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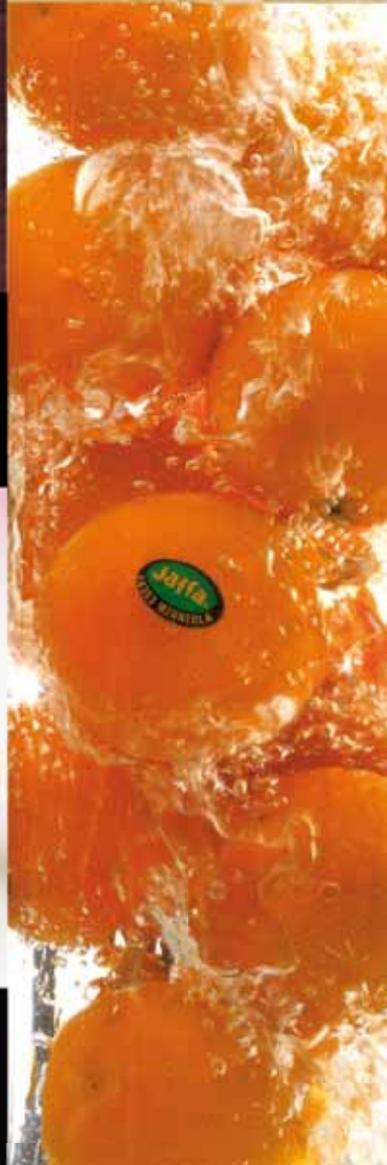
FR*ui*TROP **magazine**

fruitrop.com

Close-up **Citrus**

Counter-season **asparagus** : still balanced

Sweet potato : a vegetable boom?



MEHADRIN INTERNATIONAL
 696, chemin du Barret, ZA du Barret — 13160 Chateaufort, France
 • Tél. +33(0)4 32 60 62 90 • Fax. +33(0)4 90 24 82 54
 benchadod@mehadrin-inter.com — www.mtex.co.il

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On 1st January 2017, Europe and Ecuador will achieve an advance in economic science... or not! We will actually bear witness to a live and full-scale experiment, and suffer the consequences. The question we would ask is as follows: what will be the effects on the value chain of a fall in customs duty of a half-euro per box on Ecuadorian banana exports to the EU? Potentially, and in very conventional terms, the five links in the chain – producers, exporters, importers/ripeners, distributors and consumers – could benefit from this revaluation. But we should not jump the gun by contemplating the effects of this reduction solely in terms of redistribution. The industry would need to prove itself highly adult and responsible to share the 3 to 5 % bonus on the import price, for example, with its producers or its labourers, i.e. its weakest links. Quite the contrary, we can bet that this surplus will not benefit anyone, since according to many downstream operators, they have already incorporated this reduction into their negotiations with the supermarket sector for 2017. For their part, Ecuadorian producers have just started the half-yearly negotiations on minimum price, and are claiming the bonus in full. Yet the exporters of course have a completely different strategy: cut their sale price to restore their competitiveness. So in the end, there is every chance that the added value on the fruit can be cut by another 50 eurocents, across all the operators and industries. Since Aldi and co., in their annual contracts, make no distinction between an Ecuadorian banana and a Colombian or Ivorian banana. But I almost forgot about the consumer who, if the distributors passed on the fall in the price of the raw material, could see get their bananas even cheaper: which would be a great victory for European purchasing power. Hang on though: cheaper than cheap means practically free, right?

Denis Lœillet

Publisher
Cirad
TA B-26/PS4
34398 Montpellier cedex 5, France
Tel: 33 (0) 4 67 61 71 41
Fax: 33 (0) 4 67 61 59 28
Email: info@fruitrop.com
www.fruitrop.com

Publishing Director
Hubert de Bon

Editors-in-chief
Denis Lœillet and Eric Imbert

Editor
Catherine Sanchez

Computer graphics
Martine Duportal

Iconography
Régis Domergue

Website
Actimage

Advertising Manager
Eric Imbert

Subscriptions
www.fruitrop.com

Translators
James Brownlee, Tradeasy

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FRUITROP

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Cover photograph: © Carolina Dawson

Banana

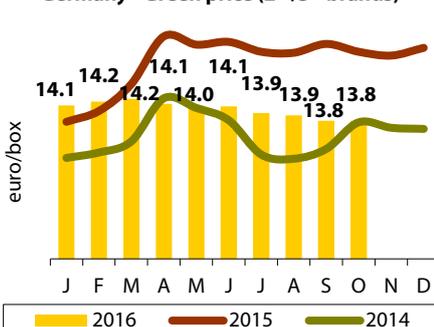
October 2016

The banana market struggled to pick itself up from the avalanche of volumes in September. Although the supply proved to be lighter, it remained above average. Dollar banana imports, though down slightly, maintained levels 5 % higher than in previous years. The Ecuadorian supply eased into shortfall, while the Costa Rican supply started to fall after September's big shipments. However, Colombia reached a production peak, with a distinctly high level offsetting the fall from other sources. Meanwhile, after the record September, the supply from Africa and the French West Indies rapidly returned to average. The FWI shortfall observed from week 42 (production losses due to Cyclone Matthieu) was largely offset by African shipments stabilising at high levels. Despite a more significant fall in temperatures and the presence of promotions, demand only managed to recover seasonal levels toward the end of the month in Western Europe. Hence the slight downturn in incoming shipments was not sufficient to balance the market, with stocks remaining available. Green banana prices stagnated at the same level as the previous month, and below average for the season. The same was true for Spain, where Canaries shipments continued to rise, exceeding the market needs despite improved demand. The supply into Russia, closer to normal, helped prices, which had been low since September, recover a better level though without reaching average.

NORTHERN EUROPE — IMPORT PRICE

October 2016 euro/box	Comparison	
	previous month	average for last 2 years
13.78	0 %	- 5 %

Germany - Green price (2nd/3rd brands)



■ **Aldi US blacklists eight insecticides used or potentially usable on banana plants.** Aldi US has just sent a strong signal to the whole market. From 1st January 2017, the US branch of the German discounter (more than 1 500 points of sale in the United States, growing steeply) is set to banish from its shelves products which have been treated by the following eight insecticides: Thiametoxam, Chlorpyrifos, Clothianidin, Cypermethrin, Deltamethrin, Fipronil, Imidacloprid, Sulfoxaflor. They are all used or potentially usable against banana plant pests, such as the weevil and thrips for the most common applications, but also against scale insects, defoliating caterpillars or aphids. Some of these pesticides are used in particular in dollar zone production systems, but also in other production zones (excluding the French West Indies). At least three lessons can be drawn from this declaration:

- No doubt this announcement will create ripples and push other distributors, not only in the US, to take a position and adopt equivalent measures.
- It is a strong signal aimed at producers to effect radical changes to their production systems. There are tried-and-tested solutions in the FWI and elsewhere, such as pheromone traps against weevils or early sheathing of clusters against thrips. It is a pity that it has

taken such abrupt commercial disruption to see them deployed on plantations.

- Finally, it is commercial validation of the organic strategy that Europe wants to promote, especially in the forthcoming version of CAP.

As we know, innovation by disruption is the driving force of change in the agricultural or industrial sectors. This new episode will shift the lines and push producers to improve the environmental and social quality of their value chain. While the distribution sector plays its role as prescriber to perfection, it must also go beyond this censorship role and support the producers on the path to sustainability. Wielding the stick but also the carrot are both parts of the same equation. The distribution sector must not just distance itself, it must also participate and even lead the production systems revolution.

Sources: organicauthority.com, CIRAD



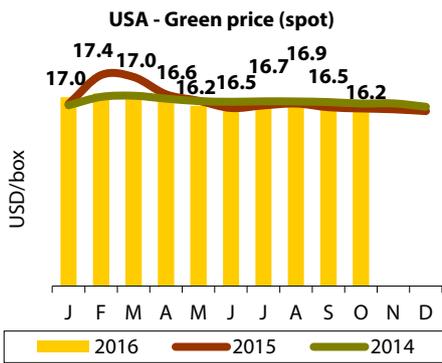
Weevil

EUROPE - RETAIL PRICE

Country	October 2016		Comparison	
	type	euro/kg	September 2016	average for last 3 years
France	normal	1.60	+ 3 %	+ 3 %
	special offer	1.30	+ 1 %	0 %
Germany	normal	1.32	- 4 %	+ 4 %
	discount	1.15	- 7 %	- 2 %
UK (£/kg)	packed	0.96	- 3 %	- 14 %
	loose	0.72	0 %	+ 2 %
Spain	platano	2.02	0 %	- 4 %
	banano	1.29	+ 1 %	- 1 %

Banana

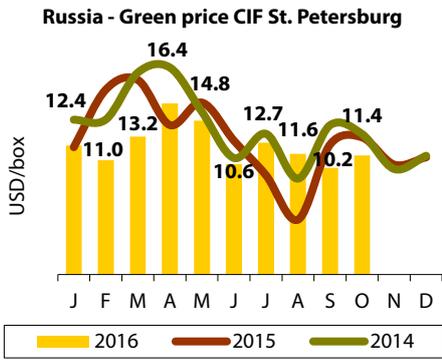
UNITED STATES



UNITED STATES - IMPORT PRICE

October 2016 USD/box	Comparison	
	previous month	average for last 2 years
16.25	- 1 %	0 %

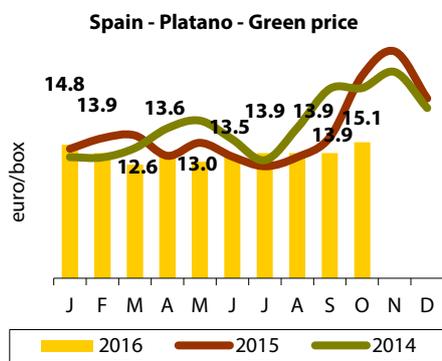
RUSSIA



RUSSIA - IMPORT PRICE

October 2016 USD/box	Comparison	
	previous month	average for last 2 years
11.43	+ 12 %	- 14 %

CANARIES



CANARIES - IMPORT PRICE*

October 2016 euro/box	Comparison	
	previous month	average for last 2 years
15.10	+ 9 %	- 31 %

* 18.5-kg box equivalent

Breakthrough made this time around: 6 million tonnes of bananas consumed in the EU.

From October 2015 to September 2016, the consumption figure was precisely 6 030 869 tonnes. Besides the record itself, this makes for an astounding dynamic. The twelve-month growth rate amounted to 5 %, again an absolute record. For the past four years, some 225 000 t on average has been added to the total consumption. The comparison with the United States is flattering, since absolute control of the quantities is the main feature there. This market, which is one of the most oligopolistic in the world, expanded over the past twelve months by a tiny 1.6 %, i.e. equivalent to its population increase. Everything is under control! Going back to the EU, we can emphasise that the unprecedented market growth is primarily to the benefit of the dollar bananas (+ 172 000 t, i.e. + 3.8 % over the first nine months of 2016 from the same period of 2015) and the African ACPs (+ 52 000 t, i.e. + 12.5 %). European production is not to be outdone, as it has risen by 9 % (+ 44 000 t), though we should note that this figure does not incorporate the destruction wrought

by Cyclone Matthew on Martinique at the very end of September. At a monthly rate, the analysis shows that after very low sales in July, consumption bounced back with a vengeance in August and September. Nearly half a million tonnes of bananas were purchased in September, which again is an absolute record for this month. The projections to the end of the year confirm that the European market would exceed 6 million tonnes at an annual rate, despite the Dominican Republic and Costa Rica being set for large production losses. This should also help the market to bounce back, or even turn around in the first weeks of January, once again confirming the rule that climate vagaries are the supreme rulers of the international banana market.

Source: CIRAD



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Banana — January to September 2016 (provisional)

000 tonnes	2014	2015	2016	Difference 2016/2015
EU-28 — Supply	4 244	4 348	4 564	+ 5 %
Total imports, of which	3 782	3 882	4 054	+ 4 %
MFN	2 981	3 089	3 207	+ 4 %
ACP Africa	412	414	465	+ 13 %
ACP others	389	380	382	+ 1 %
Total EU, of which	462	466	509	+ 9 %
Martinique	140	146	156	+ 7 %
Guadeloupe	54	47	50	+ 6 %
Canaries	253	257	289	+ 12 %
USA — Imports	3 486	3 527	3 516	0 %
Re-exports	414	416	423	+ 2 %
Net supply	3 072	3 111	3 094	- 1 %

EU sources: CIRAD, EUROSTAT (excl. EU domestic production) / USA source: US Customs

EUROPE - IMPORTED VOLUMES - OCTOBER 2016

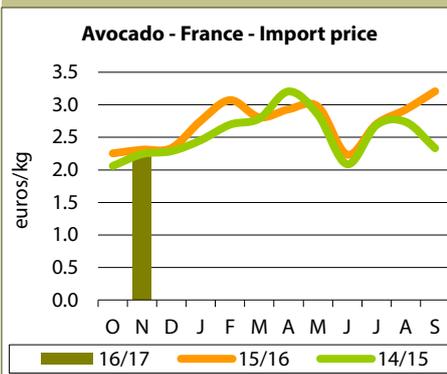
Source	Comparison		
	September 2016	October 2015	2016 cumulative total compared to 2015
French West Indies	↘	- 24 %	+ 4 %
Cameroon/Ghana/Côte d'Ivoire	⇒↘	+ 5 %	+ 12 %
Surinam	⇒↗	+ 3 %	- 13 %
Canaries	⇒↗	+ 11 %	+ 12 %
Dollar :			
Ecuador	↘	- 13 %	- 2 %
Colombia*	⇒↗	+ 10 %	- 1 %
Costa Rica	↘	- 4 %	+ 9 %

Estimate made thanks to professional sources / * total for all destinations

Avocado

October 2016

The winter sources supply progressed in a quiet but balanced market context. On the one hand, demand proved undynamic because of high import and retail prices, and the start of the school holidays. On the other hand, the supply continued its seasonal fall, though volumes remained high. While Mexico maintained lower levels than in 2015, Chile stepped up its shipments, reaching record levels for the EU. Hence supply and demand were in step at the beginning of the month, despite the prevalence of small sizes. However, toward week 42, the market started to swell more significantly, with prices dropping for the small sizes. As for the green varieties, Spanish and Israeli imports registered a distinct rise, with heavy volumes. Prices rapidly ebbed back to below average.



PRICE	Varieties	Average monthly price euro/box	Comparison with the last 2 years
	Hass	13.31	+ 30 %

VOLUMES	Varieties	Comparison	
		previous month	average for last 2 years
	Green	↗	+ 21 %
	Hass	↘	+ 24 %

VOLUMES	Source	Comparison		Observations	Cumulative total / cumulative average for last 2 years
		previous month	average for last 2 years		
	Israel	↗	+ 54 %	Supply of green varieties (Ettinger, Fuerte) continuing to progress. Levels well above average.	+ 54 %
	Spain	↗	+ 42 %	Start of campaign with the first volumes of green varieties. Some Hass batches of premature quality.	+ 42 %
	Mexico	=	+ 9 %	Stabilising at average levels, followed by slight increase at the end of the month.	+ 39 %
	Chile	↗↗	+ 70 %	Distinct increase in incoming shipments, to historically high levels for the time of year.	+ 97 %

Colombian Hass in the United States during the first half of 2017? At least, that is what the Colombian Minister for Agriculture believes. It is true that the marathon procedure for access to this market, a natural outlet for Colombia by virtue of geographic proximity, is entering its final stages. The protocol, which defines the measures enabling the United States to guard against the introduction of four quarantine insects present in Colombia, and the economic impact study, have been submitted for two months of public consultation (up to 27 December 2016). At the end of this period, and if no major problems emerge, it will probably be a few more months before the United States opens up to the Colombian Hass. So the decision would have only a moderate impact on the 2016-17 season, which would by then be in its latter stages. If we take a step back, it is nonetheless a major turning point for world trade. Besides Mexico, very closely tied to the US market, Colombia is the only source that will see a big increase in its Hass production in the coming years (15 000 ha of young Hass orchards, a very large proportion of which is not yet in production) during the period of high commercial tension of the European winter season. So volumes available to fuel the growth in European demand in the coming years will depend largely on the reception the Colombian Hass gets on the US market.

Source: Infohass

Source: Cirad



Avocado: the revenge of Donald Trump? It was a big scandal in the United States during summer 2015, at the beginning of the Republican primaries. A tweet issued from the account avocodfact offered Americans the following choice: send Donald Trump to the White House ... or an avocado. Which do you think they chose? The avocado of course! Was the short-fused billionaire motivated to take revenge on this unlikely rival when he suggested levying 35 % customs duty on products imported from Mexico, which supplies nearly a million tonnes of Hass to the USA? In any event, such a measure could have major consequences on the breakdown of world flows of this product, although no-one at present really dares to believe such a plan to be feasible, either politically or technically. The plan to reconsider the TransPacific treaty, which does seem to be on the cards, is already a first blow struck to the progression of Mexican exports to Asia, including the avocado. In the absence of this treaty, Japan could for years to come remain the only country in the region with which Mexico enjoys a preferential customs agreement.

Avocado at its best

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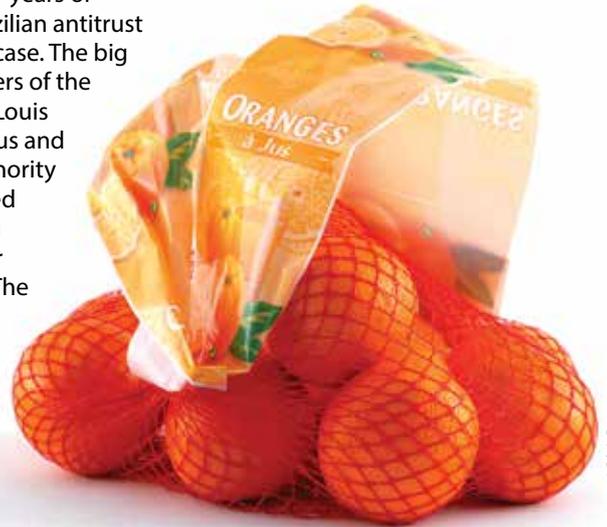
31, Avenue de l'Europe - Zone des Entrepôts - Bât. 19
BP 70122 - 94538 Rungis Cedex - FRANCE
Tel +33 (0)1 46 87 30 00 - Fax : +33 (0)1 45 12 96 74
gabriel.burunat@commercial-fruits.com

Orange

October 2016

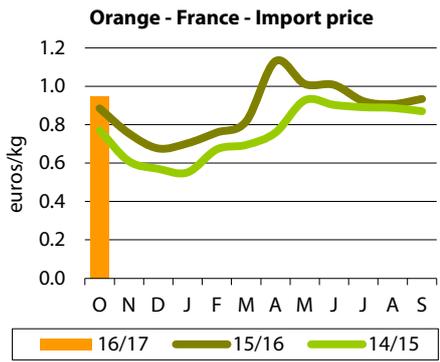
In the midst of the seasonal transition, the orange market was very tight. The Southern Hemisphere campaign came to an end at the beginning of the month, with the last arrivals of South African Valencia Late at levels well below average. So stocks were rapidly cleared, especially in small sizes, much sought-after this campaign. Hence the first batches of Spanish Naveline sold quickly from the second half of the month, despite a certain lack of coloration. The small sizes, predominant at the beginning of the campaign, barely compensated for the lack of juice oranges. Given the paucity of the overall supply, demand was particularly lively. Hence prices were high and strong.

■ **Orange juice: agreement between the Brazilian manufacturers finally condemned!** The Brazilians are crazy for telenovelas, including in the field of justice. It has taken 17 years of proceedings for the Brazilian antitrust authorities to close the case. The big world orange juice players of the time (Cutrale, Citrovita, Louis Dreyfuss, Cargill, Bascitrus and their representative authority Abecitrus) acknowledged that they had agreed on the prices to pay to their fresh orange suppliers. The proceedings ended in a joint fine of 89 million USD: a sum deemed highly insufficient by the producers' unions, given the losses they have suffered.



© Régis Domergue

Source: Reuters



PRICE	Type	Average monthly price euro/15-kg box	Comparison with average for last 2 years
	Dessert orange	13.20	+ 1 %
Juice orange	15.75	+ 40 %	

VOLUMES	Type	Comparison	
		previous month	average for last 2 years
Dessert orange	↗	+ 15 %	
Juice orange	↘	- 22 %	

VOLUMES	Varieties by source	Comparison		Observations	Cumulative total / cumulative average for last 2 years
		previous month	average for last 2 years		
Spanish Navel	↗	+ 15 %	Levels much higher than in previous years at beginning of campaign, due to very lively demand.	+ 15 %	
South African Valencia Late	↘	- 22 %	Volumes continuing their rapid fall. Early end to the campaign, with levels into Europe well below average.	- 7 %	



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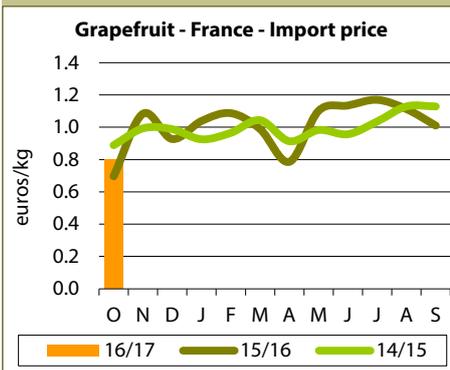
■ **Orange juice limits risks of ovarian cancer.** A study conducted by the University of East Anglia (Norwich, United Kingdom) on a very large sample and over a long period has demonstrated that women whose diet included fruits such as the apple, grape and citruses (in fresh or juice form) had a lower risk of developing ovarian cancer. This phenomenon is reportedly due to the protective role of flavonones and flavonols, abundant in these fruits.

Source: Knowridge.com

Grapefruit

October 2016

After beginning the month on a positive trend, the market deteriorated rapidly. Consumption, already quiet, was further impeded by the arrival of the school holidays. In addition, the supply was bigger than predicted. While contrary to the forecasts, there were some South African stocks available, incoming Mexican shipments rose, with highly undersized fruits exhibiting numerous appearance defects. Hence despite their premature taste quality, demand switched to the first Mediterranean batches (Israel, Turkey and Spain), volumes of which were still limited though their prices more competitive. Mexican stocks, primarily comprising small sizes at the beginning of the month, thereafter extended to all the sizes, whose prices came undone in the second part of the month.



■ **2016 Argentinean citrus export review: some very good points and some less good.** The 2016 season fairly accurately reflects the health of the Argentinean citrus industry. The lemon sector is going well, reinforced by a succession of modest campaigns in terms of volume, but excellent in terms of economic returns. It has emerged further strengthened by a really excellent 2016 season, when the average price hit the heights and volumes climbed back to their level from the beginning of the decade. The rise in surface areas of approximately 1 000 ha per year, steady and high, also attests to this good health. The same cannot be said for the other varietal groups. The orange and easy peelers are still in torment, in terms of both exports and surface areas. Argentina, already off the international trade radar for the grapefruit, seems to be heading the same way for the orange and easy peelers. The economic measures put in place by the Macri government do not seem, for the moment, to be having any more effect on the citrus industry than on the national economy, still in great difficulty (GDP established in July as down 3.4 %, with inflation at 40 % according to the Argentinean press).

Sources: Senasa, Federcitrus

Citrus – Argentina – Exports

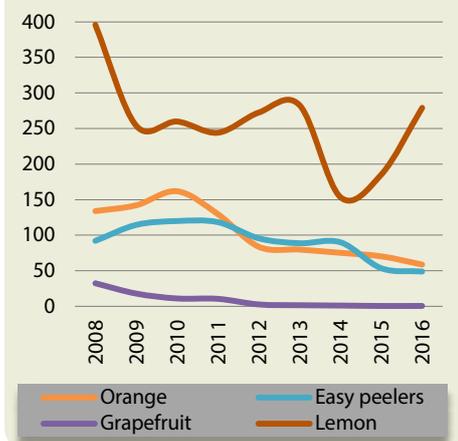
in tonnes	2016	Comparison	
		2015	Average for last 4 years
Orange	58 713	- 16 %	- 17 %
Easy peelers	48 894	- 9 %	- 30 %
Grapefruit	505	+ 10 %	- 43 %
Lemon	279 116	+ 51 %	+ 24 %
Total	387 228	+ 25 %	+ 5 %

Source: Senasa

■ **Grapefruit consumption in France: lower and lower...** France remains Europe's main grapefruit consumption market in Europe, but is losing its lustre. French consumers take in approximately 30 % of the Community supply, though consumption per capita is now no more than 1 kg per year, down 500 g in the space of a decade. The fruit is now consumed by just 44 % of the French, as opposed to nearly 49 % in 2011. The prospects are hardly encouraging, given the consumer profile. There is complete disillusionment among young people, whose consumption is less than half of the average. The over-50s and above all the over-65s are now the product's main consumers. The sole plus point is that it is above all high-income consumers who are still interested in this fruit (higher management, pensioners, etc.). This is good news for the very tasty – but expensive – Floridian grapefruit.

Professional sources

Citrus - Argentina - Exports (in 000 tonnes / source: Senasa)



PRICE	Source	Average monthly price	Comparison with average for last 2 years
		euro/17-kg box equivalent	
	Israel	11.16	- 3 %
	Mexico	13.31	- 8 %

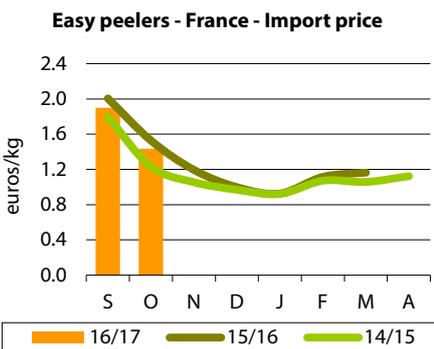
VOLUMES	Source	Comparison	
		previous month	average for last 2 years
	Israel	↗	- 40 %
	Mexico	⇒↘	-

VOLUMES	Source	Comparison		Observations	Cumulative total / cumulative average for last 2 years
		previous month	average for last 2 years		
	Israel	↗	- 40 %	After an early start, progress of the supply restricted by the Jewish holidays. Levels well below average for the season.	- 40 %
	Mexico	⇒↘	-	Resumption of incoming shipments after a temporary dip, followed by start of the seasonal fall. Small sizes in the majority, with sorting rejects due to quality concerns.	-

Easy peelers

October 2016

After a particularly below-average start (Clemenrubi, Clemenpons), the supply progressed with the arrival of Oronules in week 42. Although they remained at below-average levels (rains at the production stage, sorting rejects), volumes were sufficient to cover the particularly quiet demand due to mild temperatures for the time of year and to the school holidays. Furthermore, the overabundant small sizes did not favour sales. However the rains enabled the average sizing start to improve at the end of the month. Prices followed a downward trend, though levels remained above average given the paucity of the supply.



PRICE	Source	Average monthly price euro/kg	Comparison with average for last 2 years
	Clementine	1.64	+ 20 %
Hybrids	-	-	

VOLUMES	Source	Comparison	
		previous month	average for last 2 years
Clementine	↗	- 24 %	
Hybrids	-	-	

VOLUMES	Varieties by source	Comparison		Observations	Cumulative total / cumulative average for last 2 years
		previous month	average for last 2 years		
	Spanish Clementine	↗	- 24 %	Late and below-average start by Clemenrubi and Clemensoon. Primarily small sizes. Arrival of Oronules in week 42, but volumes making slow progress (rains).	- 32 %

■ **Easy peelers: record promotion budget for "Halos" in 2016-17.** Wonderful will put 30 million USD on the table this season to promote its range of easy peelers, a dream come true for Europe, where the narrowness of the margins but also the lack of will and unity are leaving citrus defencesless against their hyper-marketed dairy competitors (yogurts, etc.). In particular the campaign includes a big TV presence, with four humorous ads encouraging kids and parents to "make the right choice" in their diet. Wonderful has more than 23 000 ha of orchards worldwide, located in large part in California.

Source: Wonderful

■ **Californian citrus: calm before the storm?** This is the worrying prediction by an entomologist at University of California Riverside, Mark Hoddle. The number of trees detected positive for greening, which started to increase in 2015, progressed considerably in 2016 (30 since the outbreak of the disease in 2012, 18 of which for 2016 alone to mid-November). According to the researcher, this indicates a breaker which could hit the region within 3 to 5 years. California has approximately 120 000 ha of citrus plantations, divided between 3 900 producers. The industry employs 22 000 people and generates a turnover of nearly 5 billion, 3.3 of which directly. The region provides the bulk of the local fresh citrus supply and controls the majority of the country's orange and lemon exports.

Source: californiacitrusfreight.org

■ **Leanri: a high-quality late hybrid.** This South African hybrid variety (Citrogold) is a mutation of Furr and therefore a cross between a clementine and a Murcott. Its calendar positions it between the second part of the Nova campaign and the start of the Nadorcott campaign (January-February). The fruits, which are a pronounced orange-cum-red, are rounded in shape, with a diameter of 65-80 mm and a weight of 130-200 g. The juice content is 50 %, with a Brix of up to 14°. In agronomic terms, one of its major advantages is its tolerance to Alternaria. Plantations are limited to 2 200 ha in South Africa (already distributed) and to 2 000 ha in Spain (CVVP managed).

Sources: Citrogold, CVVP



Late hybrid Leanri

Pineapple

October 2016

The situation on the pineapple market deteriorated constantly throughout the month. The rising Costa Rican supply struggled to sell since demand was flat. At the beginning of the first half-month, sales scheduled with the supermarket sector raised hopes, but very quickly demand could no longer absorb the fruits placed on the market. So we saw a marked fall in rates. The established brands too had to revise their prices downward. At the beginning of the second half-month, rates continued to come undone. Several operators cut back their imports in the hope of preventing stocks from forming. In fact there were stored batches to be found across the board, available at post-sale prices. At the end of the month, the reduction in the supply seemed to start to take effect, since the pressure on sales was lower. The drop in rates also seemed to have stopped, although the prices charged remained low.

During the first half-month, the lightly supplied air-freight market was fluid and sales were made at high rates. The paucity of Cameroonian volumes was offset by higher availability of the Beninese supply. Ivorian fruits, of steadier quality, sold without difficulty. The increase in the overall supply from the beginning of the second half-month, the All Saints' Day holidays and a catastrophic sea-freight market led to poor sales and a big drop in rates. Sugarloaf sales were fairly irregular, depending on the coloration of the batches on the market (between 1.80 and 2.10 euros/kg).

The Victoria market was marked by a steep rise in the Reunion supply. As the small sizes were overabundant, operators were forced to expand their price range to remain fluid.

■ **Cashew nut.** In October and November, cashew nut rates exceeded their historic record from 2011. The foundations of the market have remained stable. Unprocessed nut imports and exports of cashew kernels (shelled nuts) from India and Vietnam, which between them account for 90 % of the world shelling industry, confirmed the estimates from previous months. West African production has remained fairly similar to 2015, under the effect of a fall in yields per tree, which has overall offset the increase in surface areas. Harvests in India and Vietnam were slightly smaller than last year, again due to a fall in yield, while the surface areas in production are relatively stable. The good harvests in East Africa (Tanzania and Mozambique) and in Indonesia, in progress since early October, are insufficient to offset the shortfall from this campaign, since the Southern Hemisphere countries account for just 15 % of world production. On the demand side, the high price of the cashew compared to its main competitors (almond and hazelnut) is causing a slowdown in demand, especially in the United States and India, which has hitherto been insufficient to offset the product shortfall on the world market. Stocks available should remain relatively low until the arrival of the Northern Hemisphere harvests next March. For the moment, the prospects for the 2017 harvests are good, in both Asia and West Africa, thanks to a normal to slightly above-average rainy season. In West Africa, the

beginning and end of the rainy season were rather early, and so the harvests should start earlier than last year. At present in northern Côte d'Ivoire, approximately one-third of trees have already begun flowering and so should bear their first nuts towards late January. If temperatures are not too high and the Harmattan does not blow too strongly in December and January, yields could be considerably greater than the previous year in West Africa. Bearing in mind that productive surface areas are continuously increasing, thanks to the strong incentive provided by the high prices over the past three campaigns to small planters on the Sahelo-Sudan strip, we can expect a much bigger 2017 harvest in the sub-region, and a gradual decrease in prices over the next campaign.

Source: RONGEAD

Cashew nut - Average monthly price for cashew kernel grade WW320 FOB India (USD/lbs / source: Service N'Kalo)



PINEAPPLE — IMPORT PRICE

Weeks 40 to 43	Min	Max
Air-freight (euros/kg)		
Smooth Cayenne	1.60	2.10
Victoria	2.30	3.80
Sea-freight (euros/box)		
Smooth Cayenne	7.00	8.00
Sweet	5.00	13.00

PINEAPPLE - IMPORT PRICE IN FRANCE - MAIN SOURCES

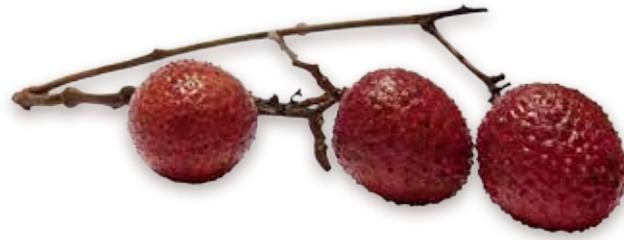
Weeks 2016		40	41	42	43
Air-freight (euros/kg)					
Smooth Cayenne	Benin	2.00-2.10	1.90-2.00	1.80-2.00	1.70-1.90
	Cameroon	2.00-2.10	1.90-2.00	1.80-2.00	1.60-1.90
	Côte d'Ivoire	2.00-2.10	1.90-2.00	1.90-2.00	1.80-1.90
Victoria	Reunion	2.80-3.80	2.30-3.80	2.50-3.60	3.00-3.50
	Mauritius	3.00-3.60	3.00-3.60	3.00-3.60	3.00-3.50
Sea-freight (euros/box)					
Smooth Cayenne	Côte d'Ivoire	-	7.00-8.00	7.00-8.00	7.00-8.00
Sweet	Côte d'Ivoire	9.50-13.00	8.50-11.00	8.50-11.00	7.50-11.00
	Ghana	9.50-13.00	8.50-11.00	8.50-11.00	7.50-11.00
	Costa Rica	7.00-9.00	6.00-8.00	5.00-6.00	5.00-7.00

Mango

October 2016

In October, the European mango market supply was based primarily on Brazil on the one hand, and on Spain on the other hand. The Israeli campaign came to an end at the beginning of the month, though sales of stocks continued until the end of the month involving limited and shrinking volumes. The Brazilian shipments were composed mainly of Keitt and Palmer. It was only in the second half-month that this source began to sell Kent. Sales of Brazilian produce were steady and stable, except for the less popular Tommy Atkins, whose price collapsed in the middle of the month. Spain continued its campaign with Osteen, with prices strengthening in the second half of October, given the decreased shipments of this variety at the end of the season. Kent volumes also dipped, with price ranges widening depending on the coloration and stage of maturity of the batches on the market. In addition, at the end of the period, pressure from the Brazilian air-freight mango intensified the competition for Spanish produce. Some small batches of Spanish Irwin were also sold throughout the month, with prices stable overall, though sales became more difficult for large-sized fruits.

The air-freight market was characterised by the near-exclusive shipment of Brazilian produce. The air-freight supply shortfall led Brazil to supply Haden, Keitt and Red Moon, varieties seldom exported by air-freight. Their rates ebbed as the Kent supply progressed. The main highlight was the launch of the Peruvian export campaign from the second half of October. This particularly early start could well greatly harm the market conditions for the last few months of the year.



© Guy Brühner

■ **Costa Rican pineapple: exports up for the master of the king of fruits.** After a 2015 of sharp decline, Costa Rican pineapple exports should return to growth in 2016. The projection, fairly reliable on this finely tuned market, indicates that volumes sold on the international market should be around 1.9 million tonnes, a figure up 4 % from 2015, but quite a long way off the record from 2014 (nearly 2.1 million tonnes). This growth trend should be confirmed in 2017, since production is set for a very good level (+ 15 to 20 %, to be corrected for any losses due to Hurricane Otto which hit the north of the country).

Professional sources, Procomer

■ **2016 litchi campaign: the cool ship?** This product, so iconic of the end-of-year holidays, has struggled to get started this season. While the quality of fruits shipped to Europe by air-freight has been up to scratch, volumes have been large in view of the extremely slack demand. Things augur better for the sea-freight campaign. On the one hand, the supply will return to a level similar to 2015. On the other hand, the commercial window will be wider, with the season starting one week earlier. The 7 700 pallets on the first ship will be unloaded on 5 December, with the second ship docking in the Northern ports in week 50.

Source: Pierre Gerbaud

Pineapple – Costa Rica – Exports

In tonnes	2012	2013	2014	2015	2016*
EU-28 + rest of Europe	910 369	925 854	958 354	860 006	890 000
North America	942 649	994 203	1 081 747	980 824	1 000 000
Others	9 935	20 159	23 699	18 496	40 000
Total	1 862 953	1 940 216	2 063 800	1 859 326	1 930 000

*estimates / Source: Eurostat

MANGO - IMPORT PRICE ON THE FRENCH MARKET

Weeks 2016		40	41	42	43	Oct. 2016 average	Oct. 2015 average
Air-freight (euro/kg)							
Spain	Irwin	4.00-5.00	4.00-4.50	4.00-5.00	4.00-5.00	4.00-4.85	4.50-5.50
Spain	Kent	4.50-5.00	3.00-5.00	3.00-5.00	4.00	3.60-4.75	5.00-5.50
Brazil	Kent	5.50	5.00-5.50	5.00	5.00-5.50	5.10-5.35	4.75-5.50
Brazil	Others	4.00-5.00	4.50	4.00	4.00	4.10-4.35	-
Peru	Kent	-	-	-	5.50	-	-
Sea-freight (euro/box)							
Brazil	T. Atkins	5.00-6.00	4.00	3.00-4.00	4.00	4.25-4.50	4.75-5.85
Brazil	Palmer	6.00-8.00	6.00-7.00	6.00-7.00	-	6.00-7.30	7.30-8.00
Brazil	Keitt	6.00-8.00	6.00-7.00	6.00-7.00	6.00-7.00	6.00-7.25	6.50-7.80
Brazil	Kent	-	7.00	6.50-7.50	6.50-7.50	6.65-7.30	7.00-8.50
Israel	Keitt	6.00-7.00	6.00-7.00	6.00	-	6.00-6.65	8.00-8.50
By truck (euro/box)							
Spain	Osteen	6.00-8.00	6.00-8.00	7.00-9.00	7.00-9.00	6.50-8.50	8.85-10.75
Morocco	Osteen	6.00	-	-	-	6.00	-

MANGO - INCOMING SHIPMENTS (estimates in tonnes)

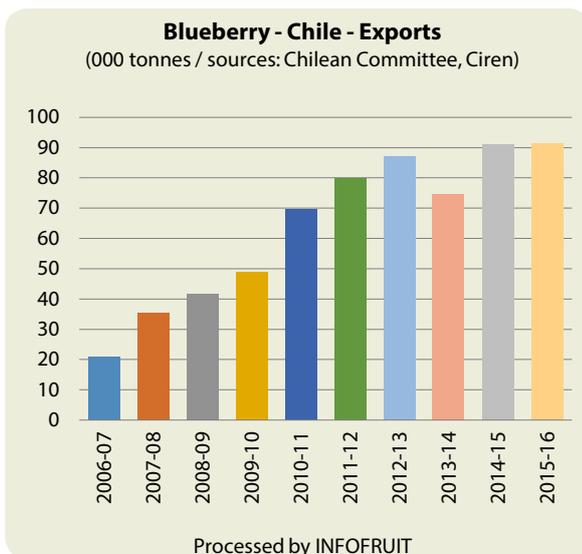
Weeks 2016	40	41	42	43
Air-freight				
Brazil	60	80	80	80
Peru	-	-	15	30
Sea-freight				
Brazil	3 100	3 170	3 340	3 890
Ecuador	-	-	-	22

EUROPE

Temperate fruits & vegetables

■ **Chilean blueberry: another small rise in potential.** After rather treading water last year because of the El Niño phenomenon, blueberry production should see a 4 % increase in Chile, to reach 141 404 t, although surface areas have now stabilised at a little below 15 000 ha. Exports could rise again. The Chilean Committee has declared a potential of 94 276 t (+ 3 % on 2015-16), with quantities which are already more than double last year's when the beginning of the campaign was particularly cut short. Shipments should rise above all out of Maule province (31 600 t). The promotions should be concentrated from late December to March, primarily in North America but also in Europe in the United Kingdom, Germany, France and Italy. In Asia, China, South Korea, Japan and Taiwan should be particularly targeted. The bulk of volumes is of course aimed at the North American markets (70 %), with Europe still the number two destination (19 500 t) ahead of Asia (8 100 t).

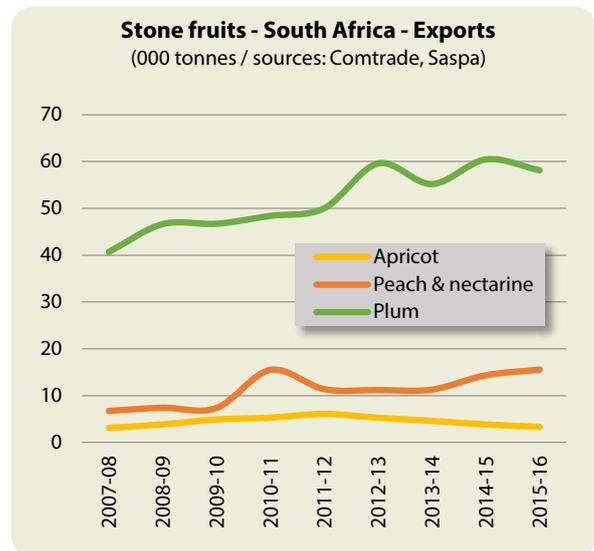
Sources: Chilean Committee, Ciren



© Chilean Blueberry Committee



© Guy Beheer



■ **South African stone fruits: a renewal which is paying off!** After a 2015-16 season with fairly good volume and value levels, South African exporters are confident for the coming campaign, in spite of concerns which the prolonged drought and a cool spring have generated. The export potential for most stone fruit species should be up by 4 to 5 % from 2015-16. In particular a record level is expected for the plum, with an estimated potential of 11.76 million 5.25-kg boxes (+ 6 %), but also the peach and nectarine (6.5 million 2.5-kg boxes, i.e. + 5 %). This is due to the entry into production of young orchards and to the regular renewal of peach and plum plantations in recent years, which is also helping stagger the campaign. Exports should be around 3.4 million 4.75-kg boxes (+ 4 %).

Sources: Comtrade, SASPA

Sea freight

October 2016

The month of October brought mixed blessings for reefer operators: on the one hand the charter market tightened and strengthened for tonnage large and small, but on the other, there was news that vessels were redelivering as charterers switched modes on previously core specialized reefer banana trades.

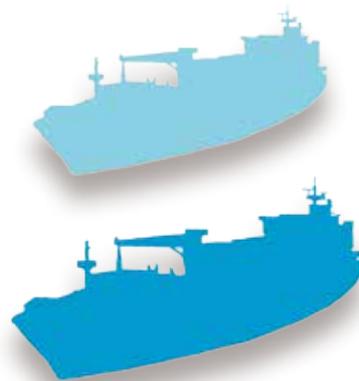
The shortage of large units was driven by demand to charter the surplus banana volumes east of the Andes and in the Philippines. While there was good money to be made for voyages from Davao into the Persian Gulf, fixtures on the transatlantic run yielded a rangebound 30c/cbft TCE. What was already a difficult banana market in the Eastern Med was further complicated by the imposition of an import quota system on banana imports into Algeria. The combination led to congestion in Mersin with vessels waiting 1-2 weeks for a berth, and this in turn resulted in a contraction of spot capacity, but no material gain in box rates.

While the shortage of large units was caused principally by supply side variables, it was the increase in demand from fish charterers that was responsible for the change in sentiment for small tonnage. Although the benchmark Mauritania to West Africa rate stayed constant throughout October, operational efficiency and therefore also yields improved as lay time reduced.

On the Period business perspective, what was good news for owner/operator Maestro was the opposite for Chartworld, as the former wrested Chiquita's 4-vessel Med banana service away from the latter. Although Chartworld has yet to declare its intentions, of all the operators it will likely be Seatrade that will be under the greatest pressure in 2017. As it stands, the Seatrade pool will absorb the

four vessels re-delivered by Del Monte and Turbana, plus two from De Nadai at a time when the operator is introducing its own high capacity, fully cellular ships. These are to be deployed in the liner service between New Zealand and Europe at the expense of its conventional tonnage.

It will be interesting to see how Seatrade rises to the challenge. The combination of the dismal performance of the spot market, aggressive pricing from the lines, the containerization of core reefer trades and more of the same likely in 2017, when the market will have to absorb the additional 'inconvenience' of four specialized reefer newbuilds, will surely lead to extensive demolition. And this will happen despite the low scrap price and whether or not there is any squid in the South Atlantic!



■ **Del Monte launching its "fresh cuts" in France.** The multinational has set up a fruit cutting workshop in its Rungis ripening plant. Initially, the range proposed will be based primarily on the Gold pineapple, and will be aimed above all at Paris and the surrounding region. There are other projects underway in this strategic avenue, aimed at extending the supply to other fruits and expanding distribution nationwide.



Source: Del Monte

■ **APNM launching its "Morocco Nadorcott Seedless" label.** The Moroccan Nadorcott producers' association wants to ensure that its supply stands out on the high added-value, but increasingly competitive, late mandarins segment. This label emphasises the assets of the Moroccan Nadorcott: native to the region, naturally tasty seedless fruits, thanks to a variety derived from a natural mutation cultivated under conditions helping overcome problems of cross-pollination (isolated orchards). It also guarantees complete traceability and the industry's commitment to a sustainable production approach.



Source: APNM

Web: www.reefer-trends.com
 Tel: +44 (0) 1494 875550
 Email: info@reefer-trends.com

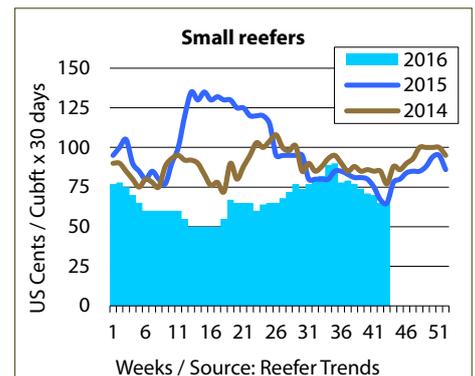
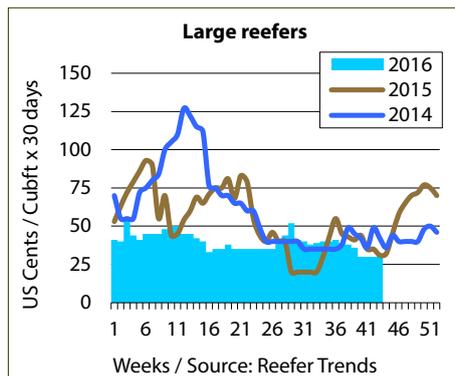
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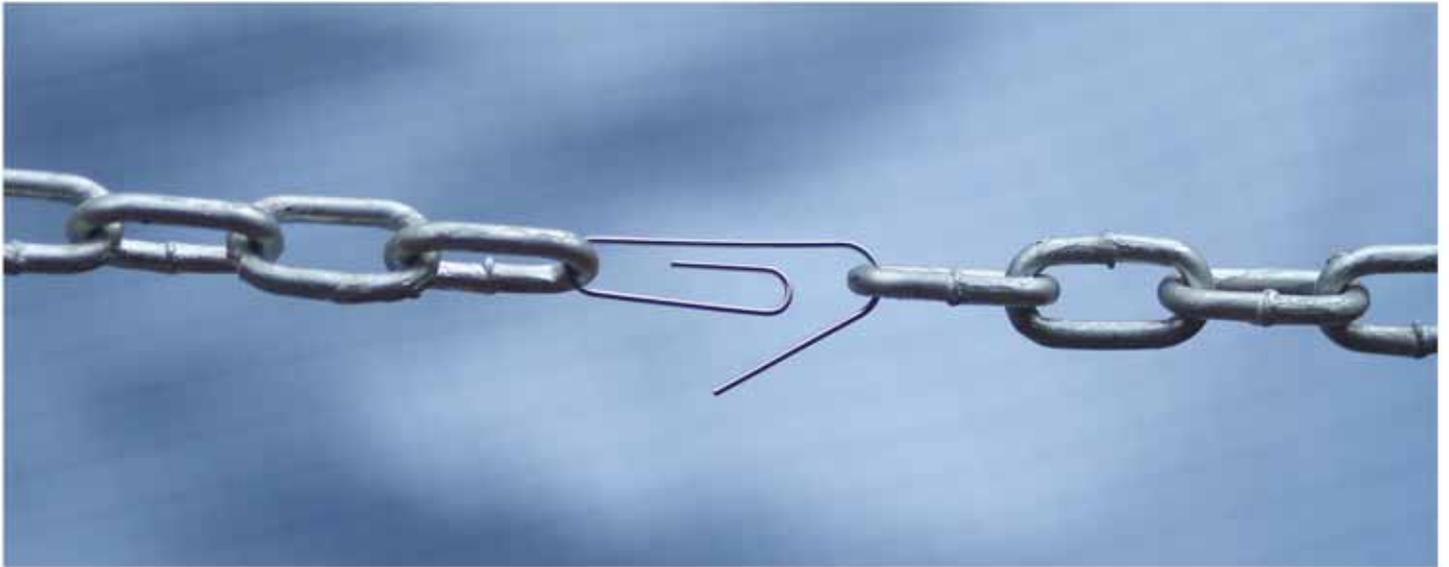
EUROPE

MONTHLY SPOT AVERAGE

USD cents/cubic foot x 30 days	Large reefers	Small reefers
October 2016	32	68
October 2015	38	72
October 2014	31	86



Information... your weak link?



Reefer Trends is an independent news and information provider, financed exclusively by revenue from subscriptions.

First published in 2003, it provides a number of services for users along the reefer logistics chain: the Reefer Trends weekly charter market brief is the benchmark publication for the specialist reefer business – it tracks the charter market for reefer vessels, as well as fruit and banana production and market trends that influence charter market movement.

The weekly publication has close to 200 paying subscriber companies from 34 countries worldwide. The list of subscribers includes all the major reefer shipping companies and reefer box operators, the major charterers, reefer brokers, banana multi-nationals, the major banana exporters in Ecuador, Costa Rica, Panama and Colombia, terminal operators in the US and Europe, the world's leading shipping banks and broking houses

as well as trade associations, cargo interests and fruit importers on all continents. It is also circulated within the European Commission and the World Trade Organisation.

As well as the weekly Reefer Trends report it provides a separate online daily news service, covering developments in the global fruit, banana and logistics industries. The daily news is e-mailed direct to the desktops of several thousand subscribers worldwide.

Reefer Trends' consultancy clients include shipbuilding yards, banana majors, banks, brokers and equities analysts. Reefer Trends provides sector reports and forecasts for brokers and charterers. It has also acted as an expert witness in a chartering dispute.

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reefer trends

Counter-season asparagus

Still balanced



© Régis Domergue

The European counter-season asparagus market, a battleground between the nearby sources such as Morocco and the American sources, seems finally to have swung in recent years in favour of Peru, with some top-up volumes from Mexico. However, this balance could be altered with new prospects on the North American market.

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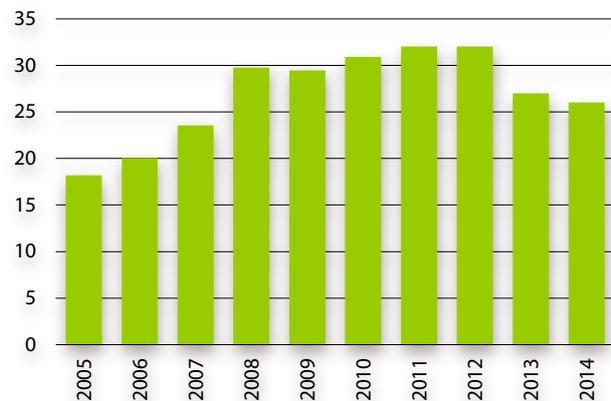
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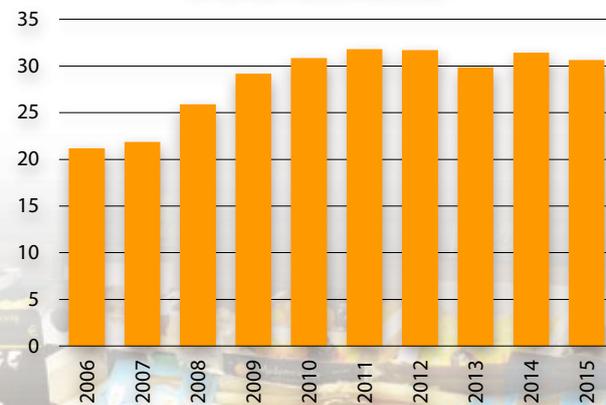
European market at deadlock?

In the early 2000s, European imports of asparagus from third countries saw a considerable rise with the advent of Peru, which gradually overhauled the other suppliers. Due to its greater competitiveness, it gained the upper hand over the local Mediterranean sources, such as Morocco, despite the great hopes placed therein by certain operators, especially from Spain. The market now seems to have reached maturity. Community imports have plateaued out since 2010 at around a maximum of 38 000 t, with 88 % from Peru, 8 % from Mexico, 2 % from the United States and 1 % from Morocco. Certain sources managed to make a breakthrough until 2012, such as Mexico, whose imports are now stagnating at a little under 5 000 t. Yet it is Morocco most of all which has suffered from this situation. Its volumes have been slashed after a very steep decrease. From their high point in 2009 (2 800 t) they fell to 1 000 t in 2012, before tumbling to just 240 t in 2015. Tonnages are continuing to decline for Thailand (220 t in 2015 as opposed to 950 t in 2008). The United States is also struggling to hold up, with volumes down to 200 t in 2010, as opposed to more than 1 000 t before 2000, although they did register a better performance in 2015 (600 t).

Asparagus - Peru - Planted areas
(000 hectares / Sources: FAO, USDA)



Asparagus - EU-28 - Extra-Community imports
(in tonnes / Source: Eurostat)



© Denis Loeillet



Peru still at the cutting edge...

This slowdown is also due to the fall in Peruvian surface areas (26 000 ha according to the latest figures from the Ministry of Agriculture, as opposed to 32 000 ha in 2012), with the conversion to other more lucrative crops such as the grape and blueberry. Nonetheless, the source remains by far the world's number one asparagus exporter, ahead of Mexico. Thus export volumes reached 132 600 t in 2015, when the source was hindered by the poor climate conditions caused by the El Niño phenomenon. The dynamic is far from over, although the consumption of this vegetable is at a standstill. In particular, there has been new planting activity in recent years in the provinces of Ica, Ancash and Lambayeque. Competition may be a bit more intense with Mexico, whose shipments, after rising until 2014 (129 000 t exported), have also reached a standstill.

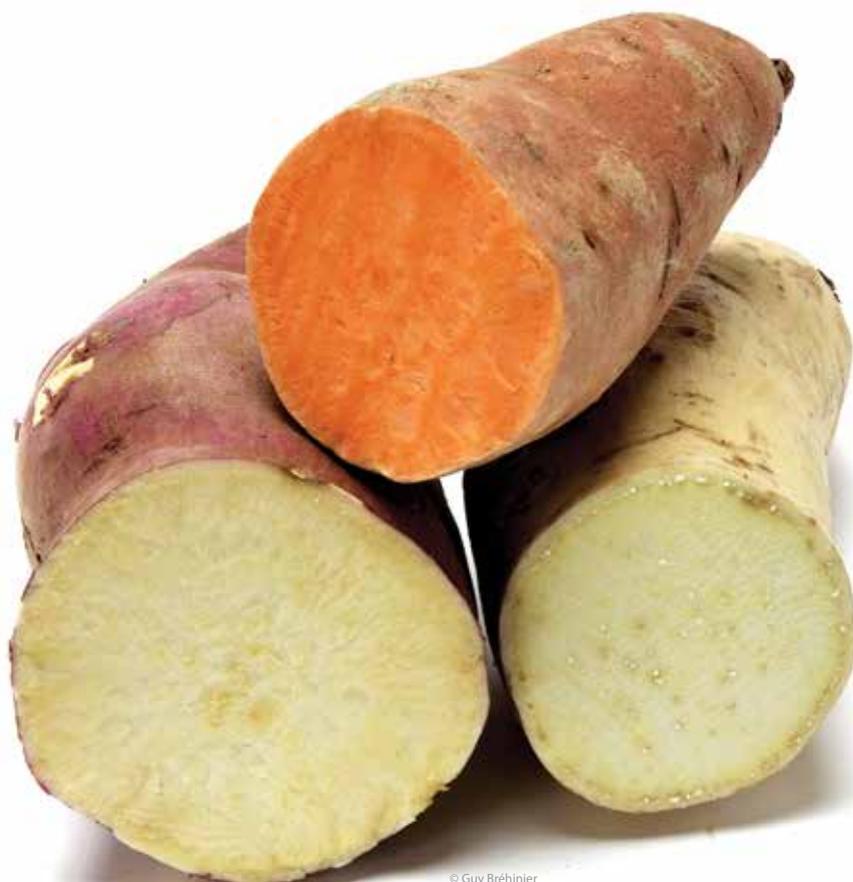
...but drawn above all by the North American market

Once again this year we are expecting a potential at least similar to last year, especially as the climate conditions have been less unfavourable. However there are no predictions of real progress on the European market, but instead a trade-off favouring other markets. Since although some have switched to other crops in recent years, other still hope to be able to expand their exports, especially to the United States. This outlet represents the bulk of exported fresh volumes (70 %), bearing in mind that shipments were hitherto restricted by a highly costly fumigation treatment, imposed by the US sanitary authorities to combat *Copitarsia corruda*, which ate into producers' revenue. The lifting of this measure by APHIS, starting from this campaign, could therefore change the hand. Furthermore, Peruvian exporters should continue their expansion in Asia, with in particular the opening up of the Chinese market. However, despite an agreement protocol signed since 2013, this market's development is still dormant ■

Cécilia Céleyrette, consultant
c.celeyrette@infofruit.fr

Sweet potato

A vegetable boom?



© Guy Bréhinier

It is quite a rare occurrence. The emergence of a new product always attracts special attention, especially in the fruits and vegetables industry, which is more characterised by stagnating or even decreasing consumption. Novelty often springs up where it was not expected. Indeed, what could be more common and insignificant than the potato, a product with apparently little crowd-pulling potential. Yet it is this tuber, in its sweet version, hitherto with no impact on the markets, that is generating some excitement. True, the expansion trend goes back to the mid-2000s rather than yesterday. However, it has picked up noticeably in recent years, accompanied by modifications in terms of supply. This will be especially clear when the forthcoming Medfel in April 2017 puts the potato and sweet potato in the limelight.

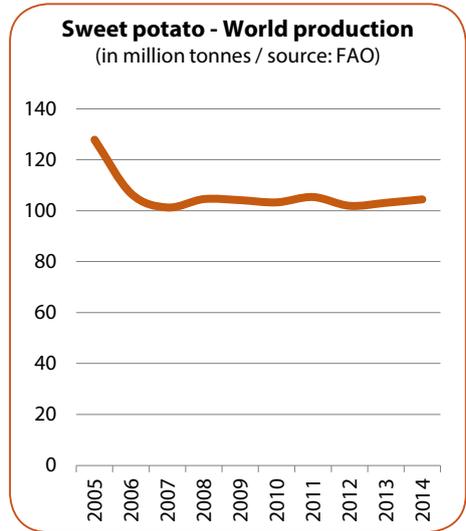
World production

World sweet potato production is estimated at nearly 104 million tonnes per year (FAO, 2013), making it one of the most cultivated tubers. It is in third position behind the potato (385 million tonnes) and cassava (270 million tonnes), but ahead of the yam (68 million tonnes) and taro (10 million tonnes). World production has been stable since the mid-2000s, after going through a big downturn in the early 2000s due to the collapse of Chinese production, which went from 140 million tonnes in 2000 to nearly 71 million tonnes in 2014. China, although on the slide, remains by far the world number one sweet potato producer. The top ten producer countries produce nearly 88 % of the world total.

Sweet potatoes are primarily produced in Asia (75 %), due to China's massive production. Africa follows far behind with 20 % of world production. The Americas contribute just around 4 % and Oceania 0.8 %. Europe provides only an anecdotal proportion of world production, with just 0.05 %. The predominant cultivation of the potato, the resulting dietary habits and the less favourable weather conditions doubtless explain this lower interest in sweet potatoes. Production has shown fairly high stability in its development over the past decade. It is rising, though slowly, in Asia, the Americas, Oceania and Europe. Only Africa seems to be seeing a slightly more marked rise.



Sweet potato - World production
(in million tonnes / source: FAO)

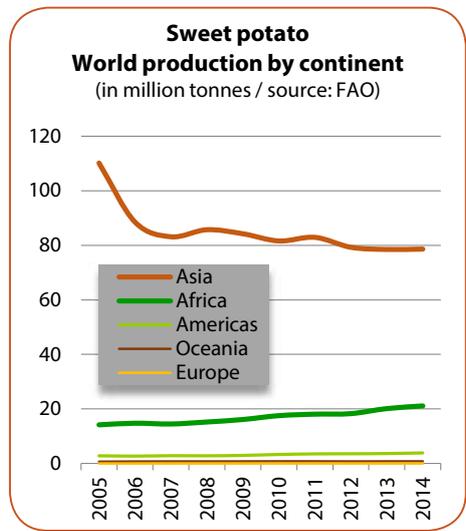


European production

In Portugal, the main sweet potato production region is Alentejo, south-east of Lisbon. According to the cross-referencing carried out based on European statistics, Portugal's exportable production is around 1 300 tonnes. The varieties most frequently encountered from Portugal are Beaugard (orange-fleshed) and Rubina.

Spain had a total cultivation area of around a thousand hectares, for an estimated production of 10 000 tonnes, in the early 2000s. This has apparently doubled since then. Sweet potato production is concentrated in Andalusia, in the Cadiz region, with approximately 60 % of Spanish surface areas dedicated to this crop. The second production region is Valencia, with nearly 20 % of surface areas. The remainder is divided between the other regions, including the Canaries. The Valencia region primarily cultivates the California variety

Sweet potato
World production by continent
(in million tonnes / source: FAO)



Sweet potato – Top 10 producer countries

Countries	in tonnes
China	70 731 680
Nigeria	3 478 270
Tanzania	3 345 170
Ethiopia	2 701 599
Indonesia	2 382 658
Angola	1 928 954
Uganda	1 863 000
Vietnam	1 401 055
United States	1 341 910
Mozambique	1 313 380

Source: FAO

(orange-fleshed). In Andalusia, certain particular varieties have developed: Amarilla from Malaga (white-fleshed and skinned), Rosa de Malaga (white-fleshed), Violeta Roja (white-fleshed), Lisa de Tucuman and Georgia Jet (orange-fleshed). Production extends from September to April. The most common export variety is Beauregard.

Italian sweet potato production occupies approximately 250 hectares for a harvest varying, depending on the year, between 5 000 and 10 000 tonnes. The bulk of production is located in Veneto (60 %) and Puglia (22 %). Additional production is based in Tuscany, Marche and Sicily. The Beauregard variety, but also white-skinned and fleshed, and violet-skinned and fleshed varieties, seem to dominate Italian production. The harvest is carried out mainly between August and October.

Sweet potato production in Metropolitan France remains marginal, with planted surface areas still modest though rising. They are situated mainly in the south of the country, though also in the Western regions and as far north as Normandy. Production is estimated at around one thousand tonnes. Previously absent from the traditional trade circuits, it emerged in 2014 and 2015.

There are some indications to be found in national agricultural statistics under the section "Other tropical tubers" (excluding the potato, yam and cassava). We can assume that this section corresponds to the sweet potato, though it may also relate to other products (dasheen, taro, etc.). According to these documents, the planted surface areas were 1 314 ha in 2013, down to 1 134 ha in 2014; while the harvest was 8 794 t in 2013 and 6 134 t in 2014. This production is primarily located in the Overseas Departments, more particularly Reunion, Martinique and Guadeloupe, and mainly consumed locally.

Varieties

According to the literature, there are approximately 500 varieties of sweet potato, divided by skin and flesh colorations (o = orange-fleshed; w = white-fleshed; ww = white-skinned and fleshed; v = violet-fleshed). We can mention the following varieties:

- For Africa (Benin, Senegal): Ndargu, Fanaye, Ciam, Clone 2, Clone 29, 2532 Tis, 2544, 83-176 Tis, Walo.
- Unspecified source: Evageline (o), Cavington (o), Beauregard (o), Hernandez (o), 573 (o), Puerte



Rican (o), 4 Rubina (o), Orleans (w), Japanese (w), Murasaki (w), 14 Purple (v), Bonita, O'Henry (ww).

- In the United States, the variety which is apparently the most cultivated, especially in Florida, is Beauregard (o), but we can also find Covington (o), Hernandez (o), Carolina Ruby (o), Japanese (w) and O'Henry (ww), especially in Carolina.

Packing

The packaging is described for each source, and the dimensions are given as a guide, since they can vary to within a centimetre after assembly and use depending on the moisture absorbed and pressures applied. The 40x30 cm open-top box seems to be the most often used by the majority of sources. All the boxes observed possess locking tabs, enabling them to be stacked on the pallets.

Marking

While the marking on the packaging includes the source and nature of the product as a matter of course, the other usual information is less regular. The variety is rarely mentioned. It can be found on Portuguese and Spanish produce (Beauregard, Rubina), incidentally for Honduran produce (Beauregard, Blesbok, Bosbok), sometimes for South African produce (Bushbuk) and never for the other sources. Some sources, such as Israel, the United States and South Africa, state the storage temperature of 14°C. The size scales remain irregular depending on the sources and commercial brands. The size scale is often printed on the packaging, but not specified.



Sweet potato – Main packaging types on Rungis market (France)

Source	Box capacity and dimensions		
	telescopic	open-top	with flap
Egypt	8 kg net 42x32x14 cm	6 kg net 40x30x14 cm	
Honduras		6 kg net 39x29x14 cm	10 kg net 40x30x18 cm
Spain		6 kg net 40x29x14 cm	
Italy		39x29x12 cm	
South Africa			10 kg net 40x30x19 cm
Israel		6 kg net 40x32x13 cm or 40x29x14 cm or 39x29x15 cm	
Portugal		18 kg net 60x40x18 cm	
United States		6 kg net 39x29x14 cm	
		40x30x14 cm	

Source: Pierre Gerbaud

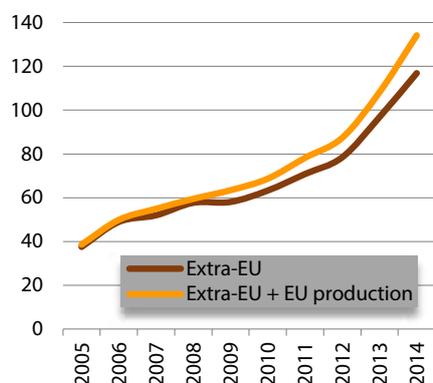
Sweet potato – Main sizes on Rungis market (France)

Source	Type of box	S – Small	M – Medium	L – Large	L1 – Large 1	L2 – Large 2	EL or XL – Extra Large	G – Giant
Egypt	telescopic 8 kg	80-150 g	150-300 g		300-450 g	450-600 g	600-800 g	
	For open-top box, the size is defined by the number of pieces per box (6 to 20 pieces)							
Israel	open-top 6 kg	80-150 g or 100-150 g	150-300 g		300-450 g	450-600 g	600-800 g	800-1 300 g or 800-1 000 g
	open-top 18 kg							800-1 000 g or 800-1 100 g or 800-1 200 g
Portugal	open-top 6 kg				300-450 g	450-600 g	600-800 g	
United States		100-150 g	150-300 g		300-450 g	450-600 g	600-800 g	800-1 000 g
Honduras		110-230 g	230-450 g	400-1 000 g	x	x	x	
South Africa		x	x	x			x	

x = size with no weight mentioned / Source: Pierre Gerbaud

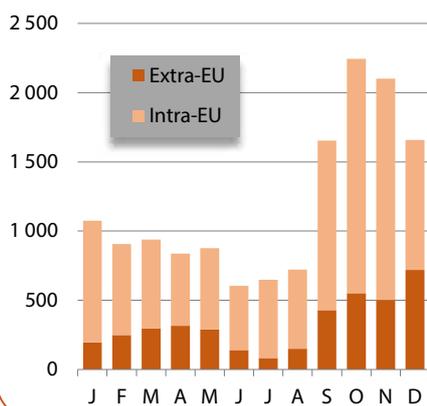
Sweet potato - European Union Evolution of imports

(in 000 tonnes / source: Pierre Gerbaud)



Sweet potato - France Monthly imports in 2015

(in tonnes / source: Pierre Gerbaud)



World trade

Of the 104 million tonnes produced worldwide, the world trade involves only 240 000 tonnes. The disproportion between production and trade illustrates the predominance of self-consumption of this product in the producer countries, where it is a staple.

China and Indonesia are among the top ten producer countries and have little involvement in international trade. More astonishing is the position of the American countries, and more particularly the United States, in the production/export ratio: though small producers at a world level, they play a major role in the field of exports. More astonishing still is the position of certain European countries, all situated in the Mediterranean zone. While Italy and Spain have indeed seen increasing production for some years, French production remains very limited and is above all based in the Overseas Departments. The main importer countries are, in some cases, also exporters, but there is minimal correspondence.

Sweet potato – Main exporter countries

Countries	in tonnes
United States	184 130
Spain	19 200
Honduras	17 636
Vietnam	16 222
China	15 286
Laos	14 123
Canada	11 923
Indonesia	11 873
Egypt	11 677
Dominican Rep.	8 938
Israel	7 164
Peru	3 487
Total	346 600

Source: Comtrade 2015

Sweet potato – Main importer countries

Countries	in tonnes
United Kingdom	122 541
Netherlands	58 823
Canada	55 618
Thailand	21 480
France	20 297
United States	19 664
Germany	18 305
Japan	16 143
Malaysia	11 725
Singapore	9 165
Italy	8 514
Saudi Arabia	7 358

Source: Comtrade 2015



The plant

The sweet potato, *Ipomoea batatas*, is part of the order Solanales, family Convolvulaceae and genus *Ipomoea*. It is a perennial herbaceous plant cultivated as an annual plant. The creeping stems can reach 6 metres in length and 3 to 10 mm in diameter. The leaves are alternating, with a long stalk variable in shape, toothed or lobed (5 to 7 lobes), and green to reddish in colour. The flowers with solid white and/or violet-coloured corollas appear on their own or grouped on the leaf axils. The sweet potato is cultivated for its tubers (actually tuberous roots), which are more or less elongated or spherical in shape and variable in colour. The flesh and skin coloration is a varietal characteristic. Hence we can find varieties with white skin and flesh, violet skin and white flesh, red skin and yellow flesh, orange skin and flesh, or also violet skin and flesh.

Origin and dispersal

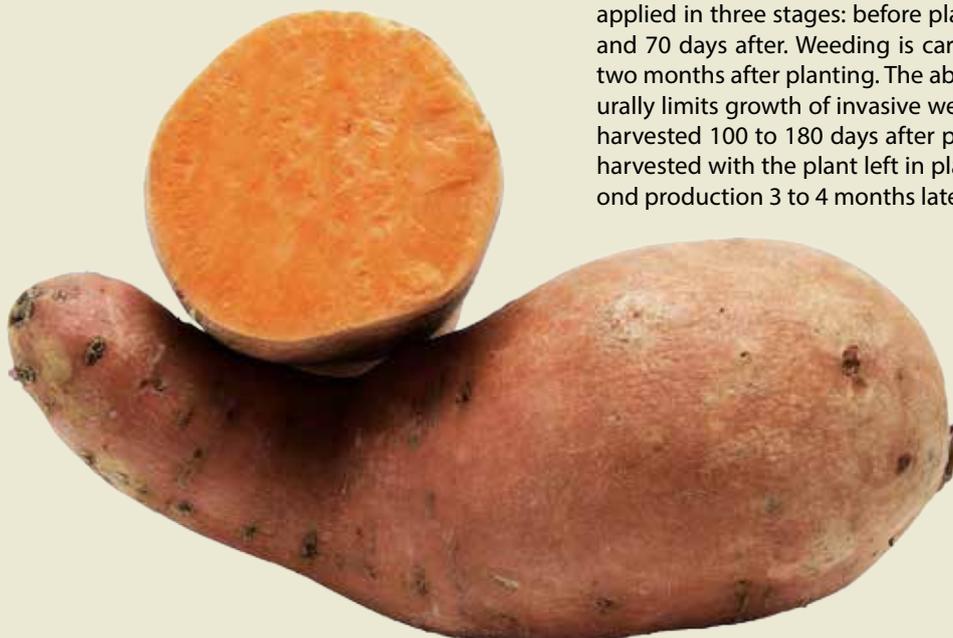
The sweet potato apparently originates from the American tropics, spreading from two centres, one between Yucatán and Venezuela, and the other between Peru and Ecuador where it was known as far back as 8 000 years BC. A world research centre on the potato and sweet potato has been set up in Lima, Peru (Centro Internacional de la Papa, CIP). Later on it was found as a cultivated plant in the American tropics, as well as in Polynesia and New Zealand before the arrival of the Europeans. Very widely distributed by the Spanish and Portuguese, it is now present in all the tropical, subtropical and Mediterranean zones.

Plant ecology

The plant struggles in temperatures below 10°C. Vegetation starts from 15°C, with maximum growth at between 21 and 28°C. Tuberization is faster in 11-hour days; it is inhibited by days of more than 14 hours, which explains its preference for the tropical zones. Flowering is rare in days of more than 13 hours. Water requirements are 600 mm per cycle. The optimal annual rainfall is 750 to 1 000 mm. The plant requires a regular water input. Water shortage during tuberization affects the yield. Sweet potatoes develop better in light and well-drained soils, with a pH of between 5.2 and 6.6. They cannot withstand either salinity or alkalinity. In tropical zones, cultivation can take place year-round. However, it is preferable for the harvest to take place outside of the rainy season, as tubers are sensitive to excess moisture which can cause rotting.

Cultivation

The plant stock used for sweet potato production comes from cuttings or vitroplants. 25-30 cm cuttings bearing three or four buds, and with the lower two-thirds defoliated, are buried at an angle of 45°. Beforehand they are disinfected by soaking to facilitate weevil management. Planting is carried out on nursery beds or ridges, depending on the nature of the soil. Densities vary from 30 000 to 60 000 cuttings per hectare. The cuttings are placed in a single or double row depending on the width of the ridge, with a spacing of 30 cm. In the United States, planting is often carried out with a 30 cm spacing on the row and a gap between rows of 90 cm to 1 m in drained soil, or around 1.20 m in heavier soil. Fertiliser inputs are applied in three stages: before planting, and then 40 and 70 days after. Weeding is carried out in the first two months after planting. The abundant foliage naturally limits growth of invasive weeds. The tubers are harvested 100 to 180 days after planting. The crop is harvested with the plant left in place, enabling a second production 3 to 4 months later.



© Guy Bréhinier

Diseases and pests

Feathery Mottle Virus is observed mainly in the United States and South Africa. The only management method appears to be using resistant varieties and selecting sound cuttings.

The fungi *Ceratocystis fimbriata* and *Fusarium oxysporum*, which attack the stems and tubers, are fairly widespread. Again, using sound plant stock for planting appears to limit attacks.

Weevils (*Euscepes postfasciatus* and *Cylas formicarius*) probably represent the most common enemies of the sweet potato. Stem borers (*Omphisa anastomosalis*) and nematodes (*Meloidogyne*, *Rotylenchulus*) also cause considerable damage. Pheromone traps are a management method.

In sound soil, the sweet potato can be cultivated three or four years in a row without major sanitary problems. In crop rotation systems, alternation should be avoided with plants sensitive to nematodes, which would lead to their proliferation.

Preservation

The sweet potato needs a maturation phase to achieve its optimum flavour. After harvesting, it is stored in a warehouse at a temperature of 30°C and 95 % relative humidity, to set the skin and enable any injuries caused by harvesting to scar. The starch in the tubers then begins its transformation into sugar. The tubers are then stored at a temperature of approximately 15°C and 85 % relative humidity. The tubers are kept in this way for several months.

Use

The sweet potato is consumed in the same way as the potato: boiled, fried or mashed. Its sweet flavour also enables it to be used for cakes and even jams. It can also be converted into flour. The leaves are also consumable, like spinach. Leaves and tubers are used as livestock fodder. The tubers contain starch and sucrose which can be used for alcohol production by fermentation and distillation, as well as starch production. Hence, American producers were able to unveil at the last edition of Fruit Logistica (Berlin 2016) a sweet potato-based beer.



© Eric Imbert

Sweet potato – Nutrition facts

Components	Average content per 100 g of cooked sweet potato
Calories (kj/100 g)	334
Calories (kcal/100 g)	79.1
Water (g/100 g)	78
Protein (g/100 g)	1.69
Carbohydrate (g/100 g)	16.3
Fat (g/100 g)	0.145
Sugar (g/100 g)	6.11
Starch (g/100 g)	6.14
Fibre (g/100 g)	2.9
Saturated fat (g/100 g)	0.0325
Monounsaturated fat (g/100 g)	0.0005
Polyunsaturated fat (g/100 g)	0.0625
16:0 fat, palmitic (g/100 g)	0.032
18:0 fat, stearic (g/100 g)	0.0005
Minerals	
Sodium (mg/100 g)	31.5
Magnesium (mg/100 g)	22.5
Phosphorus (mg/100 g)	43
Potassium (mg/100 g)	352
Calcium (mg/100 g)	32.5
Manganese (mg/100 g)	0.382
Iron (mg/100 g)	0.705
Copper (mg/100 g)	0.127
Zinc (mg/100 g)	0.26
Iodine (µg/100 g)	3
Beta carotene (µg/100 g)	10500
Vitamins	
C (mg/100 g)	16.2
B1 (mg/100 g)	0.0815
B2 (mg/100 g)	0.0765
B3 (mg/100 g)	1.01
B5 (mg/100 g)	0.732
B6 (mg/100 g)	0.226
B9 (µg/100 g)	6

Source: anses, quical 2012

A report by
Eric Imbert

Citrus

Citrus

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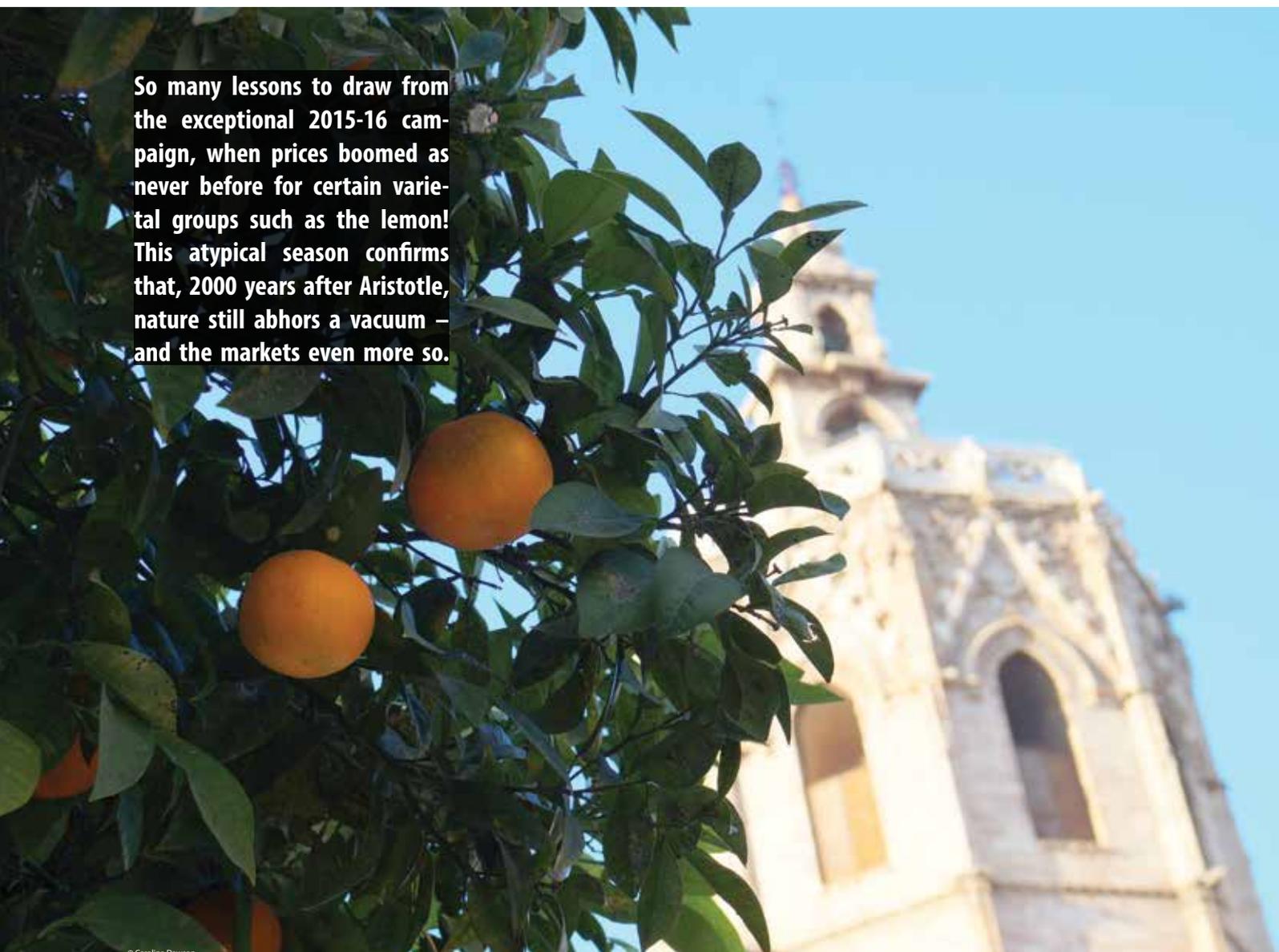
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Citruses

Mediterranean citruses

2016-2017 campaign forecast



So many lessons to draw from the exceptional 2015-16 campaign, when prices boomed as never before for certain varietal groups such as the lemon! This atypical season confirms that, 2000 years after Aristotle, nature still abhors a vacuum – and the markets even more so.

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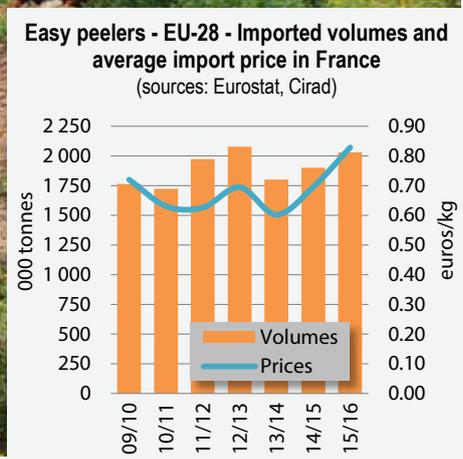
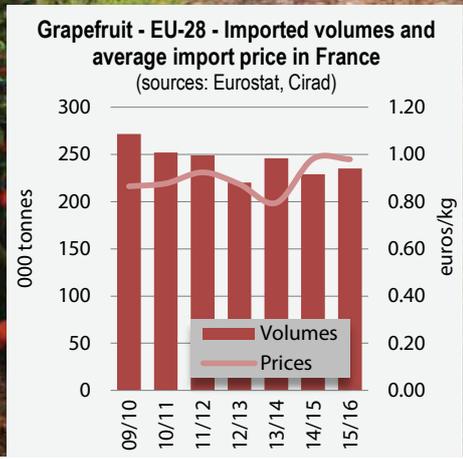
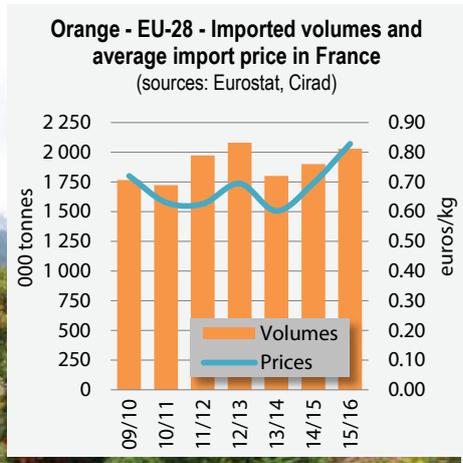
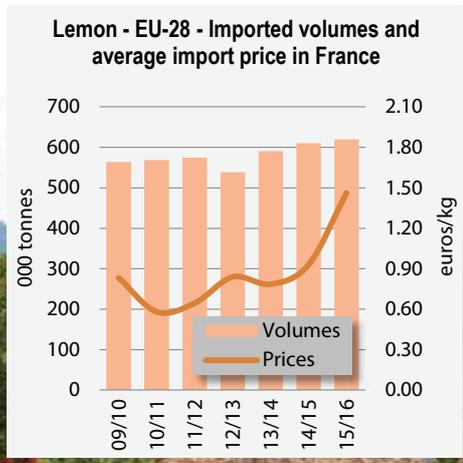


Back to familiar ground

While the production shortfall was severe and widespread, after the heatwave which hit the Mediterranean in spring 2015, it did not result in a supply shortfall. Statistics from Eurostat show that volumes of easy peelers, orange, lemon and grapefruit sold across the European Union were close to four-year average levels (from 0 to + 7 % depending on the varietal groups). There is nothing bizarre in this phenomenon, though there were big movements between the communicating vessels of industry and the fresh market (for the lemon and orange especially). In addition, the trade-offs made by the big exporter countries favoured the EU-28, to the detriment of local sales or other export markets, such as Russia in particular, because of the weakness of the rouble, and of course the ban on imports imposed on Turkish citruses on 1st January 2016. Finally, the volumes normally not sold for lack of demand probably came into play, especially since the distribution sector was a bit less inflexible on its quality requirements.

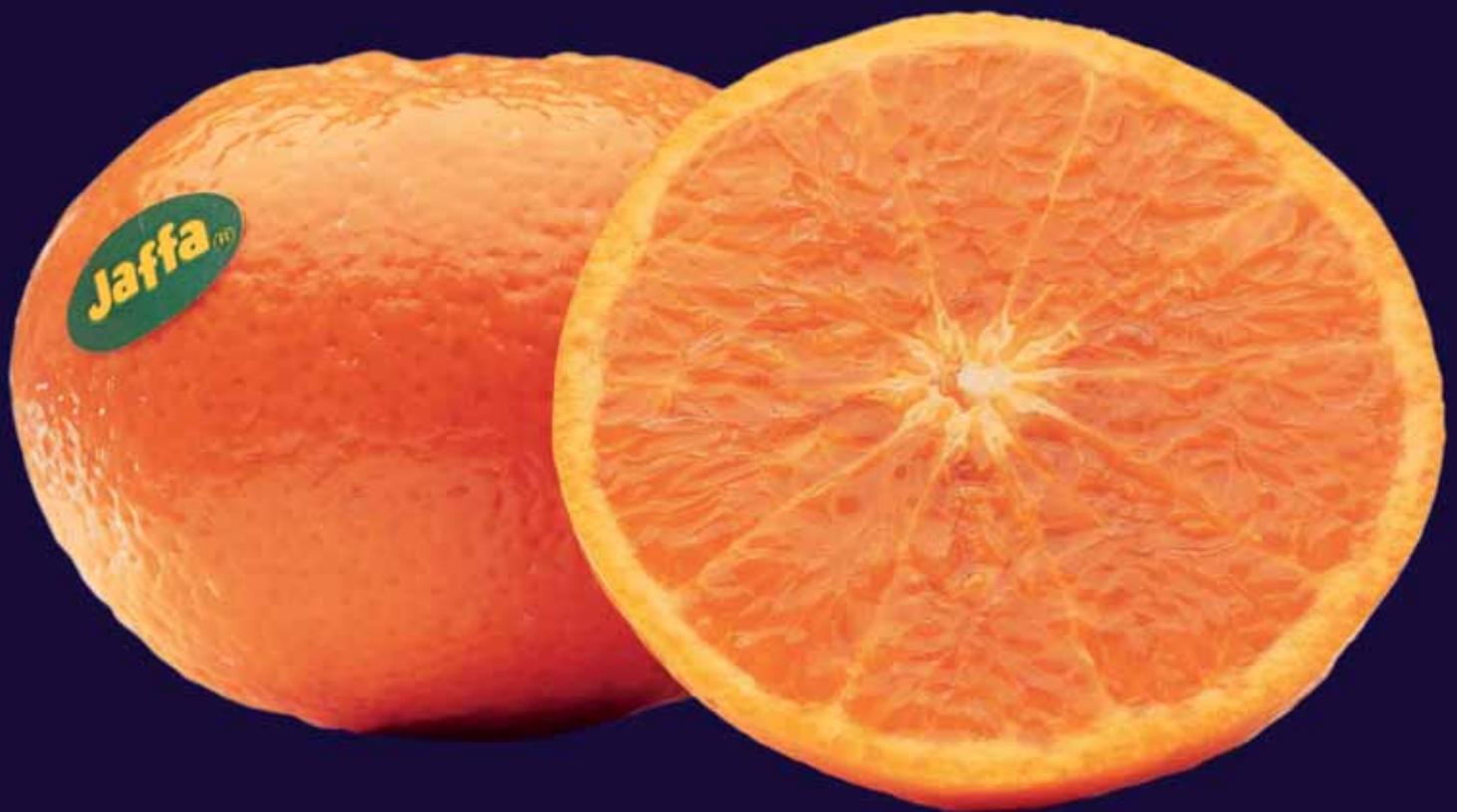
The other major lesson from this 2015-16 season concerns prices. There is some good news and some less good news. To start with the less good, we have to recognise that remuneration for the end-of-season hybrids

segment, hitherto distinctly positive, has continued to decline despite the excellent prices during the first part of the season (see comparison of clementine/hybrids average campaign prices). However, as for the other varieties, the supply was only near-average. Conversely, its fragmentation between an increasingly large number of operators (across all varieties and sources) is increasingly obvious, and is dragging the market down. This is an alarming trend for producer countries with high costs, since this segment, which is one of the few to guarantee a decent level of profitability, often helps absorb losses from the mid-season. Yet the main point to take from this brief review is positive, and must be emphasised. The exceptional price levels, at both the import and retail stages, in no way hindered consumption, as is attested by the market supply level. This shows the continuing importance to European consumers of citruses, so often described by some as old hat, to the point of being a must. We can also assert that consumers are prepared to pay a little more per kilo of oranges or lemons, albeit a few cents, but this makes all the difference to the operating accounts of the long-suffering producers from all around the Mediterranean. This is a message that the big distributors need to hear!




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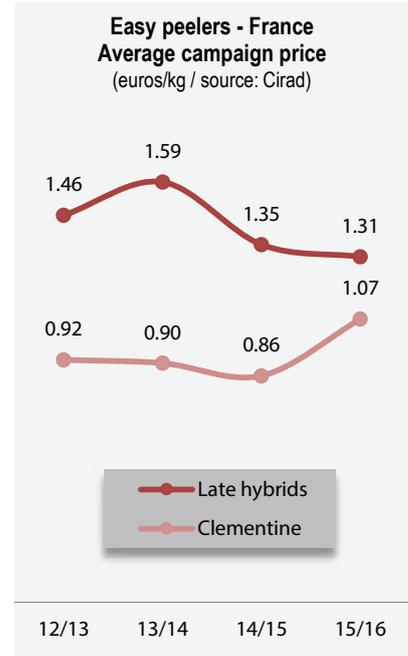
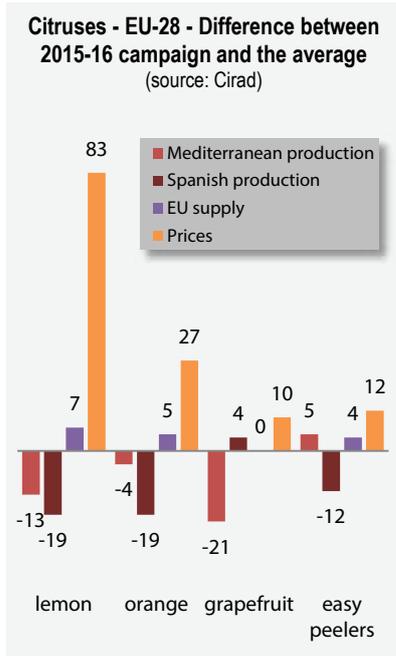
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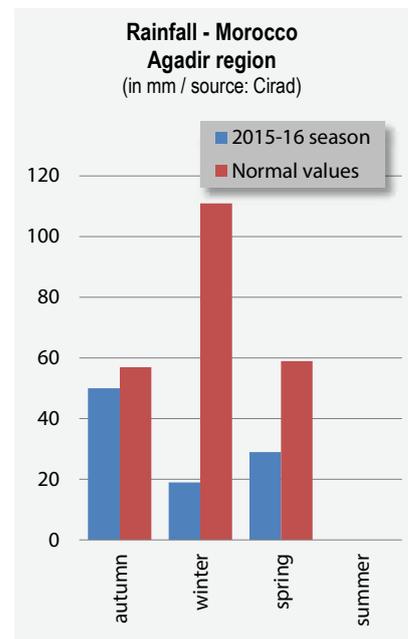
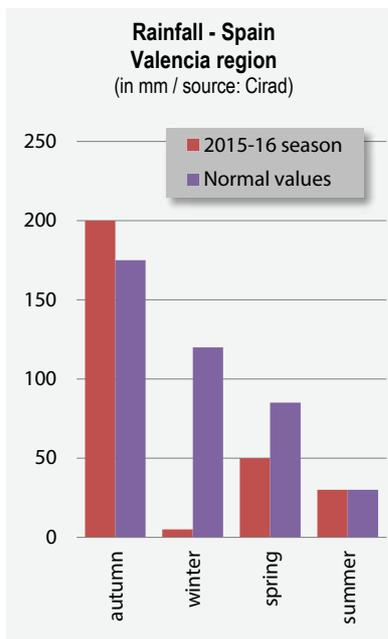
Generally back to at least average production

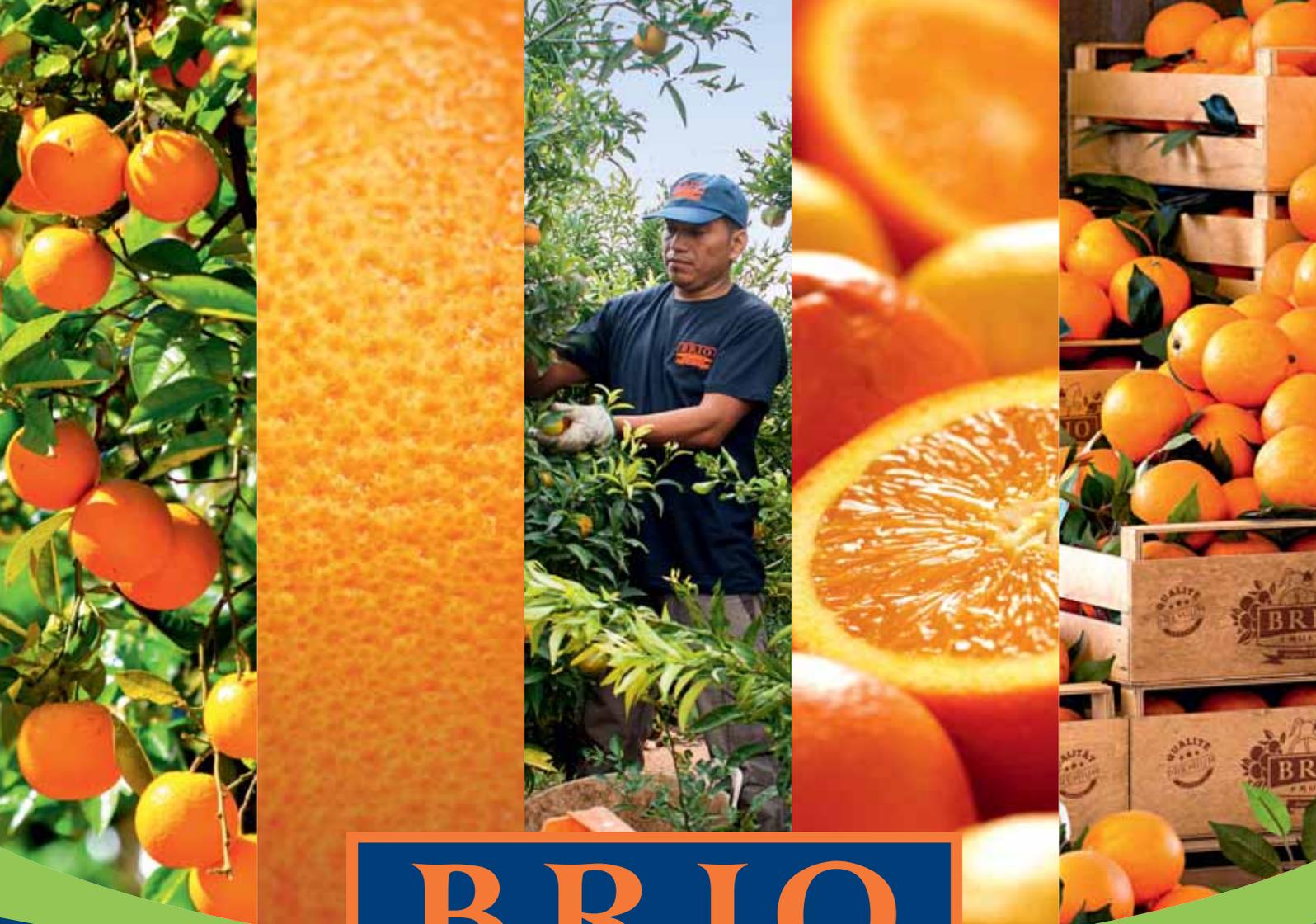
The 2016-17 season is shaping up to be completely different in terms of production. Barring a few exceptions, all the Mediterranean players on the market are back to an at least normal production level. This is the case for Spain, which has clearly demonstrated the extent to which its harvest level structured the market, returning to volumes similar to 2014-15. Most other countries in the zone are registering high production levels, or even record levels for those which have seen significant cultivation area expansions in recent years (Morocco and Turkey in particular). Only Egypt and Italy seem to have a downturn, due to a considerable orange shortfall.



A dry, dry, dry winter 2015-16 in the Western Mediterranean

The production increase, or in the case of Spain simply the return to normal, could well not result in a comparable rise in export volumes, at the very least for certain sources. Winter 2015 was particularly dry in the Western Mediterranean, and the rainfall remained considerably below normal in spring. Hence the lack of sizing should reduce packing yields and curb the export potential, at least for the early varieties and for fruits marketed at the beginning of the mid-season (November). This could be rectified if the rainfall returned to an at least normal level, which seems to be the case for Spain in September and October.





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Market context less disturbed in Russia and the United States

The 2015-16 season was marked by import ban measures on all sides. Russia, already as tight as Fort Knox (ban on citrus produced in the EU-28), locked down its market even more on 1st January 2016 by closing the border to citrus from Turkey, its main supplier. Similarly, the US borders closed to Moroccan citrus in early February 2016 for "sanitary reasons". The 2016-17 season is heralding better fortunes. While the Russo-European dispute has still not been settled, trade with Turkey can flow once more, after the ban was suspended in mid-October 2016. Conversely, the rate of the rouble remains very unattractive, though it has stabilised. Nonetheless, as Winston Churchill said, "Russia is a riddle, wrapped in a mystery, inside an enigma" and so anything — absolutely anything — could happen during this campaign. The spectre of a ban on Egyptian citrus was raised in September,

when the Egyptians had refused access to a batch of Russian wheat exhibiting traces of ergot fungus.

The situation has also returned to normal between Morocco and the United States. Could the highly protectionist policies of Donald Trump, announced during his presidential campaign, affect Mediterranean citrus? Perhaps, but it is Chinese and Mexican products which seem to be the main targets (plans for 45 % taxation on the borders!), and these measures seem somewhat infeasible (complex unpicking of the agreements signed and WTO rules). The only certainty that we can have today is that local easy peeler production will continue to grow, unlike for the orange which is expected to be slightly down ■

Éric Imbert, CIRAD
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Spain

Back to an average harvest

by *Eric Imbert*

With an expected 7 million tonnes, the Spanish harvest will return to an average level, similar to 2014-15, after last season's big plunge. The recovery could well be incomplete in the export sector. Though, unlike in 2015-16, the production zones have been spared a devastating heatwave, there has been a severe lack of rainfall after a particularly dry winter and spring (annual total approximately 30 % below normal in Valencia and 20 % below normal in Murcia). The distinctly below-normal sizing in October should result in big sorting rejects for the early varieties, though this could be rectified for the later ones if the rains come.

Normal production across all variety groups

Production of easy peelers is large, though without reaching record levels: 10 % above the four-year average. Unsurprisingly, the harvests of early clementines and late hybrids are registering the biggest rises, while Clemenvilla and Nules have only average levels. Orange production is around normal (2 % above average), with late Naveline and Navel climbing more than seasonal Navel and juice oranges. The lemon harvest too is average (+ 2 %).

Little change in volume to be expected for the medium term, except for the lemon

The planting statistics (available until 2013-14) show that production levels should barely change in the medium term, at the very least for the orange and easy peelers. The annual planting rate across all varieties has stabilised at between 3.5 and 4.0 million plants since the beginning of the decade. The orange planted stock seems to have reached a degree of maturity, its structure offering both fruits of an excellent qualitative level and a very well-spread supply. The conversion trend initiated in the middle of the previous decade has helped suppress the excessive volumes available in the middle of the season, and increase the late table oranges supply (late Navels such as Lane Late, and super-late varieties such as Powell, Barnfield or Chislett), while improving juice orange quality (Valencia

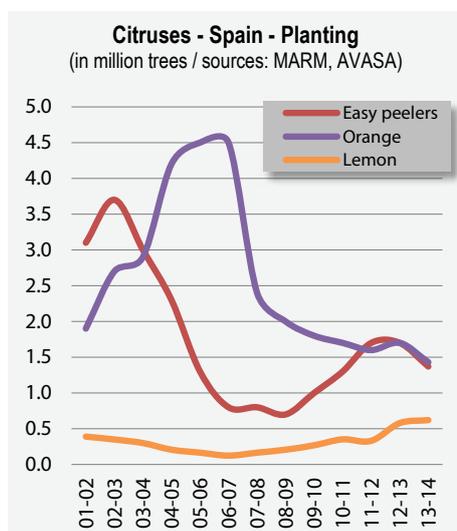
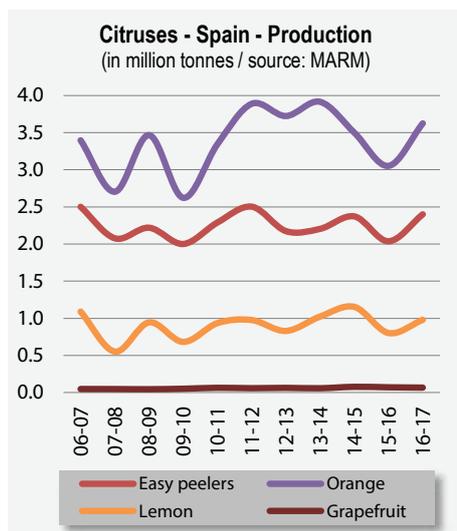
Late partially replaced with Midnight and Delta Seedless or Barberina). The developments now in progress are small in scope, and relate in particular to the beginning of the season (cultivar M7 for example, with an available quota of 2 000 ha in Spain). The dynamic is more perceptible for easy peelers, though still unremarkable. While the idea of a varietal conversion, similar to that made with the orange, is clearly a strategic avenue, its implementation still remains complex. There are currently few varieties identified as bearing real potential (Nadorcott, Or and Tango), and the number of plants available is restricted. The uprooting of illegal Or plantations which has started in Spain shows how serious the controls and sanctions are. Surface areas of early clementines are also on a slightly upward trend (Oronules, Clemenubi, Orogros). Finally, there are some minor movements to note in the mid-season with the improved Nules varieties, which provide a better size, fewer seeds and a slightly earlier commercial calendar (Nero) or a later one (Neufina, Clemenuverd). The lemon is the only citrus with highly distinct growth in surface areas. The excellent economic results of recent campaigns have revitalised the planting dynamic (500 000 to 600 000 plants sold in 2012-13 and 2013-14), and seem to have wiped away memories of the major overproduction crisis that the industry has gone through over the past decade. The country's production potential is currently around 1.2 million tonnes.

Sector still two-speed

The fall in Spanish citrus growing areas is the other factor driving stabilisation of production. The cultivation area of the Valencian Community is in decline, while in Andalusia, it has stabilised, having continued to grow until the end of the last decade. This trend illustrates the endemic lack of competitiveness in the small production facilities characteristic of the Valencian Community, with often fragmented plots cultivated by people with two trades and a low technical level. It is hard for these facilities to follow the rapid tempo of technical developments essential to stay in the race (varietal conversions, etc.), with their competitiveness hampered by the high labour costs and absence of economies of scale. The Valencian citrus industry lost 20 % of its farms between 2007 and 2013, with surface areas disappearing at a rate of 3 000 ha per year between 2010 and 2015; average production facility size rose, though it remains extremely small (approximately 2.35 ha).

Rootstocks: another major strategic avenue

The challenges of varietal innovation are strategic in more than one way. The necessary use of rootstocks resistant to tristeza has had adverse effects. The concentration of the production calendar is one of the main ones. By way of example, the halving of the Nules clementine marketing period is largely attributable to the change from bitter orange to Carrizo, now extremely widespread in Spain. So the upstream segment needs new rootstocks in particular to prevent these concentration phenomena. Work is underway to rectify this shortcoming ■



Citruses – Spain – 2016-17 forecast

in 000 tonnes	2016-17	Comparison	
		2015-16	Average for last 4 years
Easy peelers	2 400	+ 18 %	+ 9 %
Orange	3 624	+ 19 %	+ 2 %
Lemon	980	+ 22 %	+ 3 %
Grapefruit	67	- 6 %	- 1 %
Total	7 071	+ 19 %	+ 5 %

Source: CAV

Citruses – Spain – Valencian Community forecast

in 000 tonnes	2014-15	2015-16	2016-17	2016-17 compared with 2014-16 average
Easy peelers	1 707	1 385	1 792	+ 16 %
Satsuma	112	96	199	+ 91 %
Clementines	1 237	938	1 206	+ 11 %
Early	240	178	273	+ 31 %
Mid-season	909	697	859	+ 7 %
Late	88	64	74	- 3 %
Hybrids	358	350	388	+ 10 %
Clemenvilla	105	84	110	+ 16 %
Ortanique	149	161	129	- 16 %
Nador	62	67	74	+ 15 %
Others	42	39	75	+ 84 %
Oranges	1 867	1 551	1 843	+ 8 %
Navel type	1 527	1 267	1 547	+ 11 %
Naveline	703	621	732	+ 11 %
Navel	150	133	139	- 2 %
Lane Late/others	674	513	676	+ 14 %
Juice	341	284	296	- 5 %

Source: CAV

© Eric Imbert

Morocco

The acid test ?

by *Eric Imbert*

The first tangible effects of the “Maroc Vert” plan on citrus production are here. The 2016-17 harvest should be around 2.3 million tonnes, a record level up 15 % from the previous season. The increase should be very significant for easy peelers, especially for the late varieties whose cultivation area has seen big expansion in recent years. Conversely, orange production has reportedly registered a slight fall. Just as in Spain, fruit size is rather below normal because of the lack of rain.

Good news from North America...

What avenues are there for selling off these additional volumes? The signals sent by two of the country's three big export markets are mixed. The news from North America is good. On the one hand, the growth dynamic of the Canadian market remains strong, with nearly 60 000 t exported to this destination in 2015-16, as opposed to 45 000 t in 2014-15. It could increase further this season, with the Moroccan industry having decided to invest in a promotion campaign on this market. On the other hand, the US borders, closed last campaign in early February for sanitary reasons, were re-opened in mid-October. Growth in shipments to this market, which absorbed nearly 50 000 t in 2014-15, should therefore be able to resume.

...but a heavyweight competitor back in Russia, the country's number one export market

Unlike last season, Moroccan exporters will not enjoy the windfall effect caused by the absence for several months of their main competitor on their main market. The space vacated by Turkey on the Russian market from January 2016, due to the highly political ban on Turkish fruit, enabled the Moroccans to export more than 200 000 t in 2015-16, a figure up by approximately 50 000 t from the

previous season. It was a fine campaign in terms of volume, but with economic returns hit by the recurrent weakness of the rouble. Morocco's objective is to at least hold its ground in 2016-17. To do so it has indisputable qualitative assets in easy peelers against a Turkish range which is developing but still largely comprising Satsuma, which cannot withstand comparison with an expanded, high-quality Moroccan clementine supply. Conversely, economic competitiveness, a more crucial problem than ever since the collapse of the rouble, is clearly in favour of Turkey, which has comparative advantages in terms of proximity and commercial organisation. Moroccan exporters are meeting this challenge by greater structuring of their supply: rigorously adjusting the supply to demand (renewal of the market management system), economies of scale in terms of logistics, a planned joint Russo-Moroccan commercial platform to guarantee payments while limiting the economic burden of advances for the importers.

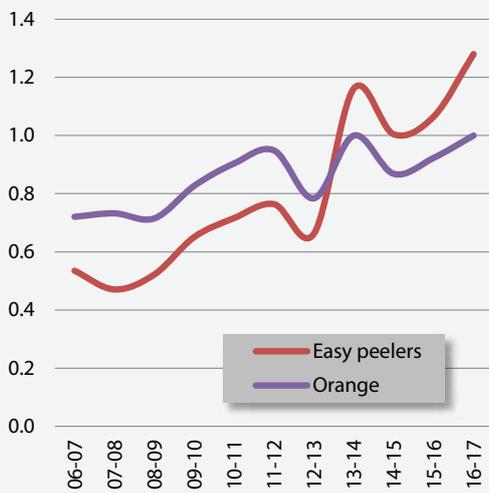
Aiming to diversify its outlets

Morocco is also seeking to diversify its markets. While Asia and the counter-season exporter countries are medium-term objectives (establishment of sanitary protocols), Moroccan exporters are also seeking to take advantage of nearby African markets. Export volumes to the various countries in this continent exceeded 33 000 t in 2015-16: 25 000 t of easy peelers and 8 000 t of orange, mainly (more than 80 %) aimed at Senegal and Mauritania. While the dynamic is there, it remains curbed by its reliance primarily on the informal sector. The industry is working to lift the obstacles in place in terms of customs duty, fund transfers between countries and establishing a commercial platform at the port of Abidjan (Côte d'Ivoire).

The issue of winning back the European market and diversification of outlets is crucial for the Moroccan industry. This season, the country will only take a step forward in its production growth process. With 120 000 ha planted in 2015, the Moroccan cultivation area has already surpassed the objectives of the “Maroc Vert” plan (108 000 ha), which was for a harvest level of 2.8 million tonnes, with 1.3 million tonnes for export ■



Citruses - Morocco - Production
(in million tonnes / professional sources)



Citruses – Morocco – 2016-17 forecast

in 000 tonnes	2016-17	Comparison	
		2015-16	Average for last 4 years
Easy peelers	1 280	+ 20 %	+ 32 %
Orange	1 000	+ 8 %	+ 12 %
Total	2 280	+ 15 %	+ 22 %

Professional sources

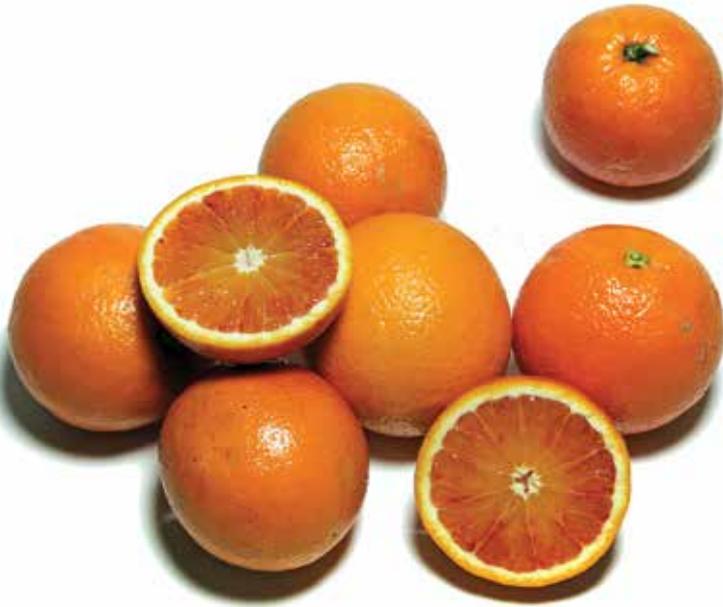


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Tunisia

A developing industry, but still focused on its local market

by *Eric Imbert*



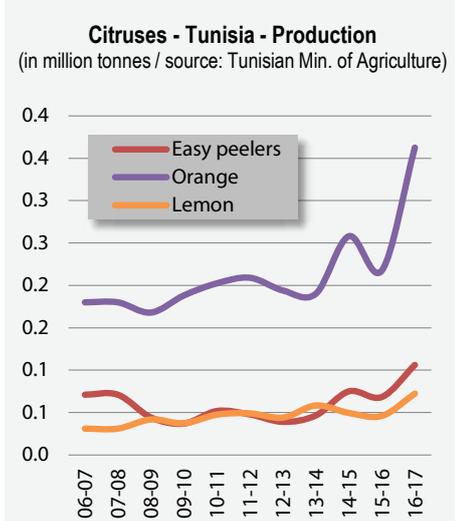
The Tunisian Ministry for Agriculture forecasts a record harvest of 560 000 t, up by nearly 50 % from the previous one. While the level of the increase may be questionable, the dynamic is clearly present.

An ageing stock, but some efforts at renewal

True, the country does still have a large proportion of old orchards: of the 27 000 ha surveyed, approximately 7 000 ha is more than 50 years old. However, the planting rate remains high (approximately 450 to 500 ha additional surface areas per year), whereas approximately 3 000 ha has not yet fully entered production (trees aged 5 and under). Cultivation zones are tending to diversify. While the governorship of Nabeul (Cap Bon region) remains the centre of gravity for the industry, other zones are progressing. On the one hand, water salinity is increasingly posing problems in this historical citrus growing zone. On the other hand, producers are seeking to get an earlier start to take advantage of periods of low supply to the local market, by setting up further south, in the regions of Gabes, Kairouan or Gafsa.

Local market still in the line of sight

These surface area increases are not synonymous with a bigger Tunisian presence on the international market. The country's citrus growing industry remains clearly focused on the domestic market, which absorbs more than 90 % of production. Most of the new orchards are planted with Navel Thomson or easy peelers, varieties which are very popular locally and provide a better economic return than Maltaise (practically double, according to professional sources). The latter is only being planted on a marginal basis, despite the subsidies offered by the State (50 % of the cost of the plants covered by the State, up to a maximum quota of 100 ha, which has yet to be reached) ■



Citruses – Tunisia – 2016-17 forecast

in 000 tonnes	2016-17	Comparison	
		2015-16	Average for last 4 years
Easy peelers	106	+ 55 %	+ 85 %
Orange	363	+ 67 %	+ 69 %
Lemon	72	+ 57 %	+ 46 %
Total	541	+ 63 %	+ 68 %

Source: Tunisian ministry of Agriculture



The Tunisian
Maitaise orange
specialist



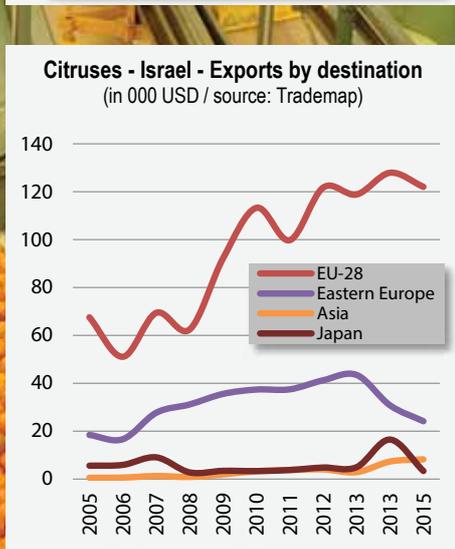
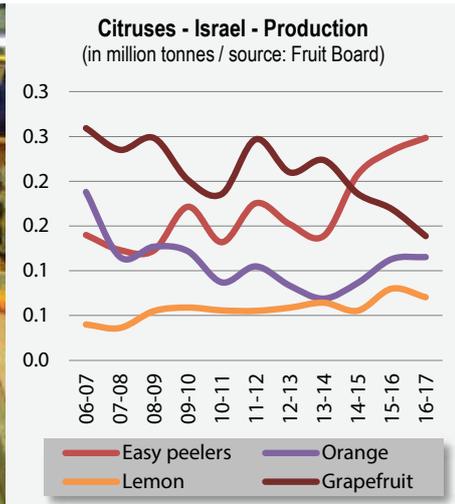
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Israel

Better than in 2015-16... weather permitting

by *Eric Imbert*



Production registered a high level, of approximately 30 % above average. The developments in each varietal group reflect the trends in the cultivation area. The harvest set a record for easy peelers (+ 30 % on the four-year average), thanks to young orchards coming into their prime. Exports could approach 90 000 t for this variety, as opposed to just under 70 000 t in 2015-16, if the winter is quieter than the two previous ones in terms of climate. Conversely, the grapefruit harvest is suffering from the wave of uprooting over recent campaigns. With barely 140 000 t, it has faded to a historically low level. Exporters nonetheless should be able to maintain an export potential similar to last season, if the market is sufficiently lucrative. Profitability is more than ever the crucial issue for the Israeli industry. The weakness of the euro against the dollar, which could well deteriorate in late 2016-early 2017, is a first negative point. Furthermore, the growing competition on the late varieties segment, including between Israeli players, is an additional problem in this country where production costs are high. This is a major concern, as Israeli citrus growing is now very much dependent on the economic results of this variety, which on its own represents more than a quarter of the stock ■

Citruses – Israel – 2016-17 forecast

in 000 tonnes	2016-17	Comparison	
		2015-16	Average for last 4 years
Easy peelers	249	+ 6 %	+ 36 %
Orange	115	+ 2 %	+ 31 %
Lemon	70	- 12 %	+ 9 %
Grapefruit	139	- 18 %	- 30 %
Total	573	- 4 %	+ 8 %

Source: Fruit Board

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Corsica

A record season!

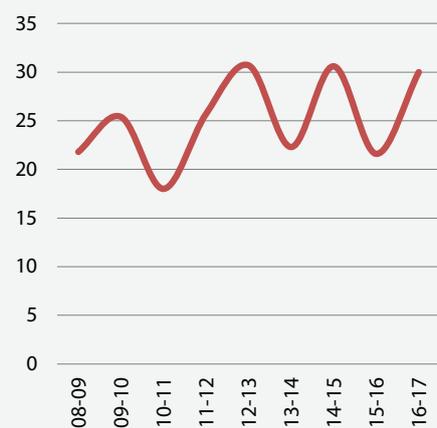
by *Eric Imbert*



In citruses, there is often no resemblance between successive campaigns. This is clearly true for the forthcoming Corsican clementine season, where a record harvest of more than 30 000 t is expected, following on from the small production of 2015-16. The weather was ideal, hence the sizing should also be extraordinary, in particular if we consider the magnitude of the volumes. Unlike other campaigns, big fruits should predominate (sizes 1 to 3 with two thirds of the supply).

The 2016-17 harvest level confirmed the trend for a slight increase in marketable production, with volumes of between 20 000 and 30 000 t per season since the beginning of the decade, as opposed to more like 15 000 to 20 000 t previously. This increase is apparently more due to a more open market and improvement in cropping practices than to expanding surface areas, with the productive cultivation area remaining relatively stable at around 1 400 ha according to Agreste ■

Clementine - Corsica - Shipments
(in 000 tonnes / source: CEBFL)



Easy peelers – Corsica – 2016-17 forecast

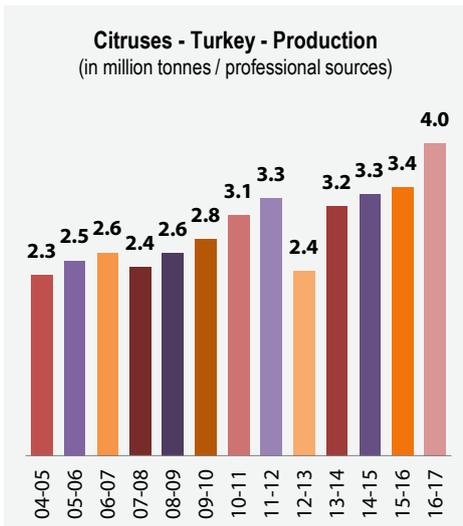
in 000 tonnes	2016-17	Comparison	
		2015-16	Average for last 4 years
Easy peelers	30	+ 39 %	+ 14 %

Source: CEBFL

Other Mediterranean producers

by Eric Imbert

What information has been collected on the other main players in the zone is in summary form. After a 2015-16 season with a distinct shortfall following a spell of frost, Turkish production is reportedly resuming its upward trend, reaching approximately 4 million tonnes across all varieties, according to the Turkish press. This is a record figure, up by one million tonnes from the level seen at the beginning of the decade. Conversely, Egypt should see a temporary interruption to its strong upward dynamic. The spring heatwave apparently resulted in a very significant fall in Navel production. Similarly, Italian production should see another considerable fall. While the lemon harvest promises to register a fairly good level (+ 10 to + 15 %), another big fall is expected for the orange (- 50 % from the previous very heavily laden season, corresponding to a harvest 25 % below an average year). Easy peeler production should be stable ■



Florida

Greening giving producers no respite

by *Eric Imbert*

Unsurprisingly, Floridian production will reach a new low point in 2016-17, falling for the first time to less than 10 million field crates. As in previous years, the downturn will be slightly more marked for the white grapefruit than for the coloured grapefruit (harvest reduced by a factor of 4 in 10 years for white, and by just over 2 for coloured). Fruit size is tending to return to a near-average level, after starting the season well below-average. Exports should see a fall of a level comparable to that in production, of approximately 10 %, with the slight downturn in volumes to industry having somewhat benefited local sales in recent years. The breakdown between the country's two big export markets, namely the EU-28 and Japan, is still uncertain. The strengthening of the dollar against foreign countries, sensitive since the election of Donald Trump and the prospect of massive investments in infrastructures (1 000 billion funded by tax reductions!), should be confirmed with the very likely increase in interest rates by the FED. The yen currently seems to be holding up better than the euro, despite the high fragility of the Japanese economy.

Grapefruit – Florida – 2016-17 forecast

in 000 tonnes	2016-17	Comparison	
		2015-16	Average for last 4 years
White	2.1	- 16 %	- 44 %
Coloured	7.5	- 10 %	- 30 %
Total	9.6	- 11 %	- 33 %

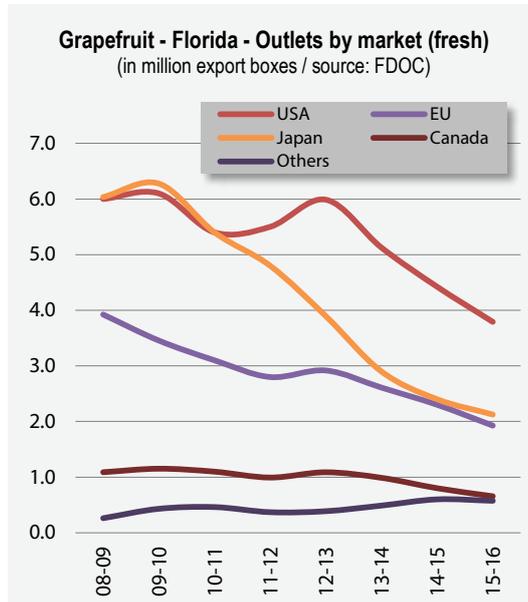
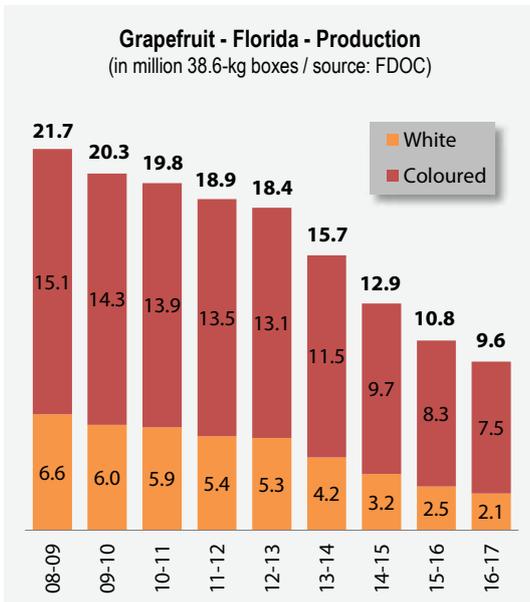
Source: FDOC

A pessimistic development scenario

This umpteenth forecast for a steep fall unfortunately matches the highly pessimistic production scenario issued by the FDOC in 2014 (see graph). This hypothesis factors in the two main avatars of greening, namely falling yields (down by one third in ten years) and surface area reductions, with planting unable to offset uprooting. It predicts a production of approximately 7 to 8 million boxes by the end of the decade, i.e. 270 000 to 310 000 t. The harvest should fall below the 5-million boxes mark (200 000 t) in the middle of the next decade. This level calls into question the economic survival of the industry. The sector's players are however a long way from throwing in the towel. Greening management is continuing to advance, especially through new bacterial management methods (heat treatment, approval of bactericides), whereas control of the vector is increasingly effective (Citrus Health Management Area programme, an effective management tool for treatments against the Asian psyllid, the disease vector). The search for resistant varieties, which would finally help the industry back to its feet, is also continuing, but it is a long-haul process. These are massive efforts, but well deserved by this grapefruit which is one of the best in the world, and by its industry!

Texas holding firm

Texas, which exports some volumes to Europe, should have a fairly similar production to 2015-16 (4.7 million field crates as opposed to 4.8 million, i.e. 170 000 to 175 000 t). While the sanitary situation is serious, greening is less widespread than in Florida due to the absence of cyclones (which played a role in the dissemination of the bacteria in Florida). Hence the cultivation area has stabilised in recent years, after waning considerably at the beginning of the decade, with certain producers even talking of reinvestment ■



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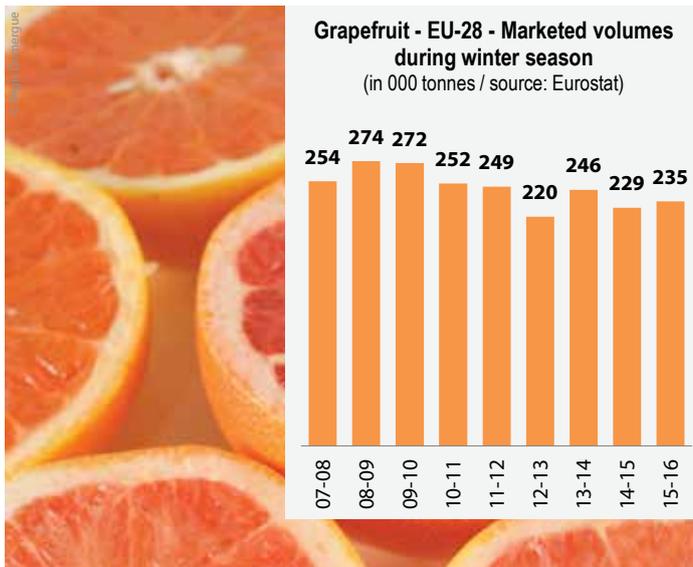
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2016-17 european market

Grapefruit

A similar scenario to 2015-16?

by **Eric Imbert**

Mediterranean grapefruit – 2016-17 production forecast

in 000 tonnes	2016-17	Comparison	
		2015-16	Average for last 4 years
Israel	139	- 18 %	- 30 %
Spain	67	- 6 %	- 1 %
Total	206	- 14 %	- 25 %

Professional sources

Tropical grapefruit – 2016-17 production forecast

in 000 tonnes	2016-17	Comparison	
		2015-16	Average for last 4 years
Florida	370.6	- 11 %	- 33 %

Source: FDOC

The scenario for the 2016-17 season seems fairly similar to the previous one, at the very least in terms of volumes expected. The grapefruit is the only citrus for which the Community market should not see a rise, and could even see a slight downturn, from both the Mediterranean supplier countries and Florida. The Spanish harvest seems to be average and slightly smaller than in 2015-16. As for the other citrus, the sizing appears to be down, but remains at a decent level (45/50 majority). Unsurprisingly, Israeli production should fall considerably by 30 to 35 %, because of the uprooting carried out in recent years due to lack of profitability. Coloured grapefruit surface areas now cover just 1 700 ha, as opposed to approximately 2 800 ha at the beginning of the decade. Nonetheless exports should be able to maintain last season's level, especially since prices paid by the juice industry are no longer as attractive (juice rates down by approximately 30 %). Turkey should be the only country to see its production grow. Nonetheless, shipments to the European Union should not reach the record level of 2015-16 (more than 95 000 t). A large part of the export flow should find its way back onto the Russian market, re-opened since the start of the campaign. The trend of price consolidation, on a finally lucrative footing for certain sources, should continue.

The supply from Florida should also see a downturn. On the one hand, production has registered another fall of approximately 10 %, down to a level half of what it was at the beginning of the decade. On the other hand, the increase in the dollar could well weigh down on demand, with costs already prohibitive for certain distributors ■

Grapefruit – European Union – Imports and introductions

in tonnes	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Total N. Hemisphere*	254 310	273 654	271 878	252 081	249 008	220 297	246 155	228 986	235 075
Turkey	42 767	64 634	75 004	66 286	81 960	52 786	87 702	70 729	95 573
Israel	60 898	68 502	58 101	48 576	44 170	45 401	41 664	37 887	33 820
United States	77 089	64 548	55 132	52 721	45 988	40 676	41 760	38 243	31 421
Spain	37 800	36 300	47 900	51 825	44 560	52 324	48 463	63 291	45 004
Cyprus	12 521	11 880	10 617	11 773	13 081	11 031	8 364	5 557	6 811
Honduras	8 820	9 478	6 063	1 109	76	73	20	54	37
Mexico	9 304	11 600	9 167	14 385	13 472	13 428	11 949	9 725	14 612
Cuba	-	1 276	754	-	-	-	-	-	-
Others	5 111	5 436	9 140	5 406	5 701	4 578	6 233	3 500	7797.7

*excl. Chinese shaddock / Source: Eurostat

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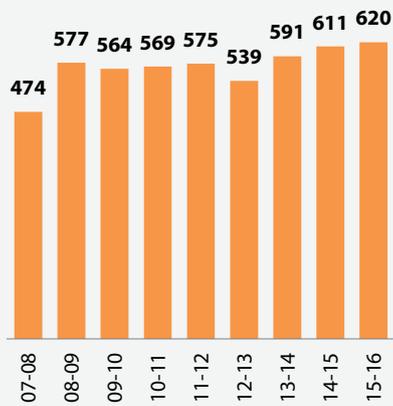
2016-17 european market

Lemon

A whole new ball game!

by *Eric Imbert*

Lemon - EU-28 - Marketed volumes during winter season
(in 000 tonnes / source: Eurostat)



Lemon – Mediterranean – 2016-17 production forecast

in 000 tonnes	2016-17	Comparison	
		2015-16	Average for last 4 years
Italy	485	+ 13 %	+ 5 %
Spain	980	+ 22 %	+ 3 %
Total	1465	+ 19 %	+ 4 %

Professional sources

The professionals are not about to forget the 2015-16 season, when prices reached previously unseen heights. 2016-17 is shaping up to be a sad return to normal. Spain, which controls approximately 80 % of the Community market, apparently has an average harvest of close to one million tonnes, after the dip in 2015-16. The sizing, considerably below-average at the beginning of the season, should return to a near-average level thanks to a fairly wet autumn. The lemon industrial derivatives sector should play a considerable regulating role. The rate for these products is down from last season, though it is maintaining a good level (approximately 38 000 USD per tonne for essential oil and 2 250 USD — with prospects of increases — for concentrated juice).

The presence of Turkey, very strong in 2015-16 because of the shortage of Spanish lemon, should be much more discreet (approximately 12 to 15 % of the market in years of high Spanish production, as opposed to more than 17 % in 2015-16). Overall citrus production is expected to see a distinct rise in Turkey, though the sanitary barriers preventing access to the Russian market have been lifted. Conversely, the European market appears to be considerably less open to trade, and much more difficult to operate on. The reinforced sanitary inspections on the Community's borders were decided in early November, due to a large number of batches with abnormally high pesticide residue contents (Turkish lemon added to the list of sensitive products of Community Regulation 669/2009). The system will be implemented from 1st January 2017 ■

Lemon – European Union – Imports and introductions

in tonnes	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Total N. Hemisphere*	473 987	577 020	564 141	568 702	574 652	538 895	590 562	610 622	619 789
Spain	305 116	439 194	372 445	412 568	432 293	426 860	452 051	500 692	447 968
Turkey	75 812	85 519	132 610	110 261	106 512	72 299	95 305	75 684	107 077
Italy	62 971	40 889	47 306	37 226	29 210	33 377	34 955	29 539	42 406
Greece	8 224	3 481	4 493	3 790	2 624	3 658	4 951	2 792	15 319
Cyprus	2 524	2 947	1 658	2 031	2 169	1 883	1 121	635	1 205
Egypt	3 928	1 001	2 191	554	572	236	810	166	1 023
Israel	1 596	730	1 099	373	200	262	520	492	1 214
United States	1 346	1	428	2	22	31	22	42	331
Morocco	11 006	3 184	1 785	1 771	970	192	693	443	1 886
Iran	143	63	85	73	68	88	82	99	103
Tunisia	1 322	11	43	53	12	9	53	38	1 257

Source: Eurostat

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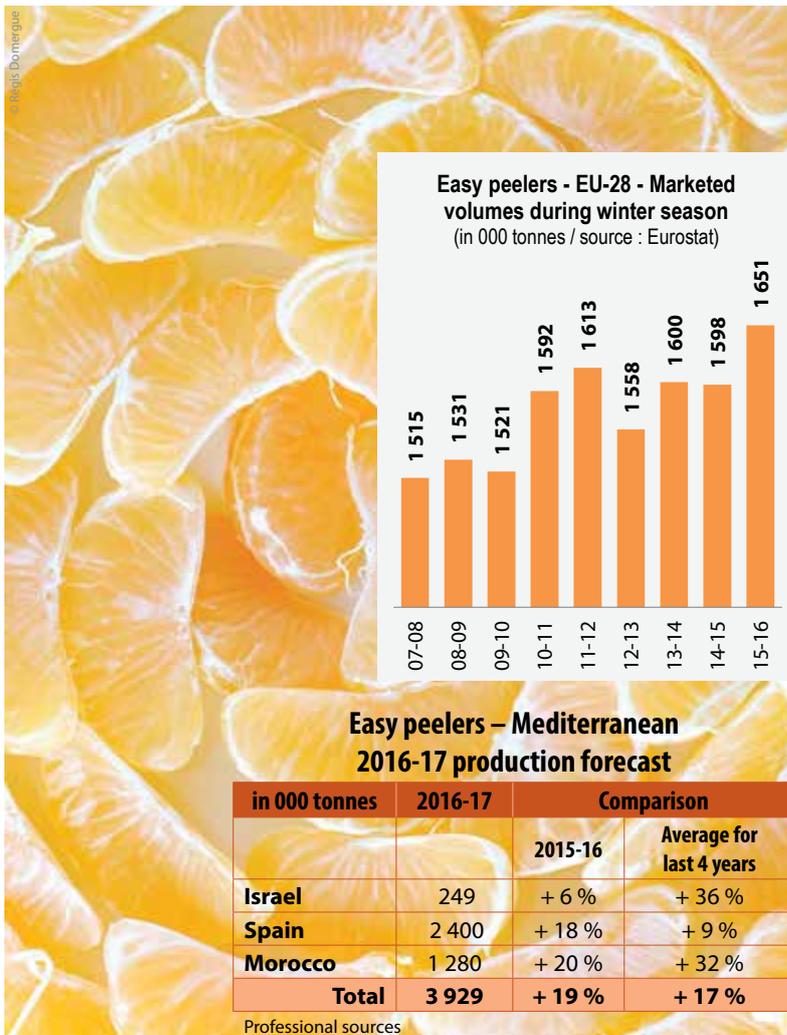
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2016-17 european market

Easy peelers

Abundant production, especially for late varieties

by **Eric Imbert**

The steep plunge in early clementine prices from October set the tone for a 2016-17 campaign which looks to be very different from the previous one. All the big Community market players have medium to large production, guaranteeing a high supply throughout the season. The supply was abundant at the beginning of the campaign, because of the Spanish early clementines stock coming into its prime. The small sizing and the consequences on fruit shelf life of the abnormally high temperatures in the Valencian Community did nothing to facilitate trade. The supply should return to an average level during the mid-season, though volumes to enter the market are nonetheless large. Spain, which also reigns supreme in this niche, has an average harvest for Nules but large for Clemenvilla (+ 10 to + 15 %). The sizing should return to a level closer to average thanks to the more favourable rainfall during the autumn. The latter part of the season is set to be heavily laden and competitive, on a market which nonetheless is not yet completely mature in terms of consumption, in particular at the very end of the period. The young Nadorcott orchards are coming into their prime in Spain and Morocco, as are the Israeli Or orchards in Israel and Spain. The volume rises are around 10 to 15 % from last season for all these sources and varieties. Despite a less open context, Morocco should continue its efforts to reinforce its position in the EU-28, especially on the most distant markets where Spain's logistical advantages are less clear-cut (Scandinavia, United Kingdom) ■

Easy peelers – European Union – Imports and introductions

in tonnes	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Total N. Hemisphere*	1 514 918	1 531 238	1 520 655	1 592 180	1 612 829	1 558 129	1 599 879	1 597 770	1 650 500
Spain	1 241 432	1 262 336	1 157 584	1 295 700	1 305 726	1 284 121	1 277 044	1 249 991	1 236 100
Morocco	76 357	79 880	114 185	90 534	80 606	64 056	104 445	98 442	140 300
Italy	70 867	47 275	91 742	75 108	91 426	77 519	66 054	81 804	81 400
Turkey	58 558	80 851	64 344	50 332	45 571	36 849	46 637	41 056	48 500
Israel	23 005	24 750	36 287	29 037	42 652	40 623	41 387	56 232	48 700
Cyprus	12 251	11 539	13 574	8 126	5 840	6 883	6 863	6 376	5 300
Greece	21 100	14 380	31 479	36 100	31 816	40 105	48 920	50 232	75 300
Portugal	4 556	4 386	4 093	2 800	5 428	5 458	5 237	12 078	13 700
Egypt	1 757	1 500	2 282	1 143	1 197	345	1 543	1 559	1 200
Pakistan	5 036	4 341	5 084	3 300	2 568	2 170	1 747	-	-

Source: Eurostat

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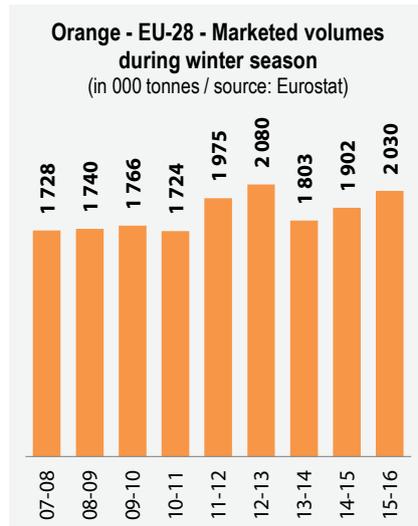
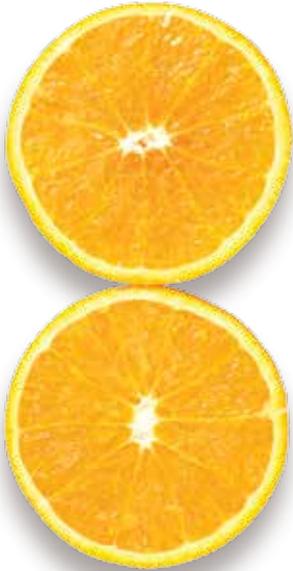
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2016-17 european market

Orange

A big Spanish harvest, though in a rather buoyant context

by **Eric Imbert**

Orange – Mediterranean – 2016-17 production forecast

in 000 tonnes	2016-17	Comparison	
		2015-16	Average for last 4 years
Israel	115	+ 2 %	+ 31 %
Tunisia	363	+ 67 %	+ 69 %
Spain	3 624	+ 19 %	+ 2 %
Italy	1 300	- 32 %	- 28 %
Morocco	1 000	+ 8 %	+ 12 %
Egypt	2 400	- 13 %	- 5 %
Total	8 802	- 1 %	- 3 %

Professional sources

The campaign started rather well, though it is set to be heavily laden. Spain, which provides 70 % of the Community market supply, is back to an average production level (higher than in 2014-15 and 2015-16, yet less than the previous two bumper seasons). The Naveline harvest is very large, though tempered by the slight shortfall of the Navel harvest (this variety nonetheless represents only a small proportion of production). The harvest for late Navel, a varietal group which has made great progress in recent years, has also been large. The sizing is somewhat below average (central size 6), just as for the other Spanish citrus fruits this season.

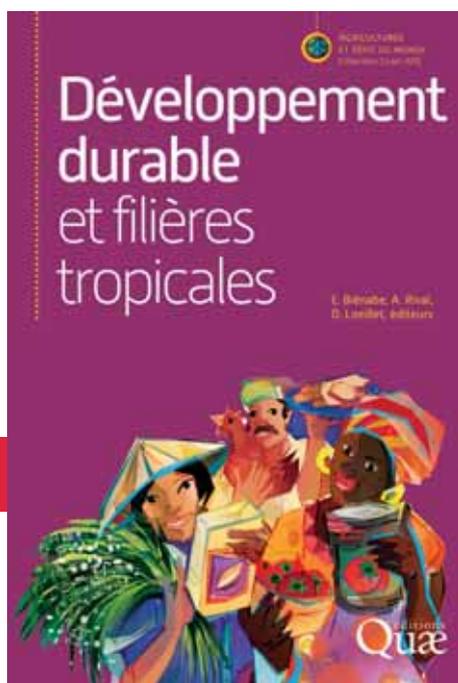
However, certain parameters should help at least partially ease the pressure, especially from small fruits. On the one hand, the considerable fall in the South African Valencia supply and its large sizing enabled a highly dynamic start to the season, particularly for small fruits. On the other hand, the market to supply the fresh juice dispensers in the supermarket sector and in catering, growing with every passing year, should absorb increasing volumes, especially of small-sized fruits. Finally, the sources topping up the Community market supply are mostly in shortfall. This is the case for Egypt, the number two supplier to the EU-28, at least for its flagship variety Navel. It is also the case for Italy, where the expected scale of the fall in local production could even lead to significant imports, as was the case in 2014-15 (approximately 150 000 t imported, mainly from Spain). Moroccan production too is reportedly below average ■

Orange – European Union – Imports and introductions

in tonnes	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Total N. Hemisphere*	1 727 720	1 740 302	1 765 840	1 723 883	1 975 193	2 080 343	1 803 093	1 902 452	2 030 351
Spain	1 113 067	1 233 935	1 097 480	1 146 248	1 382 095	1 464 457	1 210 809	1 323 336	1 233 704
Morocco	138 891	90 430	92 965	99 281	46 570	46 628	54 944	75 392	68 153
Greece	138 167	120 811	221 229	195 743	196 100	214 532	206 232	152 492	236 559
Egypt	110 439	131 496	133 650	101 350	176 339	178 600	177 304	192 069	265 830
Italy	125 080	57 591	127 233	100 392	89 942	93 565	83 294	84 196	115 493
Portugal	11 899	13 747	10 305	17 699	24 291	25 708	20 447	32 012	47 559
Israel	20 022	22 833	17 836	11 101	6 436	6 434	5 863	4 154	4 452
Tunisia	25 784	19 945	22 329	20 307	19 445	19 445	15 174	17 055	15 741
Turkey	20 805	32 912	17 400	10 695	13 338	13 449	16 527	8 473	29 560
Cyprus	7 767	4 861	7 135	8 020	7 444	7 587	4 980	4 545	2 605
Others	15 799	11 741	18 277	13 047	13 195	9 939	7 520	8 728	10 696

Source: Eurostat

Un livre des Éditions Quæ



Développement durable et filières tropicales

Estelle Biénabe, Alain Rival,
Denis Loeillet, éditeurs

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Un cap politique et diplomatique majeur a été franchi en 2015. Les trois sommets internationaux, organisés à Addis Abeba sur le financement du développement, à New York au siège des Nations unies avec l'adoption des objectifs du développement durable, à Paris avec un accord

universel sur le climat, se complètent pour forger un cadre d'action rénové et ambitieux pour le développement durable. Les agricultures du monde sont au cœur des défis globaux. Dans un contexte de mondialisation portée par des flux commerciaux et financiers plus intenses, des risques sanitaires globalisés et une évolution rapide des comportements alimentaires, les filières tropicales - liens entre les agricultures et les autres secteurs économiques - connaissent de profondes transformations techniques, économiques et sociales. Face aux préoccupations environnementales et sociales que soulève leur expansion, les filières sont de plus en plus à l'initiative de démarches de développement durable.

Les mutations liées aux filières s'opèrent de manière différenciée et cet ouvrage se propose d'en rendre compte. Fruit des recherches et de l'expérience de chercheurs et agents de développement, ces contributions discutent le rôle des filières et de leurs transformations au regard du développement durable, comme vecteurs de développement, espaces d'innovation, objets d'évaluation et arènes de régulation. Le Cirad et ses chercheurs, acteurs du système de recherche public français agissant avec des partenaires au Sud, et l'AFD et ses agents, sont les témoins et les accompagnateurs des changements techniques, biologiques et institutionnels qui traversent le monde agricole et les sociétés.

Estelle Biénabe, docteur en économie du développement agricole, chercheur au Cirad, a coordonné des projets sur les dynamiques de restructuration des marchés dans les pays du Sud. Ces travaux couvrent l'analyse des filières et les questions d'accès aux marchés des petits producteurs.

Alain Rival, biologiste et physiologiste moléculaire, est enseignant et chercheur sur les variations épigénétiques et les applications biotechnologiques à l'amélioration des plantes tropicales. Il a coordonné des projets en Afrique, en Amérique latine et en Asie.

Denis Loeillet, agro-économiste, est responsable de l'Observatoire des marchés du Cirad, et de la revue *FruitTrop*. Il participe à l'élaboration d'un système d'intelligence économique au sein des filières fruits et légumes et à la méthodologie d'évaluation des impacts sociaux des chaînes de valeurs.

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Quæ

Citruses

Diseases and pests

There are numerous pests and diseases, which can have serious economic impacts, possibly requiring quarantine (material subject to regulations concerning movement) and the prohibition of exports to other production zones to prevent the spread of harmful organisms. The use of tolerant rootstocks is an effective measure in the control of several organisms, but the choice of variety is often dictated by the market. In addition to the production of healthy plant material, the control of these pests and diseases generally combines genetic, biological and chemical components in an integrated control framework.



DISEASES	TRISTEZA Virus: <i>Citrus Tristeza</i> Closterovirus	HUANGLONGBING (greening) Phloeme: <i>Liberibacter africanum</i> , <i>L. asiaticum</i>	CITRUS CANKER Bacterium: <i>Xanthomonas axonopodis</i> pv. <i>citri</i>
Distribution	All regions except some Mediterranean countries.	Asia, subtropical and tropical Africa, Middle East.	Asia, South America, Florida, certain regions of Africa.
Symptoms	Dieback of varieties grafted on bitter orange (except lemon trees), vein clearing and stem pitting.	Shoot yellowing, leaf mottling, small poorly coloured fruits.	Corky pustules on leaves and fruits.
Susceptible species	Lime, orange and grapefruit trees.	Broad host spectrum. Affects orange and mandarin above all.	Broad host spectrum. Above all grapefruit, orange, lime and some mandarins.
Transmission	Aphids (<i>Aphis gossypii</i> , <i>Toxoptera citricida</i>).	Psyllas (<i>Diaphorina citri</i> , <i>Trysoza erytrae</i>).	By air and water.
Economic impacts	Loss of trees and decreased production.	Tree dieback, shorter orchard life.	Harvest loss.
Quarantine organism	Present in the EU.	Not present in the EU.	Not present in the EU.



PESTS	FRUIT FLY Diptera Tephritidae: various species of the genera <i>Ceratitis</i> , <i>Anastrepha</i> , <i>Dacus</i> , <i>Bactrocera</i> , etc.	THRIPS Thysanoptera: thripidae. <i>Scirtothrips</i> spp. (<i>S. aurantii</i> , <i>S. citri</i> , <i>S. dorsalis</i>)	DIASPINE Hemiptera: Diaspididae. Genera <i>Aonidiella</i> , <i>Unaspis</i> , <i>Chrysomphalus</i> , <i>Cornuaspis</i> , etc.
Distribution	Americas: <i>Anastrepha</i> . Africa: <i>Ceratitis</i> , <i>Dacus</i> . Asia-Pacific: <i>Bactrocera</i> .	Variable according to the species. Present in the Mediterranean area: <i>Tetranychus urticae</i> , <i>Panonychus citri</i> .	Variable according to the species. Present in the Mediterranean area: <i>Aonidiella aurantii</i> , <i>Cornuaspis beckii</i> , etc.
Symptoms	Holing caused by females laying eggs in the fruits.	Greyish patches in a ring around the fruit stalk (thrips feeding on young fruits).	Scale on leaves, shoots and/or fruits, trees weakened in case of large populations.
Susceptible species	Mandarin, orange, grapefruit. Mandarins and thin-skinned oranges susceptible.	Orange, mandarin, tangor, tangelo, lemon, etc.	Broad host spectrum.
Economic impacts	Harvest loss.	Deterioration of the external appearance of fruits.	Deterioration of the external appearance of fruits.
Quarantine organism	Not present in the EU.	Not present in the EU.	Not present in the EU.

Citruses

Cultivation

The world's leading fruit crop grown between the latitudes 40° N and 40° S, citrus fruits were domesticated in Asia. Ancient texts refer to sour citrus fruits in India from 800 BC onwards, and mandarins, oranges and grapefruit in China at the time of Confucius. Trade and military conquests contributed strongly to the spread of citrus. This was first overland via Asia Minor and the Middle East as Roman and Greek influence spread (citron fruit, bitter orange) and then through Islam and the Crusades (sour citrus). The citron fruit was the first species grown in the Mediterranean several centuries before the Common Era. New citrus fruits such as sweet oranges were introduced around the Mediterranean basin in the Sixteenth Century thanks to Portuguese navigators and the possibility of direct maritime trade with the Far East and China. These species were then disseminated in Africa and America. The first mandarins were introduced in the Mediterranean region much later. The fruit is mentioned at the beginning of the Nineteenth Century in Italy and not until 1850 in North Africa. However, the Mediterranean has been an important diversification zone for the three most important economic species—orange, mandarin and lemon. The grapefruit, *C. paradisi*, a natural hybrid of shaddock, is one of the few commercial citrus fruits to have originated in the Caribbean.

AGRONOMY

The most suitable soils for growing citrus are slightly acidic and well-filtering. The choice of rootstock is one of the essential factors for success, giving tolerance or resistance to biotic (soil pests and diseases, degenerescence diseases) and abiotic constraints (acidic or alkaline soils, salinity, reaction to cold or drought, etc.). It strongly influences factors such as vigour, the start of production, and fruit yield and quality. The risk of contamination by tristeza has led to *Poncirus* hybrids (Citrange, Citrumelo) being favoured over the sour orange. Disease-free plant material must be used. Today, new rootstocks are bred by hybridisation or using biotechnologies.

Certification plans have been set up in many countries. They combine the use of healthy plant material and prevention of possible recontamination by inoculum or a disease spread by an insect vector by siting outdoor nurseries in clean zones or by sheltered production in risk zones. The rootstocks are sown, replanted and then shield budded or chip budded, using a bud from a shoot of the desired variety.

It is recommended that the base of the trunk should be set in a slightly raised position at planting to limit attacks by *Phytophthora*. Tillage is reduced after planting so as not to damage the surface roots. The base of the trunk must be weeded. The maintenance technique used (permanent plant cover, chemical or mechanical weed control) depends on soil/climate and economic constraints.

Preliminary pruning is performed in the early years. Annual maintenance pruning then balances and aerates the foliage and ensures the renewal of fruit-bearing shoots. Irrigation is essential in dry areas and can be in the form of subfoliar sprinkling or trickle irrigation (soakers, drip, etc.). Fertilisation can be combined with irrigation in this case (fertigation) to save inputs and ensure steady mineral nutrition.

Mineral fertilisation must make up for losses via fruits and pruning and ensure the growth of the vegetative organs. Fertilisation includes nitrogen, phosphorus and potassium. Trace elements are sprayed on the foliage. Fertilisation is based on the results of mineral analyses of leaves and soil.

Among growth regulators, gibberellic acid improves the setting of clementines and synthetic auxins increase fruit grade.



THE INFLUENCE OF CLIMATIC CONDITIONS

Citruses originated in South-East Asia. The climate there is equatorial, tropical or subtropical according to the latitude and always strongly marked by a monsoon regime. The year features a hot, humid season (the monsoon season) and a fairly rain-free, often cooler season. The developmental cycle of citrus is keyed into these seasons. The hot, humid period is one of intense physiological activity, with shoot and fruit growth. Vegetative growth halts in the cool, dry period, a feature all the more marked when drought is severe or temperatures low. A marked halting of vegetative growth is essential before any flowering of certain citruses such as mandarin, orange, grapefruit and shaddock. Others with repeat-flowering such as citron, lemon and lime have less strict requirements but react to the same phenomena.

Temperatures between 21 and 30°C are optimum for physiological activity. This is strongly reduced when the temperature is significantly higher than 35°C or lower than 13°C for a sustained period. Citrus growing is in fact limited by threshold and ceiling temperatures. Citrus trees are partially or totally destroyed at temperatures below 0°C. The extent of the damage depends firstly on frost duration and intensity, and secondly on the susceptibility of plant parts and the type of citrus. Thus flowers, young leaves and fruits are more sensitive than branches and trunks. Citron, lime and lemon are more sensitive than mandarin, orange and grapefruit. Temperatures lower than -7°C are generally lethal for citrus trees. Temperatures higher than 50°C also cause damage.



Strong insolation is also better tolerated when the water supply is satisfactory. Irrigation must be used in citrus growing in arid or very dry regions. Plant water requirements are directly correlated with the climatic parameter total radiation (the main feature) related to insolation, temperature, wind, relative humidity, etc. These parameters are used in water requirement models and irrigation management tools.

Temperature plays an important role in the changes of fruit pigmentation as maturity approaches. Temperatures lower than 15°C cause the disappearance of chlorophyll pigments from the epidermis. This reveals carotenoid pigments. The synthesis of carotenoids (yellow and orange) and lycopene (red, specific to shaddock and grapefruit) is enhanced by a temperature of between 15 and 35°C. Red anthocyanin pigments (blood oranges) require lower temperatures but still higher than 12°C.

The synthesis and senescence of the various pigments are thus strongly affected by ambient temperature. In the tropics, the absence of low temperatures means that chlorophyll pigments do not disappear and the fruits remain green. Anthocyanin synthesis does not take place for the same reason and blood oranges remain blonde. In contrast, the red pigmentation of grapefruit is more intense. The alternate high daytime temperatures and cool nights in Mediterranean zones create an optimum environment for the breakdown of green chlorophyll pigments and the synthesis of the yellow, orange and red pigments of the various types of orange, mandarin and lemon. The external colour of the fruits is thus very well expressed.

Citruses

Harvesting and storage

Citrus fruits are not climacteric, so their quality does not improve after harvesting. Suitable storage can slow their development: an appropriate positive temperature, 85 to 90% relative humidity and ventilation. Fruits must be harvested at a stage of maturation close to optimum ripeness—and hence optimum quality. Quality is characterised mainly by the juice content, the dry extract/acidity ratio and flavour. Fruits must be handled with care during the harvest, avoiding wetting, so as to limit subsequent risks of physiological deterioration or the entry of pathogens. Transport to the packing stations must be carried out as soon as possible.

DEGREENING AND STORAGE

As fruits approach the ripe stage, green chlorophyll pigments disappear gradually, revealing the other yellow, orange and red epidermis pigments. This change requires cool temperatures lower than 13°C. These temperature conditions are not found in the tropics or in a Mediterranean climate in early autumn when the early varieties are picked. The fruits therefore remain green or are poorly coloured. Degreening is possible if significant breakdown of chlorophyll pigments has started naturally. Degreening is performed by placing the fruits in a chamber with a controlled atmosphere containing 1.0 to 5.0 ppm ethylene. The temperature is set at 22 to 25°C for oranges, and at a lower temperature for lemons, with a relative humidity of 85 to 90%. The technique reduces storage time since ethylene stimulates senescence in citrus fruits. The duration of chilled storage can be lengthened by the application of wax or a stretch film reducing respiratory exchange and water loss. In contrast, controlled atmospheres have little or no effect.

PHYSIOLOGICAL DETERIORATION

This is caused mainly by impacts in the orchard that are revealed later or during storage.

Frost: in the orchard or after the harvest. The skin looks wet and translucent and the segments dry out.

Chilling injury: exposure to temperatures that are above freezing point but lower than the optimum storage temperature. They cause the bursting of the essential oil glands, resulting in the burning of tissue and the appearance of small sunken brown spots on the peel; these may become coalescent. Fungal damage may subsequently occur.

Oleocellosis: caused by temperature variations in the field or bruising during harvesting or storage. Symptoms are very similar to those of chilling injury.

Abrasion by brushing: caused by skin fragility, the use of brushes that are too hard or by too high a brushing speed. The upper layers of the skin are eroded, resulting in dry patches of varying width and flow of essential oil that burns the tissue.

FUNGAL DAMAGE

More than 75% of postharvest citrus rots are caused by two *Penicillium* moulds (*P. italicum* and *P. digitatum*). Some rots should not appear during storage if harvesting is performed carefully:

- bitter rot caused by *Geotrichum candidum* affects fallen fruits or fruits soiled with earth;
- *Cladosporium herbarum* causes symptoms similar to those of *Alternaria citri*. Contamination by rotting, infested plant wastes occurs during harvesting;
- black mould rot of peel caused by *Aspergillus niger* affects wounded or damaged fruits stored at a temperature of over 15°C;
- infection in the orchard by *Botryosphaeria ribis*, *Phyalospora rhodina* or *Diaporthe citri* causes a brown and then blackish rot of the skin and the underlying tissues in the stalk zone during storage. It is controlled by orchard or postharvest treatments.

POST-HARVEST DISEASES	BLUE MOULD <i>Penicillium italicum</i>	GREEN MOULD <i>Penicillium digitatum</i>	BLACK ROT <i>Alternaria citri</i>	BROWN PATCH <i>Glomerella cingulata</i> (= <i>C. gloeosporioides</i>)	BROWN ROT <i>Phytophthora sp.</i>
Symptoms and part of fruit affected	Paling and softening of the skin; white down (mycelium) then appears; covered with blue spores; pulp affected simultaneously.	Slight paling and softening of the epidermis; then bright white down grows in circular layers, covers with green spores from the centre. The entire fruit (peel, pulp) is finally affected, fruit cannot be eaten from the beginning.	Black rot on columella and segments, and/or peel.	Spotting of unripe fruits developing into brown patches that become soft with ripening and then affect the pulp. Marked odour. Degreened fruits very susceptible.	Start: spotted discoloration of peel and then spread of the patches; variable colour with brown patches and finally fruit disintegration. In storage: fine white mycelium with brown areas; characteristic odour.
Infection pathway	Spores on intact epidermis, fruit to fruit contamination.	Spores on wounded epidermis.	Wounds, penetration by the navel and the style scar.	Fruits wounded in the field.	Spores on intact epidermis.
Site of infection	From packing to consumption.	In the orchard, but above all from picking to consumption.	Orchard and warehouse.	Orchard.	Orchard: splashing with water. Packing: contaminated washing water. Storage: fruit to fruit contamination.
Species and varieties susceptible	All varieties.	All varieties.	Navel orange, madarin, lemon.	All varieties, but above all mandarins.	All varieties (orange more susceptible).

Citruses

Main varieties

photos © Régis Domergue

EASY PEELERS

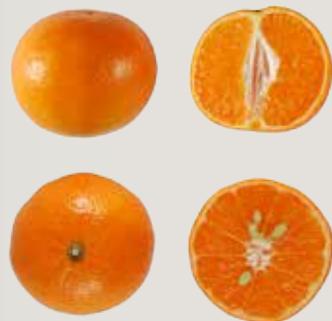
CLEMENTINE

This group of varieties is probably the result of hybridisation of *Citrus deliciosa* and an orange. Its success — considerable around the Mediterranean — is related to the useful fruit characteristics (seedless in pure plantations, good colour and flavour) combined with a long sales period. Indeed, clementines are present on markets in the Northern Hemisphere from the end of September to the end of February thanks to the different cultivars (Marisol, Oroval, Oronules, Nules, Common or Fine, Hernandine, Nour, etc.).



NOVA

Present on markets from mid-November to January, this medium-sized fruit is the result of a cross between common clementine and Tangelo. It has useful qualities: marked skin colour, a deep orange tender juicy seedless pulp, and sweet flavour with low acidity. The fruits must nevertheless be picked rapidly to prevent swelling of the peel. It is widely grown in Spain (Clemenvilla), Israel (Suntina) and Morocco.



MINNEOLA

A hybrid between tangerine and grapefruit, this large round fruit is characterised by a pronounced stem-end neck. The peel is a particularly strong reddish orange colour. The pulp, with few seeds, has a very special flavour. The variety is grown mainly in Israel and Turkey.



ORANGE

VALENCIA LATE

Originating in the Azores, Valencia is the most commonly planted variety in the world. This medium-sized variety is round and slightly oblong. The peel is thin, well-coloured and slightly grainy. The flesh is very juicy, with 2 to 4 seeds. It is also known as Maroc Late (from Morocco) and Jaffa Late (from Israel).

NAVEL

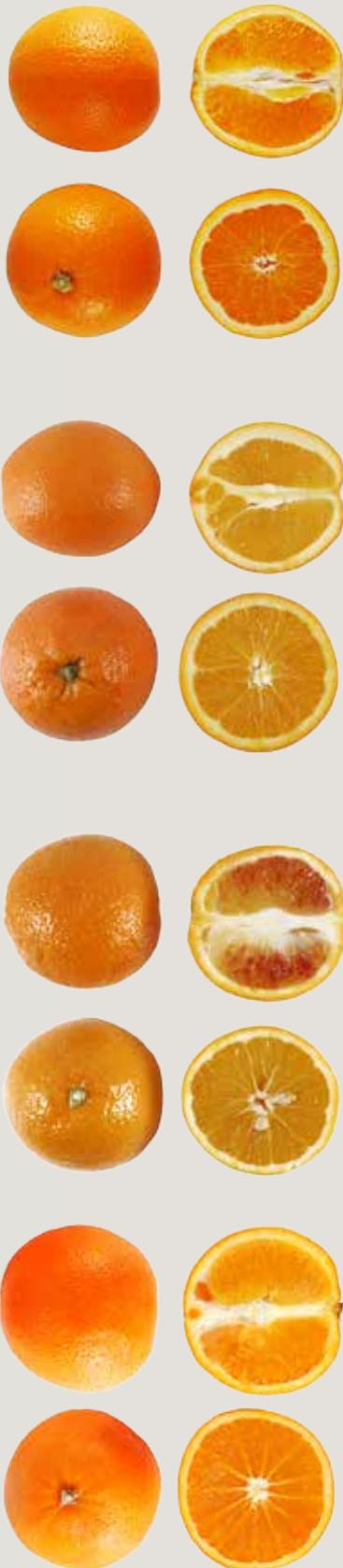
A round to oval dessert orange with a strongly developed navel. The peel is grainy, thin and fairly well coloured. The flesh is crisp, fine and not very juicy. Early cultivars (Naveline) and late cultivars (Navelate, Lane Late) in the Navel group are available on Northern Hemisphere markets from October to May.

MALTAISE

This high-quality well-coloured orange is grown almost only in the Cape Bon region of Tunisia, where conditions bring out its full potential. It is medium-sized and slightly oval. The soft peel is slightly grainy and easy to remove. The tender, juicy flesh is little coloured for a blood orange. The flavour is particularly pleasant with sweetness balanced by a good level of acidity.

SALUSTIANA

Very popular in Spain, this blonde juice orange is medium-sized to large. The peel is of medium thickness with fine granulation. The flesh is delicate and sweet with a very pleasant taste. It is also seedless.



LEMON

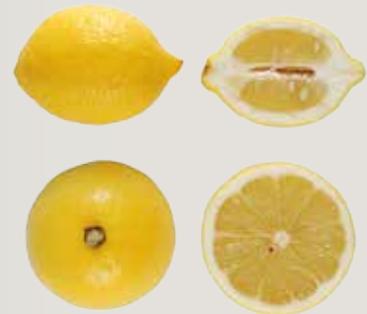
EUREKA

This variety, little planted in the Mediterranean, forms the greater part of world production. It is widespread in the Southern Hemisphere. The fruit is of average size, elliptic to oblong in shape with a medium-sized apical nipple that is slender at the base. The peel is fine to medium thick. The pulp is generally seedless and rich in juice with high acidity.



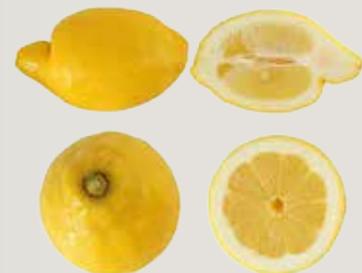
FINO

This cultivar dominates Spanish production and is abundantly grown in the Murcia region. The fruit is a regular spherical or oval shape. The nipple is shorter than that of Verna. The peel is thin and smooth. The pulp contains 5 to 8 pips and is juicier than that of Verna.



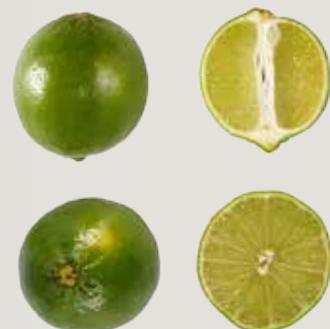
VERNA

The fruit is medium to large with a pronounced, broad-based nipple. The rough epidermis is fairly thick. The juice has high acidity but only a medium extraction yield. One of the main Spanish varieties.



LIMES

The Tahiti lime (*Citrus latifolia*) is a triploid variety and is the most widespread of the sour limes. The peel is green/yellow to pale yellow and contains an essential oil with a very characteristic odour. The pulp is generally seedless, yellowish green and rich in very sour juice. Another variety, Mexican lime (*Citrus aurantifolia*), is little exported as it contains a large number of seeds.





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vitropic@vitropic.fr

ZAE des Avants
34270 Saint Mathieu de Tréviérs
FRANCE
www.vitropic.fr

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Wholesale market prices in Europe

October 2016

					EUROPEAN UNION - EURO				
					Germany	France	Holland	UK	
AVOCADO	Air	TROPICAL	BRAZIL	Box		14.00			
			DOMINICAN REP.	Box		11.20			
		Sea	FUERTE	PERU	Box		11.00		
				HASS	BRAZIL	Box			12.34
				CHILE	Box	13.75	12.33	15.25	
				COLOMBIA	Box		12.08		
			KENYA	Box		14.00			
			MEXICO	Box		12.33	11.63		
	Truck	RYAN	PERU	Box		14.50	15.25		
			SOUTH AFRICA	Box	12.13	13.50	15.25	11.78	
		ETTINGER	SOUTH AFRICA	Box		8.50	8.00		
			FUERTE	ISRAEL	Box	6.00	5.75	6.25	9.54
BACON			SPAIN	Box			6.25		
			SPAIN	Box		5.50	6.00	6.73	
BANANA	Air	RED SMALL	ECUADOR	kg			5.25		
			COLOMBIA	kg		7.92			
	Sea	SMALL	ECUADOR	kg			5.67		
			ECUADOR	kg		1.90			
CARAMBOLA	Air		MALAYSIA	kg		4.00	5.31		
CHAYOTE	Sea		COSTA RICA	kg			1.56		
COCONUT	Sea	NOT DETERMINED	COTE D'IVOIRE	Bag		13.33	11.17	12.34	
			SRI LANKA	Bag				8.41	
		YOUNG GREEN	THAILAND	Bag			12.50		
			COSTA RICA	Bag			16.50		
DATE	Sea	DEGLET	ALGERIA	kg		5.20			
			KOUAT ALIGH	TUNISIA	kg			1.88	
			MEDJOOOL	ISRAEL	kg		9.13	8.65	
		NOT DETERMINED	ALGERIA	kg			2.80		
			ISRAEL	kg				4.94	
		GOLDEN	TUNISIA	kg				1.97	
			PERU	kg			4.00		
DURIAN	Air		THAILAND	kg			11.00		
EDDOE	Sea		COSTA RICA	kg			2.25		
GINGER	Sea		BRAZIL	kg			1.31	1.38	
			CHINA	kg		1.90	1.24	1.02	
			PERU	kg	2.00		2.31		
GUAVA	Sea		BRAZIL	kg				2.47	
KUMQUAT	Air		ISRAEL	kg		4.80			
LIME	Sea		BRAZIL	kg	0.75	1.55	0.94	1.00	
			MEXICO	kg	0.75	2.00	0.99	0.93	
MANGO	Air	KEITT KENT	MEXICO	kg		4.50			
			BRAZIL	kg		6.25	6.17		
			MEXICO	kg		4.50			
	Sea	NAM DOK MAI	THAILAND	kg			12.00		
			ATKINS	BRAZIL	kg	0.94	1.25	1.03	
			KEITT	BRAZIL	kg			1.50	
			KENT	BRAZIL	kg			1.75	
			NOT DETERMINED	BRAZIL	kg				1.25
				EGYPT	kg				1.55
	Truck	PALMER KENT OSTEEN	BRAZIL	kg	1.63	1.75	1.50		
			SPAIN	kg		4.38			
SPAIN			kg		1.95	1.82			
MANGOSTEEN	Air		THAILAND	kg		9.80	8.50		
			INDONESIA	kg		9.80			
MANIOC	Sea		COSTA RICA	kg		1.50	1.39		

					EUROPEAN UNION - EUROS			
					Germany	France	Holland	UK
MELON	Sea	CHARENTAIS CANTALOUPE GALIA	BRAZIL	kg		1.40	1.55	
			BRAZIL	kg		2.00	1.60	1.46
			BRAZIL	kg			1.30	1.51
	HONEY DEW SEEDLESS WATER WATERMELON PIEL DE SAPO	BRAZIL	kg		0.95	0.83	0.79	
		BRAZIL	kg		1.10	0.89	0.84	
		BRAZIL	kg			0.81	0.59	
		BRAZIL	kg			1.17	0.90	
PAPAYA	Air	FORMOSA NOT DETERMINED	BRAZIL	kg		3.50	3.22	
			BRAZIL	kg		3.50	3.43	4.12
	Sea		JAMAICA	kg			4.00	
			BRAZIL	kg				2.61
			ECUADOR	kg			1.58	
PASSION FRUIT	Air	NOT DETERMINED PURPLE	COLOMBIA	kg	5.00	5.50	6.25	4.77
			KENYA	kg			5.75	
			SOUTH AFRICA	kg		5.50		
		VIETNAM	kg		8.25	8.00		
		YELLOW	COLOMBIA	kg			8.75	
			ECUADOR	kg			7.40	
PAPAYA	Air	FORMOSA NOT DETERMINED	BRAZIL	kg			2.86	
	Sea	FORMOSA	BRAZIL	kg		3.70	3.64	4.27
			BRAZIL	kg			2.06	
PASSION FRUIT	Air	NOT DETERMINED PURPLE	COLOMBIA	kg	4.75	5.50	6.50	4.81
			SOUTH AFRICA	kg		6.50		
			VIETNAM	kg		9.00		
		YELLOW	ZIMBABWE	kg			6.25	
	COLOMBIA		kg			8.08		
PHYSALIS	Air	PREPACKED	COLOMBIA	kg		9.16		7.99
	Sea		COLOMBIA	kg	5.42		5.42	
PINEAPPLE	Air	MD-2 VICTORIA	BENIN	kg		2.20		
			MAURITIUS	Box			14.00	
			MAURITIUS	kg		3.45		
	Sea	MD-2	REUNION	kg		4.00		
			COSTA RICA	Box	6.25		5.85	
			COSTA RICA	kg		0.97		
			COSTA RICA	Piece				0.71
			COTE D'IVOIRE	Box				7.29
			COTE D'IVOIRE	kg		1.00		
PITAHAYA	Air	RED	ISRAEL	kg			6.50	
			THAILAND	kg		8.25	7.00	
			VIETNAM	kg		8.25	7.17	
		YELLOW	ECUADOR	kg			10.00	
PLANTAIN	Sea		COLOMBIA	kg		1.10	1.13	
			ECUADOR	kg		1.00	1.00	
			JAMAICA	kg				1.25
POMEGRANATE	Air	NOT DETERMINED	ISRAEL	kg			2.89	
			EGYPT	kg				1.38
	Sea	WONDERFUL	SOUTH AFRICA	kg		1.80		
			TURKEY	kg			2.29	1.40
			CHILE	kg		2.00		
			EGYPT	kg			1.40	
			PERU	kg		1.75		
			HICAZ	TURKEY	kg			1.30
RAMBUTAN	Air		THAILAND	kg		9.00		
			VIETNAM	kg		9.00	11.00	
			GUATEMALA	kg			8.25	
SAPODILLA	Air	NOT DETERMINED	THAILAND	kg			8.00	
SWEET POTATO	Sea	RED/RED RED/WHITE ORANGE	EGYPT	kg		1.00		
			ISRAEL	kg				1.37
			SOUTH AFRICA	kg				0.62
			HONDURAS	kg			1.25	
			HONDURAS	kg			1.55	
			EGYPT	kg			1.04	
			ISRAEL	kg			1.21	
TAMARILLO	Air		COLOMBIA	kg			7.10	
TAMARIND	Air		THAILAND	kg		3.08	3.45	
TARO	Sea		COSTA RICA	kg		2.70		
YAM	Sea		BRAZIL	kg				1.00
			GHANA	kg		1.30	1.25	

Note: according to grade

These prices are based on monthly information from the Market News Service, International Trade Centre UNCTAD/WTO (ITC), Geneva.
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15, boulevard du Delta | Zone Euro Delta | DE1 - 94658 | RUNGIS CEDEX | France

T +33 1 49 78 20 00 | F +33 1 46 87 16 45 | contact@univeg.fr | www.univeg.fr

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