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FRUITROP

English edition

CLOSE-UP

Banana



European stone fruit season:
2011 harvest forecasts

Trends in citrus diseases:
the situation in Italy

<http://passionfruit.cirad.fr>

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Banana

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European consumption is decreasing slowly but surely. A few ACP and community sources recovered in 2010 but the trend is still poor, as is shown by the first statistics for 2011. The situation is all the more worrying as the United States displays a very strong increase in volume together with an improvement in unit price. Europe is thus paying for deregulation while the US is garnering the fruits of its very concentrated organisation. That's one in the eye for the WTO!



La filière Banane et la Biodiversité en Guadeloupe et Martinique

Alors que 2010 est l'année de la biodiversité, la filière Banane nous parle des pratiques mises en place par les producteurs pour préserver et développer la diversité des animaux, insectes et plantes vivant au sein des bananeraies aux Antilles.



Photo : Pierre-Damien Lucas

La richesse de la biodiversité dans les bananeraies

Des inventaires de la faune et de la flore dans les bananeraies ont permis de répertorier **273 espèces de plantes différentes** (contre 80 à 115 sur des vignobles métropolitains en comparaison) et **72 espèces d'oiseaux** !

L'étude **ADVENTILLES** menée par les CTCS* de Guadeloupe et de Martinique et le CIRAD, en partenariat avec les filières Banane et Canne a pour objectif la conception d'un **guide exhaustif de la flore présente en bananeraies** et dans les champs de canne à sucre.



Les pratiques qui favorisent la biodiversité

La filière Banane de Guadeloupe & Martinique met en place des pratiques durables concourant de manière croissante au **retour et à la préservation de la biodiversité** dans les bananeraies.

Parmi ces pratiques : la réduction de 72% de l'emploi des produits phytosanitaires ; la généralisation des **jachères** permettant la mise au repos temporaire d'une terre entre deux cultures ; la **rotation des cultures** avec pour objectif la **reconstitution de la richesse du sol et donc de sa faune et de sa flore** ; la sélection de plantes dites de couverture sous les bananiers ; la mise en place de corridors biologiques : haies et bandes enherbées en bordure des parcelles.

Quand on travaille avec la nature...

Dans la logique de développement de la biodiversité et de réduction de l'utilisation de produits phytosanitaires, la filière recherche des moyens naturels de lutte contre les ravageurs en favorisant la présence de leurs ennemis naturels. Par exemple, les plantes de couverture au pied des bananiers augmentent de 4 à 5 fois le nombre de prédateurs du charançon, un coléoptère dont la larve se développe à l'intérieur du bananier.

D'ailleurs, l'étude réalisée par l'IT** en partenariat avec la FREDON***, montre une présence importante et variée d'insectes ennemis des ravageurs : coccinelles, larves prédatrices et araignées. Un premier résultat prometteur !

LE GRAND LIVRE DE LA BIODIVERSITÉ EN GUADELOUPE ET EN MARTINIQUE

Parti du constat qu'il n'existait pas d'ouvrage commun à tous les écosystèmes de Guadeloupe et de Martinique, **Éric de Lucy**, Président de l'Union des Groupements de Producteurs de Bananes de Guadeloupe & Martinique, a eu l'idée originale, avec **Lyne-Rose Beuze**, Conservateur en chef du patrimoine de Martinique, de réaliser un **ouvrage de référence accessible au grand public sur la richesse de la biodiversité des Antilles**. Cet ouvrage a été réalisé grâce au travail de 15 scientifiques de renommée internationale (dont des spécialistes du Museum d'Histoire Naturelle de Paris et des universitaires spécialisés) et du photographe naturaliste Grégory Guida. De grands écrivains martiniquais et guadeloupéens ont également apporté leur regard sur la biodiversité comme, par exemple, Patrick Chamoiseau (Prix Goncourt 1992 pour son roman *Texaco*). La parution du livre est prévue pour le mois de mars 2011.

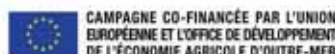
*Centre Technique de la Canne et du Sacre

**Institut Technique Tropical

***Fédération Régionale de Défense contre les Organismes Nuisibles

UNION DES GROUPEMENTS DE PRODUCTEURS DE BANANES DE GUADELOUPE ET MARTINIQUE

Ces logos attestent de l'origine et de la qualité d'une production agricole cultivée dans des régions éloignées de l'Union européenne, appelées régions ultrapériphériques. Ils garantissent le respect des réglementations sociales et environnementales en vigueur dans l'Union européenne.





Review of banana supply to the European market

Poor market!

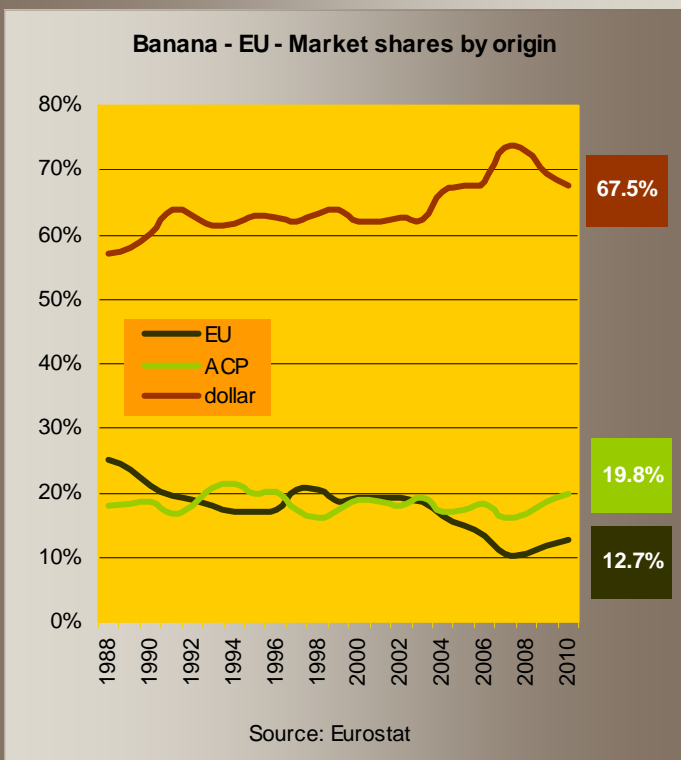
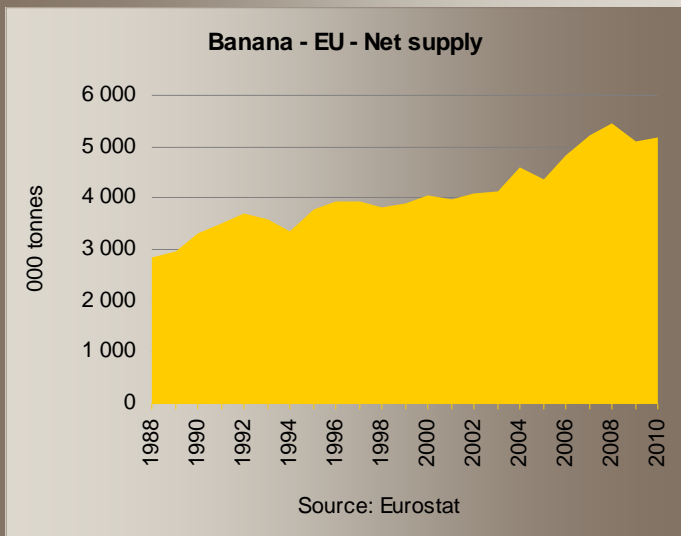


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The price review published in *Fruitrop* 185 (January 2011) is perfectly clear: regulation by a public power—in this case the common organisation of the market for banana (CMOB)—has been replaced by non-regulation by supply. As banana is an agricultural sector, it is in fact weather that now serves to regulate or deregulate the banana market. Last year has been exemplary from this point of view for both banana and for competing fruits: supply of bananas was plethoric at the beginning of the year, red fruits and summer fruits were hit by bad weather in the spring, the citrus season was light and banana supplies became larger again at the end of the summer, in particular as regards fruits from Colombia, more weather damage in the autumn, hitting apples this time, followed by a grand finale in the form of a very difficult period of floods, gales and cyclones that truly saved the banana market at the end of the year.

The interdependence of world and European prices is strong, with Europe gradually becoming the low reference for the banana market. It is long since the CMOB made it possible to ensure an extra return of up to EUR 9 per box for the greatest number! Today, although all operators have unlimited access to the European market they all run the risk of losing ... unless they just put their trust in the heavens!

It is therefore not surprising that European consumption shows no signs of a recovery in this very disturbed atmosphere. The figures are clear. Net European supply increased by a tiny 1% from 2009 to 2010, reaching 5.2 million tonnes, that is to say annual per capita consumption of 10.3 kg, a very small 100 g increase. The strong growth dynamics of 2006, 2007 and 2008 is over. Growth observed between before and after liberalisation on 1 January 2006 exceeded a million tonnes, a phenomenal 24% increase (including EU enlargement)! Consumption increased to 10.9 kg per



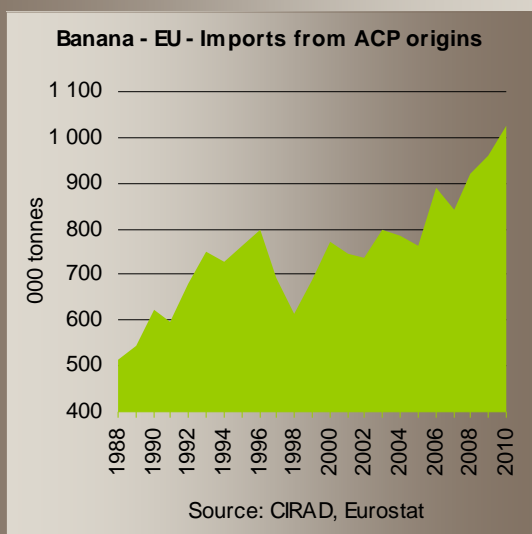
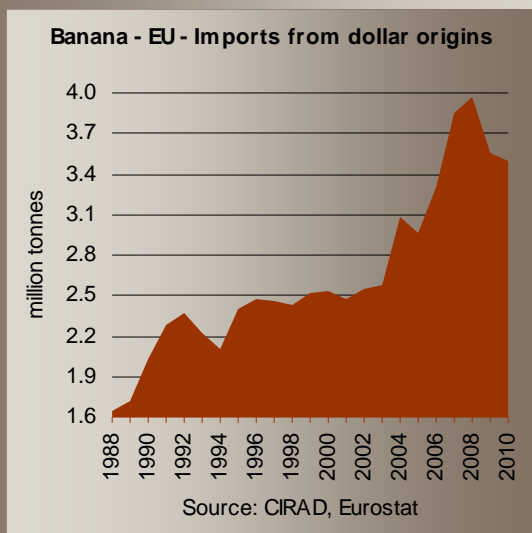
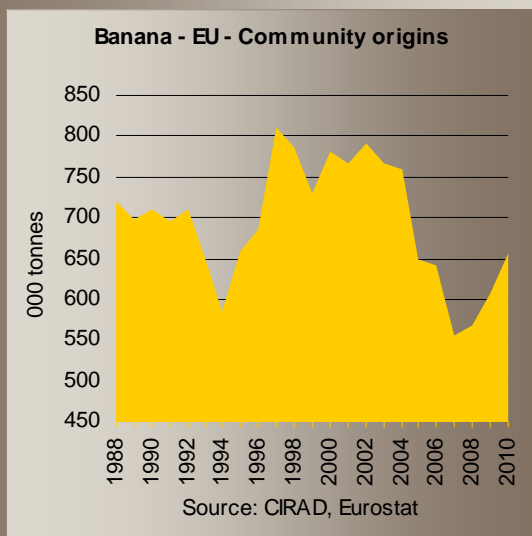
person per year in 2008. The beneficial effect of liberalisation and EU enlargement then became a distant memory. Indeed, the market stagnated at between 5.1 and 5.2 million tonnes, and the first trends observed in 2011 confirm this.

European bananas back again

The European banana market is dull, although others might call it mature. However, there are a few readjustments between sources of supply. The three main types of supplier are European producers, ACP sources and dollar sources (MFN, the most-favoured nation clause) and it is observed that 2010 was a year of reconquest, especially for European producers, and of conquest for some ACP sources.

European producers sold more than 650 000 tonnes for the first time since 2004, thanks to 8% growth in 2010. The Canary Islands and Martinique, the two main European production zones, gained 13% and 11% respectively. For Martinique, it can be considered that 2010 marked the end of the effects of hurricane Dean that hit the island in 2007. The figure is very close to the ten-year average (207 000 tonnes) and, weather permitting, this should be exceeded in 2011 in spite of the losses caused by hurricane Tomas (November 2010). Guadeloupe has not been as fortunate. Performance had improved steadily since 2007 but at the beginning of the year ash from the volcano in Montserrat and the effect of the fringe of hurricane Tomas halted the favourable trend. Shipments fell by 23% to 43 000 tonnes. Unfortunately, the trend was the opposite for Spanish production which leaped by 13% to some 400 000 tonnes, a figure that had not been achieved since 2003! The word 'unfortunately' is used deliberately. The downside of this growth is the profound deterioration of the Spanish market. This resulted directly in a 24% decrease in the price of Super Extra fruits and the destruction of 36 000 tonnes of bananas before shipment (see below). Shipments from the minor European sources (Madeira, Cyprus and Greece), fell by from 6 to 27% and totalled 18 210 tonnes.

Europe thus increased its presence on its domestic market, with its share increasing from 11.9 to 12.7% after a downward trend that lasted for three years. But this performance is not completely satisfactory. The time when one in five bananas in the EU was European has long gone. The successive enlargements of the EU to purchasers of Latin American bananas and the gradual opening of the market (an in-



crease in quotas and then a tariff-only basis) hit European production which now tries to hold up but not necessarily to develop.

Confirmation for ACP exporters

In 2010, ACP exports increased their market share and currently approach 20% (19.8%). No comparable figure has been observed since 1996, except that then the EU had 15 member-states and banana consumption was 4 million tonnes, in comparison with 27 member-states and 5.2 million tonnes today. ACP sources gained 7% in comparison with 2009 and exceed the symbolic figure of a million tonnes sold in the EU. As always, these fairly flattering figures hide a strongly uneven situation. The only thing the components of the ACP group seem to have in common is the name. Schematically, there are dynamic sources that are maintaining their positions or growing, sometimes very strongly (Dominican Republic, Côte d'Ivoire, Cameroon, Surinam, Ghana and Belize), and others that are losing ground on the world market (Jamaica, St Lucia, St Vincent, Dominica). The separation is a clear and longstanding one. It was accentuated in 2010 by particularly serious damage in St Lucia and Dominique caused by hurricane Tomas in November. Jamaica ceased all exports in 2008 after a series of such events.

On the bright side of the ACP statistics scene, the Dominican Republic stands out with unusually strong growth. In spite of gales and above all repeated, sometimes serious flooding in the northern part of the country where most bananas are grown, export records are broken every year. The sector is thus extremely resilient. This unmatched dynamics is owed partly to its organisation and structure. Bananas from the Dominican Republic are shipped only to the EU, which received more than 300 000 tonnes in 2010, a 20% increase on 2009. Exports to the EU have been multiplied by more than 7 since the end of the 1990s! The Dominican Republic accounts for more than three-quarters of the growth of ACP banana exports.

The other contributors are Ghana (52 000 tonnes) and Surinam (70 000 tonnes). The export sectors were relaunched a few years ago in these countries. Côte d'Ivoire is not lagging behind and set a new in spite of the difficult political situation in recent years and a civil war in early 2011. Shipments from Cameroon to the EU have stabilised at 243 000 tonnes, very close to the 10-year average.

Consolidation for dollar bananas

It is obvious that if European production and imports from ACP sources are increasing, the dollar sources are losing ground. It is true that the decrease is measured (- 1.6%) but it is seen for the second year running. The dollar group has lost 466 000 tonnes since it peaked at nearly 4 million tonnes in 2008.

At first sight, Ecuador and Colombia seem to have been hit hardest with 6% and 3% decreases in exports respectively. Except that in contrast with the other types of suppliers of the EU market, these banana giants do not have just one outlet. For example their exports to the United States, a rapidly growing market, increased by 2% and 9% respectively. If the national statistics of these countries are to be believed, Ecuador scored 2% better than the 2006-09 four-year average (258 million boxes) and Colombia gained 7% (98 million boxes). The increase would have been even greater if



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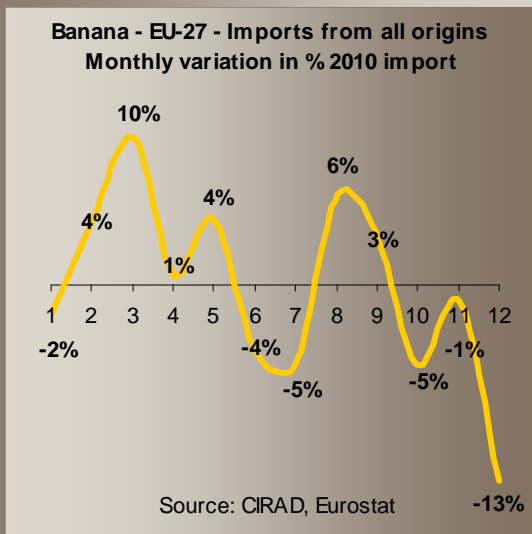
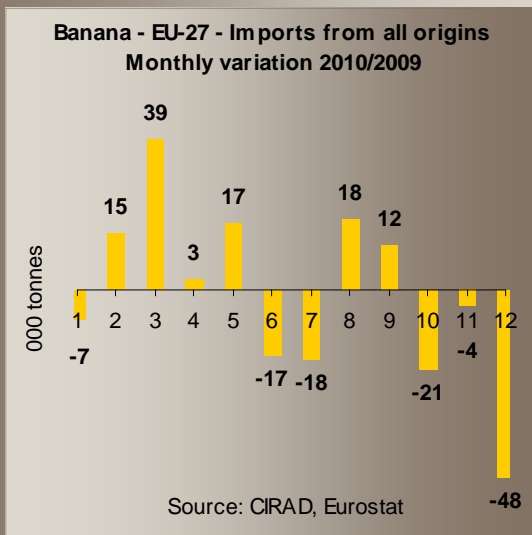
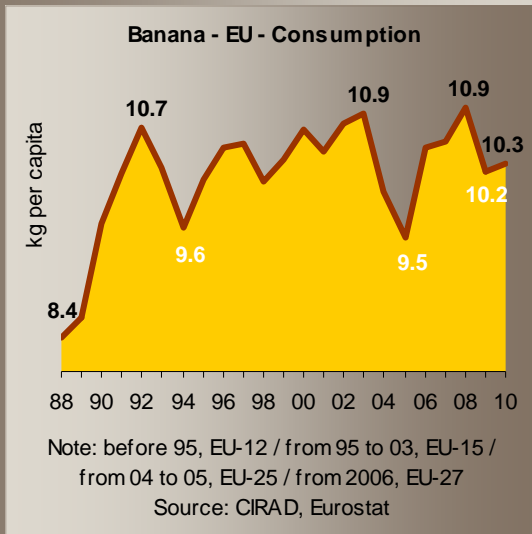
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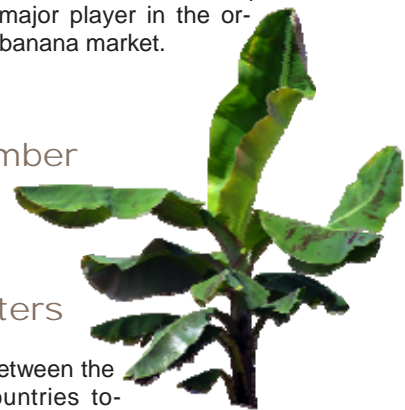


damage resulting from La Niña in the last quarter had not slowed or reduced their export potential.

The increase in Costa Rican exports to the EU were moderate (+ 3%), but phenomenal to the United States (at + 34%! This source has recovered to full capacity after the major meteorological damage sustained in recent years and, like the countries mentioned above, has chosen to focus on the excellent and profitable US market. Here the US market is thumbing its nose at the European market. Because of its very special organisation, the worst enemy of the CMOB has become the most profitable market in the world, also making the European market one of the most volatile and fought over.

With stable volumes in 2010, Panama completes supply from the three major sources. Exports from Brazil and Honduras increased strongly (by 13% and 79% respectively) but this just interrupted the slow decrease that began in 2007 in Brazil and at the beginning of the century in Honduras. Among minor sources, Peru is a more interesting case as 15% growth was recorded in 2010, confirming dynamics that took shape at the beginning of the 2000s. Exports from Peru to the EU have doubled since 2006 and, together with the Dominican Republic, has become a major player in the organic and fair trade banana market.

New EU member countries (NMCs) as second stage importers



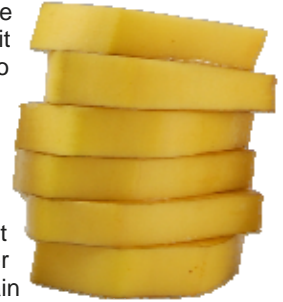
Trade in bananas between the 27 EU member countries totalled 2.2 million tonnes. Intracommunity trade was stable in comparison with preceding years. The figure reaches 2.5 million tonnes for exports from the member countries rather than imports but the trend is stable here too. The figure is extremely high and shows that bananas are much traded after their initial release on the market in a European port. Overall, the entry ports clearly structure the European banana map. The Belgian ports are favourite points of entry for dollar bananas for example and handled 1.3 million tonnes of extra-community bananas, both dollar and ACP. Germany, France, the Netherlands and Italy also serve as redistribution platforms for the whole of Europe. These countries supply Eastern European markets such as Poland, the Czech Republic, Slovakia, Hungary, etc. On markets where goods move freely from one country to

another, as is the case in the EU, it is always very difficult to obtain a clear picture of supply in each country. However, it seems that the 12 NMCs (NMC-12) receive 80% of their dollar bananas, ACP bananas and also community bananas (Guadeloupe and Martinique) from EU-15. The remaining 20% consists practically entirely of direct imports from Ecuador. When they joined the EU, NMC-12 still purchased 40% of their supplies directly. It is now 'old' Europe that supplies these countries with bananas.

Review of EU trade would not be complete without mentioning re-exports to third countries. These are very modest at less than 8000 tonnes per year, that is to say 0.14% of net EU supply. One of the reasons would seem to be the payment of customs dues on entry to the EU and refunding of this when the goods leave the EU customs zone. The operators who supply countries adjoining the EU therefore import directly and sometimes re-export to the EU if their markets are over-supplied. This is the case of Russia, which uses the Polish market as an overspill.

A drowning man will grasp at a straw

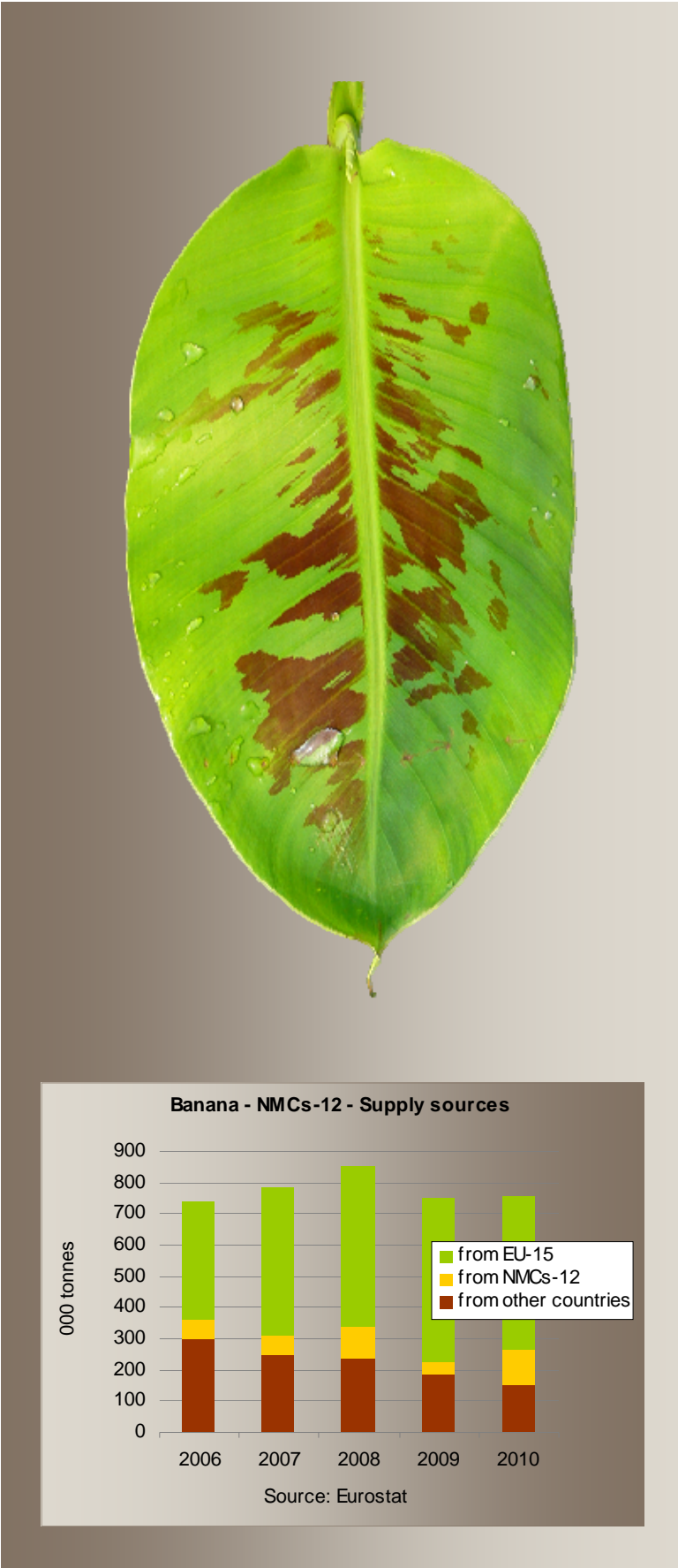
It has been seen that the European market is anything but dynamic. 2010 was an average year in terms of volumes and price when viewed as a whole, but very disturbed as regards weekly or monthly data. It was a year that was saved by the weather once again. The whole thing is to know whether the miracle will be repeated every year, with it being understood that 'miracle' also means desolation for the zones affected by serious weather events. The major operators were not mistaken when they planned drastic cuts in their programme for supplying Europe while aiming at the US market, the only one over which they have conserved a certain



Banana— European Union — Evaluation of supply — Tonnes

Year	Banane type or origin			Sub-total	Exports	Net supply
	Community	ACP	Others (\$)			
1988	719 270	514 061	1 644 100	2 877 431	17 265	2 860 166
1989	698 925	544 441	1 716 175	2 959 541	13 415	2 946 126
1990	710 635	621 875	2 024 248	3 356 758	36 219	3 320 539
1991	695 402	596 416	2 286 019	3 577 837	53 468	3 524 369
1992	711 191	680 191	2 365 883	3 757 265	39 689	3 717 576
1993	646 242	748 120	2 219 721	3 614 083	36 138	3 577 945
1994	584 622	726 927	2 102 303	3 413 852	58 044	3 355 808
1995	658 206	763 886	2 405 180	3 827 272	43 082	3 784 190
1996	684 605	798 109	2 471 263	3 953 977	30 598	3 923 379
1997	810 537	692 731	2 464 412	3 967 680	16 571	3 951 109
1998	786 232	614 459	2 426 419	3 827 110	26 448	3 800 662
1999	729 303	688 170	2 522 455	3 939 928	27 359	3 912 569
2000	782 176	770 095	2 528 170	4 080 441	35 327	4 045 114
2001	767 268	747 131	2 474 665	3 989 064	34 284	3 954 780
2002	790 622	738 439	2 554 508	4 083 569	8 011	4 075 558
2003	765 416	797 269	2 578 827	4 141 512	6 020	4 135 492
2004	758 206	782 979	3 077 361	4 618 546	11 029	4 607 517
2005	648 375	763 974	2 959 463	4 371 812	4 970	4 366 842
2006	641 559	889 176	3 306 538	4 837 273	8 386	4 828 887
2007	554 734	842 959	3 848 266	5 245 959	9 270	5 236 689
2008	567 560	918 923	3 964 866	5 451 349	10 002	5 441 347
2009	608 048	958 144	3 555 462	5 121 654	7 840	5 113 814
2010	657 155	1 023 586	3 498 574	5 179 315	7 334	5 171 981

(1) 1988 to 1993 inclusive: Eurostat + European Commission data for Madeira and Greece. From 1994 onwards: supplementary aid data or POSEI.
 (2) Eurostat data: all imports from non-community and non-ACP countries.
 (3) Duty-paid bananas (released for free circulation) in one of the EU-27 member countries and then exported outside EU-27.
General note: before 1994: dessert bananas + plantains / From 1994 onwards: dessert bananas. Before 1995: EU-12 / From 1995 to 2003: EU-15 / From 2004 to 2006: EU-25 / Since 2007: EU-27. The study concerns extra-community import data for ACP and dollar bananas and re-export. The rules of operation of the common market organisation of banana (1993 version) have been applied to the data from 1988 onwards in order to give comparable results. Source: Eurostat, European Commission / Processing: CIRAD Market News Service



mastery. Reports of increased business for the main companies in the sector confirm that their strategy was very good. Good for them, but it's too bad for the European market that is confirming its position as practically a junk market.

As we cannot work directly on the weather, at least in the short term, increasing demand could be a pathway to follow in order to handle the extra volumes that might be released on the world market. But Europe is not going in this direction. There is no further scope for growth and nothing shows any initiative whatsoever to increase consumption. The first two months of 2011 confirm the past trend with total net supply estimated by CIRAD to have fallen by a further 3%. In addition, on a more long term basis, some large banana consuming countries like Germany forecast a decrease in population from a current 82 million to 68 million in 2050.

It can be hoped that initiatives aimed at greater regulation of supply emerge. This will never be the case in a multilateral framework (UPEB has been dead and buried since 1975). But what has been happening for months in Ecuador, the world's leading banana exporter, might be somewhat reassuring for the markets. Indeed, the Ecuadorean government wants to make relations between producers and exporters more transparent and fair: contractualisation involving both parties, respect of the payment of the official minimum price to growers, the drafting of lists of authorised exporters, financial sanctions, etc. It is setting up more or less strict measures for control, blowing hot and cold in a sector that has been used to doing what it wants for years. The adjustment variable is Ecuador's immense production base to which came and still come all the operators in the world to get spot bananas. It is clear that the rationalisation of the sector could partially halt the speculation which makes Europe an overflow. Export volumes decreased by about 1.2 to 1.6 million boxes per week for three weeks at the end of April 2011 following a temporary hardening of national regulations. This proves that the public authorities still have some leverage in business matters.

In short, we should now worship either Zeus, the king of the gods who reigns over the skies, or Simon Bolivar, the liberator of the Latin American peoples. For want of anything better, the best thing is probably to make offerings to both of them! ■

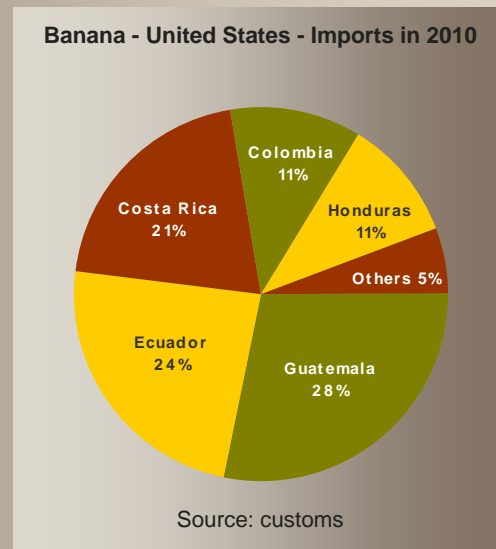
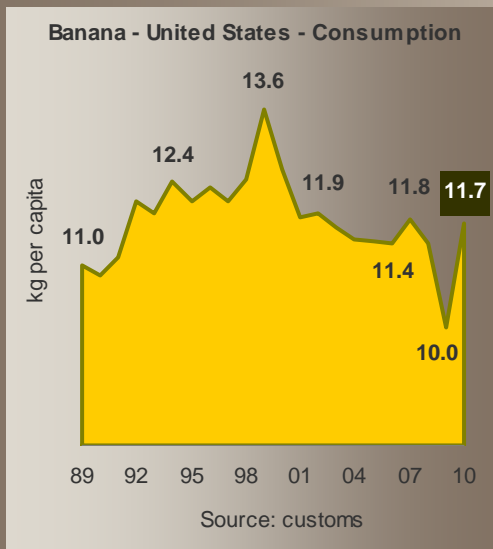
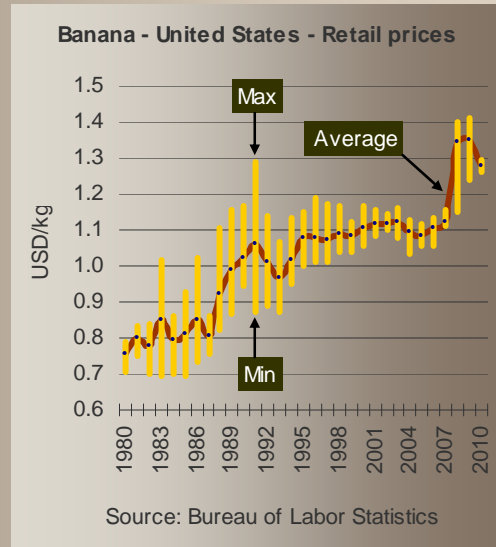
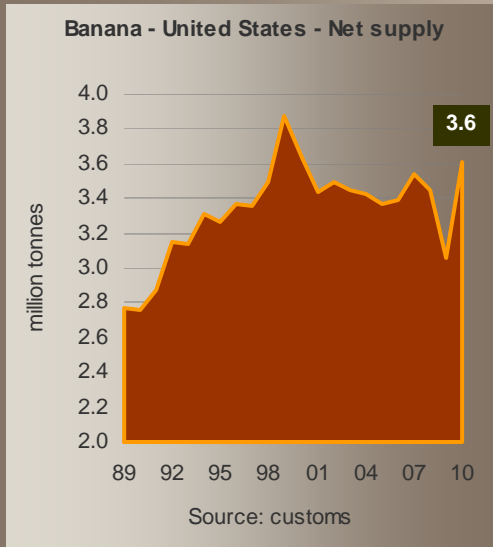
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United States market: doing very well...

We have already reported the way import prices are holding magnificently in the United States (FruiTrop 185, January 2011, page 29). The excellent economic situation of the banana sector is accompanied by a phenomenal increase in consumption. Net consumption increased by 15% from 2009 to 2010, that is to say by more than 500 000 tonnes. It is true that imports had been comparatively small in 2009 but 2010 was nonetheless a record year for consumption with 3.6 million tonnes. Gross imports exceeded 4 million tonnes for the first time, with some 500 000 t re-exported, practically entirely to neighbouring Canada. All Latin American sources benefited from this Eldorado: Ecuador (+ 2%), Costa Rica (+ 34%), Colombia (+ 9%) and Honduras (+ 11%). Thus there were no surprises in supply structure, except perhaps for Mexico (+ 28%) which is making progress year after year. As we saw in the analysis of the European market (see the article in the Close-up section), it is clear and perfectly logical for dollar sources to direct their exports to the most profitable market, the United States. Per capita consumption increased to 11.7 kg in 2010 in comparison with 10 kg in 2009. As population growth is faster than the increase in supply, the 2007 record of 11.8 kg still holds, but only just.





The banana market in France

The sector stumbled in 2010

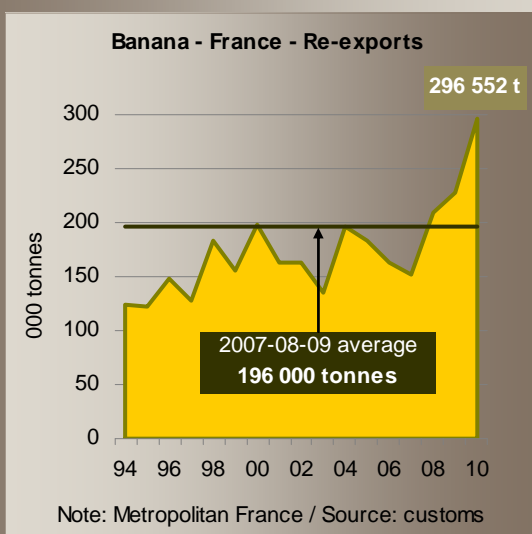
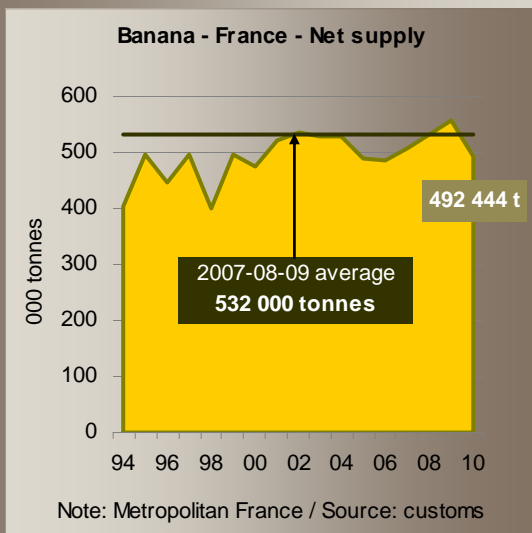
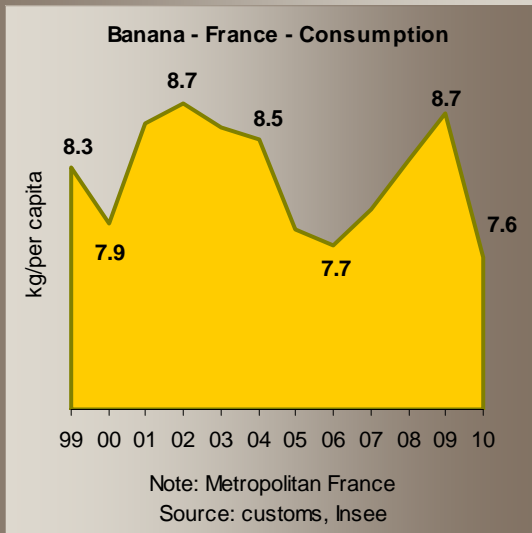


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The French exception is on the agenda once again. Since 2007, with a movement counter to the European trend, it has proved that the banana market is anything but mature and that per capita consumption can increase. This singular behaviour led to reaching net supply totalling 557 000 tonnes in 2009. This all-time record pushed consumption up to 8.7 kg per year. During a period of strong decrease in world supply for reasons of numerous and varied problems of weather, the structure of the French market, with an important national production base and a major point of entry to Europe, allowed the country to secure its supply in a way. This is doubtless what happened in 2009. We also observed (FruiTrop 177, April 2010, page 33 ff) that 'The increase in volume has created value rather than destroyed it'. We had finally discovered how to square the banana circle by increasing the volumes sold and improving value-added.

2010 marked the end of the virtuous period

This virtuous behaviour of the French market exploded in 2010. The unweighted average import price fell slightly to EUR 0.65 per kg from 0.67 in 2009 (all sources and all categories). Simultaneously, volumes plummeted to 492 000 tonnes. This takes us back four years to 2006, except that that was the first year of the major change in European regulations, the switch from a quota system to a tariff-only system. Supply had been strongly disturbed, with extreme caution at the beginning of the year and then an avalanche of spot volumes in the spring.

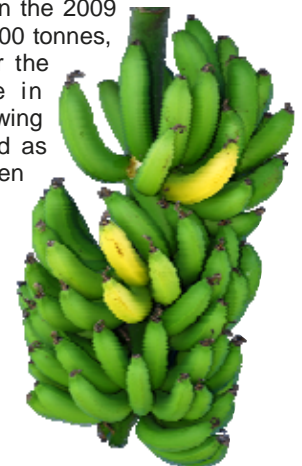


At 12%, the decrease was dramatic in comparison with 2009! Consumption fell by 1 kg per capita to 7.6 kg per year. This was even far from the historic trend (about 8 kg) as the level had not been so low since 1996. Comparison with the three-year average (2007-08-09) shows this vertiginous fall in relative terms as 2009 was such a record year. But the fall was nonetheless 7%. Furthermore, the unit value of fruits did not improve. As if further demonstration were necessary, the simple equation that says that prices fall when volumes increase or vice versa is horribly untrue for banana. What happened in 2009 and 2010 even shows that precisely the opposite is true.

It must be specified that the figures presented confirm what the main operators we spoke to told us (both upstream and downstream). However, it is noted that these very pessimistic results are contradicted by the consumer panel Kantar Wordpanel which reports a 4% increase in the quantities purchased.

France is out of step with the EU once again. For even if the European market made only very little progress in 2010 (+ 1%), this is nonetheless a positive trend that accentuates the French collapse even more. French consumption currently forms about 10% of the net supply of EU-27; this is 1% less than in 2009.

The first trend in 2011 confirms this negative movement. Net supply for the first two months of the year is 7% down on the 2009 figure, dipping below 80 000 tonnes, worse than the figure for the very bad performance in 2006. France is now following the same downward trend as the EU (- 3%) but at an even faster rate.



France: a European distribution platform

The main trends by source reveal a number of interesting phenomena. First and foremost, re-exports caused the fall in net supply. They increased by a third from 2009 to 2010, reaching practically 300 000 tonnes of the 789 000 tonnes that arrived in France. The proportion of re-exports is at its highest level ever (38%). Nearly four bananas in ten sold in France are re-exported to other EU countries. The new member countries (NMCs) in Eastern Europe took 90 000 tonnes in comparison with 67 000 ton-



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nes in 2009. Spain received about 55 000 tonnes from France in comparison with 47 000 tonnes in 2009. The quantity shipped to Germany increased by 10 000 tonnes and that to the UK by 8 000 tonnes.

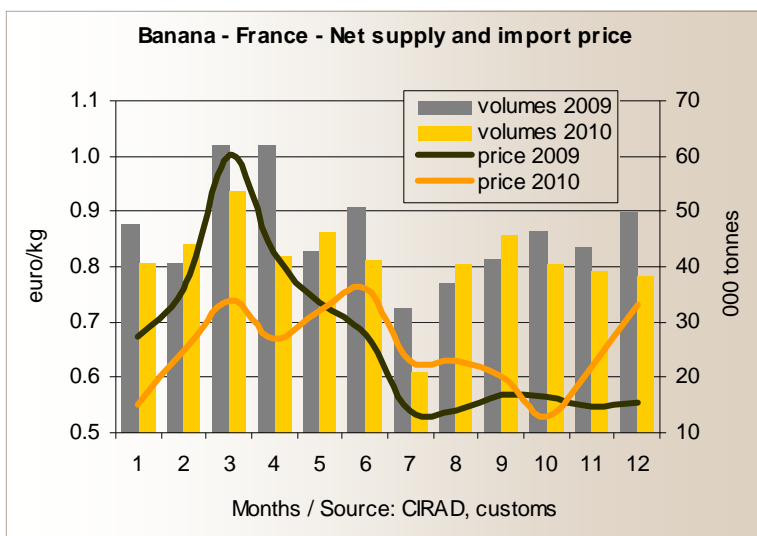

French production from Martinique and Guadeloupe released in France before possible forwarding within the EU increased very slightly (+ 3%). Imports from third countries were stable at 550 000 tonnes, with a knock-on effect between dollar sources that plummeted by 51% and ACP sources that gained 16%. Colombia, Ecuador and Costa Rica were the sources of 94% of imports from dollar zones. Cameroon, Côte d'Ivoire and Surinam shipped 80% of supply from ACP countries.

Finally, in terms of imports month by month, supply was generally very uneven with over-supply during some months and under-supply during others, especially in the last quarter with - 10 to - 23% in comparison with 2009 depending on the month.

All you can do is shed a tear

In conclusion, we observed a lifeless French market, regret the decrease in per capita consumption and finally despair of seeing a joint initiative by all stakeholders in order to relaunch consumption. For if this situation continues, it will no longer be a question of enhancing market growth but one of halting the decline ■

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Guides for improving banana production

ENDURE, a European network for the sustainable use of crop protection strategies, assembled for four years (2007-2010) more than 300 scientists working in agriculture, biology, ecology, economics and social sciences and representing 18 organisations in 10 European countries. It received financial support from the European Commission as part of Thematic Priority 5, 'Food quality and safety'.


The objectives of the ENDURE network are as follows:

- building a sustainable research community focused on crop protection;
- providing producers with a broader range of short-term solutions for solving their specific problems;
- developing a holistic approach to the management of pests and diseases;
- taking into account the changes in crop protection policies and becoming a centre of reference in this area.

Like wheat and tomato, banana was one of the model plants studied. FruitTrop is participating in the broad dissemination of the results of the project by supplying all the guides on banana with this issue .

- Guide 1: Challenging short and mid-term strategies to reduce the use of pesticides in banana production
- Guide 2: *Mycosphaerella* foliar diseases of bananas: towards an integrated protection
- Guide 3: Integrated Pest Management of black weevil in banana cropping systems
- Guide 4: Integrated management of banana nematodes — Lessons from a case study in the French West Indies
- Guide 5: Banana production under Integrated Pest Management and organic production criteria: the Canary Islands case study

Find the guides at:
<http://www.endure-network.eu>





The banana market in Spain

The end of the Canary Island banana myth?



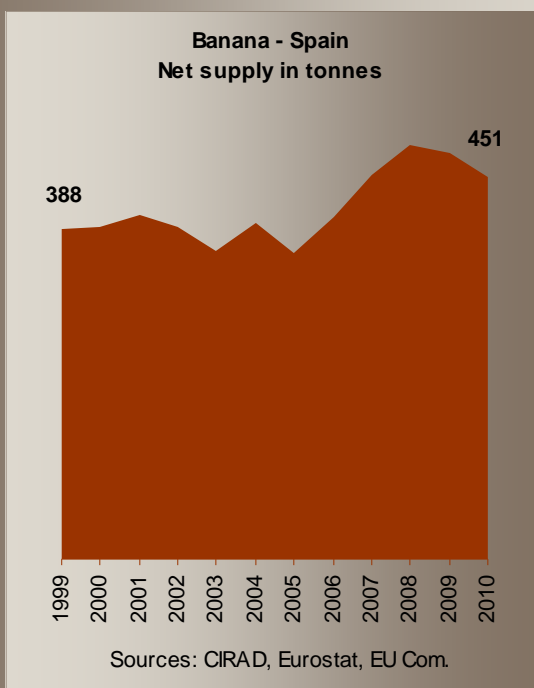
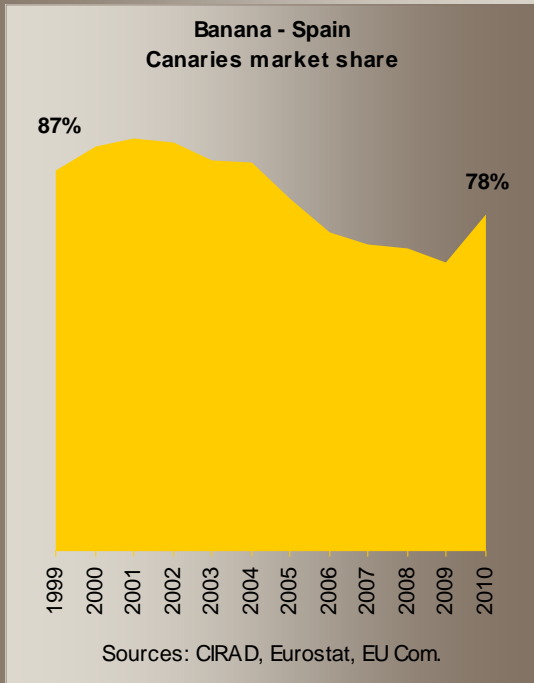
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The Spanish curse or how an income can become a financial catastrophe

We know the theory of oil income in which large deposits are associated with poverty in producer countries. With a little exaggeration, it would be possible to draw a parallel between this theory and the banana sector in the Canary Islands. Indeed, we can remember the wonderful time when Spanish growers profited to a maximum from the regime of compensatory aid for loss of income decided in 1993 when the single banana market was set up. It will also be remembered that the Spanish market was dedicated entirely to Canary Island bananas as all imports were forbidden before 1993 and substantial marketing work was performed after that year. Spanish growers even succeeded in segmenting the market by the name of the produce sold: 'plátano' for Canary Island bananas and 'banana' for those from the rest of the world. Apologies to sybarites with delicate palates, but succeeding in making scratched, stained and bumped Canary Island bananas the last word in quality was in no way a conjuring trick or a collective hallucination. It is the result of long, steady and costly marketing work performed by Canary Island growers for many years.

The sin of gluttony

However, what was an example and even the Holy Grail of bananas for all other sources and especially for growers in the French overseas departments in the West Indies is no longer



quite what it was. The myth is beginning to crumble, doubtless because of a decline of the sector but also because of the deep-seated changes in the balance of power on the community market. A guaranteed income is turning into a financial disaster. We noted last year (FruiTrop 177, page 38 ff) that 'the end of the Canary exception' had arrived. In 2009, competing sources finally launched an assault on the Spanish citadel. The market share held by Canary Island bananas fell to below 70%. But above all the difference in retail price between Canary fruits, the top of the range reference, and basic bananas became unreasonable. At EUR 2 per kg, Canary fruits were priced as much as 50 cents higher than the competition. Stimulated by the economic downturn, consumers soon made their choice. In a way, the Canaries had given in to gluttony. And remember, this is one of the seven deadly sins!

In 2010, the mechanism of the Canary Island crisis was different. In contrast with 2009, the Canaries increased their market share in mainland Spain, attaining 78% of total consumption, and imports from other EU member countries and third countries decreased strongly to 101 000 tonnes against 160 000 in 2009. The market even shrank by about 6% overall. However, simultaneous over-production in the Canaries put the Spanish market on its knees for almost the entire year, with Canary Island growers making the somewhat true but greatly exaggerated accusation that European producers were invading their Spanish patch. In our article 'Banana prices in Europe in 2010' (FruiTrop 185, January 2011, page 21ff), we mentioned '... the disastrous 2010 season in Spain [...] green prices did not get very far, even at the end of the year when they rocketed everywhere in Europe. The average import price of Super Extra category fruits fell to EUR13.3 per box, 25% lower than in 2009. Such a level had not been observed since 2001!'



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One banana destroyed for every ten shipped

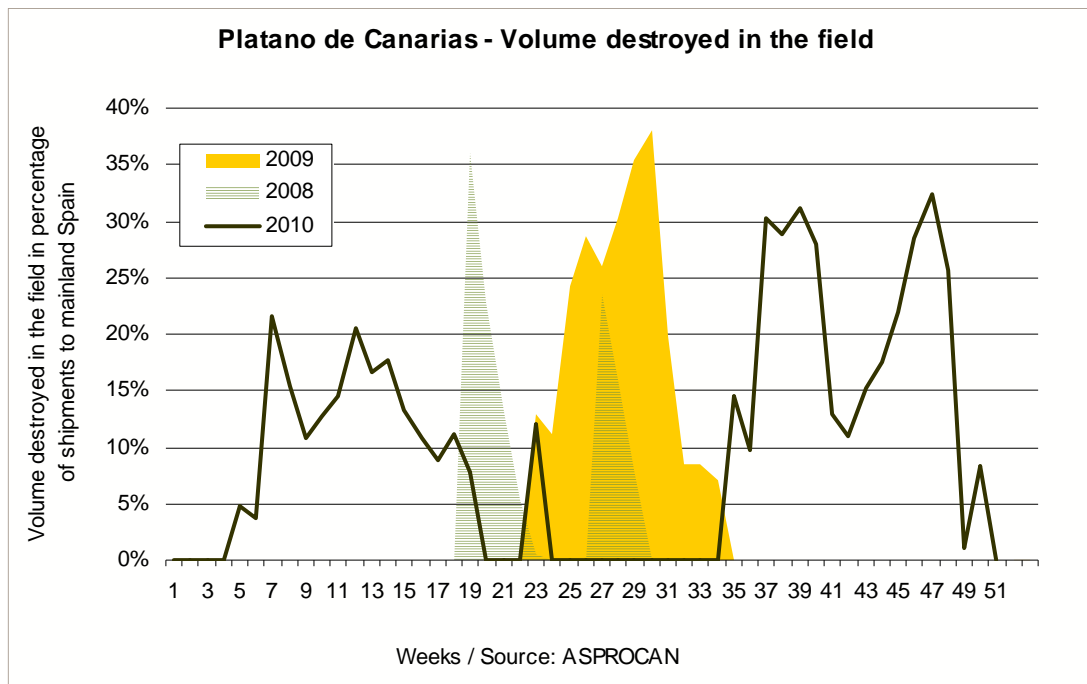
There is therefore something amiss in the kingdom of Spain. The remedies in such cases are classic. Supply is reduced on the encumbered market either by destroying goods or by gaining new markets. The European system of aid for Spanish growers is convenient in the case of the first lever. Volumes destroyed at the production stage give a right in all cases to the payments of so-called POSEI (Programme of Options Specifically Relating to Remoteness and Insularity) aid. In 2008, 2% (8 000 tonnes) of the annual volumes shipped was destroyed preventively. In 2009, the proportion increased to 4% (12 400 tonnes). An all-time record was set in 2010 with 36 000 tonnes, that is to say 10% of annual shipments to the mainland. This is economically disastrous in spite of the aid and shocking from the environmental point of view in an archipelago where attention is paid to saving every single drop of water. Finally, it is bad for the image of Canary Island bananas.

The second lever is more difficult to apply because of the specific nature of Canary bananas. As regards investing in other markets, Germany has been identified, as has been mentioned. The objectives are ambitious at one lorry per week, that is to say about a thousand tonnes per year. If they can find another 35 markets like that there will be no more problems ■

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Producer country sheet

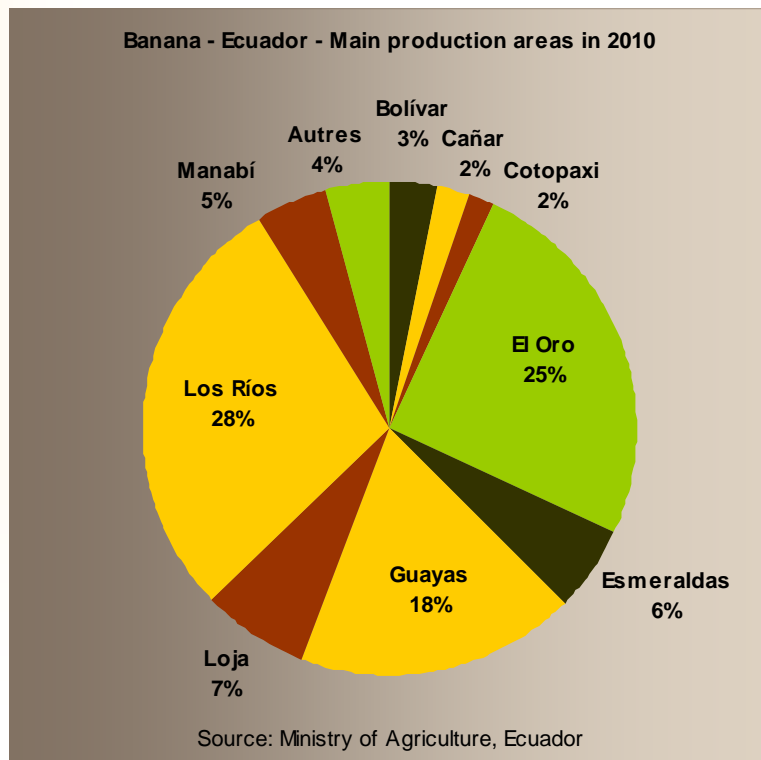
Banana in Ecuador

by Carolina Dawson

With annual exports of more than 5 million tonnes, Ecuador dominates the international banana trade thanks to an original production structure consisting of large and small growers. Although productivity is only average, Ecuador is the only exporting country to supply all the world markets on a contractual or spot basis. The sector accounts for 50% of agricultural GDP and is increasingly supervised by the government.

Production structure

About 30% of the huge area devoted to bananas (more than 230 000 ha) is in the regions in the north of the country: Esmeraldas, Manabí and Pichincha. However, this zone is losing ground because of strong logistic constraints and above all because of the agronomic problems (especially Black Sigatoka disease) that weigh on yields. Thus more than 70% of the area is concentrated in three regions in the south-west close to the main export ports: Los Rios, El Oro and Guayas. Most of the medium-sized to large production structures are located in the Los Rios region. Cultivated areas are increasing strongly with large planters using former cocoa plantations with very rich soils. Even if Sigatoka pressure is still strong, yields in this region are the highest in the country because of the high technical level. Conversely, the production structure is very traditional in El Oro province where small planters cultivate small scattered fields as the land is more hilly. The climate is drier, making irrigation necessary during the dry season but limiting Sigatoka outbreaks and making it possible to grow organic bananas. The areas under banana are stagnating or decreasing in the Guayas plains where more profitable sugar cane is taking over from plantations of very varied sizes.

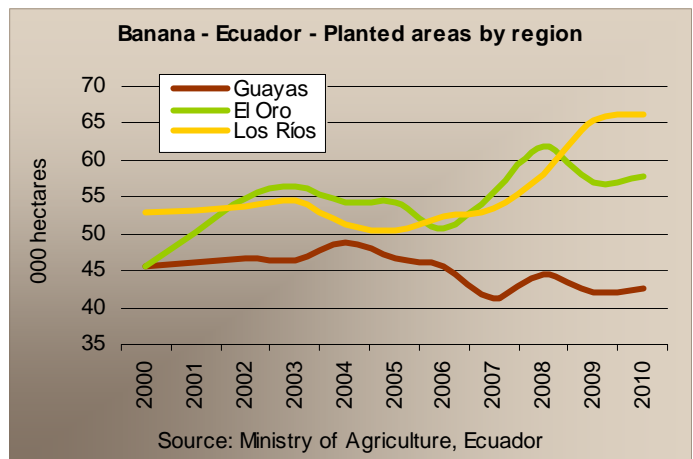
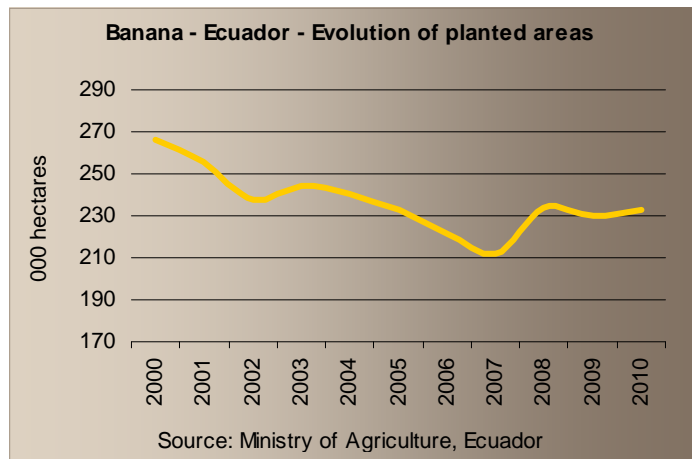
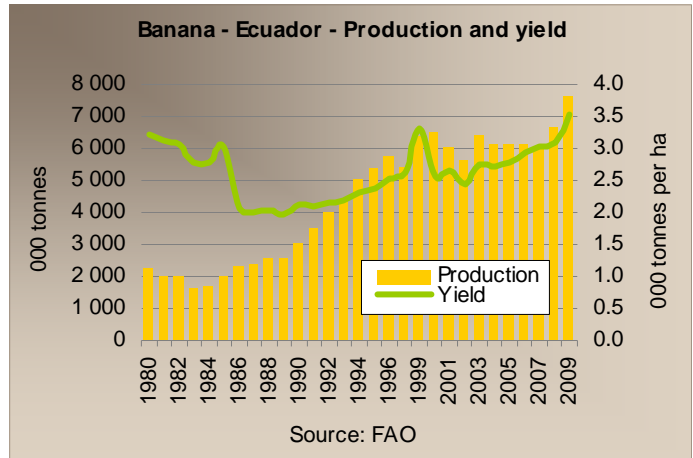


Production

The banana sector grew very strongly from 1985 to 1995, driven by a governmental plan (Ley de fomento bananero). Areas doubled and yields increased and Ecuador became the third largest world producer. The increase in yields in the past decade has compensated the decrease in cultivated area, which has remained stable at 230 000 ha since 2008. However, productivity is still modest. First, the climatic constraints are sometimes strong: rainfall induces strong attacks of Black Sigatoka and there are periods of cold during La Niña years. In addition, support structures are weaker and, above all, production structures are more varied. Most of the export supply is controlled by large growers operating on a national basis with a high level of technical skills (Wong group, Noboa), unlike other countries in the dollar zone. However, 30% of the plantation area is in the hands of 5 000 small producers who sell their fruits via cooperatives to large exporting groups on a contract or spot basis.

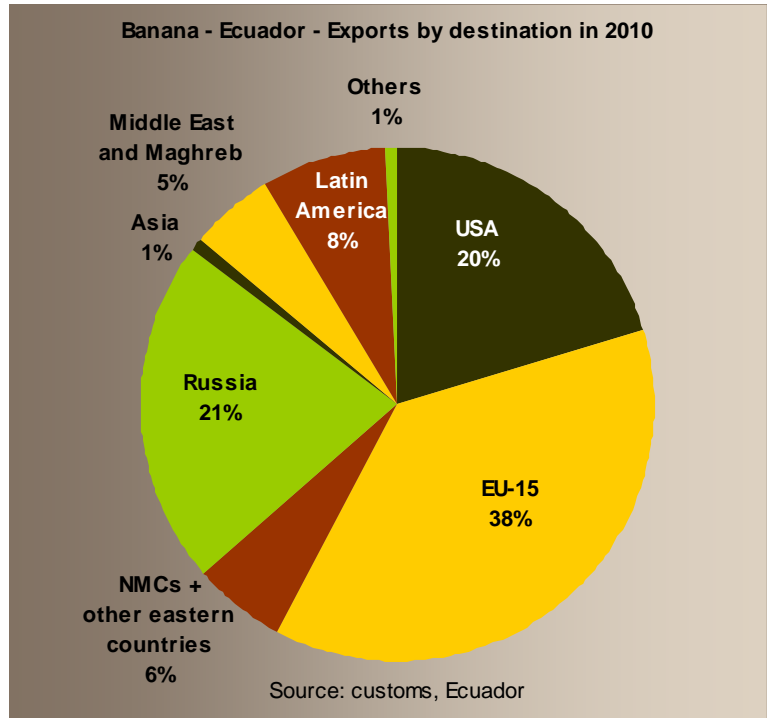


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Exports

Nearly 95% is for the international market only. Ecuador is the world's leading exporter with annual volumes of around 5 million tonnes. Its customer country portfolio is the most varied of all exporters. More than 60% of the volumes are for the two main markets, the European Union and the United States. However, exports to Eastern Europe have increased steadily in recent years and Ecuador is practically the only supplier of Russia thanks to Russian operators in the country. Likewise, it also covers the imports of other South American countries (Argentina, Chile, Peru, Central America). Ecuador also supplies Asia and the Middle East but shipments are dwindling as a result of increasing competition from the Philippines for more than a decade. As the country has large production potential, it can supply large additional spot volumes depending on market conditions. Some 25% of exports are reported to be non-contractual, in contrast with the other competitors in the dollar zone such as Colombia and Costa Rica where 100% of production is sold under contract. In this context, the government is seeking to rebalance relations between growers and exporters by setting up legislation to ensure the respect of the minimum price to be paid to growers.



Logistics

Exports are shipped mainly from the port of Guayaquil (66.5%) and from Puerto Bolivar (33.3%).



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Banana — Ecuador Transit time	
Miami	10-13 days
Newark	12-17 days
Algeciras	19-23 days
Hamburg	18-21 days
Rotterdam	15-19 days
St Petersburg	22-24 days
Yokohama	26-39 days
Istanbul	33-39 days
Tripoli	31-37 days
Shanghai	27-35 days



Producer country sheet

Banana in Costa Rica

by Eric Imbert

Dating back for more than a century, the Costa Rican banana export industry is among the four largest in the world, with some 2 million tonnes of fruits shipped annually. Centred on large multinational groups, it plays a key role on the EU and US markets.

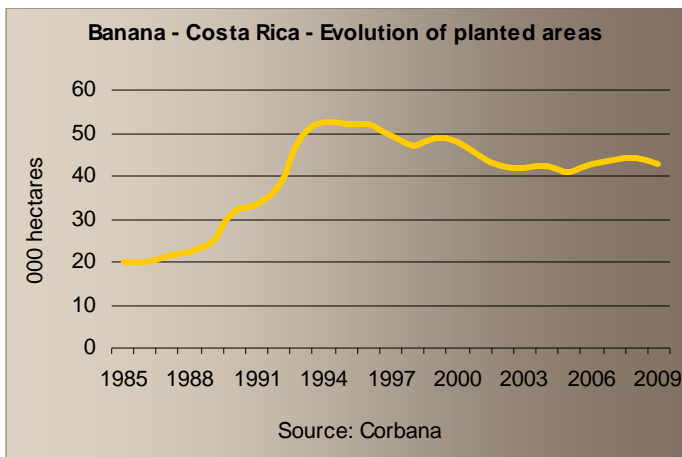
Location

Most of the cultivated areas, totalling 42 500 ha in 2009, are in Limon province on the Caribbean coast. Some 40% of the plantations are concentrated in Limon and Guacimo cantons on alluvial plains developed at the end of the nineteenth century because they are close to the port of Limon. Most of the other plantations were established at the end of the 1980s and are grouped further north (Pococi and Sarapiquí cantons in Heredia province). Rainfall is well distributed but very abundant in this part of the country, requiring drainage and costly control of Black Sigatoka, which has become resistant to systemic fungicides. The rest of the plantations, covering a small area, are in drier zones south of Limon (Talamanca canton) and in Puntarenas province on the Pacific coast (Corredores and Parrita cantons).



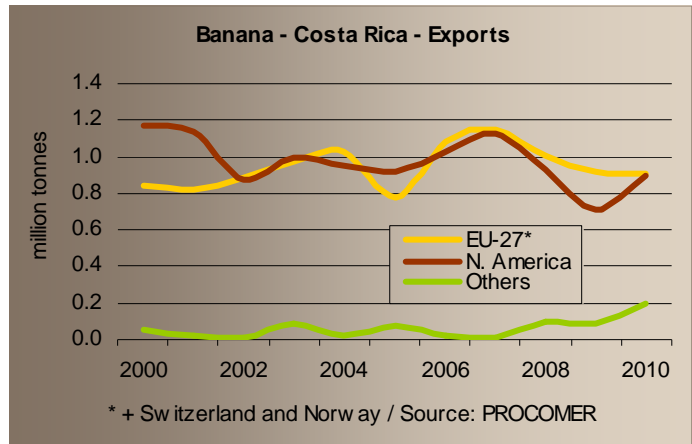
Production

Costa Rica is one of the pioneer countries where cultivation of bananas for export was developed at the end of the nineteenth century at the initiative of the first multinationals in the sector. The 'Ley de fomento bananero', a government plan aiming at making Costa Rica one of the world leaders in fruit exports generated an explosion of production between the end of the 1980s and the mid-1990s, with areas increasing from some 20 000 ha to more than 50 000 ha. Yields are among the highest of Latin America thanks to highly technical production structures that are medium-sized to large and often depend directly on large transnationals. Research facilities (CORBANA) also provide effective support for the structure. However, falling world market prices and the decrease in Costa Rica's competitiveness (high cost of the labour and social policy and among the highest costs of Sigatoka disease control in the world) resulted in a decrease in plantation areas until 2006. The strategy currently used by professionals is that of strengthening and drawing benefit from Costa Rica's advance in social and environmental terms, in particular within the framework of the national 'zero carbon' plan.



Exports

Costa Rica is one of the four largest banana exporters in the world. Volumes have been stable since the beginning of the 2000s at some 2.0 to 2.2 million tonnes in years with no weather problems. The main markets for Costa Rican bananas are the European Union and the United States. Volumes were very equally distributed between the two destinations until 2006 but have subsequently been more focused on the EU. At 2 000 000 t in 2010, the quantities shipped to diversification markets are still minimal but display a degree of growth. Shipments to Russia have developed strongly (JFC has set up in production), as have those to the Mediterranean (Turkey, Libya) and the Arab peninsula. The four main multinational groups control nearly three-quarters of exports by means of their own production or purchases of fruits.



tonnes	2005	2006	2007	2008	2009	2010
EU-27*	775 915	1 088 225	1 143 236	1 010 631	913 574	912 304
North America	917 527	1 032 363	1 130 113	932 183	715 111	900 637
Med./Middle East	33 628	1 041	5 127	2 992	30 335	117 266
Eastern Europe	39 120	18 053	347	82 230	33 438	44 386
South America	8 558	3 357	5 112	8 481	22 734	25 586
Others	37	0	1 377	664	1 132	5 718
Total	1 774 784	2 143 040	2 285 312	2 037 179	1 716 324	2 005 897

* + Switzerland and Norway / Source: PROCOMER

	million boxes	% total export	% own production
Corporacion Desarrollo Agricola Del Monte	26.5	30 %	78.0 %
Standard Fruit company*	24.1	28 %	42.0 %
Compania Bananera Atlantica**	16.6	19 %	67.0 %
Tropicalrica international SA	6.6	8 %	0.0 %
Com. Bananeros de Costa Rica	3.2	4 %	94.0 %
Cosefruta	1.9	2 %	0.4 %
Fyffes International	1.9	2 %	0.2 %
Bonanza Fruit Costa Rica***	1.5	2 %	1.0 %
Others	5.0	6 %	
Total	87.2		

* subsidiary of Dole / ** subsidiary of Chiquita / *** subsidiary of JFC / Source: CORBANA 2009



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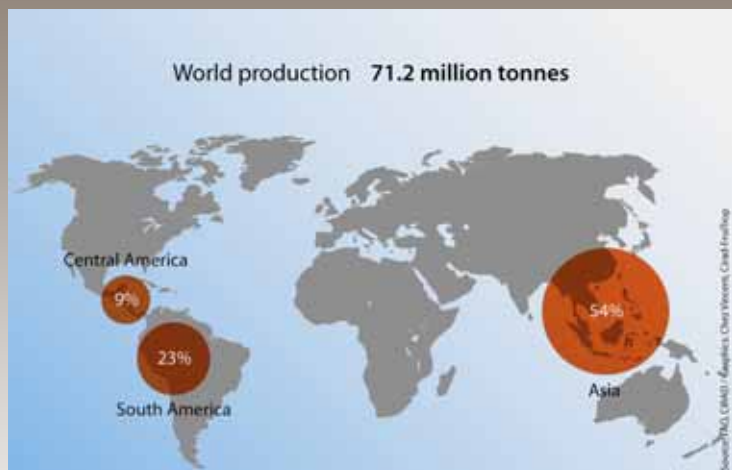
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Logistics

Preliminary transport from the plantation is by road. Practically

all exports are shipped from the ports of Limon and Moin, a few kilometres apart on the Caribbean coast. Maritime logistics is handled using dedicated shipping operated by the multinationals, with the regular lines of general all-purpose companies handling the complement. Thanks to its Atlantic seaboard, Costa Rica can ship to Northern Europe in 10 to 14 days (Rotterdam and Antwerp) and the East Coast of the USA in less than a week (4 days for Florida and 6 days for more northerly ports).

Banana — Production



Banana — The 10 leading producer countries	
tonnes	2009
India	18 582 400
China	7 540 427
Brazil	6 709 839
Ecuador	5 320 000
Philippines	5 100 000
Indonesia	3 753 056
Colombia	2 689 000
Costa Rica	2 020 000
Mexico	1 769 545
Guatemala	1 510 000

Professional sources, FAO

Banana — Imports



Banana — The 10 leading importing countries	
tonnes	2010
United States	4 114 891
Belgium	1 322 647
Japan	1 109 068
Russia	1 068 571
United Kingdom	913 516
Germany	744 932
China (2009 figure)	575 183
France*	556 360
Italy	528 038
Spain*	501 230

* of which island production sold locally or shipped to the continent.
Sources: national customs

Banana — Exports



Banana — The 10 leading exporting countries	
tonnes	2010
Ecuador	4 935 414
Costa Rica	2 005 897
Philippines	2 002 848
Colombia	1 802 581
Guatemala	1 686 705
Honduras	518 487
Canaries	350 000
Panama	295 270
Côte d'Ivoire*	244 000
Cameroon*	243 000

* EU volumes / Professional sources and national customs

USA — Imports — Main supplier countries

000 tonnes	2005	2006	2007	2008	2009	2010
Guatemala	1 029	913	1 093	1 189	1 112	1 152
Costa Rica	904	994	929	830	958	982
Ecuador	823	927	1 037	874	563	854
Honduras	514	474	377	451	422	461
Colombia	453	423	483	506	389	436
Nicaragua	34	39	32	66	105	146
Mexico	38	30	33	31	25	36
Peru	2	8	1	8	5	29
Dominican Rep.	22	25	18	23	20	20
Panama	4	6	2	-	1	-
Others	1	-	-	-	-	-
Total	3 824	3 839	4 004	3 978	3 599	4 115

Source: USDA

Canada — Imports — Main supplier countries

000 tonnes	2005	2006	2007	2008	2009	2010
Ecuador	54	94	100	121	164	147
Colombia	106	174	138	122	129	115
Costa Rica	62	88	125	115	71	106
Guatemala	57	79	75	81	93	90
Honduras	12	10	23	29	17	30
Panama	1	5	4	3	3	4
Others	7	7	6	6	5	6
Total	299	459	472	478	482	496

Source: COMTRADE

Latin America + Caribbean — Imports

000 tonnes	2004	2005	2006	2007	2008	2009
Argentina	303	302	296	319	347	344
Chile	160	168	169	169	175	179
Salvador	105	109	105	119	113	96
Colombia	71	67	31	89	72	67
Honduras	-	1	20	16	0	63
Uruguay	443	48	45	42	43	42
Costa Rica	11	26	18	24	28	26
Nicaragua	-	-	-	3	3	6
Guatemala	14	4	5	12	7	5
Trinidad	3	2	3	4	4	5
Aruba	0	0	0	0	0	3
Total	711	727	691	798	792	835

Source: COMTRADE

EU-27 — Imports — Main supplier countries

000 tonnes	2005	2006	2007	2008	2009	2010
Total EU prod., incl.	648	642	554	568	608	657
Canaries	345	348	361	371	352	397
Martinique	226	221	129	125	180	199
Guadeloupe	54	48	38	47	56	43
Madeira	14	15	17	18	14	14
Cyprus	6	7	6	4	3	3
Greece	3	3	3	3	3	2
Total dollar, incl.	2 959	3 290	3 847	3 964	3 555	3 498
Ecuador	1 059	1 026	1 186	1 349	1 278	1 223
Colombia	878	948	1 156	1 281	1 206	1 168
Costa Rica	623	825	971	902	753	777
Panama	281	311	354	295	183	184
Brazil	63	96	86	58	56	63
Peru	12	23	34	39	44	51
Honduras	19	18	32	24	9	15
Mexico	3	1	0	2	22	13
Guatemala	3	27	19	14	4	3
Venezuela	17	15	10	0	0	0
Total ACP, incl.	764	906	837	920	957	1 023
Dominican Rep.	145	177	206	171	228	304
Côte d'Ivoire	184	228	189	217	229	244
Cameroon	253	259	222	280	250	243
Belize	74	73	62	82	80	79
Surinam	35	45	59	66	57	70
Ghana	4	24	34	46	36	52
St Lucia	28	36	30	39	33	23
St Vincent	15	17	14	9	8	4
Dominica	12	13	7	10	36	4
Jamaica	12	32	18	0	0	0
Other ACP	2	2	2	0	0	0
Total	4 371	4 838	5 238	5 452	5 120	5 179

Source: EUROSTAT

Other Western Europe countries — Imports

000 tonnes	2004	2005	2006	2007	2008	2009
Norway	66	73	75	78	84	81
Switzerland	74	74	74	78	82	81
Iceland	5	5	5	6	6	6
Total	144	152	154	162	171	168

Source: COMTRADE

Russia — Imports — Main supplier countries

000 tonnes	2005	2006	2007	2008	2009	2010
Ecuador	791	798	920	903	911	977
Costa Rica	15	27	2	66	33	48
Philippines	21	30	25	32	25	30
Colombia	28	21	22	-	5	10
China	2	2	6	5	4	3
Mexico	-	-	0	0	3	1
Vietnam	1	1	-	-	-	-
Brazil	0	-	-	0	-	-
Others	6	16	3	-	-	-
Total	865	895	979	1 007	981	1 069

Source: COMTRADE

Ukraine — Imports — Main supplier countries

000 tonnes	2004	2005	2006	2007	2008	2009
Ecuador	61	221	220	289	270	202
Colombia	3	15	5	1	2	9
Costa Rica	2	9	22	2	5	8
Guatemala	0	0	13	6	0	5
Mexico	0	0	7	-	0	-
Panama	0	2	2	0	0	3
Honduras	1	2	2	0	0	0
Others	-	-	-	-	1	-
Total	68	249	272	298	278	227

Source: COMTRADE

Other Central and Eastern Europe countries — Imports

000 tonnes	2004	2005	2006	2007	2008	2009
Croatia	51	54	51	55	57	52
Serbia	0	58	56	66	69	43
Bosnia	47	45	38	38	41	37
Belarus	26	29	29	33	42	37
Albania	17	17	17	20	17	17
Macedonia	21	18	15	16	15	17
Moldavia	5	7	8	11	13	12
Montenegro	0	0	8	9	8	8
Total	166	227	222	248	263	223

Source: COMTRADE

Japan — Imports — Main supplier countries

000 tonnes	2005	2006	2007	2008	2009	2010
Philippines	944	911	879	1 019	1 159	1 035
Ecuador	91	101	52	46	62	46
Taiwan	15	16	19	9	9	10
Peru	4	4	8	7	11	8
Mexico	4	4	5	5	5	4
Thailand	2	2	2	2	2	2
Colombia	2	2	3	2	4	3
Dominica	1	2	1	-	1	1
China	3	2	2	1	1	1
Others	0	-	-	-	-	-
Total	1 067	1 044	971	1 093	1 253	1 109

Source: national customs

Far East — Imports

000 tonnes	2004	2005	2006	2007	2008	2009
China	449	430	463	402	437	575
South Korea	210	254	280	308	258	257
Singapore	35	36	36	37	38	40
Thailand	1	5	13	7	20	9
Total	695	725	793	754	753	881

Source: COMTRADE

Asia minor — Imports

000 tonnes	2004	2005	2006	2007	2008	2009
Kazakhstan	19	22	25	34	38	47
Afghanistan	0	0	0	0	0	38
Azerbaijan	5	8	10	14	15	18
Armenia	4	8	9	17	8	8
Kirghizia	2	2	2	3	5	7
Georgia	7	7	10	11	10	-
Total	37	47	55	80	77	118

Source: COMTRADE

Middle East — Imports

000 tonnes	2004	2005	2006	2007	2008	2009
Saudi Arabia	212	233	235	248	257	252
Bahrain	11	11	10	10	0	14
Oman	3	4	6	9	11	10
United Arab Emirates	0	50	0	123	127	-
Koweit	30	0	68	89	96	-
Qatar	7	13	15	18	22	-
Total	263	311	333	497	512	277

Source: COMTRADE

Africa — Imports

000 tonnes	2004	2005	2006	2007	2008	2009
South Africa	3	5	13	22	24	23
Mali	-	-	31	11	21	21
Senegal	14	15	16	17	17	17
Botswana	3	6	6	6	7	8
Rwanda	0	0	-	6	3	4
Mauritania	-	-	3	3	3	3
Namibia	3	3	2	2	3	3
Burkina Faso	1	2	0	0	0	3
Total	25	31	70	66	78	81

Source: COMTRADE

Mediterranean — Imports

000 tonnes	2004	2005	2006	2007	2008	2009
Syria	94	112	323	193	219	219
Turkey	110	151	184	224	219	182
Algeria	205	157	147	163	164	180
Tunisia	54	21	20	41	34	37
Morocco	1	5	5	17	19	27
Jordan	2	6	9	20	33	26
Egypt	1	3	6	5	3	2
Total	467	455	695	663	691	673

Source: COMTRADE

Oceania — Imports

000 tonnes	2005	2006	2007	2008	2009	2010
New-Zealand	85	88	87	88	84	81

Source: COMTRADE





Black Sigatoka disease

A challenge for the world banana industry

Banana production is confronted with two main types of leaf streak disease: Yellow Sigatoka and Black Sigatoka. They are caused by parasitic leaf fungi. The pathogen of Yellow Sigatoka is *Mycosphaerella musicola* and that of Black Sigatoka is *Mycosphaerella fijiensis*.

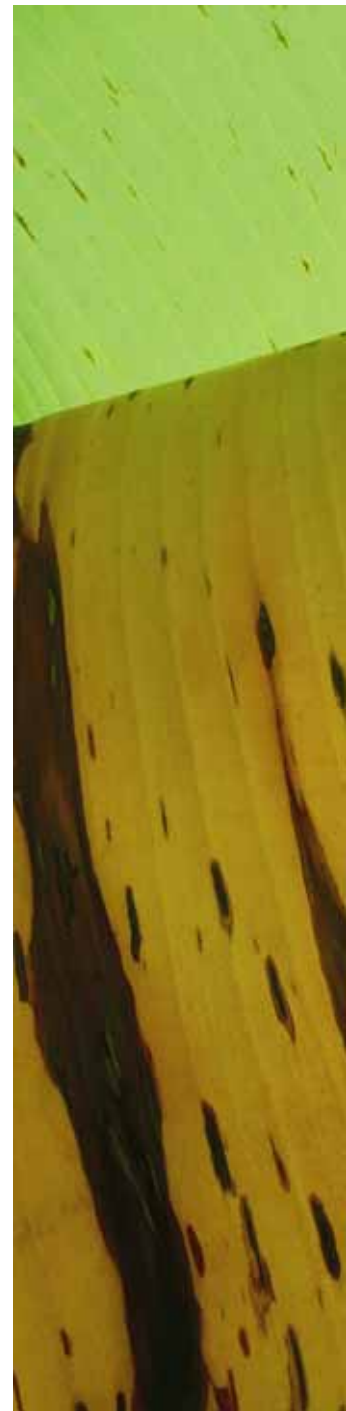
A new fungal species, *Mycosphaerella eumusa*, that may be responsible for a new, even more aggressive form of Black Sigatoka, seems to be spreading in Asia and the Indian Ocean, but this remains to be confirmed.

Propagation is from banana plant to banana plant in continental zones. Maritime zones form a natural obstacle. Although the risk of natural spread of spores by wind does exist, the spread of the disease from one zone to another is usu-

ally the result of uncontrolled transfers of germplasm. Black Sigatoka is present in all the producer countries in Latin America, Africa and Asia. The countries of the Caribbean arc were long protected by their island status. Presence of the diseases in St Vincent and Guiana was confirmed in 2009. It was demonstrated officially in St Lucia in early 2010 and in Martinique in September 2010.

In the Caribbean, only Dominica and Guadeloupe are still free of the disease but Black Sigatoka is certain to reach these islands, probably in the short term.

The fungus destroys the foliage. The disease takes the form of small elongated black streaks that soon become necrotic. Necrosis spreads



Distribution of Black Sigatoka in the Caribbean arc



© Denis Loeillet



Yellow Sigatoka

and finally destroys all the leaves of the plant before the bunch is cut. This results in smaller yields and very ripe fruits that are unsalable.

The sequence is precisely the same as that caused by Yellow Sigatoka, a fungal disease present on all the continents for about 60 years. Rational chemical control of the disease was

established by professionals in Martinique and Guadeloupe. Warning methods (biological and meteorological) based on the weekly observation of biological and meteorological descriptors in plantations make it possible to monitor the dynamics of the disease and to apply appropriate treatments. Today, Yellow Sigatoka is controlled with a small number of sprayings: an average of five to seven a year in West Indian plantations.

There are fundamental differences between the two leaf streak diseases. Unlike Yellow Sigatoka, Black Sigatoka can develop on export bananas and also on plantains and other cultivated varieties that are also very susceptible to the disease. It spreads rapidly and is very difficult to control. Depending on the country and the control facilities and strategies used, management requires from 12 to more than 50 sprayings per year.

Different control strategies

In the main Latin American producer countries, export banana plantations form vast agroindustrial units in alluvial plains. Given the areas of the estates (several hundred or even several thousand hectares), contamination from outside is weak. There are no outbreaks of the disease in the immediate neighbourhood of agroindustrial plantations. Agroclimatic homogeneity makes it possible to organise and rationalise the spraying of large units. Low labour costs facilitate the cleansing work required in the form of regular deleafing. In this context, the impact of spraying in terms of nuisance is not always taken into account by the large companies, who do not hesitate to use systematic control strategies leading to more than 50 sprayings per year. These sprayings are often performed at less than weekly intervals, and generally involve contact fungicides that are not very curative (chlorothalonil, dithiocarbamates, etc.) and whose effectiveness is small by definition. System fungicides are sometimes used but usually in 'cocktails' that are mixes of systemic, penetrating and contact substances prepared as emulsions in oil.

CIRAD has developed rational control strategies that, for the control of Yellow and Black Sigatoka, are based on warning systems involving either scouting in the plantation or the observation of meteorological descriptors (evaporation, temperature, etc.). This strategy has been applied in different countries to control Yellow Sigatoka and also Black Sigatoka. This is the case in particular in Guadeloupe, Martinique, Cameroon and Côte d'Ivoire. The main objectives are as follows:

- improving the effectiveness of control while reducing the number of sprayings per year;
- limiting the risks of the selection of fungal strains that are resistant to the systemic fungicides used;
- reducing pollution and thus achieving greater respect of human health and the environment (urban centres, rivers, water bodies, reservoirs, etc.).

The strategy is also based on the rational, alternate use of systemic fungicides (benzimidazoles, triazoles, strobilurins) and penetrating fungicides (morpholines) which are mixed with refinery oils that are also fungistatic and applied at a low volume (13 to 15 litres per hectare), prolonging the effectiveness of each spraying and hence reducing the number of sprayings required each year.

The systemic fungicides on the market have a single-site mode of action on the pathogen and the risk of the appearance of resistant strains is high if they are used irrationally or abusively. In Central America, benzimidazoles were used massively when they came on to the market and resistance was observed only two years after they began to be used to control Black Sigatoka. This made it necessary to use more contact fungicides (15 to 40 kg active substance per hectare per year). The same phenomenon was then observed in these production zones with Black Sigatoka when triazoles and then strobilurins were used.

Thanks to the warning methods and hence the reduced number of sprayings, the phenomenon did not appear in Cameroon and Côte d'Ivoire for 10 or even 15 years of use of the fungicides to control Black Sigatoka.

In Guadeloupe and Martinique, the problems started to appear with control of Yellow Sigatoka after 20 or even 30 years of rational use of these fungicides using warning methods.

New essential control methods

Present control strategies cannot be used indefinitely. The European legislation in force in the French West Indies makes it technically impossible to use rational control strategies based on the alternating of several active substances with different modes of action. Only two fungicides in the triazole family can currently be used for aerial spraying.

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Black Sigatoka

A strobilurin fungicide and another in the morpholin group received marketing authorisations at the end of 2008, but they are not used to control Yellow Sigatoka as the authorisation is accompanied by a 100-metre unsprayed buffer zone and this is incompatible with aerial spraying.

Actions can be envisaged to address this problem of regulations, such as reducing the buffer zone to 50 metres, using land-based sprayers and technical developments to reduce the drift of fungicide sprays, the registration of new systemic fungicides, requests for derogations, etc. — but the legislation may well become increasingly restrictive in the future.

The feasibility of the implementation of rational control is based on the status of the fungal strains with regard to curative fungicides. If the strains are (see status of invasive strains) or become resistant to these fungicides (see risks of the rapid mu-


tation of *M. fijiensis*), this will irremediably compromise the implementation of such strategies.

Other methods must therefore be sought for the control or regulation of biological pests of banana. Breeding new hybrid varieties with lasting resistance and good agricultural and organoleptic potential is a component of integrated management to be favoured, in particular for the control of Black Sigatoka.

These varieties must be incorporated in innovative, sustainable cropping systems that also include cultural control methods (optimum plant management, rational management of inoculum using mechanical cleansing techniques, etc.) that will thus make it possible to reduce the negative environmental impacts of commercial plantations and in particular reduce the application of pesticides.

Thinking of adopting an overall approach combining new hybrids resistant to leaf streak diseases and cropping systems that make it possible to conserve this resistance is an urgent matter ■


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Post harvest diseases

Storage diseases (wound anthracnose, ripe-fruit (quiescent) anthracnose and crown rots) strongly limit the sale of exported bananas. *Colletotrichum musae* causes both forms of anthracnose, while crown rots result from a larger parasite complex consisting of *C. musae* but also other organisms: *Fusarium*, *Verticillium*, *Botryodiplodia*, etc.

Distinction is made between two forms of anthracnose:

- ripe-fruit (quiescent) anthracnose: brown lesions develop on fruits after ripening and subsequently in the sales channel. This disease rarely has serious commercial consequences.
- wound (non-quiescent) anthracnose: broad brown lesions occur on fingers wounded during harvesting or packing. The symptoms are observed when fruits are unpacked after sea transport and have serious commercial consequences.

Crown rots are fungi that spread from cut surfaces when fruits are prepared at the packing stage. This damage is also visible after sea transport and has serious commercial consequences.

The fungi that cause post-harvest diseases are widespread in banana plantations and hence on bunches if these are not protected. In other words, control of infection begins when the inflorescence shoots at the top of the leaf cluster. Anthracnose results mainly from contamination by *Colletotrichum musae* in the field. It is not possible to detect infected fruit with the naked eye at harvesting but a test can be performed more than three weeks before cutting. Fruits are infected mainly during the first month of flowering. Spores are spread by water and develop on the organs when they start to decompose (old leaves, bracts and above all flowers). Control of the disease must begin in the field and then continue in the packing shed.

Hands can be contaminated by crown rot at various stages in the chain. This greatly complicates the implementation of control measures, but hand contamination by washing water is probably the main cause.

Chemical control of these diseases does not always give satisfactory results. Indeed, it is sometimes ineffective according to the production zone and the time of the year and resistance to fungicide has developed in the various fungal species involved. Finally, interest in developing methods other than chemical control is increasing. Indeed, these post-harvest treatments raise two crucial problems—the risks of residues in fruits and the processing of the fungicide preparations discharge near packing stations.



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Banana quality defects in the field

Photos © Luc de Lapeyre, Marc Chillet, Marie-José Rives, Fruidor



Flower thrips



Red rust thrips

Pests



Silver rust thrips



Snail damage



Damage by

Physiological defects and other imperfections



Double fruit and deformed fruits



Scarring by a fruit tip



Scarring by a leaf



Scarring by guying cord



Sunscald



Chemical burns

Diseases



Speckle



Red speckling at ripening



Deightonella



Sooty mould on fruit stalk



Cigar-end rot

Banana quality defects at packing

Photos © Luc de Lapeyre, Marc Chillet, Marie-José Rives, Fruidor

Selection problems and miscellaneous defects



Fruit too thin



Fruit too short



Latex stains



Incomplete flower removal

Dehanding problems

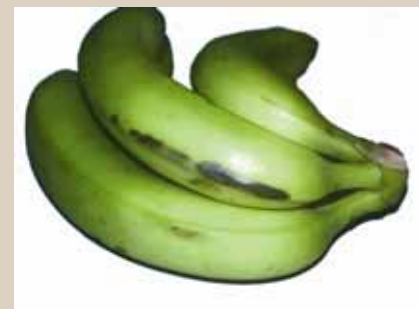


Crown cut too short



Detached crown

Bruising



Bruising caused by impact during packing

Banana quality defects after transport

Photos © Luc de Lapeyre, Marc Chillet,
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Ripening
problems



'Ship ripe' fruits



Unevenness after ripening

Storage
problems



Chilling injury



'Green ripe' fruits

Storage
diseases



Latent anthracnose infection



Wound anthracnose



Crown rot



Crown rot



Pointed crown



Knife wound



Flexed fruit stalks



The genetic diversity of banana in figures

Over a period of thousands of years, population migrations and movement of plant material have placed banana in very different ecological contexts in the various continents. Farmers have succeeded in profiting from the natural mutations resulting from vegetative multiplication. This combination of natural reproduction and selection by man since ancient times results in the present genetic diversity.

Bananas originated in South-East Asia as wild seminiferous plants. Natural crosses built up a large base of genetic diversity that still exists today. These crosses were the origin of the seedless varieties. These bananas have food qualities that soon interested man, who incorporated them in agriculture using their vegetative multiplication potential.

From the botanical point of view, the genus *Musa* is divided into seminiferous species with inedible fruits and parthenocarpic varieties with fleshy seedless fruits. The *Eumusa* section includes *Musa acuminata* (genome symbol: A) and *Musa balbisiana* (genome symbol: B). These are wild species at the origin of the cultivated varieties.

The latter are classified according to their ploidy level and their genetic make-up. Some 1 200 varieties have been counted and classified around the world.

The inedible wild species with seed-containing fruits can be used for purposes other than human foodstuff (fibre, livestock feedingstuff, etc.). They are all diploid (AA and BB). About 180 have been counted to date, all from South-East Asia, but the census is not definitive (especially for the BBs). These fertile varieties are nonetheless important since they possess different levels of resistance to pests and diseases. They therefore form base material for the various present and future conventional genetic improvement and varietal creation programmes. Numerous cultivars have been bred by man. They are classified in groups according to their genetic make-up and then in subgroups assembling the various cultivars derived from each other by natural mutation starting from a common genetic ancestor. Distinction is made between the following groups:

diploid groups: AA (such as Figue sucrée or Frayssinette) and AB. These total about 290 cultivars grown mainly

in South-East Asia where they originated;

three triploid groups (650 cultivars): AAA, AAB and ABB. The subgroups of each of these distinguish between the dessert varieties richer in sugar at maturity, cooking varieties with fruits that are firm and not sweet even when ripe, and sometimes bananas for beer-making by fermentation of the pulp (East Africa).

Even if the plants within the same subgroup display only weak genetic diversity, they do have a great range of phenotypes, resulting essentially from mutations and many centuries of selection by man. This is the case of the Cavendish (more than 20 cultivars), East African highland bananas (more than 50) and central and West African plantain (more than 150) subgroups.

Although the intensive cultivation system used for approximately 25 percent of world production favours monovarietal production, it is important to remember that most production is based on less intensive family farming with stress on varietal mixing. This contributes to the continuing of selection and hence ensures the diversity of banana ■

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Banana — Estimated world production in 2009

Tonnes	Cooking bananas		Dessert bananas		Total
	Plantain AAB group	Highland bananas + ABB group + others	Cavendish	Gros Michel + others	
North America	0	4 000	6 985	100	11 085
South America	4 927 743	581 175	12 311 521	3 899 437	21 719 876
Central America	953 800	103 693	6 570 545	98 000	7 726 038
Caribbean	946 216	465 846	1 115 491	228 841	2 756 394
West and Central Africa	8 191 008	907 396	2 397 810	451 742	11 947 956
East Africa	1 337 036	13 836 780	2 327 386	680 950	18 182 152
North Africa and Middle East	31	9 667	1 939 449	46 964	1 996 111
Asia	1 299 184	11 710 299	30 175 723	8 067 347	51 252 553
Oceania	1 431	543 210	361 032	69 924	975 597
Europe	101	1 010	434 456	1 020	436 587
World total	17 879 550	29 328 640	56 643 171	12 562 332	116 413 693

Source: Thierry Lescot - Cirad after references, surveys, professional sources, FAO, etc.

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Estimates in tonnes Production and commerce 2009 data (or 2008 data in italics)	Production				Exports		Imports		
	Cooking bananas		Dessert bananas		Total	Cavendish	Plantain	Dessert banana	Plantain
	Plantains AAB	Highland bananas + ABB + other AAB	Cavendish	Gros Michel & others					
North America									
Canada					0	39	17	496 133	150
United States		4 000	6 985	100	11 085	524 526		4 114 891	271 637
Greenland					0			250	
Saint Pierre & Miquelon								65	
Total	0	4 000	6 985	100	11 085	524 565	17	4 611 339	271 787
	0.0%	36.1%	63.0%	0.9%	100.0%	11.4%	0.0%		
Central America									
Belize	3 800	200	87 000	1 000	92 000	79 442	100	20	
Costa Rica	60 000	2 000	2 000 000	20 000	2 082 000	1 860 000	18 230	22 368	377
Guatemala	320 000	25 000	1 500 000	10 000	1 855 000	1 215 380	115 870	5 110	143
Honduras	110 000	20 000	710 000	20 000	860 000	562 340	1 728	63 086	13 917
Mexico	195 000	10 000	1 739 545	30 000	1 974 545	88 004	299	59	19
Nicaragua	90 000	30 000	82 000	5 000	207 000	5 733	7 862	6 068	118
Panama	85 000	10 000	390 000	9 000	494 000	344 660	862	20 892	24
Salvador	90 000	6 493	62 000	3 000	161 493	5		111 907	60 231
Total	953 800	103 693	6 570 545	98 000	7 726 038	4 155 564	144 951	229 510	74 829
	12.3%	1.3%	85.0%	1.3%	100.0%	63.2%	15.2%		
South America									
Argentina			181 950	50	182 000	300		344 106	159
Bolivia	160 000	11 000	122 000	60 000	353 000	79 466	50		
Brazil	453 350	30 000	3 809 839	2 900 000	7 193 189	130 888	25	37	
Chile					0	51		179 318	3 578
Colombia	2 650 000	366 784	2 200 000	489 000	5 705 784	1 802 581	120 000	25 147	66 327
Ecuador	500 000	49 388	5 200 000	120 000	5 869 388	4 944 968	162 051	1 550	
Guiana	4 193	1 000	5 892	1 000	12 085	50	110		22
French Guiana	2 200	1 000	3 000	1 500	7 700				
Falkland Isl.								20	
Paraguay		300	48 840	9 700	58 840	27 809		1 091	
Peru	800 000	80 000	270 000	200 000	1 350 000	78 166	117	41	
Surinam	8 000	1 384	70 000	6 000	85 384	57 000	10		200
Uruguay					0	1		41 611	
Venezuela	350 000	40 319	400 000	112 187	902 506	13	1 397		
Total	4 927 743	581 175	12 311 521	3 899 437	21 719 876	7 121 293	283 760	592 921	70 286
	22.7%	2.7%	56.7%	18.0%	100.0%	57.8%	5.8%		
Caribbean									
Anguilla			1					70	12
Antigua & Barbuda	1	3	212	4	220			905	355
Netherlands Antilles			10		10	10		2 070	558
Aruba					0			2 697	580
Bahamas	5	20	3 690	35	3 750	17		2 254	1 521
Barbados	5	25	675	15	720	1		2 263	1 353
Bermuda	400	30	363	50	843	160	179	1 015	
Cuba	180 000	245 000	88 000	182 400	695 400	30		25	
Dominica	3 600	600	13 500	500	18 200	10 934	1 309		
Grenada	740	200	1 300	36	2 276	191	4		
Guadeloupe	8 450	550	64 000	2 000	75 000	55 675			400
Haiti	305 000	72 000	100 000	18 000	495 000	2	300	7 515	3 803
Cayman Isl.	20	1	200	9	230			551	
Turks & Caicos Isl.								487	136
Virgin Isl. (USA)	250	50	1 300	100	1 700				1
Virgin Isl. (UK)	70	10	260	20	360	73		40	27
Jamaica	14 000	1 035	30 000	4 000	49 035	40		19	3
Martinique	15 000	3 000	193 000	3 000	214 000	179 440			3
Montserrat	75	3	80	2	160			60	50
Puerto Rico	109 000	2 000	100 000	2 200	213 200			1 738	800
Dominican Republic	300 000	139 569	450 000	10 370	899 939	249 654	2 480		
St Kitts et Nevis					0			617	500
St Vincent & Grenadines	2 800	800	15 000	2 000	20 600	11 000	1 150	20	1
St Lucia	2 300	450	47 000	4 000	53 750	41 215	200		1
Trinidad & Tobago	4 500	500	6 900	100	12 000	1		4 933	63
Total	946 216	465 846	1 115 491	228 841	2 756 394	548 443	5 622	27 209	10 166
	34.3%	16.9%	40.5%	8.3%	100.0%	49.2%	0.6%		



Estimates in tonnes Production and commerce 2009 data (or 2008 data in italics)	Production				Exports			Imports	
	Cooking bananas		Dessert bananas		Total	Cavendish	Plantain	Dessert banana	Plantain
	Plantains AAB	Highland bananas + ABB + other AAB	Cavendish	Gros Michel & others					

East Africa									
South Africa	20	117	271 000	2 500	273 637	718		36 685	
Botswana					0	5		9 341	
Burundi	170 000	1 268 679	131 321	280 000	1 850 000	40			10
Comoros	3 000	11 000	40 000	2 000	56 000			7	
Djibouti			1		1			1 995	
Eritrea			10	1	11	20		15 000	
Ethiopia	100	1 000	192 274	959	194 333	2 574			
Réunion Isl.	10	500	7 200	4 790	12 500				
Kenya	305 000	200 000	290 000	80 000	875 000	22		20	10
Lesotho					0			3 000	
Madagascar	15 000	12 000	210 000	15 000	252 000	104			
Malawi	130 000	40 000	140 000	10 000	320 000				
Mauritius	10	700	9 410	800	10 920			1	
Mayotte	640	6 400	6 000	1 000	14 040				
Mozambique	5 000	5 300	76 700	3 000	90 000	19 971			
Uganda	200 000	8 907 000	241 000	164 000	9 512 000	12 400	1 505		20
Rwanda	200 000	2 180 000	120 000	100 000	2 600 000	16	1	13 100	10
Seychelles	100	530	1 120	250	2 000			3	
Somalia	8 000	2 000	26 000	2 000	38 000	18	1		
Sudan		1 000	71 000	2 000	74 000	65			
Swaziland	5	4	10 000	1	10 010	6 000		3 000	
Tanzania	300 000	1 200 000	400 000	12 000	1 912 000	50	1	2	
Zambia	1	50	600	49	700	62		1 585	
Zimbabwe	150	500	83 750	600	85 000	5 716			
Total	1 337 036	13 836 780	2 327 386	680 950	18 182 152	47 781	1 508	83 739	50
	7.4%	76.1%	12.8%	3.7%	100.0%	2.1%	0.1%		

West and Central Africa									
Angola	120 000	10 000	156 000	14 000	300 000			20	100
Benin	45 000	100	14 500	9 000	68 600		200	237	2 100
Burkina Faso	100	10	15 000	10	15 120	210		2 968	5 600
Cameroon	1 200 000	200 000	600 000	220 000	2 220 000	281 000	30 000	36	
Cape Verde	10	30	6 730	30	6 800			3	
Congo	61 000	4 000	35 000	8 000	108 000			11	2 000
Congo (Dem. Rep.)	1 001 690	205 000	291 470	24 000	1 522 160	1 848	3 000		
Côte d'Ivoire	1 350 000	205 454	420 000	6 000	1 981 454	264 344	35 000	150	
Gabon	70 000	10 000	12 000	1 000	93 000			2	11 000
Gambia	8	1	180	1	190			380	
Ghana	1 400 000	150 000	160 000	20 000	1 730 000	50 000	400		200
Guinea	420 000	16 000	142 000	20 000	598 000	19	20		
Guinea Bissau	36 000	4 000	4 800	400	45 200	1			
Equatorial Guinea	28 000	3 000	8 000	1 000	40 000	4			9 000
Liberia	43 000	5 000	40 000	10 000	98 000			1	14
Mali	6 500	500	80 000	500	87 500			21 290	5 500
Mauritania		1	70	1	72	2		3 343	
Namibia					0	8		2 805	
Niger			350		350			1 414	2 500
Nigeria	2 296 000	83 000	263 000	85 000	2 727 000		1		1 000
Centra African Rep.	78 000	7 000	90 000	30 000	205 000				2 000
St Helena								50	
Sao Tomé & Principe	3 000	1 000	1 500	1 000	6 500				10
Senegal	200	100	40 100	100	40 500	34		16 513	2 300
Sierra Leone	23 000	2 000	9 000	1 000	35 000		1	10	
Chad			10		10			15 000	1 500
Togo	9 500	1 200	8 100	700	19 500	15	2	2	100
Total	8 191 008	907 396	2 397 810	451 742	11 947 956	597 485	68 624	64 235	44 924
	68.6%	7.6%	20.1%	3.8%	100.0%	24.9%	0.8%		

North Africa & Middle East									
Algeria		1	198	1	200			179 578	
Saudi Arabia			1		1	441		252 375	
Bahrain			700	50	750			13 835	
West Bank		5	6 150	5	6 160			10 000	
Egypt	1	3 000	1 056 999	40 000	1 100 000	4 016		10 145	
United Arab Emirates			200		200	14 797		126 713	
Iraq			10		10			848	
Iran		3 000	69 000	3 000	75 000	10		5 663	
Israel		1 000	91 400	1 110	93 510	2 261		25	
Jordan		800	42 294	740	43 834	739		39 630	
Koweit					0	186		96 097	
Lebanon	10	600	88 500	590	89 700	59 181		538	
Libya		1	2	1	4			11 584	
sub-total (contd. p. 61)	11	8 407	1 355 454	45 497	1 409 369	81 631	0	747 031	0

Estimates in tonnes Production and commerce 2009 data (or 2008 data in italics)	Production				Total	Exports		Imports	
	Cooking bananas		Dessert bananas			Cavendish	Plantain	Dessert banana	Plantain
	Plantains AAB	Highland bananas + ABB + other AAB	Cavendish	Gros Michel & others					
North Africa & Middle East (concluding)									
Morocco		500	219 000	500	220 000	79		26 712	
Oman		500	27 900	492	28 892	614		9 716	
Qatar					0	460		21 543	
Western Sahara					0			2 500	
Syria			790	10	800			219 430	
Tunisia		10	55	50	115	20		37 118	
Turkey		50	204 352	115	204 517	97		182 438	
Yemen	20	200	131 898	300	132 418	80 077		22	
Total	31	9 667	1 939 449	46 964	1 996 111	162 978	0	1 246 510	0
	0.0%	0.5%	97.2%	2.4%	100.0%	8.4%	0.0%		
Asia									
Afghanistan					0			37 566	
Azerbaijan					0			18 371	18
Bangladesh	13 000	120 000	527 603	216 520	877 123	260	10	150	
Bhutan	74	500	3 000	400	3 974			9	
Brunei		40	690	70	800			90	
Cambodia	10 000	45 000	50 000	25 000	130 000				
China	60	667 215	7 402 432	137 995	8 207 702	24 096		575 183	
South Korea					0	255		257 024	
North Korea					0			20	
Hong Kong					0	14 712		68 104	
India	898 000	3 724 400	14 581 900	4 000 500	23 204 800	30 401	1		
Indonesia	70 000	2 450 000	2 531 704	1 221 352	6 273 056	1 970	1	56	
Japan			205		205	14		1 109 068	6 380
Kazakhstan					0			46 603	6
Kirghizia					0	39		8 987	
Laos	1 000	7 000	22 000	18 000	48 000			526	
Macau					0			1 175	
Malaysia	40 000	210 000	255 000	120 000	625 000	15 624		244	
Maldives	40	80	4 000	220	4 340			1 432	31
Mongolia					0			85	
Myanmar	40 000	400 000	130 000	60 000	630 000			7 855	
Nepal		20 000	56 209	12 640	88 849			699	
Uzbekistan					0			1	
Pakistan	2 000	26 000	113 378	18 000	159 378	12 988		52	
Philippines	1 000	2 500 564	3 300 000	1 800 000	7 601 564	2 192 600		39 666	
Singapore					0	76		3	26
Sri Lanka	162 000	293 760	45 920	10 000	511 680	230	1 751	120	
Tajikistan								150 000	
Taiwan		100	700	200	1 000	10 000		9 214	
Thailand	60 000	650 000	594 082	224 000	1 528 082	21 079	100	20	
East Timor	10	40	1 900	50	2 000			100	
Turkmenistan									
Vietnam	2 000	595 600	555 000	202 400	1 355 000	10 574	11		
Total	1 299 184	11 710 299	30 175 723	8 067 347	51 252 553	2 334 918	1 874	2 332 423	6 461
	2.5%	22.8%	58.9%	15.7%	100.0%	7.7%	0.1%		
Oceania									
Australia	50	500	247 843	22 000	270 393	3		317	
Fiji	100	2 300	3 409	100	5 909	98			
Guam		145	205		350			1 000	
Cook Isl.		100	60		160	22			
Marshall Isl.								50	
Solomon Isl.		90	330		420				
Kiribati		3 800	1 600	400	5 800				
Micronesia	350	840	1 250	10	2 450				
Niue		20	140		160	120			
New Caledonia	130	1 800	2 000	600	4 530			2	
New Zealand					0	1		81 314	130
Palau								50	
Papua-New Guinea	500	500 000	90 000	42 000	632 500	1 000			
French Polynesia		2 300	3 100	500	5 900			3	
Samoa	100	13 900	6 000	3 000	23 000	1			
Samoa (USA)		230	500	60	790			1	
Tokelau		10	5		15				
Tonga	100	3 200	740	100	4 140				
Tuvalu	1	165	110	4	280				
Vanuatu	100	9 900	3 500	1 000	14 500	4			
Wallis & Futuna		3 910	240	150	4 300				
Total	1 431	543 210	361 032	69 924	975 597	1 249	0	82 737	130
	0.1%	55.7%	37.0%	7.2%	100.0%	0.3%	0.0%		



Estimates in tonnes Production and commerce 2009 data (or 2008 data in italics)	Production				Total	Exports		Imports	
	Cooking bananas		Dessert bananas			Cavendish	Plantain	Dessert banana	Plantain
	Plantains AAB	Highland bananas + ABB + other AAB	Cavendish	Gros Michel & others					

Europe									
Azores			1 000		1 000				
Albania					0	20		17 535	
Germany					0	463 847	8 284	1 388 028	10 000
Andorra					0			600	
Armenia					0	2 304		8 458	
Austria					0	18 683		120 706	43
Belarus					0			36 669	20
Belgium - Luxembourg					0	828 813	52 364	960 000	55 000
Bosnia Herzegovina					0	10		36 951	96
Bulgaria					0	1 538	5	35 541	5 137
Canaries	1	5	398 000	5	398 011	371 000			
Cyprus			5 765	5	5 770	1 086		3 772	191
Croatia					0	30		49 379	280
Denmark					0	14 629	3	98 992	784
Spain			250	5	255	56 444	969	550 000	29 738
Estonia					0	161		13 297	
Finland					0	16 363		56 762	821
France					0	197 329	12 222	742 022	13 193
Georgia					0	2 111		12 472	
Gibraltar								150	
Greece		5	3 590	5	3 600	9 306	5	81 683	355
Hungary					0	7 233		105 246	957
Faroe Isl.					0			186	
Ireland					0	8 305	174	53 593	2 302
Iceland			1		1	9		5 550	
Italy			350		350	120 685	514	703 897	7 000
Latvia					0	527		15 453	2 631
Lithuania					0	6 185	724	25 429	5 831
Macedonia					0	67	79	16 700	106
Madeira	100	1 000	22 000	1 000	24 100	18 000			
Malta					0			4 941	188
Moldavia					0			10 536	131
Montenegro								6 561	
Norway					0			73 200	21
Netherlands					0		22 204	159 198	44 321
Poland					0	9 093		242 681	5 436
Portugal			3 500		3 500	29 841	79	167 110	1 041
Czech Rep.					0	56 919	47	147 396	1 450
Romania					0	361		117 714	9 362
United Kingdom					0	67 595	1 760	958 100	38 403
Russia					0	18 215	15	1 068 571	1 800
St Marin					0			120	
Serbia & Montenegro					0			41 876	20
Slovakia					0	20 053	13	70 614	2 720
Slovenia					0	17 475		60 589	2
Sweden					0	30 904		190 344	465
Switzerland					0	4		82 144	
Ukraine					0	154		227 316	
Total	101	1 010	434 456	1 020	436 587	2 395 299	99 461	8 768 082	239 845
	0.0%	0.2%	99.5%	0.2%	100.0%	27.3%	1.1%		

Total monde	17 656 550	28 163 076	57 640 398	13 544 325	117 004 349	17 889 575	605 817	18 038 704	718 478
	15.1%	24.1%	49.3%	11.6%	100.0%	31.0%	3.4%		

Note 1: for EU member countries, imports excluding supplies from European production.

Note 2: differences between import and export totals result from re-exports between non-producer countries (intra-EU trade for example), the taking into account of two years (2009 and 2008) and the experimental nature of this work.

Source: Thierry Lescot of CIRAD, who used bibliographical research, surveys, professional sources, FAO, etc.