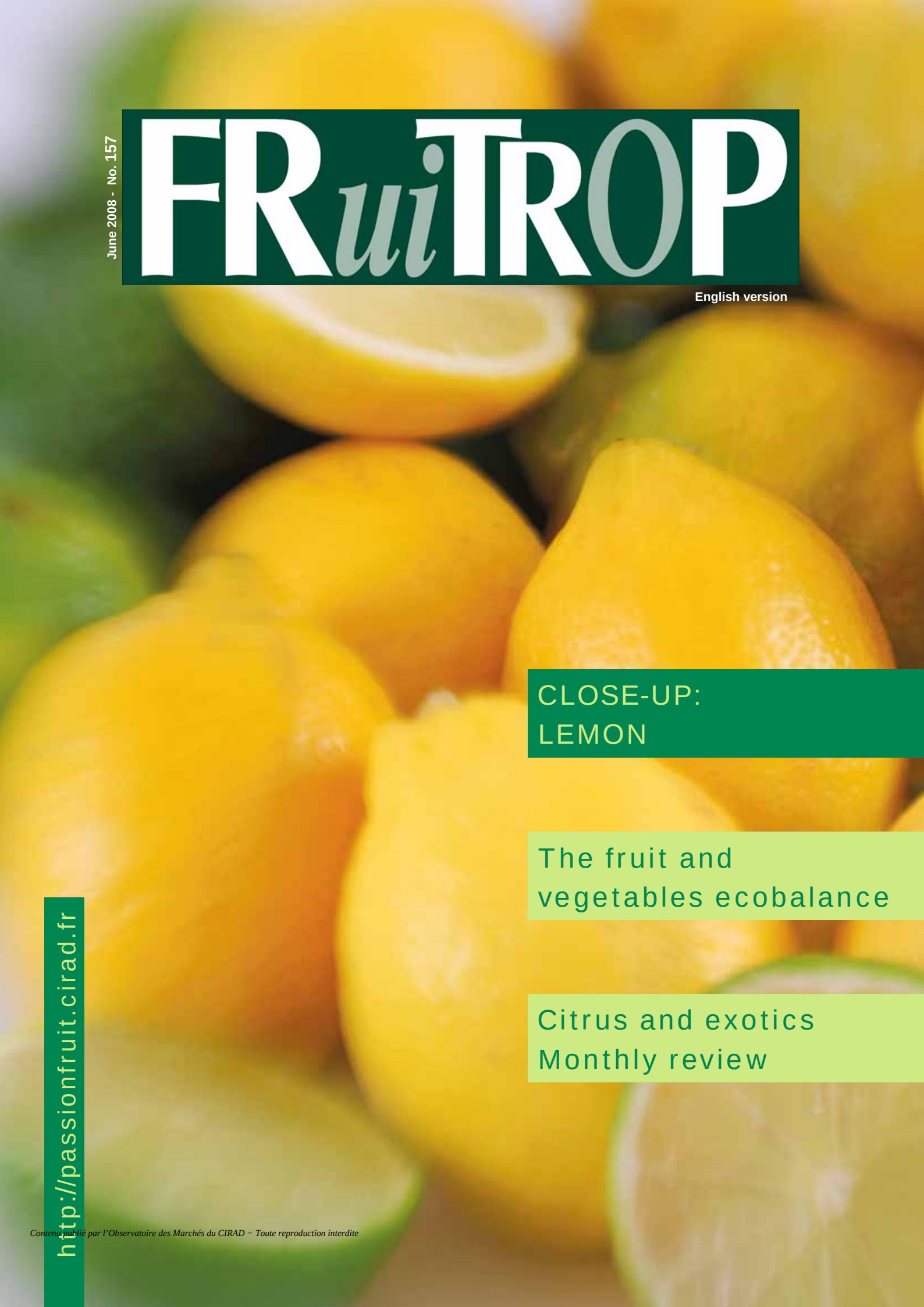
June 2008 - No. 157

FRuiTROP

English version



CLOSE-UP: LEMON

The fruit and vegetables ecobalance

Citrus and exotics Monthly review

http://passionfruit.cirad.fr

MAERSK LINE

maerskline.com

CREATING OPPORTUNITIES IN GLOBAL COMMERCE

We believe that creating opportunities is the key to success - in your business and in ours.

With our complete range of cold chain solutions, our dedicated reefer specialists take care of your perishables from pick-up to delivery.

And with our truly global reach, we ensure your products arrive in the best possible condition – anywhere in the world.

FRuiTROP

French Agricultural Research Centre for International Development
Performance of Tropical Production and Processing Systems Department

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: odm@cirad.fr
http://passionfruit.cirad.fr

Publishing director
Hubert de Bon

Chief Editors
Denis Loeillet and Eric Imbert

Editor
Catherine Sanchez

Computer graphics
Martine Duportal

Iconography
Régis Domergue

Website
Unité multimédia (Cirad)

Advertising Manager
Eric Imbert

Subscriptions
Sylviane Morand

Translator
Simon Barnard

Printed by
Imp'Act Imprimerie
34980 St Gély du Fesc, France

Separate French and English editions

ISSN
French: 1256-544X
English: 1256-5458

CPPAP
French: 0711 E 88281
English: 0711 R 88282

Subscription rate
EUR 190 euros
11 issues per year

EURO - 27 June 2008	
Currency	**1 euro =**
US dollar	1.5748
Japanese yen	167.08
Swiss franc	1.6053
Pound sterling	0.79235
Swedish krona	9.4263
Danish krone	7.458
Norwegian krone	7.979
Canadian dollar	1.585
Australian dollar	1.6383
New Zealand dollar	2.0737
Brazilian Real	2.5282
Czech koruna	24.002
Polish zloty	3.3671
Chinese yuan renminbi	10.8066
Estonian kroon	15.6466
Slovak koruna	30.31
Turkish lira	1.941
South African rand	12.488
South Korean won	1 639.76

Source: Central European Bank

The things in movement in the countries behind the new frontiers formed by non-tariff barriers do not obey the rules of 'Brownian motion'. They are more of an obstacle course. The trade concept is simple—making access to markets as difficult as possible. Perfection being to make it totally impossible on the pretext of saving local sectors—and then one for the shoppers in the North and one for the growers in the South. The new frontiers are supposed to make both products and production processes or trade relations fairer, more reliable, more clean-cut and more transparent. It is a kind of detergent that washes trade between countries whiter than white, that puts them on an equal footing. It is the almost divine hand that can lead the people to the nirvana of defect-free production.

The countries in the North are large importers and have boundless imagination in this field. There are many good reasons—justified or not. The planting substrate is fertile, a 100-percent nutritive mix of fine sentiments, food security, protection of trade interests and, more recently, saving the planet. Fair Trade, GLOBALGAP, ISO, BRC, carbon footprint, food miles, etc. The list is a long one and never complete. As soon as they have been sketched out, the new concepts are implemented and rapidly become the subject of general publicity. Let's take the example of environmental labelling. While the technical references are often lacking or wrong, the environmental impact is already noted on your receipt between your customer fidelity points and the special offers of the month. 'They' have a simple, if not simplistic approach. The average housewife is keeping an eye on it all.

And all this coming and going has nothing to do with the theories of the botanist Robert Brown in the nineteenth century. The two principles of his theory of the movement of tiny particles are first that the phenomenon is indeed random and second that the quantity of energy involved is negligible. The present movement is very definitely not random. It has clear, solid objectives. One of these is to pass on the risks to the preceding link in the chain, and if it is the grower so much the better. And the energy required for achieving conformity has a high cost for production chains, without the payer drawing the slightest benefit.

Denis Loeillet

Contents

The latest on...

p. 2 **The fruit and vegetables ecobalance**
Professionals examine the question
Pauline Feschet & Denis Loeillet

Close-up by Eric Imbert

p. 4 **LEMON**
- The world lemon market: the other side of the mirror
- The world lemon market: the future—between limited growth and structural adjustment
- Producer country sheet: Spain
- Producer country sheet: Turkey
- Producer country sheet: Argentina
- Statistics panorama: world, EU, USA, Japan
- Lemon cultivation
- The main lemon varieties
- Pests and diseases of lemon

European market - April 2008

p. 37
- Indicators
- Banana
- Avocado
- Orange
- Grapefruit
- Mango
- Pineapple
- Sea freight

Eric Imbert, Pierre Gerbaud, Thierry Paqui, Richard Bright

Wholesale market prices in Europe

p. 47 **April 2008**

Cover photograph courtesy of Régis Domergue

The fruit and vegetables ecobalance

Professionals examine the question

With the large supermarket chains grabbing the dossier on the environmental labelling of fresh fruit and vegetables, sector professionals—especially importers—fear the application of new rules without their being consulted. The equation consisting of multiple methodologies, rare technical references and approaching the question in too much of a hurry risks leading to over-simplification and falsehoods. This is why the French importers' syndicate and CIRAD are examining the question.

The environment is in fashion! In a short period of time, the environment and energy have become central social, institutional and industrial questions. This major trend is confirmed by the multiplication of environmental signs and labels on all products. Tesco, the leading British supermarket chain, was a precursor with carbon labelling based on the food miles concept. It was followed in France by Casino and then Leclerc, with the former providing consumers with the CO_2 emissions involved in packaging manufacture, the possibility of recycling and the kilometres travelled by each of its products. In addition, a traffic light system (from green to red) is adjusted to the environmental impacts related to the product, like the energy labels on household equipment like fridges. Leclerc has tested 'simplified CO_2 balance' labelling on the price ticket and customer receipts in two supermarkets in northern France. In terms of comparative advantages, this new 'ecological' awareness is a real strategic issue for retailers. The prime aim of labelling is to help buyers to make a choice. However, it would seem that this multiplication of initiatives does not always hit the target. Over-stigmatisation has the opposite effect. For example, shoppers perceived Tesco's initiative of placing the symbol of an aeroplane on the sales packaging of fresh produce shipped by air as a sign of quality and freshness as a result of the speed of this type of transport and not as a warning of the environmental impact of air freight.

Standardise approaches in order to compare the results

In addition to the variety of modes of information on these subjects, the content of the information is also puzzling. The tools for the evaluation of environmental impacts—Bilan Carbone®, food miles, life cycle assessment (LCA), etc.—are varied and clearly different and so do not have the same viewpoint. This makes it more complex and even impossible to compare the information in different labelling systems. Today, the LCA system seems to have gained a broader consensus, especially as it is covered by standards (ISO 14040/14044).

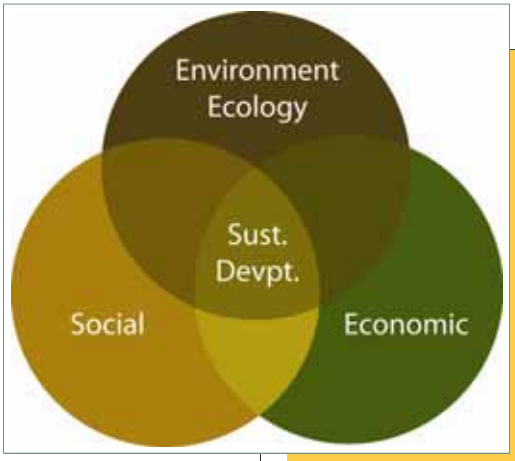
The LCA consists of assessing the environmental impacts throughout the life cycle of a product, 'from cradle to grave', with an inventory of the input and output of the system defined. In France, the 'Grenelle de l'Environnement' discussions instigated environmental labelling for all mass market products by 2011 and validated the LCA method as a reference tool. This should make it possible to reduce disparate labelling by harmonising both the assessment methods and the forms of labelling.

Sustainability or bust

Furthermore, most of the approaches are limited to obvious environmental impacts such as those of packaging and transport, whereas the issues cover all aspects of sustainable development:

- the environment (impacts on non-renewable resources), including nutritional qualities and consumer health;
- economics (competitiveness, production cost, etc.);
- social aspects (impact on populations, territories, etc.).

Today for example, people are quick to stigmatise fruit and vegetable import chains because of the distance between the production sites and the consumer. However, no serious studies have been performed with all the sustainable development parameters taken into account.



In addition, it seems that the data and references that can be used for certain agricultural products in general and for horticultural produce in particular are at best obsolete or incomplete or just nonexistent. This means that there is a serious risk of using them to provide strategic information on these chains. The worst would be to reach erroneous results that validate certain preconceived ideas.

Professionals are aware of these issues and are becoming involved in the approach by participating in research with the aim of proposing reliable, transparent measurement impact tools.

Sustainable development

Sustainable development is '…development that meets the needs of the present without compromising the ability of future generations to meet their own needs*.' This notion has two inherent concepts: that of 'needs', and more particularly the essential needs of those with the least and to whom the greatest priority should be awarded and that of the 'limits' that our techniques and social organisation impose on the capacity of the environment to respond to present and future needs.

**The definition proposed in 1987 by the World Commission on Environment and Development in the Brundtlant Report.*

Thus, the Chambre syndicale des importateurs de fruits (CSIF) in France is collaborating in a study with the Centre de coopération internationale en recherche agronomique pour le développement (CIRAD, Montpellier) aimed at developing a method for the economic evaluation of the energy ecobalances of import chains, with the application being the tomato sector, incorporating the overall LCA approach.

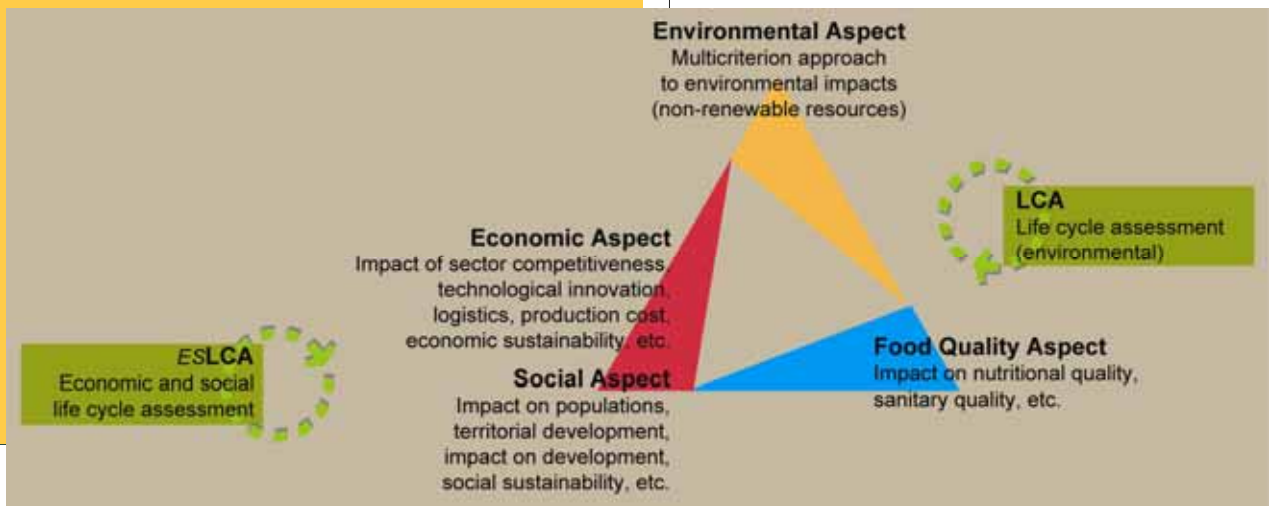
The energy eco-balance is just one aspect of the general problem but is determinant for these chains. The study will be presented in FruiTrop before the end of this year and is the starting-point for a complete life cycle appraisal encompassing all the dimensions of sustainability ■

Pauline Feschet, odm@cirad.fr
Denis Loeillet, denis.loeillet@cirad.fr

Life Cycle Assessment (LCA)

Life cycle assessment (also known as 'ecobalance') is an effective systematic method of assessing the environment impact of a product, a service or a process. The basic aim is that of reducing the pressure of a product on resources and the environment throughout its life cycle, from the extraction of raw materials to their disposal, a cycle often referred to as 'cradle-to-grave'. Life cycle assessment is both a procedure, that is to say a series of standardised stages, and also a mathematical transformation model that converts flows into potential environmental impacts. In spite of the name of the method, it is important to understand that life cycle assessment studies the function of the product or system. Indeed, if only the product itself is examined, it would become difficult to compare products serving the same function but in different ways, such as motorcars and public transport, whose common function is the transport of persons.

Source: Philippe Roux (Cemagref), various communications



FRuiTROP

A report by Eric Imbert

Lemon

The 2007-2008 season brought smiles back to growers' faces in the main producer countries. Profitability is back, both on the world fresh lemon market and on the juice and derived products after a long series of gloomy seasons. However, how should this recovery be analysed? *FruiTrop* reviews the situation on this large volume market and on the chains in the main exporting countries.

Contents

p. 6 The world lemon market: the other side of the mirror
p. 11 The world lemon market: the future—between limited growth and structural adjustment
p. 20 Producer country sheet: lemon in Spain
p. 21 Producer country sheet: lemon in Turkey
p. 24 Statistics panorama: world, EU, USA, Japan
p. 27 Producer country sheet: lemon in Argentina
p. 29 Lemon cultivation
p. 32 The main lemon varieties
p. 34 Pests and diseases of lemon

The world lemon market

The other side of the mirror

The 2007-08 winter season will remain an exceptional vintage in the memories of lemon growers the world over. Prices rocketed on all the large international markets. In the European Union, the world's largest outlet, the price of 'four fruits in cellophane' exceeded EUR1.00 at the import stage after being at 60 to 70 centimes in preceding seasons. This favourable situation should even continue, judging by the very high prices at the start of the summer season. Even the market for juices and derivatives, that had suffered a lasting slump, has recovered and stocks have been cleared.

However, this situation is magnificent, but conjunctural. Close analysis shows that the main world market trends are much less rosy. But first of all it is necessary to understand the structure of the international market.

A mainly European world fresh fruit market supplied by a limited number of sources

Although the world fresh lemon market is a large one, with some 1.5 million tonnes changing hands in 2007, it is little diversified either upstream or downstream. Only five countries export more than 100 000 t. The leading trio—Spain, Argentina and Turkey—control three-quarters of international trade between them. Winter supplies are shipped mainly by Spain, Turkey and the United States. Argentina and South Africa share the greater part of the summer market.

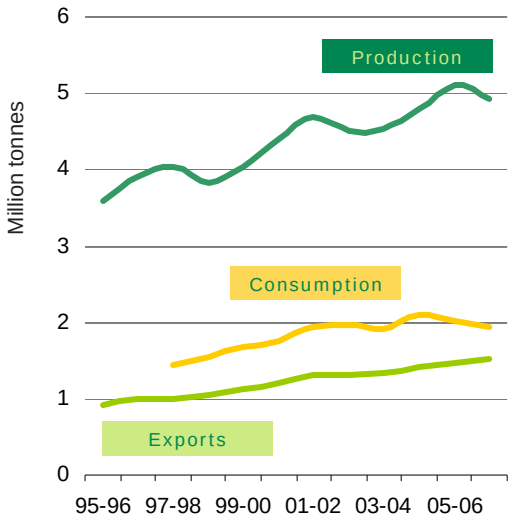
Concentration is even stronger in terms of the market as Europe is the destination for nearly three-quarters of international shipments. The United States is the only other large consumer market in the world. However, most US consumption is covered by domestic production in two West Coast states with a Mediterranean climate (California and, to a lesser degree, Arizona). As a result, imports do not exceed 35 000 t in a normal year.

The other markets only take limited volumes. Japan, the second largest import market in the world, takes only 70 000 to 80 000 t. Likewise, Canada in third position

Lemon - Main exporting countries - Volumes exported by market

Tonnes	Volumes exported by					
	Spain	Argentina	Turkey	United States	South Africa	**Total**
Total, of which	**500 000**	**340 000**	**330 000**	**110 000**	**100 000**	**1 380 000**
Western Europe 660 000 t 44% of world market	345 000	200 000	35 000		37 000	**617 000**
Eastern Europe 480 000 t 32% of world market	135 000	105 000	225 000			**465 000**
Others 360 000 t 24% of world market		Canada: 10 000		Japan: 45 000 Canada: 30 000	Middle East: 45 000	
Market share	33%	23%	22%	7%	7%	**92%**

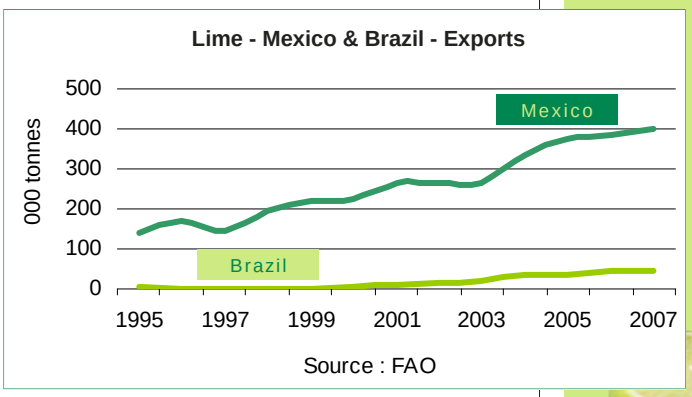
Data for 2006-07 or 2005-06 and 2006-07 seasons / Customs, professional sources – Presentation FruiTrop



imports less than 60 000 t. These are followed by the United States and four other markets on which import volumes range from 10 000 to 30 000 t according to the FAO (Saudi Arabia, the United Arab Emirates, Hong Kong and Kazakhstan).

The world's three leading exporters are the captives of one market

However, medium-sized markets like Japan and Canada have interesting potential. But the United States holds solid positions there for reasons of geographical or political proximity. In addition, the sanitary procedures are such a constraint in Japan as to be a practically insuperable barrier. As a result, Spain, Turkey and



Lime

The strong development of the world market for sour limes in recent years has

probably played a role in the decrease in lemon consumption seen in the EU and the USA. Distinction is made between two main types of lime as follows:

- *Citrus aurantifolia*, better known as Mexican, Key or West Indian lime, forms a very large proportion of world production but is little sold on the international market as it is seedy and very small;

- *Citrus latifolia*—Tahiti or Persian lime—forms the bulk of sales on the world market. Seedless and larger than C. aurantifolia, it is widely grown in Mexico (in the Martinez de la Torre region in Vera Cruz province) and in Brazil (Sao Paulo state).

These two countries are the main suppliers of a strongly growing world market. Their exports have tripled in 10 years from some 140 000 t in the mid-1990s to nearly 450 000 t in 2007. The United States is the world's leading import market, especially as production in Florida (Dade county) became marginal after the spread of citrus canker by the 2004 and 2005 hurricanes. Imports reached 350 000 t in 2007, marking a 115 000 t increase in five years. Mexico is practically the only player on this market. In Europe, the second largest market in the world, the volumes consumed by EU-25 have doubled in five years, exceeding 60 000 t in 2007. Brazil controls 80% of the market with supplies completed by Mexico. Japan and Canada import moderate but significant volumes.

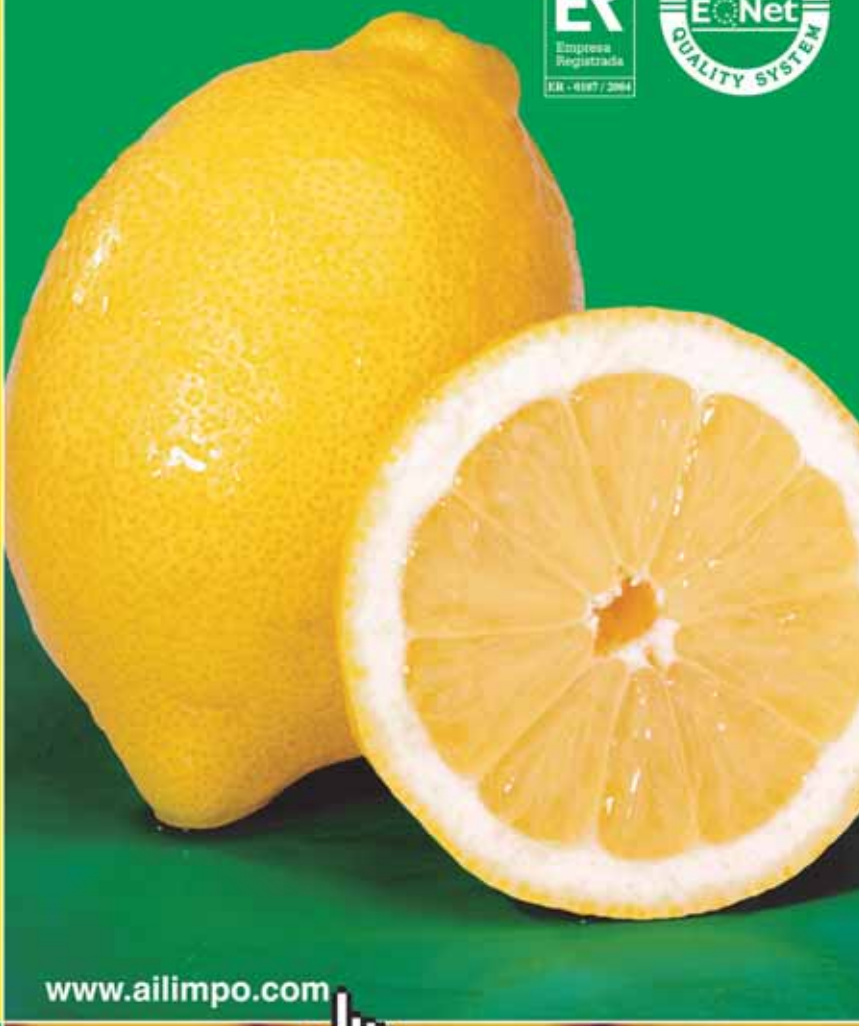
Photos © Régis Domergue




BEST LEMONS COME FROM SPAIN

AENOR ER Empresa Registrada

CERTIFIED EQNet QUALITY SYSTEM

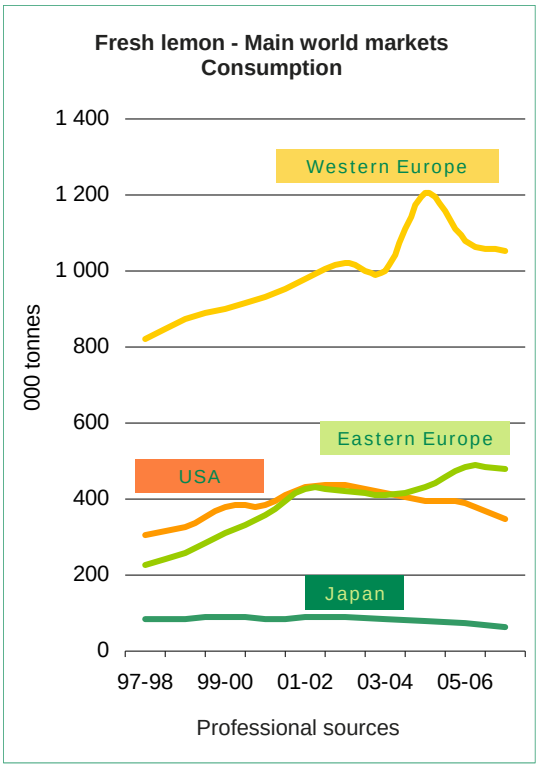


www.ailimpo.com

Ailimpo

ASOCIACIÓN INTERPROFESIONAL DE LIMÓN Y POMELO

C/ Villaleal, 3 30001 MURCIA Spain
T. +34 968 21 66 19 // F. +34 968 22 09 47
informacion@ailimpo.com



Argentina are totally dependent on the EU market and have to adapt to its fluctuations.

A large industrial market closely connected to the fresh market

The substantial weight of industry is another structural component of the lemon sector. It is the main outlet in terms of volume, taking approximately 25 to 30% of world production for the manufacture of juice (mainly concentrate) and other derivatives (essential oil, pellets, etc.). In contrast with orange, the large producer countries (except for Turkey) are both large-scale processors and exporters. Geographic specialisation by outlet is less marked than for other citrus. As a result, problems concerning fresh fruits and the processing industry are very closely linked and between them determine profitability for growers.

The 1990s—a glorious decade that led to considerable increase in planted areas

World demand for lemon truly took off in the 1990s. First, demand for concentrated juice and derivatives increased strongly with the growth of the markets of the soft drink multinationals. Second, international demand for fresh lemon increased considerably, mainly as the result of a marked increase in consumption on the markets in Eastern and Western Europe. Totalling some 900 000 t per year in the mid-1990s, international trade in lemons increased by more than 400 000 t in six seasons, exceeding 1.3 million tonnes in 2001-2002.

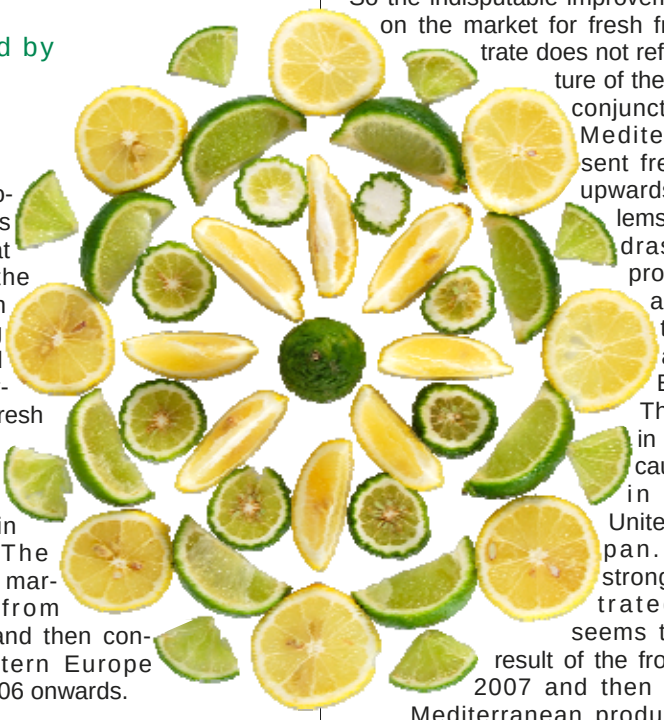
This particularly buoyant context encouraged professionals all over the world to plant massively, sometimes making short-term technical choices that favoured volume rather than fruit quality. As an example, the use of rootstocks that optimise productivity became widespread. Production in Spain and Argentina practically doubled during this period, reaching 1.0 and 1.3 million tonnes respectively, while the Turkish crop increased from 390 000 to 600 000 t.

Photos © Régis Domergue

This rocketing production hit the profitability of the concentrated juice market from the second half of the 1990s onwards. However, business was still lucrative as the market for fresh lemons was still growing strongly.

....was followed by a slump at the beginning of the 2000s

The first serious economic difficulties started to appear at the beginning of the 2000s. Production in the main exporting countries increased more slowly. In parallel, growth of the fresh market slowed distinctly, as is shown by the consumption curves for the main world markets. The Eastern European markets stagnated from 2002-03 onwards and then consumption in Western Europe slumped from 2005-06 onwards.



In addition, the degradation of the concentrated juice and derivatives market became more marked. The quantities delivered to industry increased tremendously, with the slowing of the growth of the market for fresh fruits adding to the increase in production. Producer prices paid by industry decreased strongly, sliding below the break-even point in places like Spain and California where production costs are high.

So the indisputable improvement seen in 2007 on the market for fresh fruits and concentrate does not reflect the real structure of the market. A strong, conjunctural decrease in Mediterranean supply sent fresh lemon prices upwards. Weather problems in summer 2007 drastically reduced production in Spain and Turkey, the two countries that account for most EU market supply. The effects of frost in California in 2006 caused the increase in prices in the United States and Japan. Likewise, the strong rise in concentrated juice prices seems to be mainly the result of the frost in California in 2007 and then the decrease in Mediterranean production mentioned above ■

Eric Imbert, Cirad
eric.imbert@cirad.fr

Production

World production of lemons is difficult to evaluate. Some countries such as China and India also produce limes and make no distinction between the fruits in their statistics. Lime trees are preferred to lemon trees in the tropics. The susceptibility of the latter to the fungal diseases that are very present in these environments is strong, vegetative growth becomes exuberant and the fruits become too large and unsuited to market demand.

Lemon
Production difficult to evaluate (tonnes)

World production (including some lime production)	7 000 000 to 8 000 000
International trade	1 500 000
Industry	2 000 000
Lemon, of which	6 800 000
Argentina	1 500 000
Spain	1 100 000
Turkey	825 000
Lime, of which	3 800 000
Mexico	1 900 000
Brazil	1 030 000
Peru	250 000
Lemon and lime*	2 400 000
China	1 600 000
India	780 000

* not separated in statistics / Sources: FAO, professionals

The world lemon market

The future—between limited growth and structural adjustment

Producer countries have been affected to varying degrees by the change in situation in recent years according to their positioning in terms of outlets or markets.

Turkey relatively unscathed

Turkey

Turkey is the country least affected by the slump. Production has increased strongly but, as the exporters themselves say, the Turkish chain 'is sitting on a gold mine', that is to say the Eastern European markets. Demand for fresh lemons has reawakened in recent seasons and Turkish exporters' comparative advantages allow them to gain market shares from their Mediterranean competitors. The most obvious advantage is geographic proximity. Production is concentrated in the Mersin region in south-east Turkey, on a narrow coastal strip on the Mediterranean. Exporters can supply Romania in two days, Ukraine in four days and even the most densely populated parts of the Fertile Crescent in Russia in five or six days. The special way in which export companies are organised is also an advantage. Their family structure and strong downstream integration makes payments secure on these markets where this is still a major problem. Thus a sales office run by a relation is often installed in Russia, Ukraine or Romania. In addition, the bottom of the range produce available matches present expectations of these markets well as price is very important.

Furthermore, the Turkish sector has been little affected by the recession in Western Europe. Only small volumes are exported to this destination. Turkey forms just a complement to supplies, taking advantage of its early 'Interdonato' variety to use the narrow market window between the end of the summer season and the beginning of winter operations. Finally, the fall in prices of industrial derivatives has little effect. This sector is practically nonexistent as Turkish operators benefit from a growing domestic market with strong demand to sell most sorting rejects from packing chains working for export operations.

But the weakness of the sector should not be ignored

However, although the Turkish lemon sector has been fairly sheltered from the slump, professionals should not forget its weak points. The problem of pesticide residues has now been mastered although there has been a fresh alert—but more political than technical. The closing of the Russian frontier to Turkish citrus in 2004 encouraged growers to make real efforts on this point, in particular thanks to the remarkable extension and information work conducted by the rural development board. However, progress remains to be made by trade operators in other fields. Although all exporters claim traceability, how can this be guaranteed in practice when the production end of the chain is so fragmented (average field size less than 1 hectare) and the other end has such a low technical level and is so dissociated?

Cooperatives are non-existent and the producers' organisations formed have no power in questions of marketing. As a result, the upstream end of the sector that benefits much less from growth than the export sector lacks means for modernisation. Can the sector remain competitive in this context? Adapting to increasing international quality standards on markets in both Western and Eastern Europe requirement a minimum of investment capacity. The ongoing strengthening of the powers od producers' organisations is certainly a positive feature.

A strong profitability decrease in the sector in Argentina

The situation is less rosy for Argentina, even though the sector benefits fully from the conjunctural market improvement. Growers in Tucuman, an administrative department in the north-east where most of the plantations are to be found, have been hard-hit by the fall in the price of concentrate and derivatives. However, although Argentinian professionals have been victims of the falling prices, they were also the main cause of it, with the help of certain multinational soft drinks companies. The supply contracts that they signed with several large stakeholders in the sector resulted in a huge increase in production to cover a potential increase in soft drinks consumption in China, which turned out to be totally hypothetical. This resulted in a world market slump. The prices paid by the juice industry to growers had reached nearly USD90 per t in 1996 and then fell gradually before plummeting to USD25 per t in 2002. After a conjunctural increase in 2003 and 2004 caused by the production decrease in California and then in Europe, they returned to these low levels in 2005 and 2006.

Faced with this strong decrease in profitability, producers diversified their outlets from the mid-1990s onwards. The development of fresh lemon exports to the European market in the summer re-launched the sector. The quantities shipped to the EU and then to Eastern Europe grew quickly, exceeding 300 000 t in 2003. However, this outlet also faced difficulties. EU market demand has peaked at 200 000 t since 2004 (with variations for unforeseen circumstances and growth has slowed markedly in Eastern Europe. The reason is not competition from South Africa as most of its shipments are to the Middle East, with some smallish volumes exported to the UK. The other markets are marginal. The possible opening of the US frontier should not change the situation, given the limited potential of the US and the powerful lobby protecting domestic production.

In parallel, production costs have increased considerably. However, production structures with mainly commercial plantations and strong vertical integration enable substantial economies of scale. But pressure on plant health is strong, especially since citrus canker was detected at the beginning of the 2000s. In order to conserve their export positions, professionals have had to set up a programme—both rigorous and costly—to control the disease. Spraying accounted for nearly 75% of production costs in 2007 according to INTA, the Argentinian national research body. The consequences

Lemon - Spain & Turkey
Comparison of competitiveness on the Russian market

	Spain	Turkey
Cost		
production (ex-packing station)	0.29-0.40 euro/kg	0.20 euro/kg
logistics (full truck 21 t)	EUR 5 800 to 8 900	EUR 5 000 to 6 000
Others		
Delivery speed	5-12 days	5 days
Payment risk	little mastered	mastered
Level of certification and traceability	high	average

Professional sources

Competitiveness

World exporters all seek to profit from the growth of the East European markets (within and outside the EU). In the summer, Argentina has a near monopoly. Exports from South Africa totalled less than 5 000 t an 2007, of which 80% was shipped to Russia. In contrast, Spain and Turkey fight a vigorous commercial war in the winter season. Turkey is currently ahead, but its price-based development model could have limits in the future. Will Mersin growers be able to meet the increasing traceability and MRL requirements of customers, and especially those who have recently joined the EU?

Lemon - Eastern Europe - Consumption

	Consumption (kg/capita/year)	**Population** (million inhabitants)
EU-15	**2.8**	**375.0**
Poland	2.4	38.2
Czech Rep.	2.2	10.3
Slovakia	1.5	5.4
Hungary	1.5	10.1
Russia	1.5	143.4
Romania	1.4	21.6
Bulgaria	1.4	7.7

Sources: professionals and CLAM 2006-07

of the substantial increase in oil prices for inputs such as fertilisers have aggravated the problem. Likewise, exporters have been seriously hit by higher freight prices.


© Régis Domergue

Other sanitary challenges on the horizon

The whole sector is mobilised to prevent the arrival of greening, whose consequences could be disastrous. In neighbouring Brazil, the disease is present in Sao Paulo and Parana states, 300 km from the Argentinian province of Mision, and one of the insect vectors has been detected in north-east Argentina.

Canker, greening... one can understand the lobbying carried out in particular by Spanish producers ('All's fair in love and war') to strengthen EU sanitary controls and protect their interests. The phenomenon has already resulted in an acceleration of the concentration of the export players operating and in a change of alliances. The logic of partnership with Spanish operators that had been one of the driving forces behind the development of Argentinian lemon in the EU is of decreasing importance. The flow has shifted to other points of entry such as Italy, Greece and the Netherlands with an ambition that is not necessarily that of a partnership. Thus certain Argentinian exporters have a sales office in the EU in order to contact retail distributors directly.

Finally, the lowering of MRLs and the reduction of registered active substances form another challenge to be addressed by Argentinian professionals on the very short term basis.

A serious problem of overproduction in Spain

Spain

Spain, the world's second largest producer and leading exporter of fresh lemon is undoubtedly the country that has been hardest hit. The overproduction crisis is visible when you travel through the lemon groves in Murcia, the province that accounts for 90% of Spanish production. The Llano de Brujas, or 'Witches' Plain', seems to be well-named, given the number of abandoned orchards and dead trees to be seen there. The sector was still profitable recently but now seems to be attacked on all fronts. The situation is particularly serious for fresh fruits. Demand is decreasing in Western Europe, the heart of the market for Spanish professionals. Furthermore, competition from Argentina is narrowing the sales window for Spanish lemons. First, retail distributors tend to favour switching as early as possible to 'Eureka' from South America, whose appearance is more attractive than the Spanish 'Verna', with coarser peel and less regular shape. Second, the extending of the Argentinian season tends to postpone the first referencing of 'Fino'. This delay at the start of the season has serious consequences, given the technical options chosen by producers during a good period, when the objective was to cover the rapid growth of markets. There has been a strong increase in the volumes to be sold during the first part of the season. 'Fino' grafted on *C. macrophylla*, forming about 55% of the production of this cultivar, must be marketed by the end of January at the latest. The use of this rootstock has resulted in a 15 to 20 t per ha increase in yield in comparison with sour orange rootstock, but keep quality is reduced.

A sector attacked on all fronts

Spain is also under attack on the eastern front. The Polish, Czech and Russian markets had become a major outlet for Spain in a single decade. However, Spanish producers have lost market shares in recent years to Turkish competition with the comparative advantages that have already been mentioned. The volumes shipped to these destinations had approached 200 000 t in 2003-04 before falling to 144 000 t in 2005-06 and then 126 000 t in 2006-07.

Furthermore, as if the slump in demand on the fresh lemon market were not enough, Spanish producers must also face up to the slump on the concentrated juice market. In spite of the large volumes that they handle (from 120 000 to 240 000 t in recent seasons), Spanish juice processors have little hold on the international market. In order to recover profitability, nearly

half of the professionals in the sector have developed a strategy aimed at separating them from the world market by manufacturing tailor-made combinations and emphasising service to customers (short delivery periods, etc.). However, the change has only paid off within the juice chain, as returns to producers have remained at some one or two centimes (EUR) per kg since 2002-03 (not counting European aid of 9 centimes per kg), and this is well below production cost. However, the end of direct aid for processing paid by the EU should change the balance of power and lead industrialists to paying more for raw materials in order to assure supplies.

Efforts to be made in rationalisation

As a result of all this, 200 000 to 300 000 tonnes of fruits has remained on the trees during the last two seasons, that is to say nearly 20% of production. The weaknesses of the sector went unnoticed during the glorious period but are now visible. Production costs are high. The disadvantages stemming from the high cost of labour in the EU are magnified by the scattered nature of the sector. Production structures are generally small, especially in the Huerta de Murcia area. Furthermore, packing facilities are not rationalised as there are more than 100 packing stations and these therefore handle an average of 6 500 tonnes each! It is true that the very traditional mode of marketing of production is still very favourable for the stakeholders downstream. The functioning of cooperatives in the region left to be desired in the past and now there are practically none. Transactions are still concluded mainly on an 'a resultados' basis. The grower is paid according to the amount of the final sale concluded by a middleman, the 'corredor' and has no guarantee of payment.

Relations between Spanish packers and Argentinian exporters have also weighed on the profitability of packing stations for several years. The volumes of 'Eureka' from Argentina handled by Spanish packing stations in the

summer made it possible to smooth the overheads and gain customer fidelity by means of a category management approach.

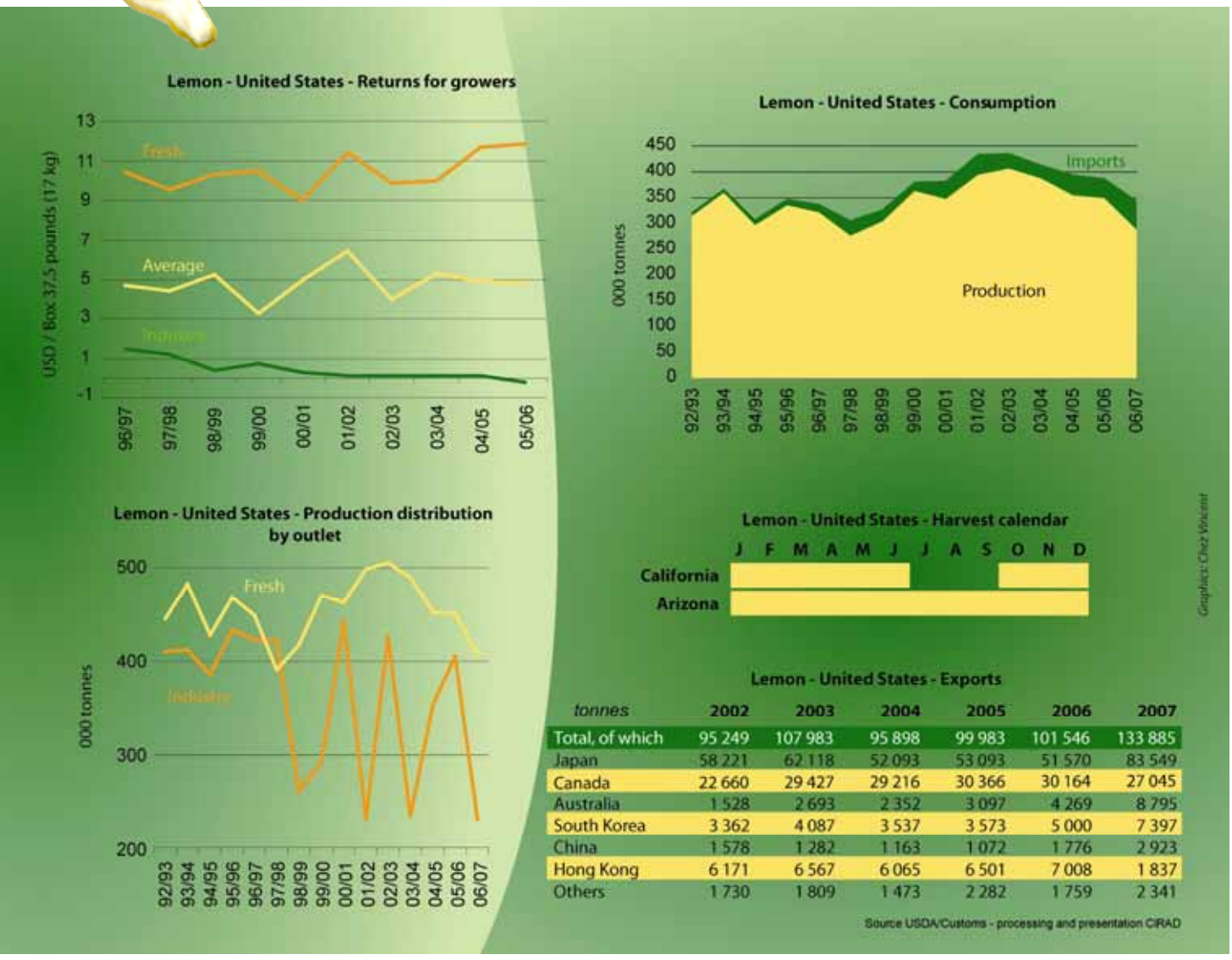
The updating of the range of cultivars is also a critical point, especially as regards 'Verna'. A long period of economic profitability meant that professionals were not encouraged to address the question, contrasting with other lemon production chains. The dynamic interprofessional association Ailimpo has launched a research programme on the subject but the work will take a while and the results are uncertain.

Irrigation—another serious problem

The slump is even gaining a political aspect in the use of water, an increasingly rare and expensive resource in the region. The province of Murcia, with annual rainfall of some 100 mm, is one of the world's arid zones. Covering the needs of the population and of farming is dependent on water conveyed from other regions in the country, and in particular via a conveyance canal nearly 400 km long running from the Tagus. The absence of replacement crops and the general building policy in this very sunny region has led to the reconversion of a large part of the regional economy to mass tourism, resulting in a tremendous increase in water requirements for human use and even for many golf courses (whose absurdity matches the aridity of the region). Pressure on water resources is therefore increasing strongly, to the extent that the region has to build costly desalination plants. The question is nevertheless there—should the whole production area be irrigated when a proportion of production will be lost?

The increasingly limited role played by the other Mediterranean countries ...

The citrus sector is going under in certain Mediterranean countries for reasons that are not solely connected with the slump. In Greece, the

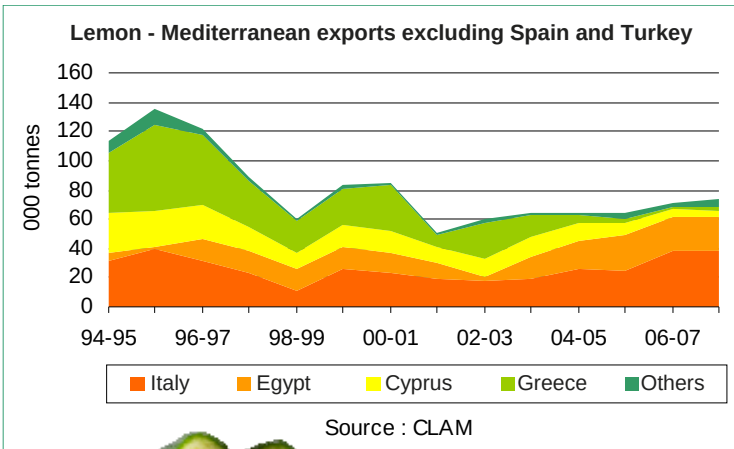


Lemon - United States - Exports

tonnes	2002	2003	2004	2005	2006	2007
Total, of which	95 249	107 983	95 898	99 983	101 546	133 885
Japan	58 221	62 118	52 093	53 093	51 570	83 549
Canada	22 660	29 427	29 216	30 366	30 164	27 045
Australia	1 528	2 693	2 352	3 097	4 269	8 795
South Korea	3 362	4 087	3 537	3 573	5 000	7 397
China	1 578	1 282	1 163	1 072	1 776	2 923
Hong Kong	6 171	6 567	6 065	6 501	7 008	1 837
Others	1 730	1 809	1 473	2 282	1 759	2 341

Source USDA/Customs - processing and presentation CIRAD

Photos © Régis Domergue



Source : CLAM

sector has not recovered after the devastating frost during the 2004-05 season. The destruction of a fair part of the lemon orchard area has drastically reduced production and this has not topped 40 000 t in recent seasons in comparison with 110 000 to 130 000 t at the beginning of the 2000s. Just like the other citrus fruits, lemon has not escaped the recurrent drought in Cyprus. Production has decreased by three-quarters over a period of about 10 years and is now not more than about 10 000 t. These two producers no longer play a prominent role in international trade. The non-negligible presence of Morocco on the EU scene in 2007-08 is conjunctural and related to market under-supply. Slightly more than 12 000 tonnes was shipped, much of this to the EU and often repacked in Spain. Moroccan production is limited (25 000 to 30 000 t) and generally sold entirely on the domestic market.

Israeli production is significant and stabilised at about 50 000 t. However, 90% of this is sold on the domestic market. Exports do not exceed 2 000 t in a normal season, especially as 'Villafranca', the main variety grown, is less appreciated than the other cultivars sold in the EU.

... even by Italy, the giant of the sector

There remains another giant in the Mediterranean, with Spain and Turkey. This is Italy. With a total lemon orchard area of about 30 000 ha, mainly in Sicily (provinces of Palermo, Catania and Messina) and a harvest of some 600 000 t in recent seasons, it is in a good position among the world's leading producer countries. However, Italy now plays only a marginal role on the international lemon market because of the high production cost of its 'Feminello' and 'Monachello' fruits. Very limited farm size (less than 0.40 ha per holding in 2000) affects the competitiveness of the sector.

A strategy of occupying high value-added niches through more profitable types of production (organic lemons) or PGIs (no less than four for lemons from Amalfi, Sorrento, Gargano and Syracuse) has given new impetus to exports, which reached 40 000 t in 2006-07 (also thanks to favourable conditions). However, there is a risk of reaching the limit in terms of volume. Thus most of the crop is sold on the domestic market or to industry.

Practically all the large Egyptian crop of about 300 000 t is based on very specific cultivars (mainly different types of lime, locally going by the name Lamuun) that do not interest the international market. Thus 90% of the 20 000 t exported in 2006-07 was shipped to the Arab countries that seek this particular produce. The volumes exported to the EU have never exceeded 2 000 t. Nevertheless, the evolution of the Egyptian lemon sector should be monitored on a medium and long term basis. The sector professionals display determination to diversify their production and possess comparative advantages in terms of production cost; they have already proved their competitiveness on the Eastern European markets. Exports of oranges hardly exceeded 200 000 t in the early 2000s but approached 800 000 t in 2006-07.

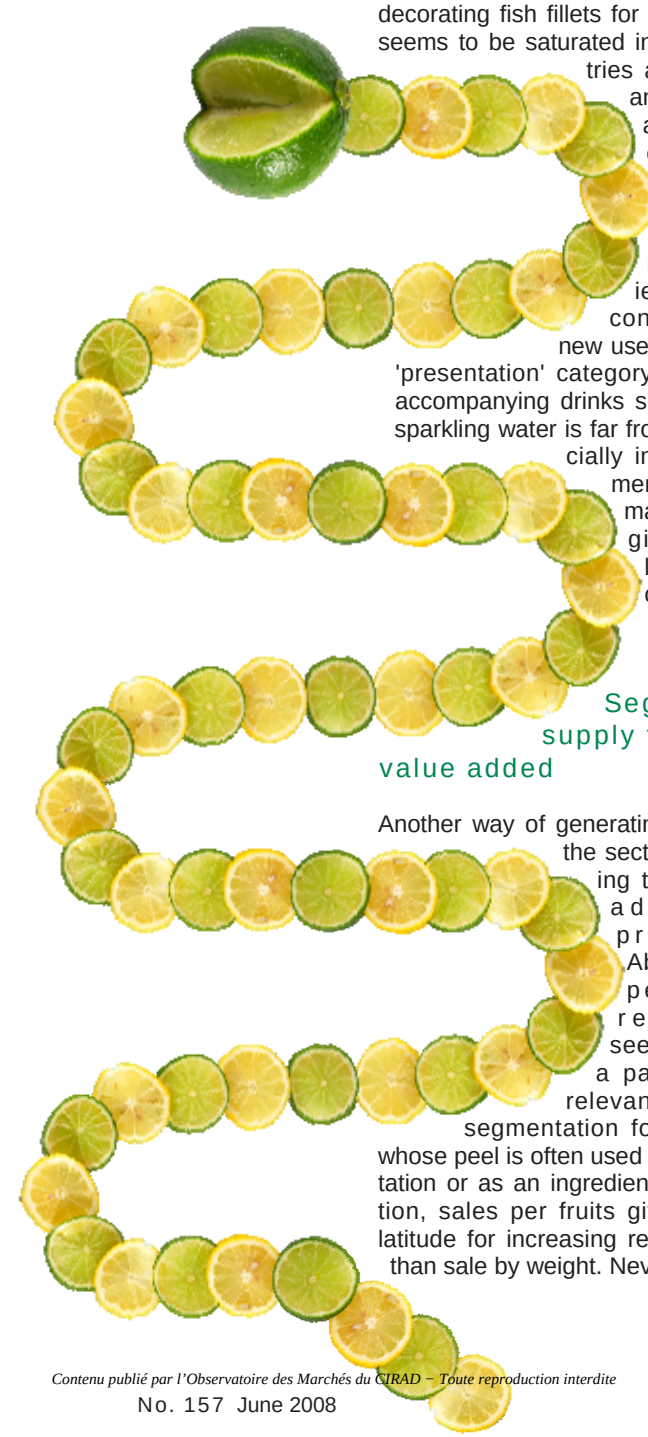
What markets to target to re-launch demand for fresh lemons?

Is any consumption potential left around the world to re-launch demand for fresh lemons? There do not seem to be many new markets to gain. Consumption habits are focused on lime in the tropics. Sour products have difficultly in Asia and substantial development potential can hardly be imagined. However, market surveys should be conducted to confirm this. In contrast, an out-of-season market might be accessible for Mediterranean producers in the southern hemisphere producer countries such as Chile, Argentina, South Africa and Australia. But, a technical obstacle remains to be overcome to gain access to these remote destinations. An alternative must be found to the cold treatment often required and difficult to perform on a fruit as susceptible to cold as lemon.

Consumption is stagnant in the Middle East. The imports by the United Arab Emirates and Saudi Arabia, the two leading markets in the region, seem to have stabilised at 20 000-25 000 t and 25 000-30 000 t respectively.

However, it is probable that there is room for growth in Eastern Europe. Consumption there is approximately 1.4 kg per person per year—half that of Western Europe. The matching of consumption levels in the two parts of Europe can be envisaged in the light of the strong growth in the eastern countries. This leads to thinking that a market for 400 000 t could be gained, mainly in Russia. It remains to know which producers will be best placed for this. Turkey seems to have a favourable position thanks to the comparative advantages mentioned above.

The prospects seem much more limited on a mature market such as Western Europe. Lemon consumption is by nature not very elastic. The acid level of the fruit limits it to two main uses: a food ingredient and a decorative feature to improve presentation (the slice of lemon decorating fish fillets for example). The market seems to be saturated in the developed countries as regards its use as an ingredient, especially as competition is increasingly fierce. Ready-prepared juices are an alternative whose strong points are convenience and duration of conservation. However, new uses probably exist in the 'presentation' category. The slice of lemon accompanying drinks such as lemonade and sparkling water is far from omnipresent, especially in fast food establishments. And the potential market is not ridiculous, given the millions of litres of fizzy drinks consumed each year.



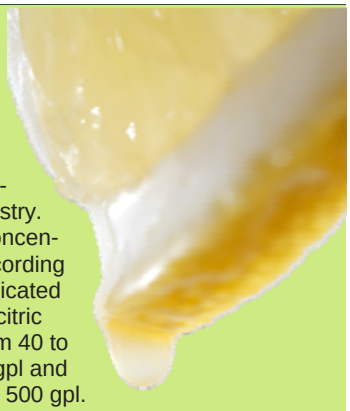
Segmentation of supply to increase value added

Another way of generating more profitability in the sector consists of increasing the value-added of products. Absence of pesticide residues seems to be a particularly relevant line for segmentation for a fruits whose peel is often used in presentation or as an ingredient. In addition, sales per fruits gives more latitude for increasing retail prices than sale by weight. Nevertheless, consumers in certain European countries seem to have found, wrongly or rightly, a product that meets their expectations—lemons with no post-harvest treatment. According to professionals, this market segment forms some 60 to 70% of sales in France. Likewise, the British market has shifted to no postharvest treatment in a big way and, unlike the French market, with no natural wax. But there still seems to be considerable room for growth in Germany, where the weight of discount chains means that the cheapest produce, that is to say with conventional treatment, is dominant. In this context, the European organic lemon market is peaking.

PGIs being examined

Among quality labels, Protected Geographical Indications seem to drawn a response from fresh lemon professionals. A project for setting

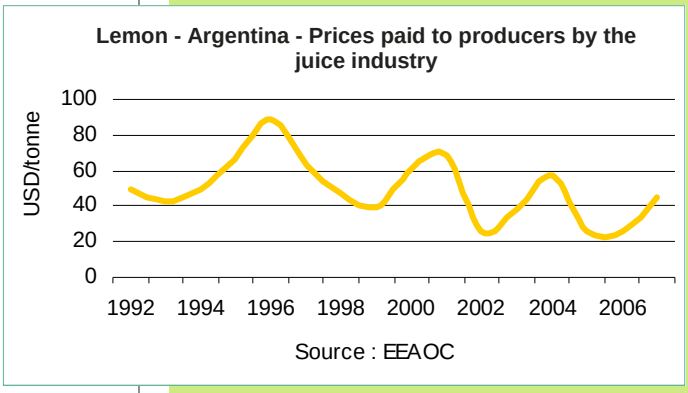
Industry



Concentrated juice is the main product manufactured by the industry. The degree of concentration varies according to the acidity, indicated by the weight of citric acid per litre: from 40 to 48° Brix for 400 gpl and 48 to 58° Brix for 500 gpl.
It can be pulped or clarified. Single juice (7 to 10° Brix) forms only a small part of production.

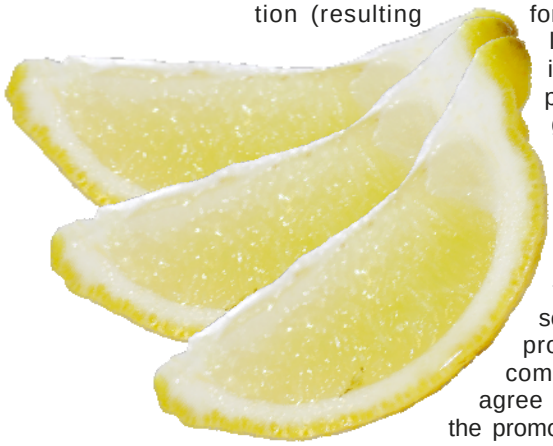
The other main co-products are essential oils extracted from the peel by mechanical scraping before juice extraction, and essences extracted from aromatic evaporation liquids. Deterpenation is performed to remove limonene and thus obtain high-quality oil with a high level of citral , the main component of lemon fragrance.

Dehydrated pulp is also used in industry for animal feed and the cells of dehydrated pulp are used in pulp beverage manufacture.



Photos © Régis Domergue

up this manner of segmentation of supply combining quality and origin is being examined by Ailimpo in Spain. The most powerful differentiation feature at the international level is probably not the 'production zone' aspect. Although a French consumer will immediately perceive the qualitative advantage of the very green grass of Normandy in the making of a Camembert, he will certainly not have such a clear perception of the advantages of the aridity of the Murcia region for the production of lemons with a crop management technique requiring less chemicals. However, such an approach will make it possible to impose a stricter technical specification (resulting for example in more limited use of fertiliser, one of the problems in the region) leading to an overall improvement in quality in the sector. Setting up this approach will also enhance the structure of the sector. Highlighting a production zone can come later, if growers agree on how to finance the promotion campaign that is necessary.



High quality lemon thanks to Californian 'curing'

The 'curing' technique used in California also increases value-added. Developed first and foremost for increasing fruit resistance to damage during transport, it also improves the appearance (smooth, thinner peel and brighter yellow colour) and increases the juice and acid contents. The procedure is simple, consisting of storage at 12.8 to 15.6°C and relative humidity of 75 to 85%. However, the main liming factor is treatment time. This is fairly long and hence expensive.

Seedless lemons: a must-have!

Another factor that could form a strong differentiation feature is the seedless character. However, this character that retail distributors seek vigorously is difficult to produce. One of the technical solution for achieving this is particularly difficult to put into practice: this is the total isolation of the crops from risks of cross-pollination with other citrus species. It is difficult except on an island or in a desert, as Moroccan growers have done with their 'Afourer' grown in very dry areas near Marrakesh. The other technical solution is to use specific cultivars. The Institute for Tropical and Subtropical Crops at the Agricultural Research Council in South Africa proposes a seedless triploid 'Eureka'. Similarly, the Alata Horticulture Institute in Turkey has bred three seedless varieties by bud irradiation ('Alata', 'Gulsen' and 'Uzun'). The cultivars are being evaluated and registered.

New industrial uses?

Synthetic vitamin C (E330), obtained by fermenting sorbose is widely used in the food industry as an acidifier in canning, as an antioxidant, etc.). Replacing it by lemon juice could create a new market with considerable potential. The nutritional advantages of the natural product could make up for its higher price. Although scientific knowledge of the question is still only partial, it seems that numerous factors may be involved in the bioavailability of vitamin C, that is to say the proportion of this constituent that truly has an effect in the body in comparison with the intake quantity. The effect of the matrix in which vitamin C is set is a primordial factor that comes into play in absorption

Seedless variety: Uzun

mechanisms. In addition, possible synergy between vitamin C and the other microcomponents (e.g. flavonoids such as hesperidin in the case of lemon) are also factors that can modulate vitamin C uptake. As an illustration, in a comparative study aimed at improving the vitamin C status of students whose average plasma level was 57 µmol/L, orange juice or vitamin C supplements were given to volunteers. Intake of 200 ml fresh orange juice (50 mg vitamin C) increased their plasma level to 75 µmol/L in 14 days, whereas the taking of 250 mg supplements did not increase plasma levels of vitamin C. A supplement cannot reproduce the complexity of a fruit and so the first feature to be favoured in terms of vitamin C intake is food (fruit, in particular citrus). The scale of the potential market justifies the performance of complementary studies focused specifically on lemon.

Necessary structural adjustments in countries where production costs are high

The basic structure of the market seems weaker than the very good performance of prices this season would seem to indicate. Fresh lemon consumption is down in Western Europe, Japan and the United States and growth of the international market is only assured by Eastern Europe. In addition, the profitability of industrial activity is not assured if the world harvest were to be normal. It is true that world production over long periods shows that adverse weather conditions occur on a cyclical basis. However, their impact will be increasingly limited in the light of the rate of increase of production in recent years. Furthermore, is it reasonable to base the profitability of an economic sector on such an uncertain factor?

Room for increasing business does exist for fresh lemon, juice and derived products. However, mobilising this potential is often a long process involving changes in production structure with the installation of seedless varieties, the adaptation of crop management sequences for PGIs, complementary studies, etc.

In the light of this, the return to profitability in the countries where production costs are high may well be both sudden and short-lived.

Spain, and probably Argentina too would seem obliged to implement a structural reform to recover lasting profitability and maintain their position as world leaders. The structuring of these sectors via inter-professional organisations such as Federcitrus in Argentina and Ailimpo in Spain is a major asset in handling this successfully. In its annual economic analysis bulletin, EEAOC, a regional research body in the province of Tucuman, observed a down ward trend in areas under lemon to the benefit of more profitable crops (cereals or sugar cane). Will this 'natural' adjustment suffice? The Spanish lemon sector is addressing the problem with awareness and courage. A large-scale reconversion plan for some 8 000 to 10 000 ha is being studied in Murcia. It will lead to necessary reductions in capacity of both packing stations and juice manufacturing units.

Although the present situation still seems favourable for Turkey, professionals should nevertheless examine the question of their competitiveness in the medium term. The very recent setting up of the National Citrus Board, grouping all the sector stakeholders, is a first step ■

Eric Imbert, Cirad
eric.imbert@cirad.fr

Photos © Régis Domergue

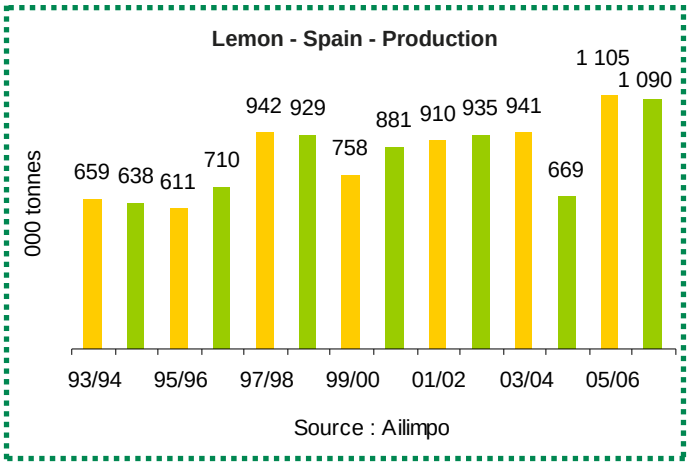
Producer country sheet

Lemon in Spain

The second largest producer in the world, Spain clearly dominates the international lemon trade. Shipping 450 000 to 500 000 t, the exporters in the Murcia-Alicante area control nearly a third of the volumes traded in the world and supply the Eastern and Western European markets during the winter season. The economic balance of the sector depends mainly on the fresh market and has suffered a serious over-production crisis since the beginning of the 2000s. The problems are the result of a decrease in consumption in the EU and increased competition from Argentina and Turkey.

Location of the plantations

The area under lemon totals about 45 000 ha, more than 90% of which is between the southernmost part of the province of Alicante and the centre of the province of Murcia, less than some 50 kilometres from the coast. Most of the plantations are around the city of Murcia (the 'Huerta tradicional ' of Murcia) and in the lower valleys of the rivers Segura (from Murcia to Almoradi) and Guadalentin (from Murcia to Almaha). The 'Campo de Cartagena' plantations complete production in the region. The climate is typically Mediterranean thanks to the rampart formed by the Baetic Cordillera. The very mild winters with minimum risk of frost are well-suited to this demanding crop. The aridity of the region (annual rainfall less than 100 mm) limits sanitary problems but means that irrigation is necessary (water from the Tagus is conveyed by a canal 400 km long). The rest of the Spanish lemon orchards are in Andalusia, in the Malaga and Almería regions where production structures are more modern. The number of small family type farms is tending to dwindle but this type of holding still accounts for a significant proportion of production, especially around Murcia.



Production

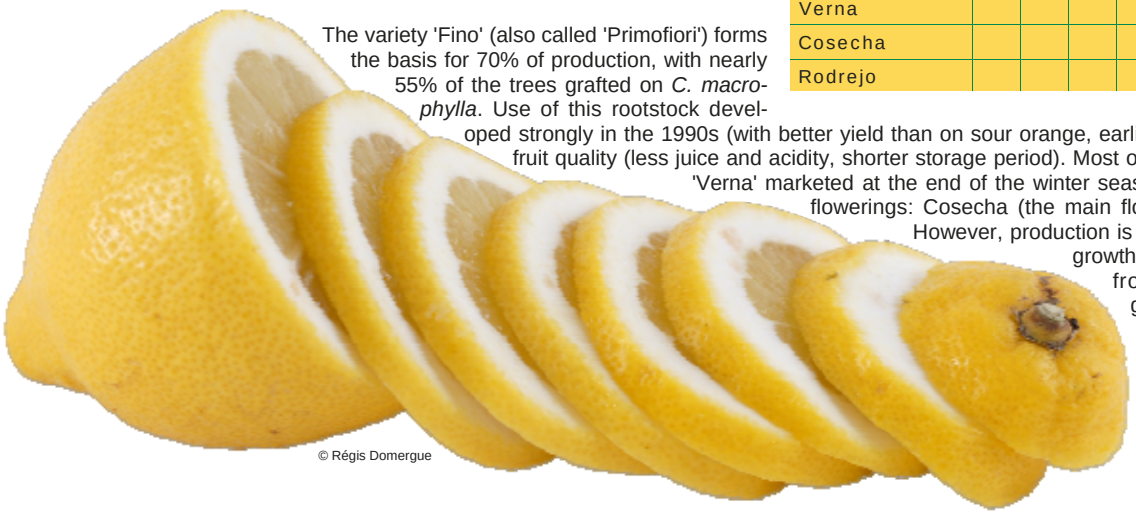
A traditional crop since the fifteenth century, lemons are one of the pillars of the economy of the region. A first production development move took place in the 1970s with the broadening of the varietal range. Increasing demand for fresh lemons from the Eastern European markets (especially Russia) generated another period of strong development from the mid-1990s, fed by the planting of very productive cultivars. However, increased competition from Turkey on these markets and from Argentina in the EU in the spring and autumn has limited outlets. The over-production crisis that has affected the sector since the early 2000s has taken the form of a social debate on the use of the increasingly scarce water resources in the region. A large-scale reconversion plan is being designed. The sector is supported by an interprofessional organisation, Ailimpo.

Lemon — Spain — Production calendar

	O	N	D	J	F	M	A	M	J	J	A	S
Primofiore/Fino	■	■	■	■	■							
Verna												
Cosecha						■	■	■	■	■	■	
Rodrejo												

Varieties

The variety 'Fino' (also called 'Primofiori') forms the basis for 70% of production, with nearly 55% of the trees grafted on *C. macrophylla*. Use of this rootstock developed strongly in the 1990s (with better yield than on sour orange, earlier fruit, etc.) in spite of the poorer fruit quality (less juice and acidity, shorter storage period). Most of the rest of production consists of 'Verna' marketed at the end of the winter season. The latter variety has several flowerings: Cosecha (the main flowering), Secundus and Rodrejo. However, production is tending to decrease in the face of growth of the more competitive 'Eureka' from Argentina. A long-term programme of research on a substitute variety has been launched. A few plantations of 'Eureka' are also found.


© Régis Domergue

Lemon - Spain - Outlets

Source: Ailimpo

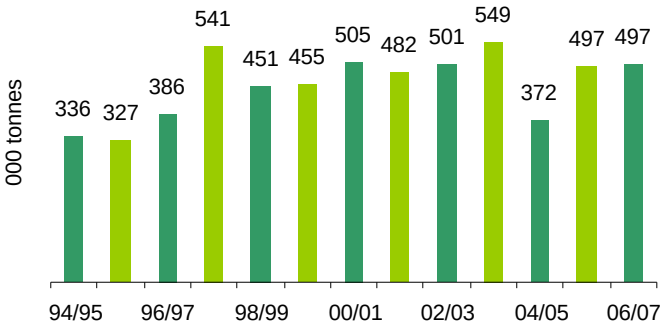
Outlets

The sector is focused mainly on the fresh lemon market. This takes more than 70% of the harvest used and provides most of the returns for producers. Exports form the main outlet with annual volumes of some 450 000 to 500 000 t. The local market represents about 180 000 t. With 9 or 10 average-sized units, the processing industry has developed total capacity of approximately 300 000 t. The volumes handled are very irregular (120 000 to 240 000 t in recent seasons) as this outlet is not very profitable and is abandoned by growers when the fresh fruit market is favourable. The end of the system of direct aid for processing from the EU may change the balance of power in the coming years. A large proportion of production has been lost in recent years for lack of a market (more than 200 000 t in 2005-06 and 2006-07).

Exports

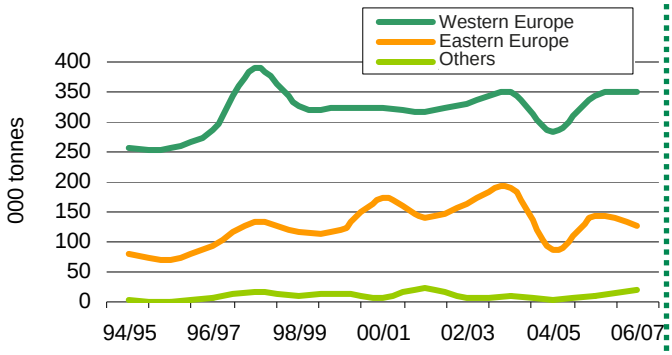
Exports grew strongly in the 1990s with the joint growth of the EU market and then that of the Eastern European markets from the middle of decade onwards. This period of development finished at the end of the 1990s. One the one hand, competition from Argentina had increased in the EU, resulting in difficulties in the sale of 'Verna', which had difficulty competing with 'Eureka' from South America and postponing the beginning of the 'Fino' season. On the other, the growth of shipments to the Eastern European markets weakened. The intensification of Turkish competition led to a decrease in shipments to these destinations from 2004-05 onwards and serious sector fragility. The export sector is very scattered, with about a hundred packing stations of significant size, eight of which handle about 50% of shipments. It is dominated by private enterprises, with the cooperative sector handling only 10 to 12% of the volumes. The anchorage of exporters in production is developing but is still limited, with three-quarters of supply purchased from independent growers via a middleman, the corredor. In the summer, Spanish packers handle a proportion of the fruits shipped to the EU from Argentina in a category management approach aimed at rationalising costs and service to customers

Lemon - Spain - Exports



Source : Ailimpo

Lemon - Spain - Exports by destination



Source : Ailimpo

© Régis Domergue

Logistics

The EU markets are supplied by road only. A proportion of the volumes transit via the Saint Charles platform near Perpignan in France. However, most of the fruits are shipped to the final client. It takes about three days to supply destinations in the United Kingdom.

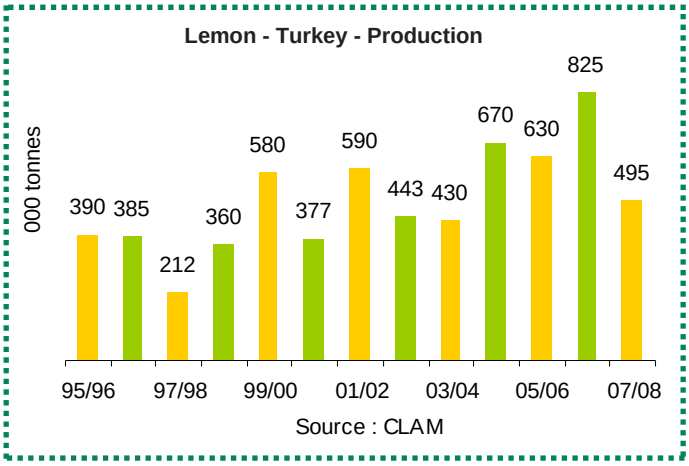
Producer country sheet

Lemon in Turkey

In a little more than a decade, Turkey has become the third largest lemon producing country in the world and one of the leading players in world trade in this fruit. Concentrated in the province of Mersin in the eastern Mediterranean region, exporters have succeeded in profiting from their advantages in closeness to markets and business organisation to make the most of the strong increase in demand for winter lemons on Eastern European markets.

Location of the plantations

About 70% of the total of 20 000 hectares of plantations is concentrated in the Mersin region in south-east Turkey. The farms are on a narrow coastal strip about 60 km long between Mersin and Silifke. The climate is typically Mediterranean as the Taurus mountains form protection against cold northern weather. The availability of water varies according to the plantation but is generally sufficient (average rainfall is about 600 to 700 mm) and winters are mild and less frosty than in the neighbouring zones. The plantation area seems to have stabilised in the last few years and is tending to shift away from the coast as a result of urban pressure and become concentrated further inland (pioneer crops on terraces on embankments in the foothills of the Taurus). The rest of the plantations are centred in the Antalya region (around Antalya and Alanya) and on the Aegean coast between Izmir and Mugla.



Production

This traditional crop developed very slowly until the mid-1990s, when the harvest was about 450 000 t. After the 1997-98 season marked by severe frost, growth increased markedly with the strong increase in demand in the Eastern European countries. Production exceeded 800 000 t in 2006-07 (according to the Turkish statistical institute, production was 710 401 tonnes in 2006) before frost hit again, damaging the 2007-08 harvest. The sector is very scattered and little structured and producers' organisations have had little power so far. Farms are generally very small, averaging less than one hectare, and have a low technical level on the coastal strip where farmers also grow other crops (vegetables and temperate fruits). The technical level is higher and orchards are larger north of Mersin, a region more specialised in growing 'Interdonato'. The main phytosanitary problems are mal secco, Phytophthora and mites.


© Eric Imbert

Lemon — Turkey — Production calendar

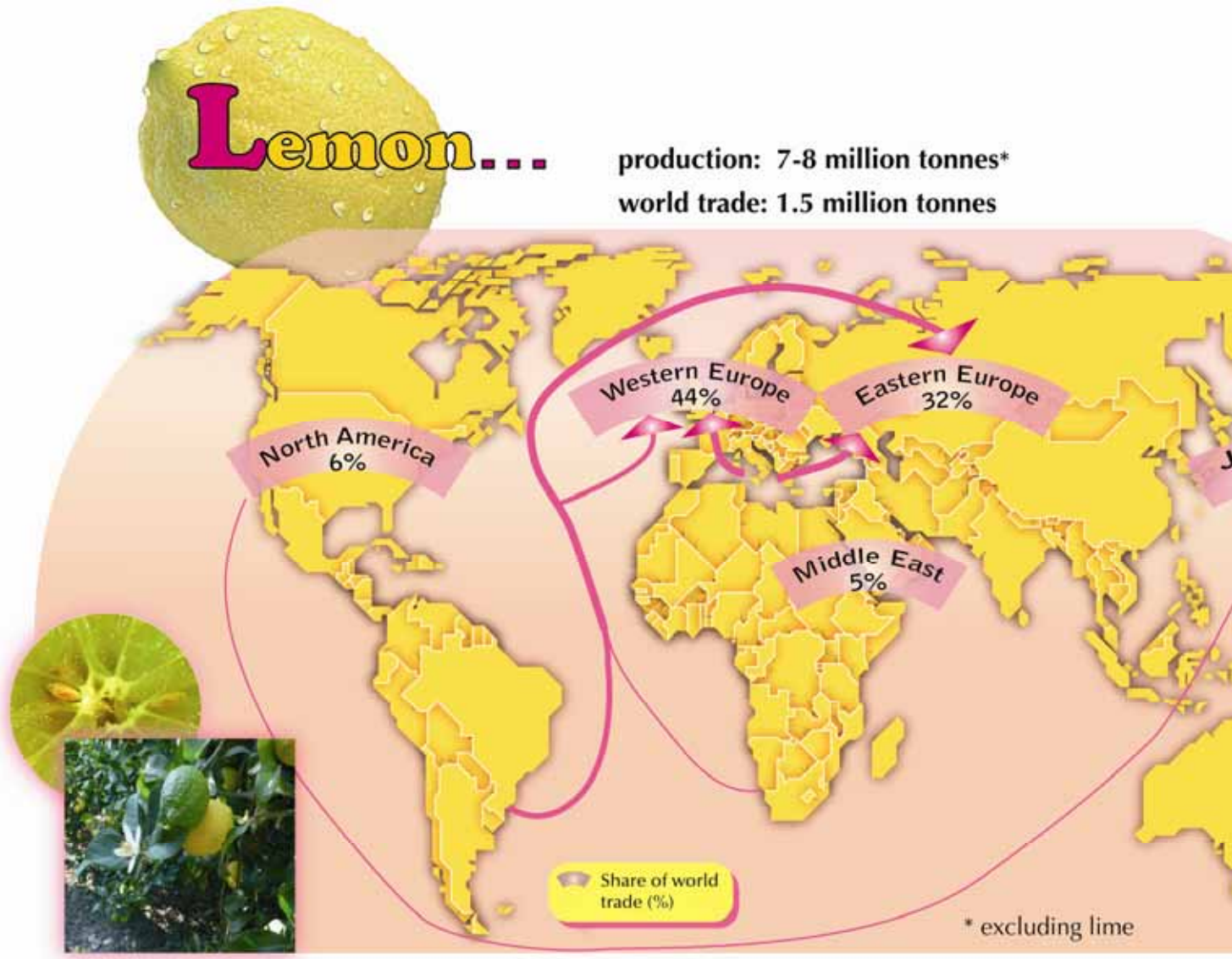
	S	O	N	D	J	F	M	A	M	J	J	A
Interdonato												
Lamas												

Stored fruit

Varieties

About 60% of production consists of 'Kütdiken' and its clones. There is only one flowering and the harvest must be finished before the coldest part of the winter because of the frost risk. However, sales continue until August as the fruits are stored in natural caves in the Urgup region. 'Interdonato', an early variety harvested before the winter, is mainly planted in zones exposed to frost north of Mersin. It forms about 25% of total production. Other varieties are grown such as 'Lamas', 'Yediveren', 'Meyer', 'Molla Mehmet' and 'Italian Memeli'.

contd. on page 26



Lemon — United States imports

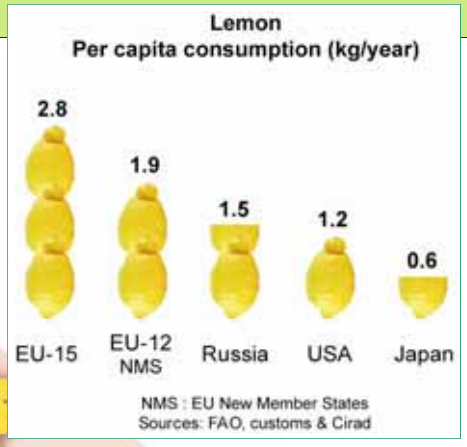
tonnes	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Total, incl.	**22 016**	**22 865**	**25 670**	**33 697**	**33 108**	**27 629**	**34 635**	**34 656**	**34 730**	**66 460**
S. Hemisphere	**5 848**	**8 047**	**14 484**	**24 349**	**11 181**	**15 704**	**19 988**	**20 660**	**15 727**	**27 688**
Chile	5 848	7 896	6 892	6 796	10 719	14 136	19 324	20 295	15 709	27 591
Argentina	0	0	7 314	17 552	0	0	0	0	0	0
Australia	0	148	231	0	77	35	216	19	7	97
South Africa	0	3	47	0	385	1 534	448	347	12	0
N. Hemisphere	**16 168**	**14 819**	**11 186**	**9 348**	**21 927**	**11 925**	**14 647**	**13 996**	**19 003**	**38 771**
Mexico	417	248	374	389	1 028	2 116	9 025	12 250	12 423	21 854
Spain	12 391	8 464	9 151	4 536	19 827	5 265	3 693	977	6 242	15 230
Turkey	0	3	22	1	0	25	8	9	19	906
Bahamas	3 238	5 740	1 315	4 209	826	4 035	1 272	388	0	0
Dom. Rep.	122	360	240	188	224	278	458	231	302	364
Italy	0	4	11	22	0	39	17	3	1	417
Cyprus	0	0	0	0	22	167	141	109	0	0
Israel	0	0	72	5	0	0	34	29	16	0

Source: US customs (code 0805302000 then 0805502000)

Lemon — Japanese imports

tonnes	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total, incl.	**92 063**	**87 497**	**85 630**	**84 578**	**91 655**	**84 321**	**88 193**	**87 974**	**82 536**	**76 686**	**73 086**	**60 864**
United States	86 652	78 184	76 755	72 614	73 881	65 227	65 017	62 699	56 969	54 445	51 964	37 397
Chile	1 129	3 027	4 560	5 841	10 713	13 016	14 969	13 954	14 396	13 498	16 426	18 579
South Africa	1 266	3 720	1 713	2 645	4 720	3 035	4 141	8 438	7 733	6 858	3 140	2 675
New Zealand	160	364	648	1 037	834	1 063	1 591	919	825	979	1 160	1 316
Argentina	0	0	0	0	0	0	0	701	2 287	839	385	339
Australia	2 852	2 174	1 920	2 193	1 286	1 864	2 267	1 264	206	34	8	306
Mexico	3	17	16	0	0	0	0	0	120	0	0	197
Spain	0	0	17	248	220	99	207	0	0	0	0	44
China	0	0	0	0	0	0	0	0	0	1	1	10

Source: Japanese customs (code 080530010 then 080550010)

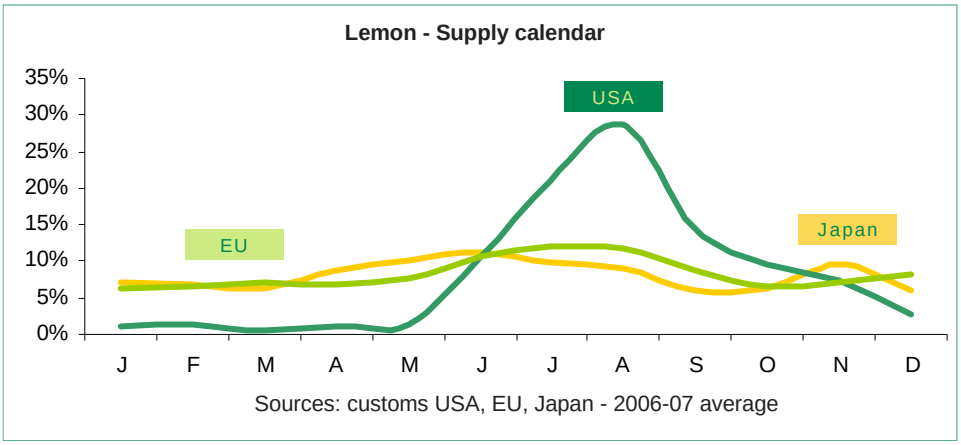


Lemon World production*	
2007	tonnes
World (lemon)	**6 815 000**
Argentina	1 500 000
Spain	1 090 000
Turkey	825 100
United States	637 800
Iran	615 093
Italy	582 577
Egypt	334 400
South Africa	191 650
Chile	167 000
Lebanon	113 200
World (Lemon & lime)	**2 400 800**
India	1 617 800
China	783 000

Lemon World exports	
2007	tonnes
World	**1 555**
Spain	497
Argentina	355
Turkey	328
United States	116
South Africa	100
Italy	39
Chile	47
Egypt	23
Uruguay	14
India	11
Jordan	7
Cyprus	6
China	4
Iran	4
Malaysia	4

Lemon World imports	
2007	tonnes
World	**1 555**
EU-27, of which	745
France	104
Germany	99
Netherlands	88
Italy	84
Poland	84
Russia	214
Japan	61
Canada	56
Ukraine	53
United States	35
Saudi Arabia	31
China	30
Serbia	21
United Arab Em.	19

* Production of lemon and lime not separated in statistics of certain countries / Sources: FAO, customs EU, USA, Japan

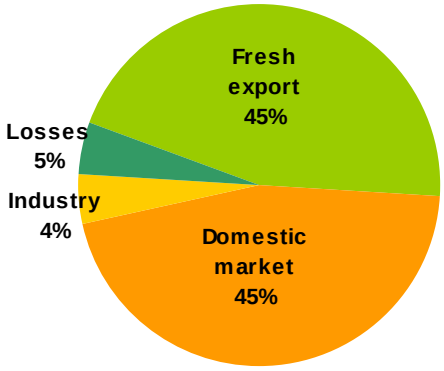


Lemon — EU-25 — Main supplying countries

tonnes	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Total, incl.	**523 779**	**534 048**	**530 947**	**588 557**	**588 661**	**594 714**	**784 585**	**754 117**	**744 999**
Winter lemon season	**383 291**	**392 483**	**366 773**	**414 611**	**356 857**	**373 332**	**472 970**	**511 974**	**490 820**
Spain	322 566	317 081	315 139	355 310	316 765	329 262	332 070	407 723	380 401
Turkey	30 624	39 360	13 652	30 979	10 565	14 207	85 641	62 151	61 002
Italy	18 106	21 673	26 361	20 563	19 188	21 993	40 339	34 339	41 906
Greece	6 037	6 306	4 742	1 953	4 346	2 655	2 043	1 936	2 667
Cyprus	5 368	7 432	6 543	5 427	4 791	4 626	7 447	3 700	2 562
Egypt	22	220	22	96	272	350	1 501	904	841
Portugal	58	196	186	180	312	87	1 031	536	731
Israel	88	82	0	40	369	66	1 984	615	391
United States	337	54	19	16	104	47	569	0	190
Morocco	71	62	42	28	127	40	64	2	82
Iran	14	17	60	13	13		49	60	38
Tunisia	1	0	7	4	5	0	232	8	9
Summer lemon season	**140 489**	**141 565**	**164 174**	**173 947**	**231 804**	**221 382**	**311 615**	**242 143**	**254 179**
Argentina	119 936	115 644	129 132	145 179	199 267	175 851	249 449	185 303	214 316
South Africa	10 873	18 531	22 824	22 528	23 519	35 005	46 571	42 466	30 313
Uruguay	8 757	6 473	11 382	5 362	7 584	9 256	13 512	11 983	9 265
Chile	22	21	100	3	414	198	95	25	187
Brazil	2	36	116	95	386	848	1 573	2 366	96
Zimbabwe	899	861	620	779	636	225	415	0	2

Note: EU-15 until 2003-04 then EU-25 / Source: Eurostat (code 08053010, then 08055010 from 2002-03)

Lemon - Turkey - Outlets



Source: CLAM

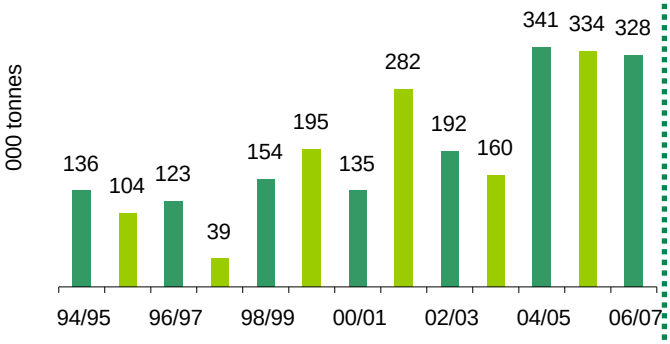
Outlets

Practically the whole of crop is sold on the fresh lemon market as there are no large juice production units in Turkey. Exports form the main outlet, accounting for more than 300 000 t. The domestic market, taking mainly large fruits, is growing, in particular in the Istanbul region and near the sea of Marmara where the standard of living is rising rapidly.

Exports

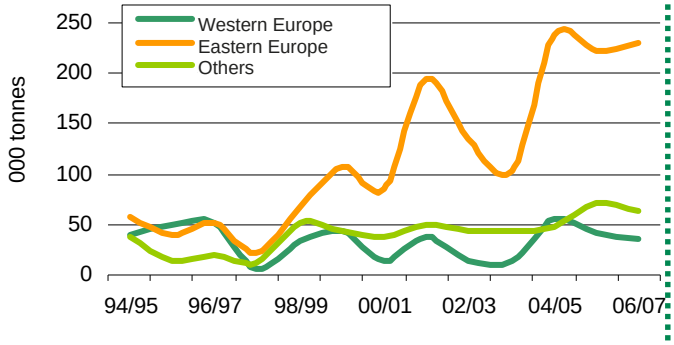
Exports have rocketed since the last part of the 1990s, increasing from 120 000-130 000 t to 330 000-340 000 t in recent seasons. Turkish professionals have succeeded in profiting from the strong demand in the Eastern European countries for reasons of the proximity of the latter and downstream integration which, in particular, makes payment secure. The main markets in this zone that takes nearly 70% of Turkish lemon exports are those of Russia, Ukraine and Romania. Western Europe, where quality and traceability requirements are greater, is now only a secondary outlet used mainly between the end of the summer season and the start of the Spanish season. Shipments to other destinations are very limited, except for those to Saudi Arabia. With rare exceptions, exporters do not have their own plantations and buy fruits on a contract or spot basis from independent growers. The sector receives increasingly limited incentives from the government (about USD70 per tonne in 2006 according to USDA, in the form of exoneration from various taxes). Representation at the international level is handled by the AKIB, the fruit and vegetable coordinator for the union of exporters.

Lemon - Turkey - Exports



Source : CLAM

Lemon - Turkey - Exports by destination



Source : CLAM

© Eric Imbert

Logistics

The fruits for Russia and Ukraine first travel by road to the Black Sea ports (Sinop, Zonguldak and Bartin). They are then loaded for shipping to Novorossiysk (Russia), Odessa or Ilichevsk (Ukraine). Average transport time to the two countries is six days. The other countries in eastern and central Europe are supplied by road (Bulgaria, Romania, Hungary, Slovakia, Poland and the Baltic countries). The fruits for the western part of the EU are also exported mainly by road (80% in 2005-06) using several routes via central Europe and Italy. Average transport time is six days. Shipment by sea alone concerns only 20% of export volumes. The fruits are loaded in the ports of Mersin and Iskenderun and shipped to the Mediterranean ports (Marseilles) or more commonly to the United Kingdom (Thamesport and Sheerness) or northern Europe (Antwerp and Rotterdam).

Lemon — Turkey — Sea freight

Port of departure	Port of arrival	Shipping time
Mersin, Iskenderun	Sheerness, Rotterdam, Antwerp	nearly 16 days

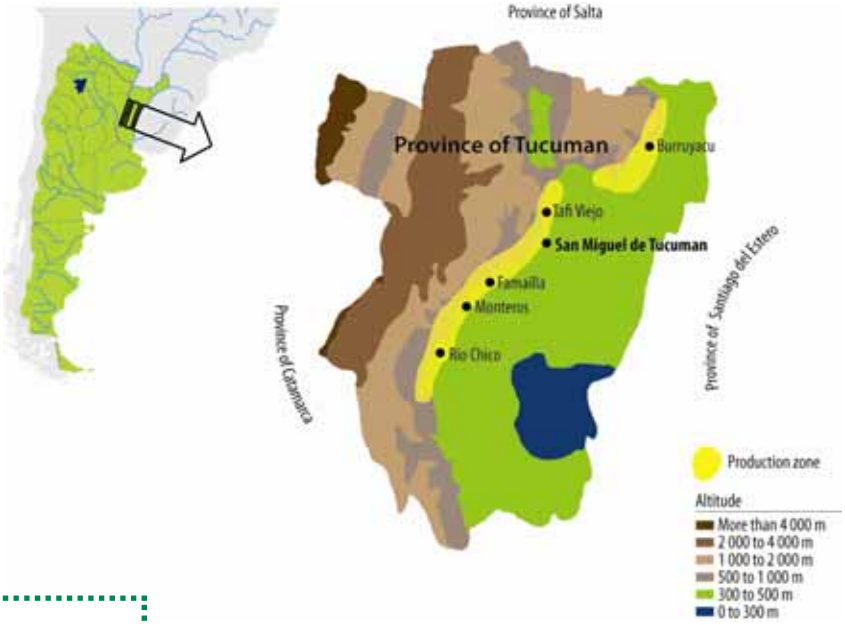
Producer country sheet

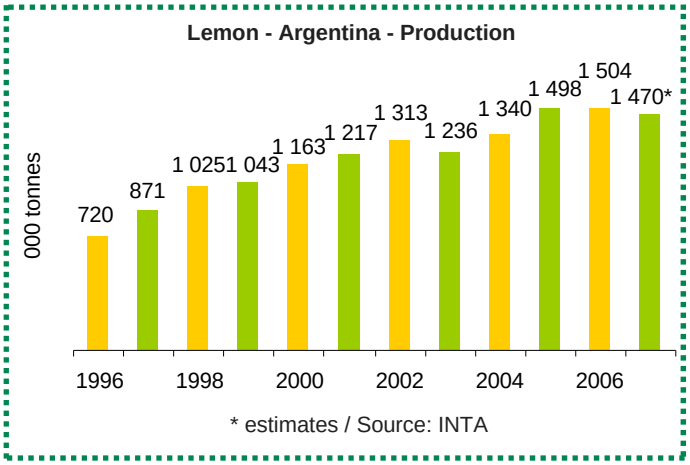
Lemon in Argentina

Argentina dominates world lemon production with a harvest exceeding 1.3 million tonnes. Historically specialised in the manufacture of juice and derivatives, the sector has played a preponderant role in fresh lemon supplies for the northern hemisphere in the summer since the mid-1990s. However, increased production cost resulting in particular from the appearance of citrus canker, the decrease in the profitability of the lemon industry and the slowing of world demand for fresh lemon has made the sector fragile.

Location of the plantations

Argentinian lemon plantations total 42 000 ha mainly concentrated in the province of Tucuman in the north-west of the country. The two main production centres are on a narrow strip of the foothills of the Sierras de Burruyacu and the Aconquija (between Tafi Viejo and the recent more southerly orchards running as far as the Rio Chico). The microclimate of the area precludes the serious risk of frost in the plains further east and more difficult topography to the west. Furthermore, rainfall is fairly satisfactory (800 to 1 500 mm) although irrigation is necessary to achieve satisfactory yields. The rest of the area under lemon is equally distributed between other provinces in the north-west (Jujuy and Salta) and the fringe in the extreme north-east of the country between Misiones and Entre Rios. However, yields are smaller there. Commercial plantations are dominant.





Production

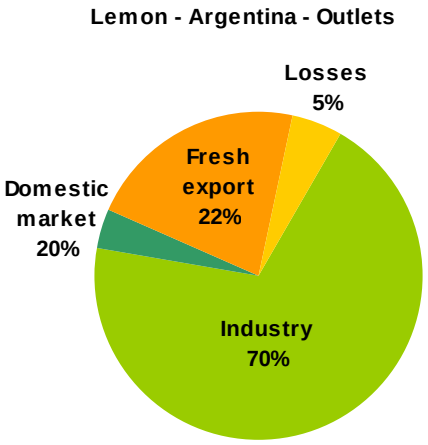
Introduced in the province of Tucuman by Spanish and Italian immigrants at the beginning of the twentieth century, lemon-growing first developed after the appearance of tristeza in the mid-1940s at the expense of the other citrus fruits that are more susceptible to the disease. However, the sector really only got off the ground at the end of the 1960s following the slump in the sugar sector. Production increased slowly but steadily until the end of the 1980s. It accelerated distinctly at the beginning of the 1990s with the signing of contracts for the supply of concentrated juice and essential oils between foreign multinationals in the beverages sector and a proportion of growers. The extremely rapid increase in production resulted in a strong decrease in profitability from the mid-1990s onwards, encouraging producers to diversify their outlets by exporting fresh lemons to Europe. The economic balance of the sector has become even more fragile since the early 2000s. On the one hand, production costs have increased strongly, in particular as a result of the additional costs of prophylactic measures and spraying to control citrus canker, detected in 2002. On the other, the stabilising of demand for fresh fruits and the strong decrease in juice prices since the beginning of the decade caused a decrease in economic returns until 2007, when a conjunctural increase occurred. In this context of over-production, the areas devoted to lemon have stabilised or are decreasing.

Production calendar and varieties

Production is based on four main varieties. 'Eureka' is grown on approximately 35% of the area, 'Limoneira' and 'Lisbon' on 25% and 'Genova' on 11%. Production is staggered thanks to four flowerings of variable intensity. The main harvest is from May to September (winter picking: approximately 70% of production). However, the export season can start in March with the crudo (about 15% of production). The fruits resulting from the other flowerings are sold on the domestic market.

Lemon — Argentina — Production calendar

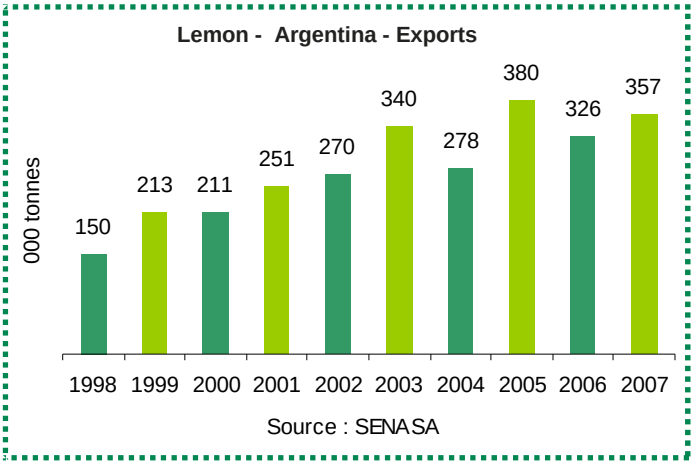
	M	A	M	J	J	A	S
Eureka and others							



Source: Federcitrus

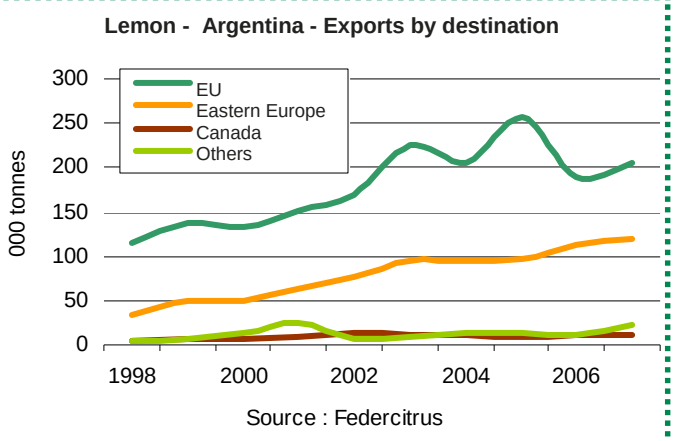
Outlets

Argentina is the world's leading producer of lemon juice and derivatives. The outlet is in leading position and handles 70% of production. Five very large companies process a total of approximately a million tonnes of lemons each year. However, the economic profitability of the sector is based increasingly on fresh fruits after the strong decrease in the price of concentrate in recent years. Exports thus account for an increasing proportion of production. Domestic consumption has stabilised at 60 000 t in a country with a population of 40 million.



Total exports

Exports rocketed in the 1990s with the emergence of a summer lemon market in the European Union and then in Eastern Europe. Shipments totalled less than 50 000 t at the end of the 1980s and reached 340 000 t in 2003. Growth has since slowed. Firstly, consumption is increasingly more slowly than before in Eastern Europe. Secondly, and above all, exports to the EU are tending to decrease in spite of the enlargement, if the conjunctural increase resulting from frost in Spain in 2005 is excluded. Holland is still a major point of entry but shipments to the producing countries in southern Europe have increased markedly since the beginning of the 2000s with a category management approach. Italy is tending to edge ahead of Spain, with Greece still receiving large quantities. Shipments to destinations outside Europe form less than 10% of total exports (Canada, Hong Kong, etc.). The Japanese market has opened up but the sanitary protocol is very strict. The US market has been closed since the early 2000s but should reopen in 2009. Only fruits from plantations approved by the SENASA and monitored by the latter from the plantation to the port of shipment are eligible for export. Argentina has about 60 export companies but the seven largest account for 75% of shipments (with the three leading companies handling 50%).



Logistics

As a rule, the fruits to be shipped to Europe are taken by refrigerated road transport to Campana on the river Parana some 1 200 km from Tucuman. They are then usually loaded on conventional ships and reach the ports in the northern part of the EU (Rotterdam and Antwerp) after 15 to 20 days at sea. The route is similar for Eastern Europe. The volumes for markets in the Far East and Canada are containerised and generally shipped from the port of Buenos Aires. Significant volumes are also shipped from the ports of San Pedro and Zarate.

Lemon — Argentina — Sea freight

Port of departure	Port of arrival	Shipping time
Buenos Aires, Campana	Rotterdam	17 to 19 days
	St Petersburg	20 to 22 days
	Black Sea	19 to 20 days


© Régis Domergue

Lemon cultivation

by Henri Vannière

The absence of ancestral lemon trees in the foothills of the Himalayas (in south-west China and north-east India), where the citron originated, makes accurate locating of the zone of origin of lemon impossible. Like many citrus species, they migrated westward over the centuries, associated with the history of human activities, via Persia and Middle East before reaching the Mediterranean area. The cultivation of lemons started in the second millennium BC in the Mediterranean, first following the Arab conquests on the southern shores of the sea and in the south of the Iberian Peninsula and subsequently, under the influence of the crusaders, in Italy and on the northern shores of the Mediterranean.

General features

Lemon, *Citrus limon* Burm. f., has a special place among citrus fruits. Together with the limes *Citrus aurantifolia* and *Citrus latifolia* and citron, *Citrus medica*, to mention only the best-known edible species, they form a group of sour citrus fruits. All have certain common features:

- greater susceptibility to cold in comparison with mandarin, orange, shaddock and grapefruit;
- purple flower buds and young leaf shoots, resulting from anthocyanin pigments in tissues, and multiple staggered flowering during the vegetative season. A picking date corresponds to each flowering. For this reason, lemon trees are referred to as being everbearing;
- great susceptibility to parasite attacks caused by *Phytophthora*.

Lemon is a hybrid citrus with citron as the male parent and sour orange as the female parent. Sour orange is in turn a hybrid between shaddock and mandarin.

© Eric Imbert

© Régis Domergue

Description of the plant

Lemon is a vigorous tree with large lanceolate pale green leaves. The petiole is short, articulated, unwinged and simply marginated. The young leaf shoots are flushed with purple. The leaf laminae contain essential oil glands whose oil has a characteristic aroma. The flowers are in blossom clusters. The buds are also purple. Flowers may be male in some cases as a result of aborted pistils. This phenomenon varies strongly from one flowering to another and from one season to another. The everbearing character is more or less marked according to the variety.

The oval fruit often has a very characteristic nipple. Lemon peel is slightly coarser than that of limes and surface irregularities—slight grooves or small ridges—can be seen. The peel clings strongly. The epidermis contains numerous glands that produce oil with very characteristic aroma. The pulp is pale yellow, contrasting distinctly with lime, whose pulp is always greenish.

Fruits from the same tree often differ in shape and appearance both during the same production cycle and from one season to the next. As the main varieties are fairly similar, the characteristics of the plant are used in addition to those of the fruits in order to distinguish between them visually. Features are habit, colour of the foliage, flowering behaviour, dates of the main harvests, susceptibility to diseases, etc.

Effects of climate

The two fruit species lemon and lime are fairly close. Their respective climatic requirements differ in certain respects and in particular in behaviour with regard to temperature. They are particularly sensitive to cold—lime more than lemon, strongly limiting its cultivation in more northern zones like the Mediterranean region. Lime is better adapted to higher temperatures, or large fluctuations during a day. Lime trees are fairly plentiful in Sahel and semi-desert zones whereas lemons are more sensitive ro very high temperatures and are much more rare or not present at all. Overall, lime is more suited to dry and humid tropical climates while lemon prefers Mediterranean types climates and more specifically the more temperate coastal zones. In addition to biotic constraints (pests and diseases), these differences in adaptation to climatic constraints go a long way towards explaining the world distribution of the cultivation areas of the two species.

The effect of temperature on fruit peel colour is well known. The two species react in a similar manner. A Mediterranean climate features schematically high summer temperatures combined with dry atmosphere and low winter temperatures, often not if at all affected by frost, combined with a more humid atmosphere. Under these conditions, the pigmentation of the fruits changes at the end of the growth cycle. Chlorophyll pigments disappear, revealing the yellow colour. In a tropical climate, the absence of a fall in temperature moderates or even inhibits this phenomenon. The fruits remain green for longer and the green is intense.

Lemon growing is suited to regions with no climatic extremes. Citrus zones where the temperature can fall to – 4°C are unsuitable as lemon is less resistant to cold than other citrus.

Humid tropical conditions are unfavourable for lemon, mainly because:

- it has great susceptibility to the fungal diseases strongly present in these environments;
- growth and vegetative growth are exuberant;
- the fruits grow too large and they do not match market requirements.


© Eric Imbert

Lemon is well suited to subtropical climates that are both warm and comparatively dry. Most lemon production is in these regions—in coastal areas in the southern and eastern Mediterranean (Sicily, southern Spain, Greece, Turkey, etc.), the coast of southern California and semi-tropical foothill zones (e.g. the lower Himalayas and Andes). The everbearing character of lemon is at its maximum in these areas and production is possible for a very large part of the year. However, successive flowerings do not have the same intensity and each results in a specific type of lemon. The Italians identify four according to harvesting dates:

- primofiori from September to November;
- limoni from December to May;
- bianchetti from April to June;
- verdelli from June to September.

Forcing lemons

In a Mediterranean climate, the trees with the most marked everbearing feature can flower four times in succession in the same year:

- in March, when there are generally few flowers; the lemons are ready in October or in September with the earliest varieties;
- from the end of March to early June, often abundant flowering with the largest harvest from November to the end of May for a classic variety;
- at the end of June, a small flowering giving lemons that reach maturity a year later;
- in August-September, for the fruits harvested in the following summer; these are known as verdelli because of the slight greenishness of the peel.

Without human intervention and without exceptional external constraint, the second flowering period is generally the most intense. The resulting fruits thus form the great majority of the fruits harvested.

Sicilian growers were the first to use special lemon management techniques to amplify the intensity of certain waves of flowering and thus achieve a marked staggering of harvest dates. The technique is known as forcing. It can only be attempted successfully with everbearing varieties. An important part of the technique is the good water management of the trees with the gradual drying of the soil and then a planned recovery with watering. Light, sandy shallow soils are the most suitable. Tillage is performed in the spring to enhance evaporation. No other cultural operation is performed and, above all, irrigation is halted completely.

The trees suffer the effects of drying and display the distinct beginnings of wilt throughout the spring until early summer. Pruning is carried out in early August and chemical fertiliser applied. This is followed by a partial return to irrigation with half-doses in one row in two. These practices result in a moderate recovery of vegetation followed by abundant flowering in September. The end-of-summer flowering gives the verdelli lemons picked during the following summer. The technique is traumatic for the lemon trees and so it is advised that it should only be applied to trees in good vegetative condition and to alternate in the same plantation to achieve at least one rotation every four years. The degree of water stress can be modulated to allow for the intensity of the everbearing character of a cultivar; those that reflower more readily require less severe stress.

Storage

Lemon is the citrus fruit that keeps best. Given the sensitivity of the fruits to low temperatures, they cannot be stored at less than 10°C. In practice, depending on the varieties and the development of maturity, storage temperatures range from 12 to 14°C, with relative humidity of between 90 and 95% to keep weight loss to a minimum. The air is replaced regularly to prevent any accumulation of CO2 and ethylene that would cause a bad taste, peel ageing and an increase in rots.

Storage duration depends greatly on the colour of the epidermis. Lemons with very green peel keep longer—for about six months. Those with intense yellow peel will not keep for long—for a few days to one or two weeks.

During extended storage under optimum conditions lemons undergo changes in appearance and composition that are often beneficial for their quality. Lemons are picked mainly according to their size, regardless of peel colour or internal quality. Sorting according to colour gives homogeneous batches. When placed in chambers with controlled temperature and humidity (temperature from 12.8 to 15.6°C and relative humidity 75 to 85%), the fruits can be kept for several months, and all the longer if the peel is green. During storage, the lemons undergo a kind of curing, with their characteristics evolving well:

- gradual yellowing of the peel,
- marked increase in juice content (as much as + 16%) and acidity (as much as + 24%),
- the rind becomes thinner,
- the epidermis firms, becoming less susceptible to postharvest fungal attacks.

This feature has been used in certain citrus growing regions to manage the flows released on to the market. Modern equipment is used in California and systems of natural caves in Turkey for example.

© Eric Imbert

The main lemon varieties

‘Eureka’ (American origin)

A variety bred in 1858 in Los Angeles, California, from a population of lemons grown from seed. The seeds were from lemons imported from Italy and were probably of the 'Lunario' variety. The tree is vigorous and not very thorny. The medium-sized fruits vary in shape from elliptic to oblong (elongated). They generally possess a short neck at the stalk base and a short apical nipple surrounded by a depression. The nipple is sometimes larger. The pulp is yellow at maturity, fine, juicy, acid and aromatic. The fruit contains few pips. The tree is everbearing, with three or four flowerings a year. Local climatic conditions strongly affect the intensity of the flowerings and hence the size of the different harvests. Although 'Eureka' trees bear fruit all the year round, production is mainly at the end of the winter and in early spring.

‘Lisbon’ (American origin)

A variety thought to have selected from sown plants of the Portuguese variety 'Gallego' and grown in California from the mid-nineteenth century onwards. The trees are very vigorous and thorny and more resistant to unfavourable conditions (heat, cold, wind and lack of care) than the other lemon trees. Buried in the vegetation, the fruits are well protected from adverse conditions such as sun, wind, etc. The fruits are of average size and vary in shape from elliptical to oblong (elongated). They have a small neck at the stalk end and a base nipple surrounded by a slight irregular depression that is more marked on one side. The pulp is very juicy, very acid and yellow at maturity. The fruits have medium seed content. The rind is of average thickness and clinging. The surface has fine markings, is slightly rough with very little ridging. The depression and nipple are often larger than in 'Eureka' and the epidermis is smoother and less ridged. 'Lisbon' trees have an erect habit and are very productive with only a slight everbearing character (a dominant main flowering). Harvesting is generally carried out from mid-autumn to mid-winter.

‘Feminello’ (Italian origin)

'Feminello' lemons form most of Italian production. The fruits are medium-sized, elliptical to oblong with a neck and a nipple varying in size. The rind is medium thick and very clinging. The peel is finely marked and moderately smooth with depressed oil glands. It is yellow when the fruit is ripe. The yellowish pulp is very juicy and strongly acid. Trees display average vigour, are only very slightly thorny and bear very heavily with harvesting staggered throughout the year. This group of lemon trees with a very marked everbearing character is well suited to the forcing technique. The lemons picked are called *primofiori* in the autumn, *limoni* in the winter and *verdelli* in the summer.

‘Interdonato’ (Italian origin)

This Italian cultivar is a natural lemon x citron hybrid identified in 1875 at Nizza in Sicily. It possesses advantageous resistance to mal secco and is an early variety. The trees display average vigour and production and are practically thorn less. The variety is not suitable for forcing. Although similar to the other lemon varieties, 'Interdonato' differs in that the fruit is larger, with smoother, finer rind and fewer segments and seeds. The internal qualities differ too as the fruit is less juicy and less acid. It is little grown in Italy, where it originated, but is has a special position in Turkey where its earliness and resistance to mal secco are appreciated. The fruits are sold rapidly after picking for reasons of the under-supply of the market in September and October.

‘Kütdiken’ (Turkish origin)

This Turkish lemon is probably of Italian origin. It is close to the 'Feminello' and 'Eureka' type everbearing lemon trees and the fruits are similar. The main variety grown in Turkey, it is an autumn variety picked from November onwards after 'Interdonato'. It is suitable for storage for up to nine months. Its main handicap is its susceptibility to mal secco.

'Verna' (Spanish origin)

This Spanish variety of unknown origin forms most of the lemon plantations in Spain but is little grown in other countries. The trees are vigorous and hardly or not at all thorny. They possess the everbearing character. Distinction is made between two harvest periods with fruits of different characteristics: cosecha for the harvest period from the end of February to early July and rodrejos or verdelli for those of the second period covering the whole summer. The fruits given by the second flowering are not quite as good. However, this potential second harvest makes it possible to release fruits when the market is under-supplied. The fruits have a more or less marked neck at the stalk end and prominent nipple at the base. The peel is slightly rough with tiny deformations. The juice content is good and the fruits have few seeds or none at all. The fruits keep well on the trees. Fruiting is marked by a few problems of alternate bearing.

Fino (Spanish origin)

(synonyms: 'Mesero', 'Blanco', 'Primofiori')

This variety is said to have originated from a seed of Limón Común de la Vega del río Segura. The tree is vigorous and tends to display thorny shoots. The fruits are slightly smaller than those of 'Verna', with no neck, a small nipple and smoother finer peel. The pulp is very juicy and acid and contains a moderate quantity of seeds. The variety is very productive but with little or no reflowering. The main harvest starts in early October and finishes at the end of February.

Staggered marketing

The staggering of production used to be based essentially on the growing of everbearing varieties in a suitable climatic environment. Several strategies were then developed:

- the forcing technique consisting of enhancing summer flowering intensity to produce lemons outside the peak production period, that is to say after the period running from the end of November to April;
- choice of cultivar, consisting of combining varieties whose natural production peaks are sufficiently staggered;
- mastery of postharvest storage (see 'Storage' above).

This approach has been developed for several decades in the United States and enables steady supplying of the market all the year round.

Rootstocks

Until the nineteenth century, the main purpose of using rootstocks was to prevent attacks of *Phytophthora* that damaged the bark on the root systems or the base of the trunks.

Awareness of the interactions (susceptibility, tolerance, resistance) between the various rootstocks and certain degenerative diseases that can spread to Citrus and the spread of cultivation zones in agriculturally less favourable places (limier and even slightly saline soils, very heavy poorly drained soils, etc.) have broadened the range of constraints and stimulated a search for new rootstocks capable of providing a more or less satisfactory response. The choice of a rootstock is the result of a compromise in the face of these biotic or abiotic constraints. It also takes into account the specific effect of each type of rootstocks on the agronomic behaviour of the trees: earliness of the start of production of a plantation, the size and regulation of production and the quality of the fruits (size, peel colour, juice content, sugar and acid contents, etc.).

Features of rootstocks

'Eureka' lemon trees are totally incompatible with *Poncirus trifoliata* and a number of hybrids of this such as citrange, citrumelo, citremon, citrandarin, etc. However, there are a few rare exceptions. This incompatibility does not concern the other lemon varieties.

The very good productivity achieved in southern Spain with rootstock *Citrus macrophylla* has had to be seen in a new light as the lemons keep less well. However, trials have shown that in comparison with sour orange, this rootstock increases yield by about 50% over a seven-year period.

Rootstocks have a marked effect on certain fruit quality parameters and in particular the peel colour and the soluble dry matter content and acid content of the pulp. Sour orange enhances all these aspects, with fruits being distinctly better coloured at harvesting (less greenish) and with dry matter and acid contents 10 to 12% higher.

Agricultural trials in Argentina have demonstrated the possibility of using rootstocks with low vigour to design high density plantations with trees whose vegetative growth is smaller. The *Poncirus trifoliata* cultivar 'Flying dragon' makes this possible but the practice is limited by two types of constraint: the variety 'Eureka' cannot be used as it is incompatible with *Poncirus* cultivars and limestone or slightly saline soils that are frequent in lemon-growing zones and that do not suit this rootstock.

Pests and diseases of lemon


© E. Laville

Penicillium

The two fungi *Penicillium digitatum* (green mould) and *Penicillium italicum* (blue mould) cause more than three-quarters of citrus rots. All species and varieties are susceptible. These fungi are present all over the world, differing only in the infection mode and the symptoms generated. *Penicillium digitatum* causes the formation of green spores on the fruit. The spores are easily airborne. It is a wound parasite and incapable of contaminating a sound fruit whose peel is intact. Spread in an infected fruit is characteristic. The outer layer of the peel (flavedo) is always attacked before the deeper layer (albedo). Finally, the whole of the fruit, including the pulp, is infected. In contrast, a peeled fruits (with no flavedo) is not susceptible to attack.

Prevention of attack by this parasitic fungus is based to a considerable extent on fruit handling and the cleanliness of the equipment used during harvesting and at packing and storage stations. Chemical control is possible. This is based on curative and preventive active substances that can act on surface micro-wounds.

Penicillium italicum attacks fruit with intact peel and is thus more to be feared than *P. digitatum*. The spores are easily propagated in the air or by contact between fruits. Postharvest fungicide treatment with curative and preventive modes of action are used. The repeated application of benzimidazole fungicides causes the appearance of resistance. This class of fungicides has been replaced by others, including sterol synthesis inhibitors.


© P.J. Cassin

Mal secco

Phoma tracheiphila (Petri) Kantsch & Gik.

This fungal disease was first observed on the island of Chios in 1894. It is present on the shores of the Black Sea and in the northern and eastern Mediterranean from the Gulf of Genoa to Syria. North Africa is reported to be affected and the Iberian peninsula free of the disease. It can spread to almost all kinds of citrus but lemon is the most frequently and severally infected. The fungus penetrates the tree via a wound and develops in the conducting tissues, hindering the movement of sap. In aerial contamination, the fungus develops downwards and comparatively slowly without necessarily contaminating the whole tree at first. The symptoms associated with mal secco are then seen: chlorotic leaves, withered shoots with pink to reddish wood. In case of contamination of the base of the tree (base of the trunk or roots), the fungus spreads upwards more rapidly and contaminating nearly the whole tree, causing the total withering of the main branches and possiblly the death of the plant.

Control of mal secco is based mainly on prevention: the use of healthy plant material, resistant varieties (such as 'Interdonato'), the use of cultural practices that limit the vigour of the trees and the risk of mechanical wounding (by which contamination starts) and the burning of all infected parts. There is no really effective chemical treatment.


© Henri Vannière

Phytophthora

Phytophthora fungi are found in the soil in all citrus regions. Some citrus species, such as lemon, are particularly susceptible to the disease. This is one of the reasons why lemon is always grafted on *Phytophthora*-resistant rootstocks such as sour orange, *Citrus macrophylla*, etc. The fungus destroys the living cortical tissues in trunks, branches and roots and can even totally halt the movement of elaborate sap. According to the intensity of the attack, the trees display sectoral leaf yellowing, growth blockages and, finally, the total withering of the plant. In the summer, sap exudation is observed at the level of cortical attacks; for this reason the disease is known as gummosis. Another kind of attack concerns only fruits in the final stage of development. During rainy periods, splashing of soil contaminates the fruits in the lower parts of the trees. These fruits will rot completely on the tree or later after the harvest.

Phytophthora prevention is based on practices that reduce or eliminate the following conditions:

- the closeness of fruits organs to the ground;
- the transporting of soil in the vegetation (feet, ants, etc.);
- the mechanical wounding of susceptible tissues, especially in the lower or underground parts of the trees;
- a humid microclimate and stagnant water at the base of the trunk.

Planting on ridges, grafting at a height of 30-40 cm, the forbidding of climbing with muddy shoes, training pruning avoiding the start of many main branches at the same level, watering a sufficient distance from the trunk, moderate nitrogen fertilisation (resulting in less vigour) and the removal of low branches with fruits too close to the ground are all simple techniques that reduce *Phytophthora* attacks very significantly.

Citrus flower moth

(*Prays citri*)

This small moth is a microlepidopteran found throughout the Mediterranean area and also in tropical and subtropical citrus zones. Its small size and nocturnal habits make it difficult to identify. Population monitoring has been made easier by the development of pheromone traps. The larvae attack flower buds, perforating them and eating the stamens, pistil and ovaries that they contain. They move from one bud to the next, causing the same damage. Young leaves and very young shoots are affected in very severe outbreaks. Lemon trees can withstand significant attacks without being too penalised unless more than 50% of the flowers are affected. Biological regulation using beneficial insects exists but its impact is limited.

A *Bacillus thuringiensis* biological insecticide can be sprayed at the bud stage, with the treatment repeated weekly. The treatment does not affect bees, which are particular active during the flowering of citrus.

Bud mite

(*Aceria sheldoni* Ewing)

This mite is not specific to lemon trees but its pricking causes spectacular deformation of lemon fruits. Both leaf buds and flower buds can be damaged. The growth of very young parts is disturbed if they are pricked. The young leaf shoots have a squat appearance (court-noué), buds grow without lengthening and the petals are thick and tough. The ovarian carpels tend to become detached from each other and the fruit has a characteristic digitate appearance. High relative humidity enhances the development of this mite, which is strongly present in coastal areas.

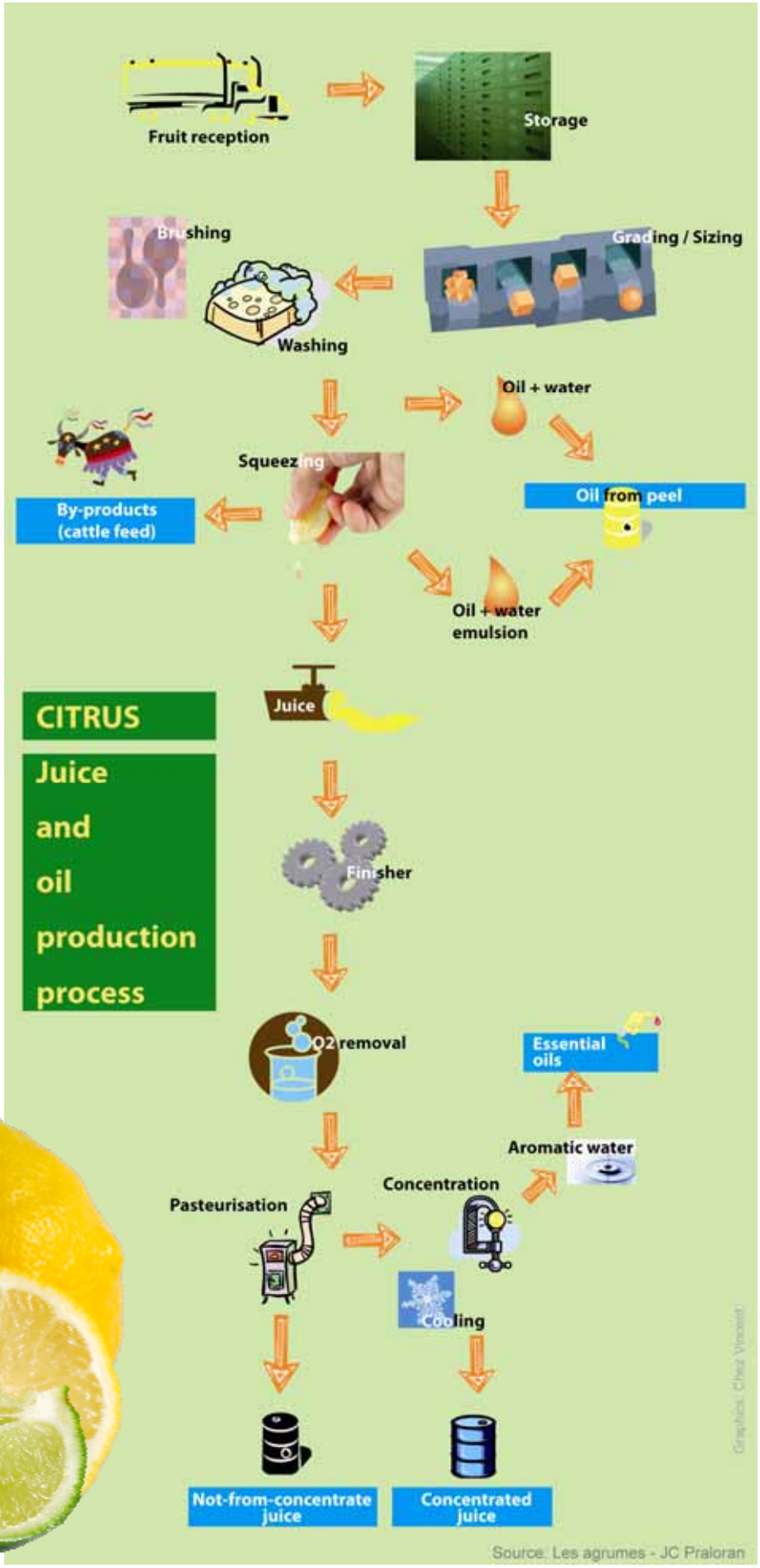
Chemical control is not very easy as the mite is in young plant organs with compact tissues. Intermittent applications of mineral oil or a specific acaricide are used if infestation is too severe.

Tristeza

In contrast with numerous citrus species like orange and mandarin, citrus tristeza virus (CTV) does not affect lemon grafted on sour orange. For this reason, citrus plantings traditionally budded on sour orange have not suffered from the decline caused by the virus. They have even figured as survivors when other citrus were badly hit.

Effect of the common rootstocks on the different characters of lemon trees

		Citrange Troyer	Citrange Carrizo	Mandarin Cléopâtre	Citrumelo CPB 4475	*Citrus volkameriana*	*Citrus macrophylla*	Sour orange
Viruses	**Tristeza**	tolerant	tolerant	tolerant	tolerant	tolerant	susceptible	susceptible
Fungal diseases	***Phytophthora***	medium resistant	medium resistant	slightly susceptible	resistant	medium resistant	very resistant	very resistant
Soil and climate	**Lime**	medium susceptible	medium susceptible	resistant	very susceptible	resistant	resistant	resistant
	Active lime (maximum %)	8-9	10-11	12-14	5	12	12	12
	Salinity	susceptible	susceptible	resistant	moderately resistant	moderately resistant	resistant	resistant
	Drought	susceptible	susceptible	average resistance	resistant	resistant	resistant	moderately resistant
	Frost	resistant	resistant	resistant	moderately resistant	susceptible	very susceptible	very resistant
	Start of production	normal	normal	normal	earlier	earlier	earlier	normal
	Productivity	good	good	good	good	high	high	good
	Fruit quality	good	good	very good	good	unfavourable	unfavourable	good
	Maturity	earlier	earlier	later	later	earlier	earlier	normal
	Fruit color	earlier	earlier	later	earlier	later	later	normal
	Rind thickness	increased	increased	reduced	normal	increased	increased	normal



Photos © Régis Domergue

Indicators

The main fruits

In shares by total volume and expenditure on fruits for the month in France		
%	Volumes	Expenditure
Apple	26	21.5
Orange	17	12
Strawberry	11	21.5

The trends for the main produce of the month significantly influence the overall situation of the fruit market. A column entitled 'Indicators' discussing these fruits precedes the pages devoted to a selection of exotic and citrus fruits.

Pages

Banana *39*
Avocado *41*
Orange *42*
Grapefruit *43*
Mango *44*
Pineapple *45*
Sea freight *46*

APRIL 2008

Apple

The market continued to be satisfactory. Sales of 'Golden Delicious' were still fluid but it was not possible to increase prices, except for top of the range niches. However, the situation for bicolour apples improved considerably. The very large deficit in arrivals from the southern hemisphere reactivated sales of European produce.

April 2008 / April 2007			
Price	=↗	Vol.	↘

Orange

The market continued to display an upward trend in spite of the return to a normal level of supply. The start of the Spanish 'Valencia' season and larger shipments from Morocco and Tunisia made up for the shortage of 'Navelate'. Nevertheless, sales were fluid and prices became firmer.

April 2008 / April 2007			
Price	↗	Vol.	=

Strawberry

The market remained very well balanced and prices were satisfactory. The French season started very gradually because of poor weather. Imported strawberries therefore continued to be present on a fair proportion of retail shelf space. Prices held at a good level, thanks in particular to the good quality of the fruits available.

April 2008 / April 2007			
Price	↗	Vol.	↘

Sea freight

A number of factors conspired to make the April Time Charter Equivalent (TCE) average the highest April figure for the past decade and possibly on record. Had demand for banana cargoes from Ecuador matched available fruit supply the 133c/cbft TCE figure would have been even higher. But such is the diminishing size of the fleet on the one hand and the inventiveness of the operators on the other that a dip in demand made little-to-no difference.

April 2008 / April 2007			
large reefers	↗	small reefers	↗

Notes concerning market appraisal methodology

The statistics on the following pages are estimates of quantities put on the market in France. They are only calculated for the main supplier countries and are drawn up using information on weekly arrivals or market release statements by representative operators. The figures in the 'Main fruits' section above are provided by athe CTIFL, with SECODIP being the source. The data published in the French market pages are provided solely as a guide and CIRAD accepts no responsibility for their accuracy.

COMPAGNIE FRUITIERE

Retrouvez bientôt

KIRIKOU

dans votre rayon banane...

www.compagniefruitiere.com

Contact service commercial : +33(0)141806520

Monthly and annual comparisons	
Volumes*	**EU reference price****
April 2008 / March 2008	
↗↗ + 36%	↘ – 12%
April 2008 / April 2007	
↗ + 11%	↗ + 6%

* Arrivals from Africa/West Indies ** Green price in Germany (GlobalGap)

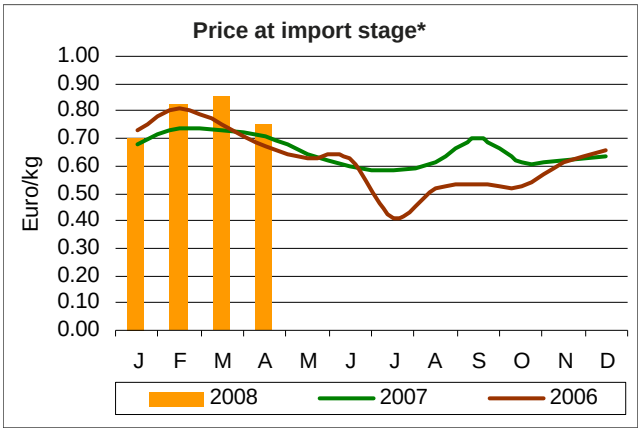
APRIL 2008

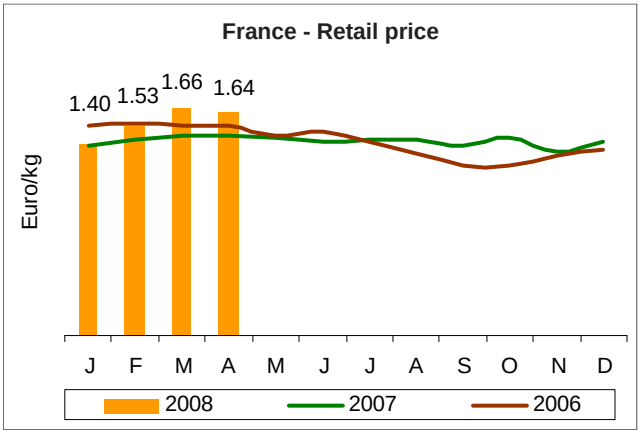
The market displayed a downward trend throughout the month. However, performance was fairly satisfactory in the light of the scale of arriving shipments. Volumes from Africa remained average. However, shipments from the French West Indies returned to an average level after a long period of deficit resulting from the production losses caused by hurricane Dean. Above all, supplies of dollar bananas have been very large with some 3 million boxes more than in an average year according to our estimations. Arrivals from Ecuador have been distinctly larger than average in spite of the flooding of banana plantations in the south of the country. Colombian deliveries were also large. Finally, the Costa Rican export deficit affected the US market rather than the EU.

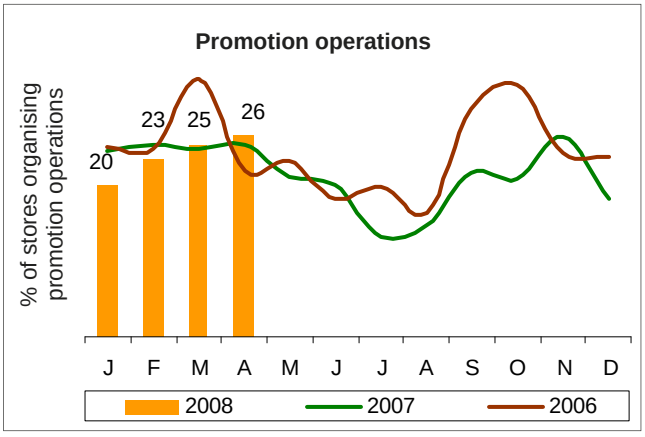
However, demand was fairly good even though average retail prices were set rather high in relation to quay prices on most EU markets. On the one hand, the fairly cool weather for the season was favourable for consumption. On the other, competition from red fruits (especially strawberries) and from winter fruits that are still strongly present at this time of year (orange) was fairly moderate. Promotion operations for banana were thus still fairly numerous, especially in France.

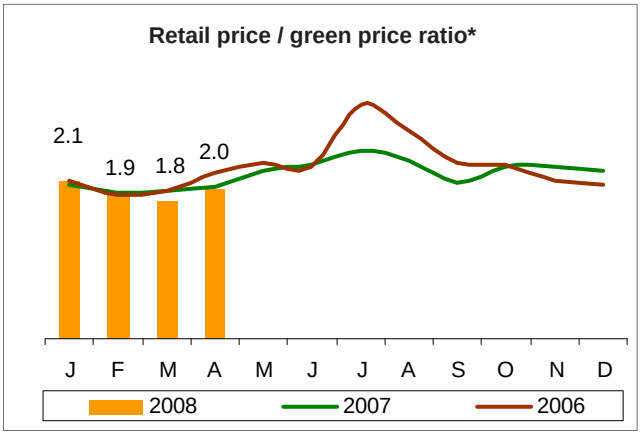
The average monthly price was down in comparison with that observed in March but remained distinctly higher than average.

French banana market — Indicators









* African origin

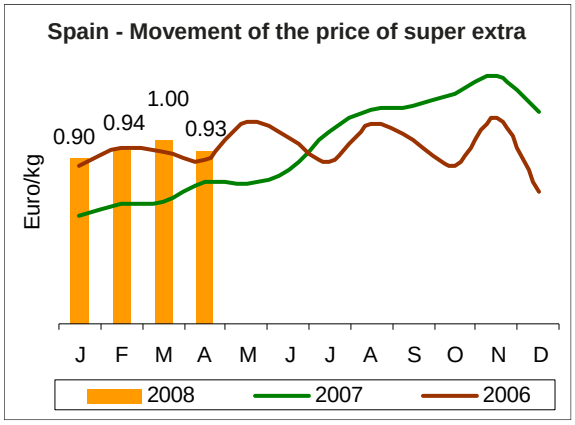
European banana market — Indicators

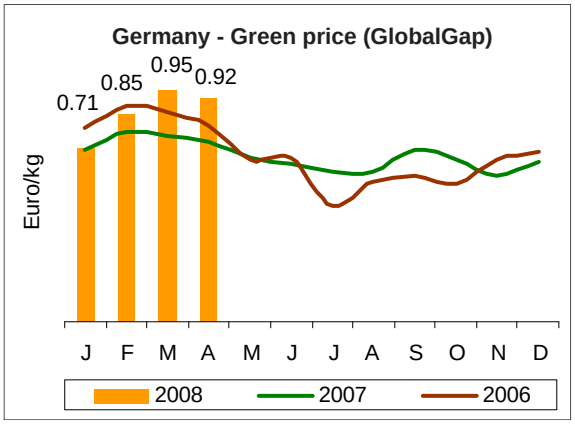
Main origins in Europe

Tonnes	April 2008	Comparisons (%)		Total season	Season comparisons (%)	
		2008/2007	2008/2006	2008	2008/2007	2008/2006
Martinique	20 779	+ 19	+ 39	24 920	- 62	- 58
Guadeloupe	2 901	- 26	+ 7	10 285	- 35	- 23
Canaries	41 150	+ 19	+ 45	134 606	+ 10	+ 12
Côte d'Ivoire*	12 017	- 15	- 28	28 924	- 34	- 49
Cameroon	19 510	+ 22	- 10	86 715	+ 9	+ 16
Ghana	3 968	+ 140	+ 280	14 504	+ 55	+ 1 026

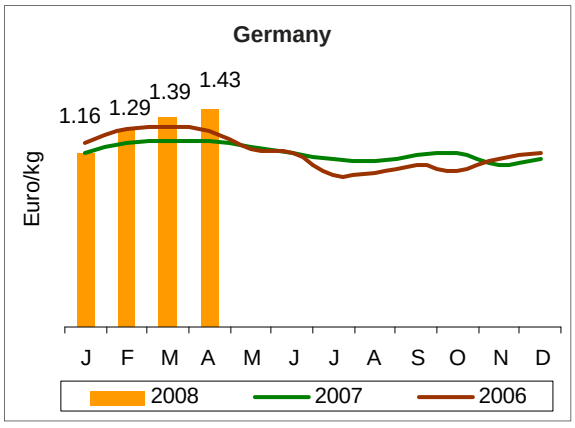
* Except for container movements

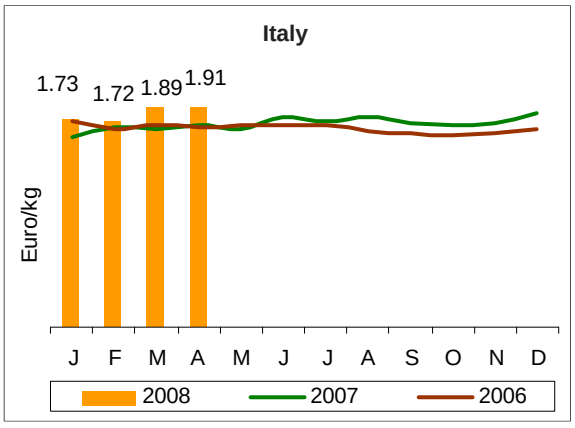
Green price in Europe

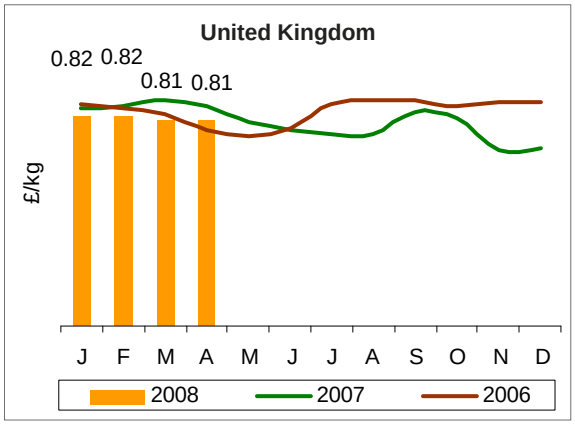


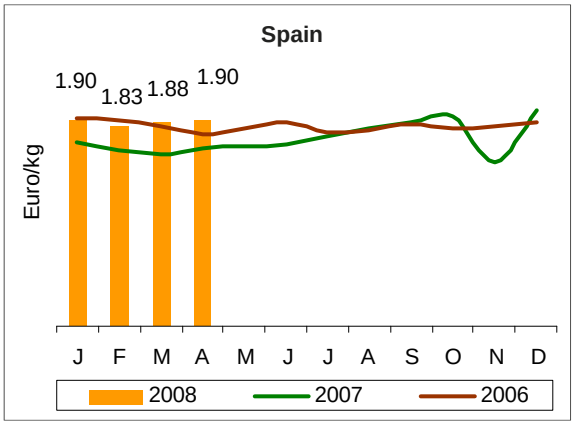


Retail price in Europe









Sources: CIRAD, SNM, TW Marketing Consulting

Avocado

Monthly and annual comparisons	
Volumes	**Price**
April 2008 / March 2008	
↘ – 7%	0%
April 2008 / April 2007	
↘↘ – 40%	↗↗↗ + 68%

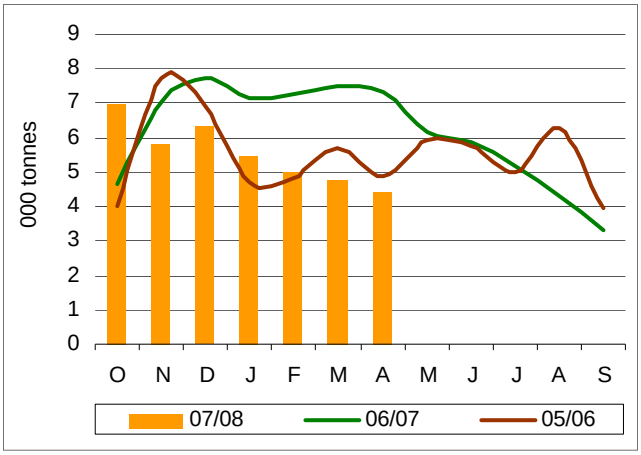
APRIL 2008

Under-supply remained serious. However, the early starting of the seasons in Peru and South Africa made it possible to broaden the range of green varieties (mainly 'Fuerte' and 'Ettinger'). But the deficit in 'Hass' worsened, reaching proportions rarely observed. Small production and frost caused the Israeli season to end very early. Likewise, the Mexican season ended in the EU at the beginning of April for reasons of fruit fragility and the satisfactory US market. Finally, arrivals from Spain decreased markedly. Exporters sold the limited remains of the harvest to continue to supply the markets until the start of the southern hemisphere 'Hass' season.

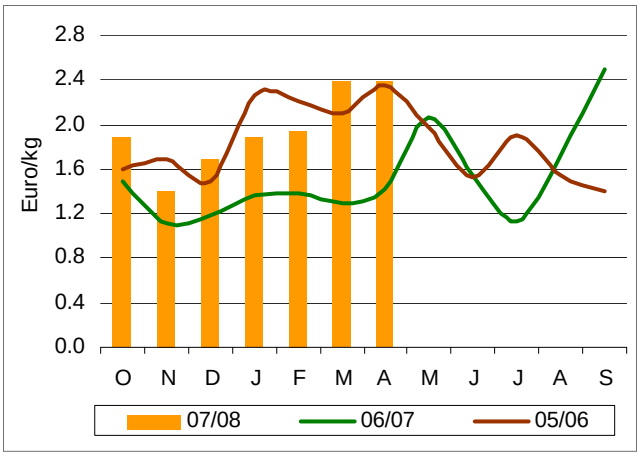
In this context, the price of 'Hass' reached historic levels—sometimes as much as EUR13 to EUR14 per box for certain sources and certain sizes. The prices of green varieties fell slightly in comparison with those of March but kept at a very good level.

Estimated market releases in France

Volumes



Price at import stage



Estimated market releases in France by origin

Tonnes	April 2008	Comparisons (%)		Total season	Season comparisons (%)	
		2008/2007	2008/2006	2007/2008	07-08/06-07	07-08/05-06
Mexico	179	- 37	- 75	7 962	- 3	- 41
Peru	689	+ 910	+ 116	1 158	+ 1 597	+ 264
Israel	80	- 97	+ 60	9 444	- 56	0
Spain	1 922	- 26	- 11	12 438	0	+ 3
Kenya	758	- 22	- 41	1 407	- 33	- 27
South Africa	811	+ 316	+ 119	811	+ 316	+ 119
Total	**4 439**	**- 40**	**- 9**	**33 220**	**- 34**	**- 17**

Orange

Monthly and annual comparisons	
Volumes	**Price**
April 2008 / March 2008	
↘ – 11%	↘ – 1%
April 2008 / April 2007	
↘ – 7%	↗↗ + 25%

APRIL 2008

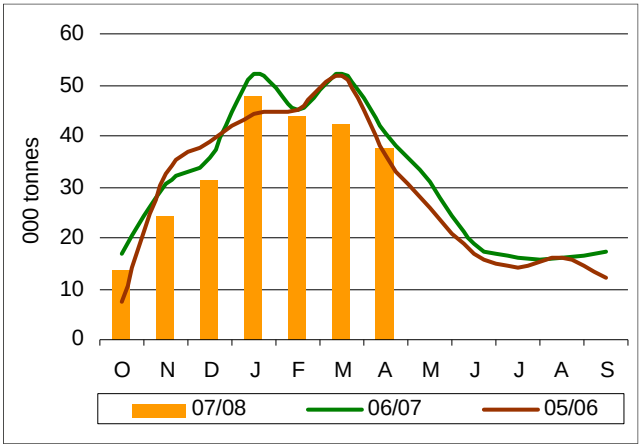
The market remained very well oriented even though supply returned to an average level. The Spanish 'Navelate' season ended early at the end of the month. However, although it was very gradual, the development of the 'Valencia' season made it possible to reduce the deficit in Spanish shipments. In addition, Moroccan exporters shipped distinctly larger volumes of 'Maroc Late' than usual to the EU, even if most of the shipments were still destined for the Russian market. Finally, available volumes of 'Maltese' from Tunisia were distinctly larger than in preceding years in this final month of the season. Cumulated exports reached 25 000 t this season, a ceiling that has not been reached since the 1990s.

Demand was satisfactory. Prices were already healthy and continued to increase for all varieties from all sources. The only exception was slight flexibility observed for certain batches of 'Maltese' whose quality left to be desired.

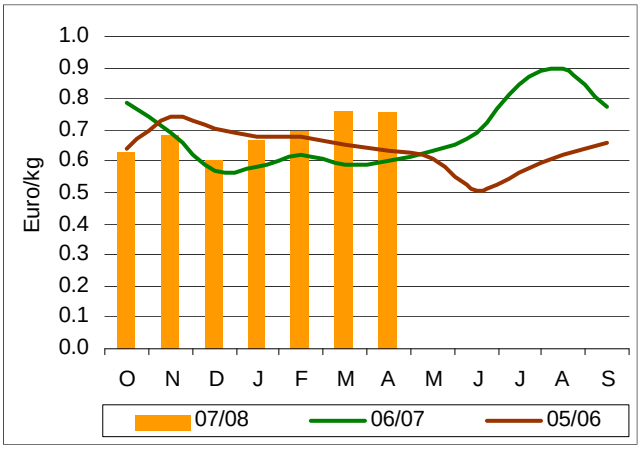
.

Estimated market releases in France

Volumes

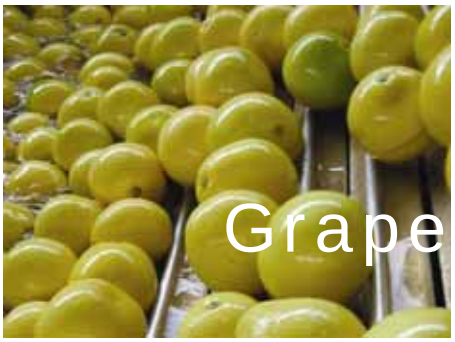


Price at import stage



Estimated market releases in France by origin

Tonnes	April 2008	Comparisons (%)		Total season	Season comparisons (%)	
		2008/2007	2008/2006	2007/2008	07-08/06-07	07-08/05-06
Spain	29 498	- 21	- 8	196 768	- 19	- 12
Morocco	4 010	+ 243	+ 70	8 239	+ 119	- 9
Tunisia	4 080	+ 102	+ 108	24 880	+ 52	+ 32
Total	**37 588**	**- 7**	**+ 4**	**229 887**	**- 13**	**- 8**



© Eric Imbert

Monthly and annual comparisons	
Volumes	**Price**
April 2008 / March 2008	
↘ – 4%	↗ + 9%
April 2008 / April 2007	
↗ + 14%	↘ – 2%

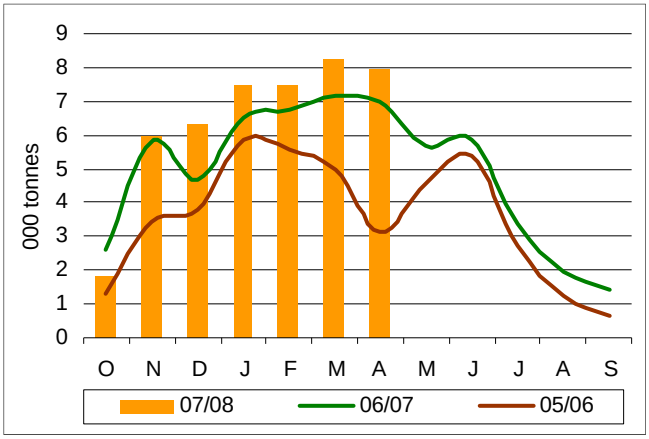
APRIL 2008

Market supply was fairly broad-based. Arrivals from Florida were distinctly larger than in preceding years. Substantial volumes remained available at production as a result of the late sales caused by lack of fruit sizing at the beginning of the season. Thus a large proportion of the commercial lines remained in the hands of the Florida operators. Prices were slightly lower than average and not raised but the fruits were shifted fairly smoothly.

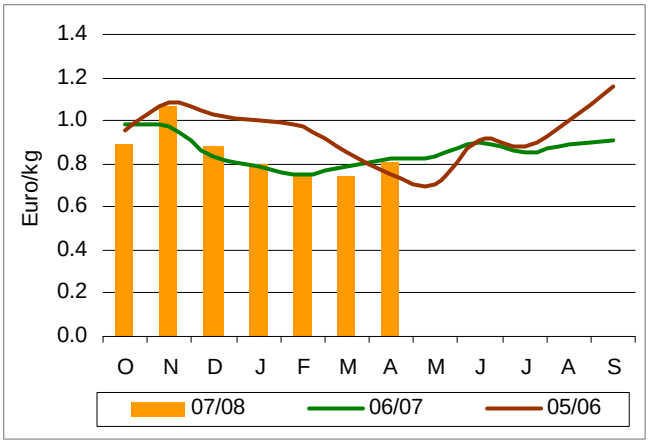
There was little room for Mediterranean supply sources in this context. However, operators were able to make prices a little firmer in spite of laborious sales as only moderate volumes remained to clear. Israel, the main player in this group of supply sources, held distinctly smaller supplies than in previous years as a result of early sales at the beginning of the season and production losses caused by frost. Turkish exporters continued to ship practically all their produce to the Eastern European markets. Supply from Cyprus was moderate.

Estimated market releases in France

Volumes



Price at import stage



Estimated market releases in France by origin

Tonnes	April 2008	Comparisons (%)		Total season	Season comparisons (%)	
		2008/2007	2008/2006	2007/2008	07-08/06-07	07-08/05-06
Florida	6 961	+ 28	+ 580	35 397	+ 19	+ 134
Israel	833	- 39	- 29	6 371	- 4	+ 23
Turkey	166	+ 63	- 82	3 209	- 16	- 59
Total	**7 960**	**+ 14**	**+ 155**	**44 977**	**+ 12**	**+ 60**

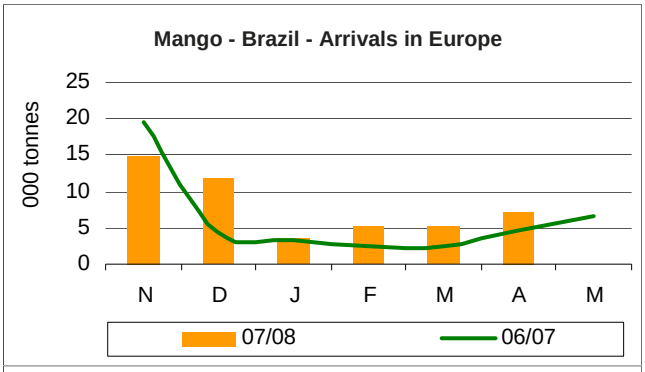
© Christian Didier

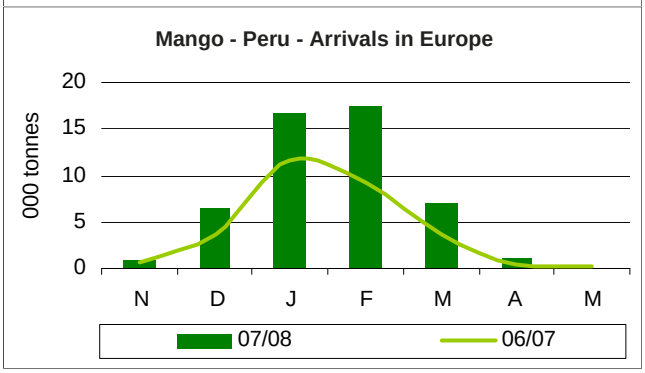
Mango — Weekly arrivals — Estimates in tonnes					
weeks 2008	14	15	16	17	18
By air					
Peru	50	30	-	-	-
Mali	30	30	50	80	100
Burkina Faso	15	20	20	30	30
Côte d'Ivoire	-	-	30	50	60
By sea					
Brazil	1 740	1 400	1 300	1 200	1 600
Peru	220	220	220	200	110
Côte d'Ivoire	-	70	110	110	330
Burkina Faso	90	130	150	150	130
Guinea	-	-	-	-	100

APRIL 2008

The market was buoyant but contrasted in April, with the month being marked by under-supply resulting from the rapid tailing off of shipments from Peru and very late harvest seasons in West Africa. Prices remained high for fruits from most sources, with a few disparities resulting from variations in quality and the unevenness of varieties and sources. On the air mango market, the Peruvian season ended while shipments from West Africa started to build up.

Arrivals from Peru decreased throughout April; the last batches by air arrived during the first fortnight of the month while deliveries by sea continued with limited volumes until the end of the month. Peru gradually left the market to West African sources, where considerable lateness resulted in the under-supplying of the European market for the greater part of the month. Brazil profited from this to sell 'Tommy Atkins' under good conditions, making up for the deficit of 'Kent' but not fully compensating the general shortage of mango. Furthermore, sold mainly on the northern European markets, these fruits were often delicate and this did not encourage shipping to other European markets. Starting on the second week of April, Côte d'Ivoire shipped a few containers of 'Amélie' to form the transition between the Peruvian season and the first 'Kent' from West Africa. Sold to supermarket chains, they eased the shortage of fruits without making up for it fully. Under-supply continued until the last week of April when the first 'Kent' were shipped from West Africa. However, the market remained confused with inadequate overall quantity and multiple production sources. Sales were made difficult by the disparity of sources, varieties and quality. The shortage of goods also put off certain buyers as asking prices were high.





The air market was difficult at the beginning of the month with the last deliveries from Peru. The fairly large quantities amply covered demand that was less dynamic than at Easter. Numerous batches of overripe or blemished fruits sold with greater difficulty. In addition, mango shipped by sea from Peru was of air standard in terms of presentation, causing confusion with the large volumes sold at prices between those of air and sea fruits. The West African season got under way but quantities were moderate, resulting in under-supply. The arrival of fruits lacking maturity and colour did nothing to enhance sales. The mango varieties shipped from Mali partially made up for the shortage of coloured fruits but they found takers with difficulty as they are relatively unknown to retail distributors. Supplies of 'Kent' increased in the second half of the month and soon dominated the market. The end of the month featured a balance between supply and demand, with prices falling slightly.

Mango — Import prices on the French market — Euros								
Weeks 2008		14	15	16	17	18	April 2008 average	April 2007 average
By air (kg)								
Peru	Kent	3.50-4.50	3.50-4.50	-	-	-	3.50-4.50	4.65-5.80
Mali	Amélie	2.50-3.00	2.50-3.00	2.50-3.00	2.20-2.50	2.30-2.50	2.40-2.80	2.70-2.85
Mali	Valencia	3.20-3.50	3.20-3.50	3.00-3.50	2.80-3.30	2.80-3.30	3.00-3.40	3.10-3.95
Mali	Kent	-	-	-	3.00-3.80	3.00-3.80	3.00-3.80	2.90-3.75
Burkina Faso	Amélie	2.50-3.00	2.50-3.00	2.50-3.20	2.20-2.50	2.20-2.40	2.40-2.80	nc
Burkina Faso	Kent	-	3.50-3.80	3.50-3.80	3.00-3.80	2.90-3.80	3.20-3.80	3.00
Côte d'Ivoire	Kent	-	-	4.50-5.00	4.50-4.80	3.50-4.50	4.15-4.75	4.25-5.00
By sea (box)								
Brazil	Tommy Atkins	5.50-6.50	5.50-6.50	5.00-6.00	6.00-6.50	6.00-6.50	5.60-6.40	5.35-6.50
Peru	Kent	6.00-7.00	6.00-7.00	5.50-6.50	6.00-7.00	6.00-6.50	5.90-6.80	6.00-7.75
Côte d'Ivoire	Amélie	-	5.50-6.50	5.00-6.00	4.50-5.00	5.00-6.00	5.00-5.90	5.00-6.50
Côte d'Ivoire	Kent	-	-	-	-	6.00-7.00	6.00-7.00	4.15-6.30

Pineapple — Import price		
Euros	**Min**	**Max**
By air (kg)		
Smooth Cayenne	1.60	1.95
Victoria	3.00	4.60
By sea (box)		
Smooth Cayenne	5.00	8.00
Sweet	5.00	9.00

APRIL 2008

The situation on the pineapple market was fairly special throughout April. Operators had to face a decrease in demand while supply increased fairly irregularly from one week to the next. And prices fell or lost vigour continuously. It is noted however that in certain cases transport problems resulted in the worst being avoided. Although sales were irregular on the air market, they were still fairly dynamic. It was also seen that some sources made an effort to manage their shipment volumes and this had a positive effect on both sales and the prices of the fruits concerned. The 'Victoria' market was marked by small supply and irregular prices, while the trade waited for the season's fruits to arrive.

Operators had to face up to irregular, weak demand throughout April. The beginning of the Easter holidays in France coincided with the return of operators in other countries. However, the situation remained very tense on the pineapple market as the volumes of 'Sweet' increased week after week while demand continued to be fairly small. The strong pressure of the volumes of 'Sweet' available led to aggressive policies from well known brands such as Del Monte, with prices quickly lowered to EUR7 to 8 per box. This placed a degree of pressure on other 'Sweet' supplies whose prices had to be lowered by EUR2.00 and sometimes EUR3.00 to shift fruits whose quality was often uneven (keeping problems on the display shelves). The fall in 'Sweet' prices also strongly affected sales and prices of 'Smooth Cayenne'. Supplies were already small and problems of quality (fruits too green) and lack of interest on generally reliable markets (Eastern Europe) had to be faced. Some boxes were sold as cheaply as EUR4.00. The situation would have been worse if shipping delays had not resulted in temporary shortages that made it possible clear stocks but this did not improve prices.

Sales were fairly fluid although irregular on the air pineapple market. Supply was fairly small overall but demand was not exceptional, being just sufficient to move the stocks available. A marked feature was that sales were more dynamic at the end of the week that at the beginning or middle.

As regards quality, even though much remains to be done to homogenise sizes and colour, serious efforts were made in the presentation of boxes (especially in Cameroon) and in a quality approach in which only the best fruits were shipped. This resulted in higher prices for certain brands and sources. Finally, it is noted that the prices of the always appreciated 'sugarloaf' pineapples from Benin held at between EUR1.90 and 2.00 per kg.

On the 'Victoria' market, supply was very small although diversified and operators already began to fear fine weather and the arrival of the season's fruits, with waning interest in 'Victoria'.

Pineapple — Import prices on the French market — Main origins — Euros

Weeks 2008		14	15	16	17	18
By air (kg)						
Smooth Cayenne	Benin	1.80-1.85	1.80-1.85	1.80-1.90	1.80-1.90	1.80-1.85
	Cameroon	1.60-1.95	1.60-1.90	1.65-1.90	1.60-1.80	1.60-1.90
	Côte d'Ivoire	1.80-1.85	1.60-1.80	1.60-1.70	1.60-1.80	1.70-1.75
	Ghana	1.60-1.80	1.60-1.80	1.60-1.80	1.60-180	1.60-1.70
	Guinea	-	-	-	1.80-1.90	1.80-1.90
Victoria	Côte d'Ivoire	3.00	3.00	3.00	-	-
	Réunion	3.80-4.00	3.40-4.60	3.40-4.60	3.50-3.80	3.60-3.80
	South Africa	3.50	3.00	3.00	-	-
By sea (box)						
Smooth Cayenne	Côte d'Ivoire	5.00-8.00	5.00-7.50	5.00-7.50	5.00-7.50	5.00-8.00
Sweet	Côte d'Ivoire	7.00-9.00	6.00-8.00	6.50-8.00	6.50-8.00	6.00-8.00
	Cameroon	7.00-9.00	6.00-8.00	6.50-8.00	6.50-8.00	6.00-8.00
	Ghana	7.00-9.00	6.00-8.00	6.50-8.00	6.50-8.00	6.00-8.00
	Costa Rica	6.00-8.00	5.00-8.00	5.00-8.00	6.00-7.50	5.50-8.00

Sea freight

Monthly spot average		
US$cents/cubic foot x 30 days	Large reefers	Small reefers
April 2008	133	139
April 2007	103	114
April 2006	111	113

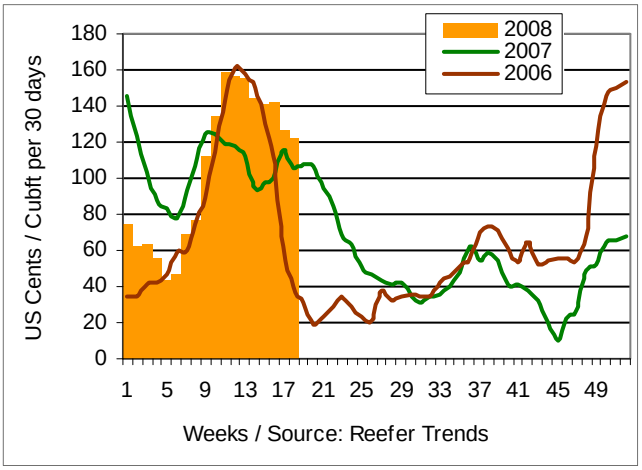
APRIL 2008

A number of factors conspired to make the April Time Charter Equivalent (TCE) average the highest April figure for the past decade and possibly on record. Had demand for banana cargoes from Ecuador matched available fruit supply the 133c/cbft TCE figure would have been even higher. But such is the diminishing size of the fleet on the one hand and the inventiveness of the operators on the other that a dip in demand made little-to-no difference.

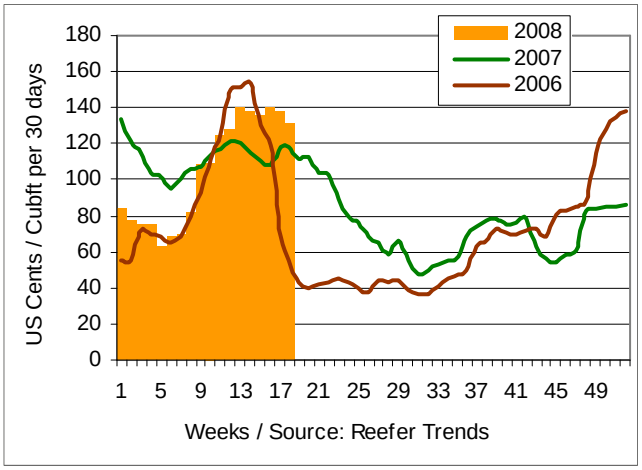
As soon as the Med banana markets started showing signs of pressure, levels of Spot banana chartering activity dropped dramatically – according to Ecuadorian banana association AEBE exports fell from 6.5m boxes in week 15 to below 5m boxes in week 16. The Ecuadorian Government unwittingly facilitated the decision not to charter by increasing the minimum reference price by 25% to US$4.70 per box. Although this has ultimately brought some stability to market pricing in Russia and the Med, the short term consequences for its banana producers were disastrous, with so much fruit left unexported. The general shortage of reefer containers in the US is having a 'devastating' impact on US agriculture according to the Agriculture Transportation Coalition. According to the group the shortage has been caused by container lines withdrawing vessel strings from the US and moving units into more profitable trades. Given that reefers are merely passengers on most, if not all, liner services it has unsurprisingly been those shippers of perishable product dependent on the box schedules who have been worst affected. Although the shortage has provided reefer operators with an opportunity to plug the gap, it is also a lesson in what will happen when the specialised reefer fleet is a lot smaller than it is today – i.e. in about 12 months if the current rate of demolition is maintained. In none of the global trade lanes does demand for reefer capacity drive the liner schedules – if the dry trade in a particular trade lane is no longer commercially viable, full services will be pulled no matter what the consequences for the 'marginal' reefer element. Late demand for tonnage to cover a likely second successive record Falkland Island squid catch at the same time that vessels were being positioned for what also looks as if it may be a huge Pacific catch meant that Christmas came very early for operators of the appropriate tonnage. Finally, delays at the Panama Canal showed few signs of improving, with 4-5 days each way factored in to vessel calculations. This is surely not going to improve until the new Canal is inaugurated in 2014.

Weekly market movement

Large reefers (450 000 cuft)



Small reefers (330 000 cuft)



Wholesale market prices in Europe

April 2008

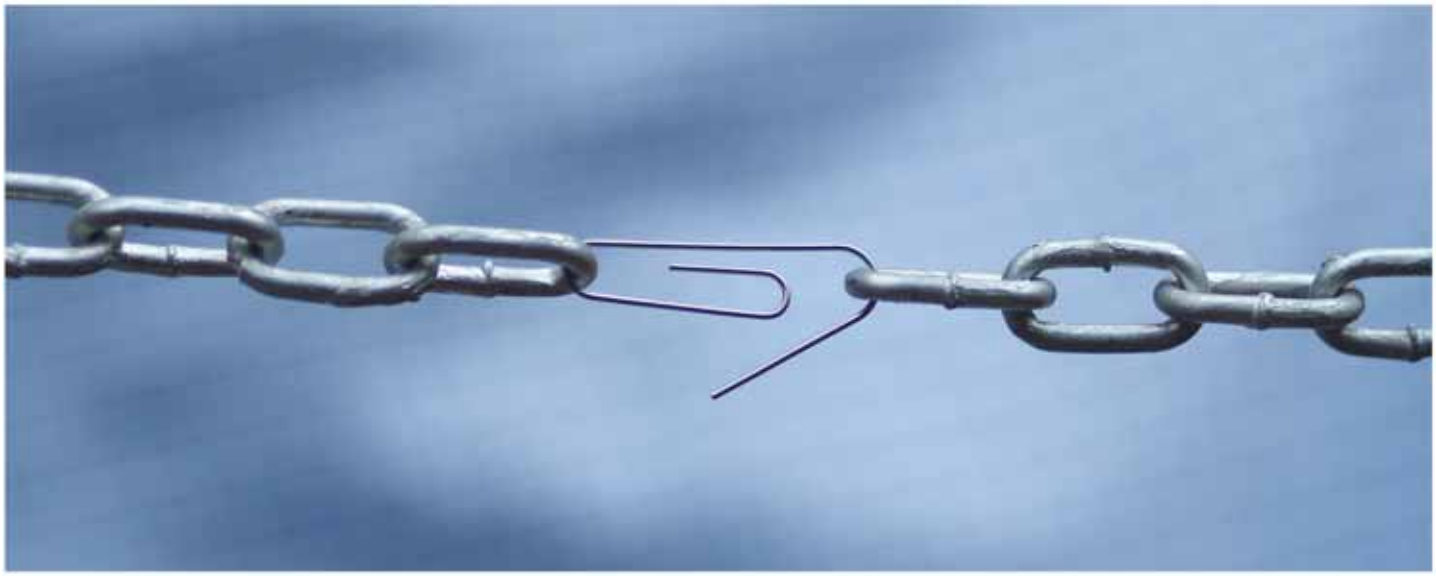
					EUROPEAN UNION — IN EUROS				
					Germany	Belgium	France	Holland	UK
AVOCADO	Air	TROPICAL	BRAZIL	Box			10.00		
	Sea	FUERTE	KENYA	Box	5.00	7.00	6.00	6.00	
			PERU	Box	6.50	8.25	5.81	7.25	
			SOUTH AFRICA	Box			7.00		
		HASS	SOUTH AFRICA	Box				11.00	
		NOT DETERMINED	ISRAEL	Box					8.69
			KENYA	Box					6.83
			PERU	Box					7.97
			SOUTH AFRICA	Box					9.58
		REED	ISRAEL	Box				8.50	
			SOUTH AFRICA	Box		8.25			
	Truck	HASS	SPAIN	Box	11.00		14.00	11.25	
			GREECE	Box				11.50	
BANANA	Air	RED	ECUADOR	kg				6.00	
		SMALL	COLOMBIA	kg		6.50	6.41		
			ECUADOR	kg				5.00	
	Sea	SMALL	ECUADOR	kg			1.60	2.13	
CARAMBOLA	Air		MALAYSIA	kg		4.17	4.78	3.85	4.25
	Sea		MALAYSIA	kg	3.29	2.64		2.50	
COCONUT	Sea		COTE D'IVOIRE	Bag		7.45	5.95	6.44	
			DOMINICAN REP.	Bag			7.50	11.06	
			SRI LANKA	Bag		13.38			
DATE	Sea	NOT DETERMINED	ISRAEL	kg		3.40		2.72	
			TUNISIA	kg					1.29
		MEDJOOL	ISRAEL	kg	8.00	7.00	8.50	7.35	6.51
			SOUTH AFRICA	kg		7.60			
			UNITED STATES	kg				8.30	
GINGER	Sea		THAILAND	kg	1.02	1.24	1.50	1.20	1.10
			CHINA	kg		1.01	1.30	1.42	1.28
GUAVA	Air		BRAZIL	kg		4.80	4.10	4.50	3.72
KUMQUAT	Air		ISRAEL	kg	3.25		3.50	3.50	3.72
LIME	Air		MEXICO	kg			3.70		
	Sea		BRAZIL	kg	1.44	1.61	1.32	1.47	1.60
			MEXICO	kg					1.43
LITCHI	Air		THAILAND	kg		8.35			
	Sea		THAILAND	kg				7.13	
LONGAN	Air		THAILAND	kg		7.30			
MANGO	Air	KENT	COTE D'IVOIRE	kg			4.80		
			PERU	kg		4.37		4.10	
		AMELIE	MALI	kg			4.00	3.55	
		PALMER	BRAZIL	kg	3.00			3.13	
		VALENCIA	MALI	kg			3.50		
	Sea	ATKINS	BRAZIL	kg				1.78	
			COSTA RICA	kg					1.71
			GUATEMALA	kg				1.57	
		KEITT	SOUTH AFRICA	kg				1.85	
		KENT	BRAZIL	kg	1.50				
			COTE D'IVOIRE	kg					1.32
			PERU	kg	1.25	2.25	2.00	1.69	
		NOT DETERMINED	BRAZIL	kg					2.06

					EUROPEAN UNION — IN EUROS				
					Germany	Belgium	France	Holland	UK
MANGOSTEEN	Air		INDONESIA	kg				6.75	
			THAILAND	kg		8.00		7.00	
MANIOC	Sea		COSTA RICA	kg		1.10	1.00	0.94	
PAPAYA	Air	NOT DETERMINED	BRAZIL	kg		2.43	3.00	2.51	
			COTE D'IVOIRE	kg			2.75		
		FORMOSA	BRAZIL	kg				2.88	
	Sea	NOT DETERMINED	BRAZIL	kg		1.69		1.57	2.66
			ECUADOR	kg				1.64	
			THAILAND	kg					1.95
PASSION FRUIT	Air	PURPLE	COLOMBIA	kg	5.00	4.38	5.50		
			KENYA	kg	5.00			4.25	3.85
			SOUTH AFRICA	kg	5.00		7.50		
			ZIMBABWE	kg		4.77		4.13	
		YELLOW	COLOMBIA	kg		7.50	7.80	6.69	
PERSIMMON	Air		BRAZIL	kg	2.60			3.80	
PHYSALIS	Air	PREPACKED	COLOMBIA	kg		6.66	8.38	5.52	5.16
			THAILAND	kg					6.21
	Sea		COLOMBIA	kg	4.50			4.48	
PINEAPPLE	Air	SMOOTH CAYENNE	CAMEROON	kg			1.84		
			GHANA	kg		1.60	1.75		
		VICTORIA	COTE D'IVOIRE	kg			3.00		
			MAURITIUS	Box		12.50		10.50	
			REUNION	kg			3.85		
			SOUTH AFRICA	Box	10.00	11.00		10.50	
	Sea	MD-2	BRAZIL	Box					8.38
			CAMEROON	Box			7.50		
			COSTA RICA	Box	7.00	8.69	6.75	9.20	8.38
			COTE D'IVOIRE	Box					7.14
PITAHAYA	Air	RED	ECUADOR	kg				6.17	
			THAILAND	kg	6.80	6.00			
			VIET NAM	kg		6.10		6.00	
		YELLOW	COLOMBIA	kg			10.80	8.40	
PLANTAIN	Sea		COLOMBIA	kg			0.87		1.10
			COSTA RICA	kg				0.84	
			ECUADOR	kg		0.77	0.85		
RAMBUTAN	Air		THAILAND	kg				6.50	
			VIET NAM	kg		6.95		6.13	
SWEET POTATO	Sea		BRAZIL	kg			1.35		
			EGYPT	kg			0.90		
			HONDURAS	kg					0.93
			ISRAEL	kg		1.33	1.27	1.25	1.50
			SOUTH AFRICA	kg		1.25	1.30		1.12
			UNITED STATES	kg	1.21				
TAMARILLO	Air		COLOMBIA	kg	5.60	6.10	8.40	5.60	
YAM	Sea		BRAZIL	kg			1.77		
			GHANA	kg			1.00	1.13	

Note: according to grade

These prices are based on monthly information from the Market News Service, International Trade Centre UNCTAD/WTO (ITC), Geneva.
MNS - International Trade Centre, UNCTAD/WTO (ITC), Palais des Nations, 1211 Geneva 10, Switzerland
T. 41 (22) 730 01 11 / F. 41 (22) 730 09 06

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.

For more information on subscriptions, please contact:
info@reefertrends.com or visit www.reefertrends.com

reefertrends

Member of Univeg

katopé
INTERNATIONAL

The personal touch

Contact :
Nadir CHAOUCH
Tel +33149782026
fax +33149782004
email nchaouch@katope.fr