrus grandis* and several hundred varieties with very varied characteristics are grown. However, production is based mainly on about ten cultivars. 'Shatian' is the most common, accompanied by 'Wendan', 'Pingshan' and 'Guangximi'. Practically all the fruits exported to the EU consist of "Guangximi', often sold under the name 'Honey pomelo'. The fruit is pear-shaped and weighs 1.0 to 2.0 kg. The greenish-yellow peel is fairly thick. The seedless pulp is fairly juicy and sweet. The fruits are harvested between mid-September and December, when the temperature falls sharply and strongly throughout most of the country. However, fruits can be exported until the end of January as they have good storage qualities. 'Honey pomelo' may therefore be found on markets from October to February, given the shipping time required.

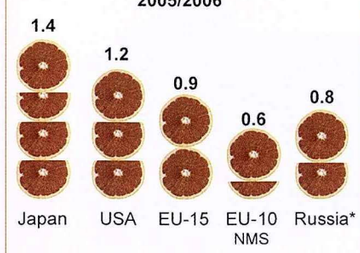
Grapefruit and shaddock in 2006-2007... production 5 900 000 t

world trade 935 000 t



Sources: professional sources, FAO, EU customs, Japan, IFAS

Grapefruit and shaddock
Per capita consumption (kg/year)
2005/2006



NMS : EU New Member States / *: 2005
Sources: FAO, customs & Cirad

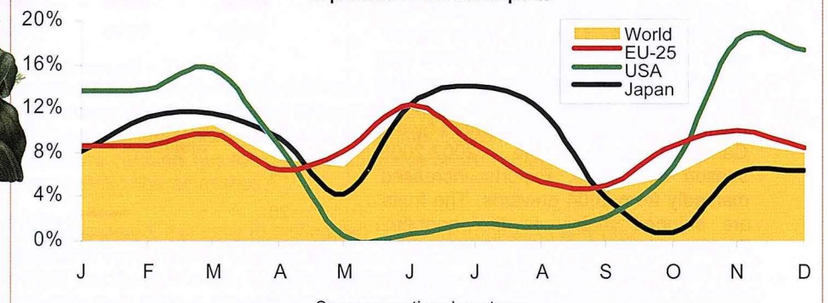
Grapefruit and shaddock World production	
2006-2007	tonnes
World	**5 877 213**
China	2 020 000
United States	1 555 000
Mexico	320 000
Israel	263 540
South Africa	212 348
Turkey	175 000
Cuba	155 650
Argentina	150 000
India	142 000
Brazil	68 000
Sudan	68 000
Belize	55 966
Spain	43 600
Jamaica	43 500

Grapefruit and shaddock World exports	
2006-2007	tonnes
World	**935 536**
United States	384 246
South Africa	144 000
Turkey	135 000
Israel	78 000
Spain	37 000
China	23 795
Cyprus	19 000
Argentina	16 941
Bahamas	15 981
Honduras	15 285
Swaziland	11 532
Mexico	9 653
Egypt	9 073
Thailand	6 310

Grapefruit and shaddock World imports	
2006-2007	tonnes
World	**894 197**
EU-25	385 396
Japan	264 582
Russia	45 593
Canada	45 212
China	21 156
United States	18 950
Saudi Arabia	18 430
Romania	15 711
Turkey	15 172
Mexico	10 190
Ukraine	7 667
Switzerland	7 313
Singapore	4 170
Bulgaria	3 624

Source: FAO, national customs, USDA

Grapefruit and shaddock — Supply calendar
in percent of annual imports



Sources: national customs

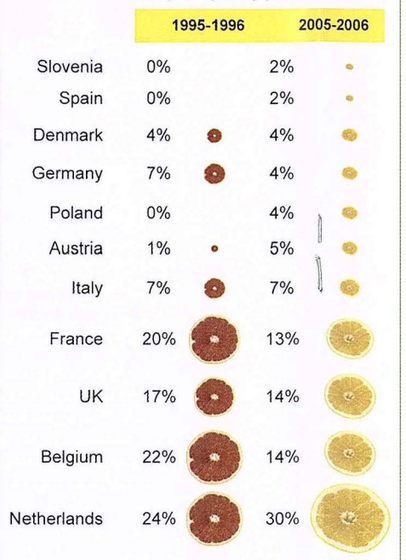
Grapefruit and shaddock — United States imports											
tonnes	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total, incl.	**13 609**	**12 198**	**9 730**	**8 738**	**10 040**	**25 221**	**23 246**	**20 710**	**14 316**	**14 348**	**18 951**
Bahamas	12 921	11 753	9 422	8 224	9 749	23 821	23 016	20 459	12 676	13 812	16 216
Mexico	-	-	-	-	1	-	33	115	1 567	506	2 687
Israel	442	423	301	441	171	142	197	79	56	27	43
Others	246	22	7	73	119	1 259	-	56	17	3	5

Source: US customs, code 080540

Grapefruit and shaddock — Japanese imports											
tonnes	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total, incl.	**270 479**	**283 773**	**229 905**	**262 416**	**272 278**	**268 650**	**284 687**	**274 328**	**288 510**	**205 961**	**170 881**
United States	224 137	222 398	194 038	206 975	216 652	202 286	219 457	194 262	202 663	93 335	109 341
South Africa	11 396	24 430	12 906	30 147	32 193	48 431	52 564	65 775	69 408	96 707	48 562
Israel	27 171	24 769	17 067	17 498	17 607	11 673	7 503	8 568	8 354	10 418	9 335
Swaziland	7 703	12 176	5 462	7 344	5 710	6 143	5 009	4 904	5 443	4 572	2 316
Cuba	-	-	423	430	38	75	19	609	1 381	151	671
Chile	-	-	-	-	-	41	134	188	1 173	757	599
Others	73	-	10	22	78	-	1	23	89	21	56

Source: Japanese customs, code 080540000

Grapefruit and shaddock
EU import by entry points



Source: Eurostat

Grapefruit and shaddock — European Union imports											
tonnes	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Total	**386 588**	**426 985**	**443 102**	**424 541**	**424 364**	**363 227**	**385 330**	**357 608**	**357 511**	**378 742**	**357 758**
Total N. hemisphere*	**277 756**	**330 011**	**305 716**	**316 103**	**301 599**	**265 874**	**269 241**	**246 821**	**273 835**	**240 451**	**254 579**
Turkey	28 792	33 272	18 078	36 149	45 268	45 107	49 066	38 918	43 017	42 709	80 893
Israel	73 461	89 268	88 136	83 708	77 837	54 474	43 369	42 878	44 536	62 612	54 453
United States	144 382	153 712	144 570	133 521	110 896	108 330	109 033	101 119	114 010	53 077	42 911
Spain	14 173	12 951	17 975	16 806	17 978	16 453	20 463	23 848	20 936	29 358	27 808
Cyprus	0	0	0	15 065	13 351	14 932	14 275	15 070	16 425	16 967	14 832
Honduras	1 900	15 879	15 177	11 835	15 287	10 643	8 912	9 862	13 547	13 169	12 340
China	21	33	12	17	24	36	40	62	376	3 061	7 231
Mexico	1 364	2 016	1 429	2 351	2 845	1 715	5 929	3 939	5 728	7 594	4 527
Cuba	11 324	17 235	14 585	9 332	13 508	8 923	11 275	5 727	9 823	3 415	700
Others	2 340	5 645	5 756	7 321	4 606	5 264	6 880	5 398	5 438	8 489	8 884
Total S. hemisphere	**108 832**	**96 974**	**137 386**	**108 437**	**122 765**	**97 353**	**116 088**	**110 787**	**83 676**	**138 291**	**103 179**
South Africa	54 547	53 384	90 776	72 788	92 183	64 330	84 392	76 658	55 833	97 170	71 847
Argentina	30 997	27 453	24 863	19 943	14 456	19 084	18 882	24 504	19 583	26 869	17 388
Swaziland	15 358	9 260	16 567	11 241	10 928	8 604	9 144	6 111	5 369	7 197	7 003
Chile	382	27	5	5	-	-	-	-	200	474	2 513
Zimbabwe	2 710	3 894	2 519	2 859	4 148	3 534	3 117	2 586	1 436	5 001	2 227
Uruguay	2 639	868	1 643	349	58	1 325	483	665	401	576	2 063
Mozambique	1 917	1 559	561	1 009	972	283	-	88	780	919	92
Others	282	530	451	244	21	193	70	175	75	85	46

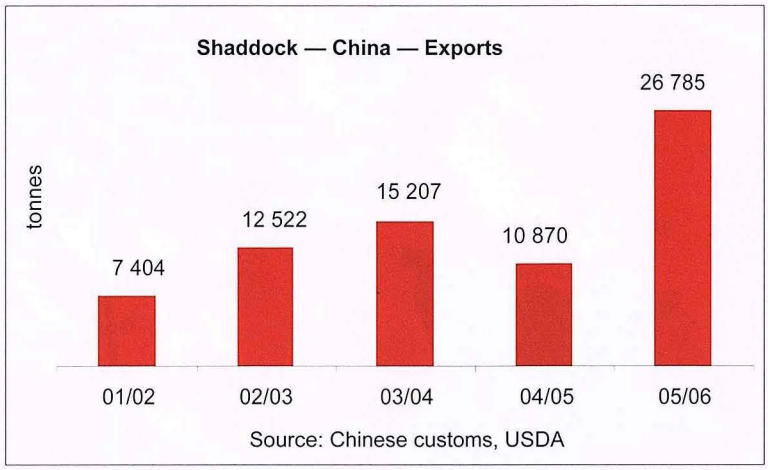
* Extra-community imports and entries from the main European producer countries (Spain, Cyprus) / Source: Eurostat

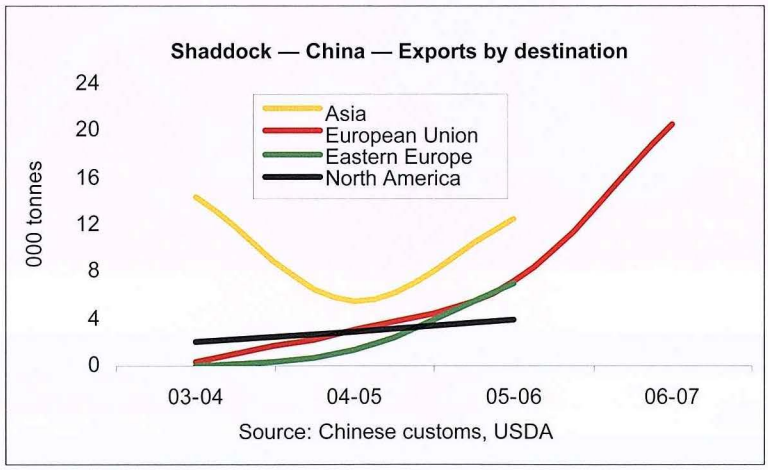
Outlets

Production is subject to little quality and sanitary control and practically the whole of production is sold locally or regionally, in particular via cooperatives. Most fruits are sold on street markets but supermarkets are developing and very present in large urban centres. As is the case throughout Asia, there is no tradition of fruit consumption; fruits tend to be purchased as offerings placed on altars devoted to ancestors, especially during the autumn Moon Festival and the Chinese New Year. However, purchases for consumption are increasing rapidly. The processing industry takes a certain quantity for the production of canned segments. Exports are growing but still concern fairly modest quantities.

Total exports

The strong development of shaddock exports in recent years is a perfect illustration of the rapid expansion of the Chinese international fruit trade sector. Many new export companies have been set up. However, only a few of them are capable of ensuring conformity with the main international specifications thanks to a varying degree of integration upstream. Asia is still the main market and especially Hong Kong, Malaysia, Singapore and the Philippines. The free trade agreement signed in 2005 between China and the ASEAN countries should strengthen this position. True entry to the EU market is recent and was initiated by the Carrefour group in the 2002-2003 season in France. Exports increased markedly from 2004 onwards. The fruits are shipped mainly to the northern European ports and then re-shipped to the main consumer markets. Initially limited to temporary operations for the Chinese New Year, the market window for shaddock has broadened considerably. Increasing volumes are also purchased in Eastern Europe (Russia and Romania) and in Canada. Exporters have also sought to develop markets in the Middle East since 2005. Exports are generally packed in 12 kg boxes containing from 7 to 11 fruits.





Logistics

Containers are filled directly at the packing stations in the Pinghe area and taken by road to the port of Xiamen, a journey that takes about two hours. Shipping time to the northern European ports is from three to four weeks, depending on the shipping company. The volumes exported to southern European ports are still limited.

Shaddock — China — Sea freight

Markets	Main shipping lines		Shipping time	Observations
	Port of departure	Port of arrival		
EU	Xiamen	Le Havre	20 to 21 days	CMA-CGM
		Rotterdam, Antwerp	21 to 33 days	CMA-CGM/COSCO/ MAERSK
		Barcelona	25 to 30 days	Safemarine, Maersk

Cultivation of grapefruit

The plant

The grapefruit tree has broad, evergreen leaves and is one of the most vigorous of the genus *Citrus*. It requires the lowest planting density. When adult and fruiting, the fruit-bearing branches acquire a falling habit enhancing the growth of new shots on the curves. This means that the species can reach fairly naturally an equilibrium in branch renewal without drastic mechanical intervention.

Climatic requirements and effect of the environment

The climatic requirements of grapefruit are fairly similar to those of other citrus but with a high temperature requirement. Low temperatures limit the cultivation area. Fruits sustain damage when the temperature falls below -1 or -2°C and the aerial parts of the tree are damaged from -3 or -4°C. Among environmental factors, temperature certainly has the greatest influence on fruit characteristics: shape, pulp and peel colour and organoleptic characteristics.

When production zone extremes are considered, it is easy to distinguish between 'tropical' quality and 'Mediterranean' quality. Tropical grapefruit have specific features because temperatures are at a steady high and day/night temperature amplitude is small. These conditions favour more intense internal and external fruit colour. Steadily high tropical temperatures enhance the development of lycopene, the red pigment found in the pulp and peel of coloured varieties. Chromatic potential is fully expressed in tropical grapefruit, with colours ranging from white to red via pink, depending on the case. These conditions also reduce bitterness and acidity and increase juice and sugar contents. The peel is often thinner and the fruit pear-shaped.

In a Mediterranean climate, except during the summer, day/night temperature amplitude is very marked and spring and autumn are cool to very cool. Here, grapefruit requires a warm exposition and plenty of sunshine. However, only the varieties with a very high lycopene content can become coloured. This is the case of comparatively recent cultivars bred in the last 25 years such as 'Star Ruby', 'Rio Red', 'Flame', etc. The production of pigmented fruits has become classic in a Mediterranean climate thanks to these varieties. Other varieties that are potentially coloured in the tropics, such as 'Thomson' (pink), 'Ruby', 'Red Blush' and 'Henderson' (red) acquire little or no colour.

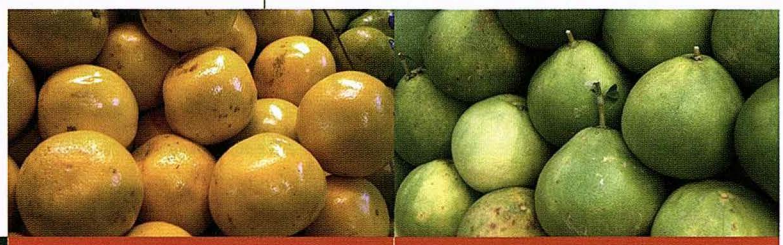
The gentle, sweet taste characteristics of grapefruit were long closely associated with coloured varieties because of their exclusively tropical origin. We still have the habit of associating, a priori, sweetness and absence of bitterness with colour when this is not at all the case.

Cumulated heat in northern zones is not sufficient for the fruits to ripen fully before the winter. The production cycle may then last for 12 months or even more. The fruits must remain on the trees before completing their development in the following spring. They are exposed to rain and low temperatures and this can cause physiological damage to peel or internal damage in case of frost

Varieties

Grapefruit and shaddock—frequently confused cousins.

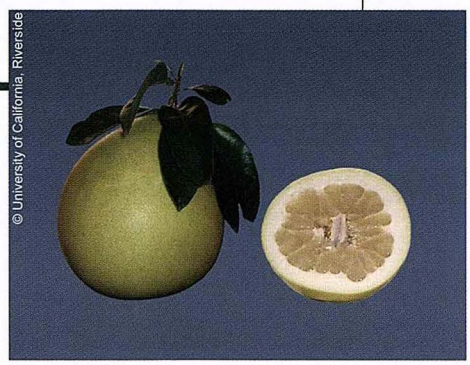
Grapefruit and shaddock are frequently confused in common or trade usage. But the two fruits have different characteristics as the grapefruit (*Citrus paradisi* Macfad.), pomelo in French, is not the same botanical species as the shaddock *(Citrus maxima)*. Shaddock, called pamplemousse in French and chadèque in the French West Indies, may be called Chinese grapefruit on European market. But it should not be called grapefruit and vice versa.

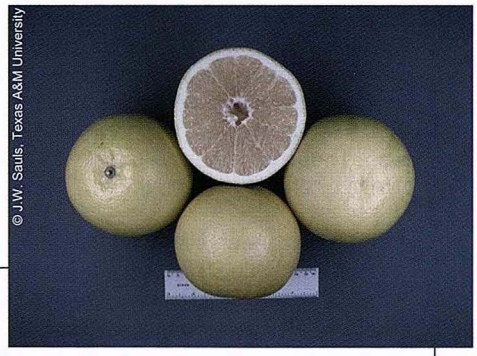


Fruit characteristics	Grapefruit	Shaddock
Size (diameter)	8 – 15 cm	10 – 30 cm
Weight	250 to 500 g	400 g to 2 kg
Shape	flattened to pear-shaped	flattened to pear-shaped
Peel	fine to medium thickness	thick to very thick
Central axis	open, little or medium-developed	open or closed, well developed
Seeds	few or none	from none to numerous
Pulp colour	pale, yellow, pink or strong red	pale yellow, pink or strong red
Pulp texture	juicy	firm or even crunchy
Bitterness	weak to strong	none to weak

Guangximi you

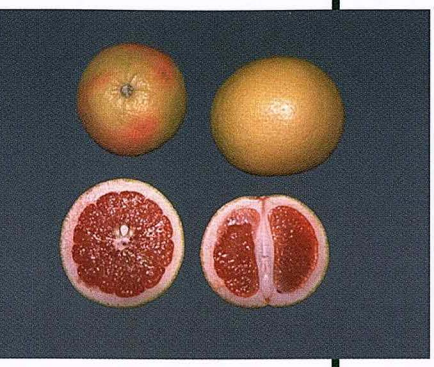
This variety originated in Fujian Province ('Guangxi' in Chinese), where it is still widely grown in the Pinghe region. It forms a large proportion of Chinese production. The fruit is medium-sized to large (from 1 to 2.5 kg) with a typical oboval shape. The yellow skin is of medium thickness (about 0.8 cm). The flesh is white and pale with some green lights, soft and medium to fairly juicy. The flavour is sweet and slightly acidulous. The fruits have excellent keeping qualities. The variety is usually sold commercially under the name 'Honey Pomelo'.





Marsh

'Marsh' was bred from a sowing of 'Duncan' seeds in about 1860 near Lakeland, Florida. The variety was the first to be practically seedless (two or three seeds per fruit) and it developed very strongly. 'Marsh' is still the most commonly planted cultivar and the most widespread in the world, even though a general trend towards coloured varieties is observed. Furthermore, it is extremely suitable for canning. Its taste qualities are satisfactory although acid and sugar contents are lower than those of 'Duncan'. However, a few problems are noted at the beginning (high acidity) and the very end of the season (loss of aroma). The fruits are medium-sized to small—not as large as 'Duncan'—and are pale yellow in colour. The skin is medium thick, regular and very smooth. The flesh is soft and very juicy.

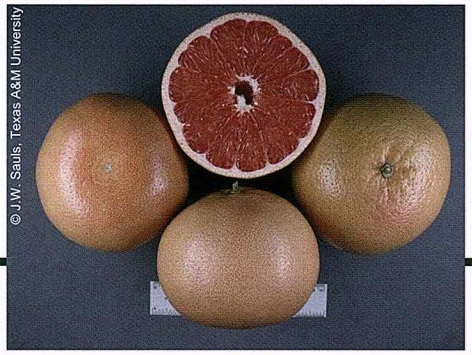


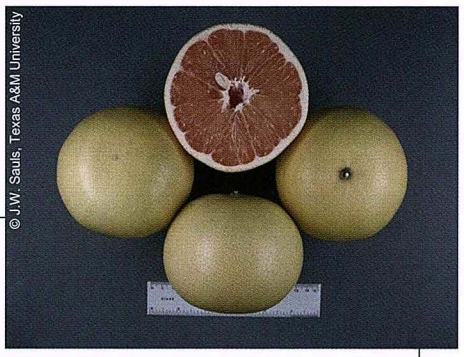
Flame

A natural mutation of 'Ruby Red', 'Flame' was discovered by H.K. Wutsher in 1973. The fruits are attractive. They are spherical and larger than those of 'Star Ruby' and of a similar size to those of 'Ruby Red'. Suitability for keeping on the tree is good. The skin is particularly fine and smooth. The basic colour is a light bronze similar to that of 'Star Ruby', differing from the pale yellow of 'Ray Ruby' and 'Ruby Red'. Large areas pigmented with as intense a red as that of 'Ray Ruby' can be observed but this colouring is nevertheless not as marked as that of 'Star Ruby'. The flesh is a uniform red similar to that of 'Rio Red'. The fruit is juicy and firm. The variety is planted in significant quantities in Florida and Argentina. It is marginal elsewhere.

Star Ruby

This recently developed variety (released in 1970) was obtained by irradiating 'Hudson' seeds. It has numerous good features. The flesh is the most strongly coloured of all the varieties currently grown. The skin is fine and smooth with strongly red faces. The fruits are practically completely seedless and finally the flesh is firm and juicy with high acid and sugar contents. The juice is intensely coloured. However, irradiation has reduced plant resistance to diseases and to excessive sunshine. Management is more delicate, especially because of its susceptibility to certain herbicides. Yields are generally smaller. The variety is therefore tending to lose ground in some countries to the benefit of hardier cultivars ('Rio Red' and 'Flame').





Ruby

(Redblush, Ruby Red, Henninger)

'Ruby', a bud mutation of 'Thompson', was discovered in Texas by A.E. Henninger in 1926. It differs from the parent by the stronger pigmentation of skin and flesh. Its other characteristics are very similar to those of 'Thompson'. However, the sugar and acid contents are sometimes slightly lower. 'Ruby' is still the most widely planted coloured variety in the world and forms a large proportion of new plantings in Florida. In contrast, it is losing momentum in Israel and South Africa.

Coloured varieties

A marked switch to coloured varieties has been observed in consumer expectations in the last 20 to 25 years. The change is almost total in Europe. Even Japan, the world's leading market and traditionally a consumer of white grapefruit, has been affected by the change.

Grapefruit — Intensity of the pigmentation of the skin and flesh of various varieties
(after James Saunt in Citrus Varieties of the World, Sinclair Publishing)

Varieties	Skin	Flesh
Burgundy	-	★★★★
Thompson (Pink Marsh)	-	★
Ruby (Ruby Red, Redblush)	★★	★★
Henderson	★★★★	★★★
Ray Ruby	★★★★	★★★
Rio Red	★★★★	★★★★
Flame	★★★★	★★★★
Star Ruby	★★★★★	★★★★★

★ = weak ★★★★★ = very strong

Grapefruit diseases	Tristeza Virus: Citrus Tristeza Closterovirus	Canker Bacterium: *Xanthomonas axonopodis* pv. *citri*	Huanglongbing (Greening) Phloem bacteria: *Liberibacter africanum, L. asiaticum*
Symptoms	Decline of varieties budded on sour orange, paling of leaf veins, stem-pitting	Corky pustules on leaves, fruits and shoots	Yellowing shoots, leaf marbling, small poorly coloured fruits, decline
Part attacked	Young, growing organs (shoots, flowers)	Aerial parts: young organs, wounded organs	Aerial parts
Cause	Presence of infected plants in the field or nearby	Bacteria released from lesions, infection enhanced by mechanical or weather (hurricanes) wounds or the citrus leaf miner (*Phyllocnistis citrella*)	Presence of infected plants in the field or nearby
Transmission	Aphids: *Aphis gossypii* and *Toxoptera citricida*, budding	Via air and water	Psyllids: *Diaphorina citri* and *Tryoza erytreae*, budding
Measures to be taken	Control of vectors (chemical, biological control, etc.)	Application of products containing copper or Kasugamycin, removal of infected trees in case of light attack, watering at soil level	Control of vectors using chemical, biological methods, etc.
Prevention	Use of healthy plant material, cross-protection (measure subject to discussion)	Use of healthy plant material, tolerant varieties, protection of young organs	Use of healthy plant material
Economic impact	Loss of trees and decreased production, EU quarantine organism (control of movements)	Harvest loss by fruit fall, EU quarantine organism (control of movements)	Decline of trees, shorter orchard life, EU quarantine organism (control of movements)
Distribution	All regions except for certain countries in the Mediterranean area	Asia (including the Middle East), South America, Florida, small presence in Africa	Asia, tropical and subtropical Africa, the Middle East, Brazil, Florida

* A region harbouring an EU quarantine organism (listed in Council Directive 2000/29EC) may only export fresh produce to the EU under strict conditions.

Grapefruit pests	Fruit flies Diptera Tephritidae, various species of the genera *Ceratitis, Anastrepha, Dacus, Bactrocera*, etc.	Citrus leafborer Lepidoptera: *Gracillariidae, Phyllocnistis citrella*	Aphids Hemiptera: *Aphididae, Toxoptera* spp., *Aphis gossypii*, etc.
Symptom	Pricking caused by females laying eggs in the fruits. The larvae develop in the pulp and cause fruit fall	Characteristic meandering larval mines beneath leaf epidermis	Colonies on young shoots. Wilt caused by viruses (tristeza)
Part attacked	Fruit	Leaves, fruits in very rare cases	Young shoots
Measures	Monitoring of populations. Patch treatments, Male Annihilation Technique (MAT), mass trapping	Monitoring of populations. Biological control by acclimatisation of exotic parasitoids	Monitoring of populations (visual inspection). Conservation of beneficials. Spraying on a threshold basis
Prevention	Destruction of fallen fruits		
Economic impact	Harvest losses	The larval mines limit photosynthesis	Growth flushes limited. Weakening or wilting caused by viruses
Distribution	American continent: *Anastrepha*. Africa: *Ceratitis*, *Dacus*. Asia-Pacific: *Bactrocera*	Cosmopolitan	Variable according to species. *Toxoptera citricida* in tropical zones; *T. aurantii* in the Mediterranean area