

Banana

A report by Denis Loeillet
In collaboration with Charles de Wulf and Luc de Lapeyre

As every year, the January issue of *Fruitrop* contained a price review of the banana year that had just come to an end. This month, we publish a special report reviewing supply. Once again, the European market came up with a pleasant surprise that can be summarised in just one word: vitality. Whereas many large fruit markets stagnated, that of the leading tropical fruit was different. It has beaten records annually during the three years following its liberalisation on 1 January 2006: record consumption (average 10.8 kg par person), record supply (+ 188 000 tonnes to 5.4 million tonnes) and record imports (+ 174 000 tonnes to 4.9 million tonnes). All types of sources (EU, ACP and other third countries) shared in the banquet, even though the detail shows that some producers benefited more than others from this European market growth.

But did these volumes have a negative effect on prices? The review published in our January issue shows precisely the opposite. Prices at the import stage were 6% higher than in 2007 (EUR13.40 per box in comparison with 12.70). Has the way to square the economic circle been discovered and might the banana market be benefiting from it? If so, this would mean—more seriously—that the increases in price and volume might be sustainable. Everybody would like to believe this and the question is open to debate. *Fruitrop* provides a few features for reflection in the form of questions and answers, together with a number of graphs.

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European banana market supply in 2008

What makes the dynamics of the EU original?

The EU has a special place in the banana world, with its regulations long being the cause. The very specific dynamics of the EU have been a surprising feature since the switch on 1 January 2006 from a quota regime to a tariff system at EUR176 per tonne. Indeed, consumption has increased year after year (+ 1 000 000 tonnes since 2005) while even US consumption has stagnated (- 1% in 2008 after + 4% in 2007). Russian imports have stuck at around 1 million tonnes for three years. Japanese imports are unchanged, blocked at 1 million tonnes.

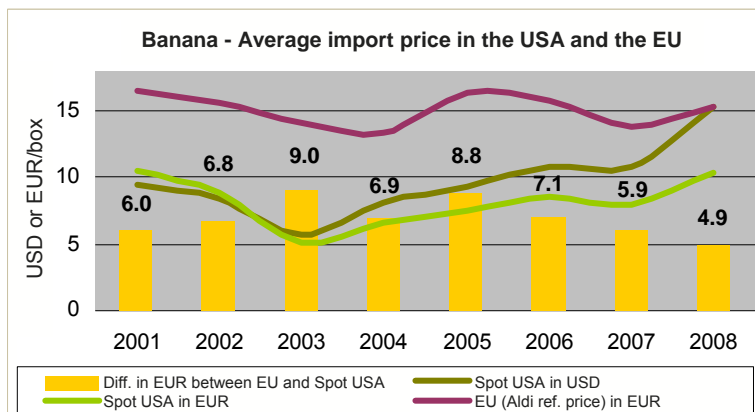
When supplies are meagre, exporters have chosen the EU as their destination. Ecuador is a perfect example of this. The world's leading exporter, it increased shipments to the EU by 142 000 tonnes in 2008 and, at the same time, reduced those to the US market by 99 000 tonnes. It is more difficult to reach a conclusion for Costa Rica as its supplies were greatly disturbed by very serious floods. However, it is noted that this Central American source reduced shipments to the EU by 'only' 78 000 tonnes (- 8% in comparison with 2007) while reducing those to the United States by 162 000 tonnes (- 16%).

It would seem that Colombia chose to affirm its position on both of these markets.

The European market has gained in attractiveness since it was liberalised. The difference in import prices between the United States and the European Union—some readers will re-

member the famous WTO 'price gap'—is greatly in favour of the EU. According to the calculations made at CIRAD, the annual average difference since 2006 is some EUR5 to 7 per box. This is less than the EUR7.00 to 9 observed before 2006 but, as all obstacles to imports have been removed, every operator now has a chance in Europe. This had not been the case after 1993 when a system of import rights closed access to the market. When customs dues (EUR176 per tonne, that is to say EUR3.20 per box) and the extra transport costs have been paid, there is still a bonus of one or two euros per box. There is no doubt that the European

market is attractive. One might even wonder whether this market accused of extreme protectionism in comparison with the most liberal of markets—the USA—is finally the one most open to everybody.



The figures?

The increase is so marked that there is no ambiguity in the results. According to the CIRAD calculation, net supply to the EU increased by 188 000 t in 2008, setting an all-time record of 5 409 131 tonnes. Calculated for a constant EU-27, this is 4% more than in 2007. Growth has attained more than a million tonnes since the liberalisation of the market on 1 January 2006, a phenomenal 24% increase! And the last enlargement of the EU to include Romania and Bulgaria in 2007 is not the cause of the

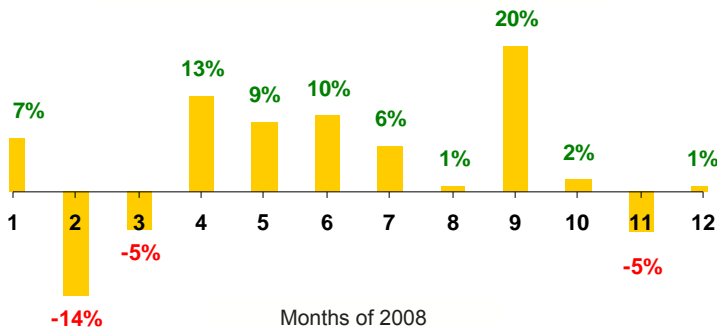


HAVE A MOMENT
OF PLEASURE,

HAVE A



Banana - EU-27 - Imports from all origins
2008/2007 difference in comparison with 2007



increase. These countries import only a limited volume, totalling some 135 000 t (2008 figure not including supply from within the EU).

The result is that European consumption has climbed to 10.8 kg per person. The previous record was 10.9 kg in 2003. This was followed by two years of decrease. The first was a fall to 10 kg in 2004 as a result of the enlargement to 10 further countries in which banana consumption was distinctly low. The 2005 dip to 9.5 kg is explained by the very marked decrease in world supply as a result of Hurricane Mitch and operators' caution on the eve of the great European upheaval of 1 January 2006 when it was suspected that hordes of bananas were positioned at the EU frontiers! Since then, the east Europeans have raised the banana to the status of favourite fruit. Europeans have discovered benefits of the fruit for their expenditure on food. Banana is now referred to as the anti-slump fruit par excellence.



tonnes. This is still 200 000 tonnes less than the peak of 790 000 tonnes reached in 2002. The three major sources—the Canary Islands, Martinique and Guadeloupe—are making progress. However, EU supply in 2008 was still 16% smaller than the average for the last decade (1999 to 2008) while supply from ACP sources increased by 16% and shipments from dollar origins by 32%. The increase in imports is impressive, even with a variable EU perimeter. No comments as regards market shares! As a result of the temporary weakness of EU production, especially French, dollar suppliers still have a market share of more than 72%, while the ACP group of banana producer countries is attempting to return to 17%. European production has a market share approaching 11%.

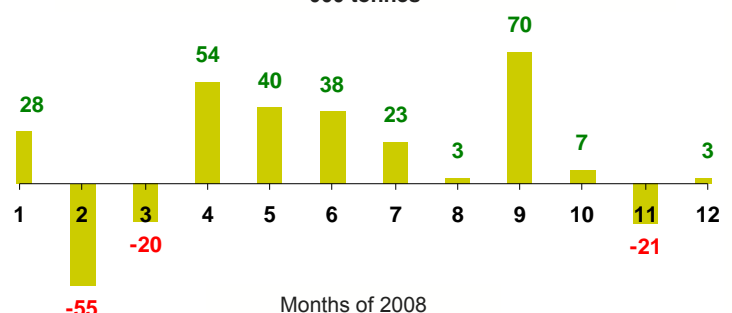
In addition to Europe's own production, 96% of European imports are shipped by only 10 supplier countries. Ecuador, Colombia and Panama are in the lead. The ACP countries Cameroon, Côte d'Ivoire, the Dominican Republic, Belize and Surinam are in the five next positions and the last in Brazil, with shipments dwindling rapidly. After these come Ghana and St Lucia, both ACP countries, in eleventh and twelfth positions, followed by Peru and finally Honduras, the last in the list of sources shipping more than 20 000 tonnes to the EU.

Exports dynamics vary. Among dollar origins, exports from Ecuador and Colombia grew three to four times as fast as the market at + 12 and + 11% respectively, with Ecuador shipping more than 1.3 million tonnes and Colombia a little less than this figure. Costa Rica and Panama were hard-hit by weather and their shipments decreased by

Who benefits?

Everybody—both ACP and MFN (dollar) sources—benefits from this excellent dynamics. EU production, and especially French production, gradually came back into the game in 2008 after the disaster resulting from Hurricane Dean in Martinique and Guadeloupe. After reaching a historical low of 552 000 tonnes in 2007, growth returned although the total in 2008 was still less than 600 000

Banana - EU-27 - Imports from all origins
2008/2007 difference in comparison with 2007
000 tonnes



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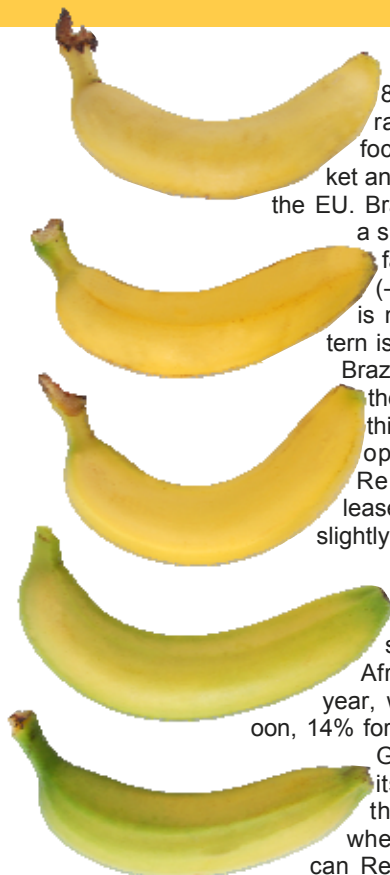
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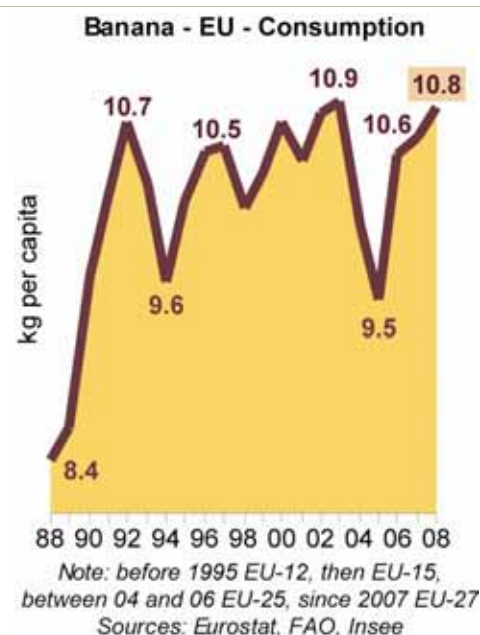




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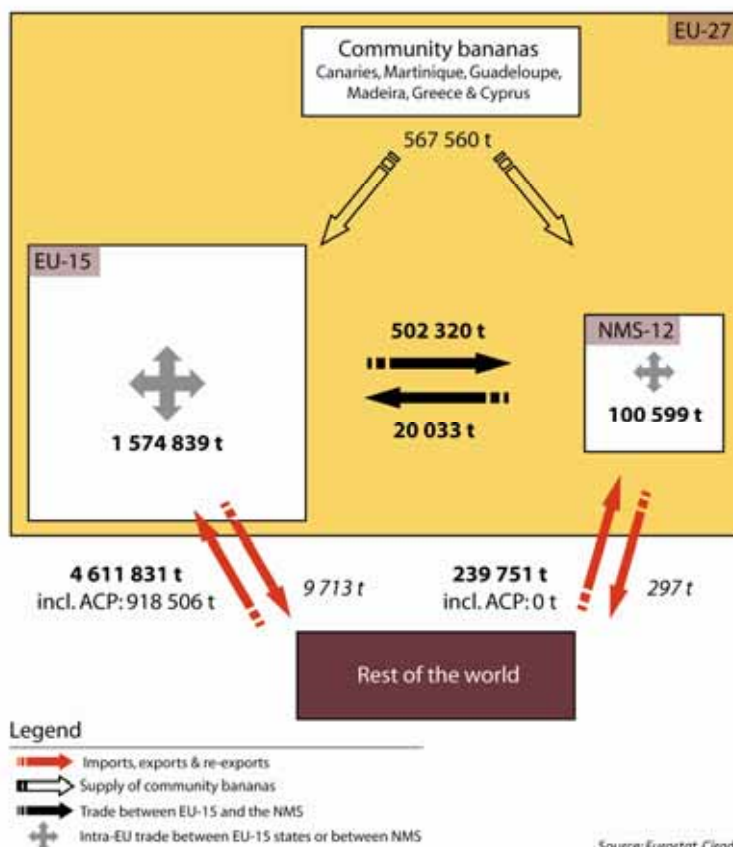
8 and 17% respectively. Honduras and Guatemala preferred to focus on the North American market and thus became minor sources for the EU. Brazil is gradually disappearing as a supplier of the EU, with shipments falling to less than 60 000 tonnes (- 32%) in 2008. A special mention is made of Peru whose export pattern is precisely the opposite of that of Brazil, thanks to its establishment on the organic and fair trade markets; this is similar to the type of development seen in the Dominican Republic. Peru increased its releases on the EU market by 14% to slightly less than 40 000 tonnes.

The situation for ACP suppliers differs considerably from one side of the Atlantic to the other. African sources had an excellent year, with a 26% increase for Cameroon, 14% for Côte d'Ivoire and even 35% for Ghana. Africa is thus returning to its best level. The situation was the opposite for the Caribbean, where shipments from the Dominican Republic dipped below their 2006 levels as execrable weather halted—very provisionally—its solid upward movement. The same happened in Jamaica, where the entire crop



was hit by a hurricane once again and which seems unable to re-launch a sector that has endured many such catastrophes in recent years. St Lucia and Dominica are exceptions among Caribbean sources as their exports to the EU increased by 26 and 41% respectively. Finally, strongly developing Surinam increased its exports by 12%.

Banana - EU-27 supply - 2008



And the rate of imports?

The supply profile was fairly unusual in 2008. European imports were smaller than those of 2007 in February, March and November while the increase had been steady since April 2006. The import curve mainly reflect weather damage, especially at the end of the year. The extreme caution displayed by operators—especially during the summer—also marked the supply profile. It is true that they had been hard hit by economic disaster in the summers of 2004 and 2007. Imports peaked strongly in September (+ 20% in comparison with 2007) and both dollar and ACP sources increased their shipments for the back-to-school period although the importance of this should be denied once and for all! ACP and dollar movements were markedly out of phase with each other. Dollar sources reduced their presence on the European market in the last four months of the year while ACP shippers pressed firmly on the accelerator pedal. The opposite was seen in May, June and July, when dollar bananas crowded the market.

Is it all structural or conjunctural?

This boils down to knowing whether the foundations of the European market can allow an in-



Banane

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*Source : Etude Ginger menée sur un échantillon de 1 003 individus de 15 ans et plus, représentatif de la population française - Octobre 2007

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France: banana, a winning curve

Without being too convinced, we believed that 2007 was the year of the reconquest of the French market. And 2008 was a superb confirmation of this. Net French supply increased by 26 000 tonnes to 533 000 tonnes, a level not seen since 2002. Annual per capita consumption rose to 8.3 kg. This is still 400 grams less than in 2002 as a result of the increase in population and nearly 3 kg less than the European average.

However, France does not diverge from the European trend and is now in the leading group with growth of more than 5% in comparison with 4% for the EU as a whole. In spite of these additional volumes, it can also be seen that both import and retail

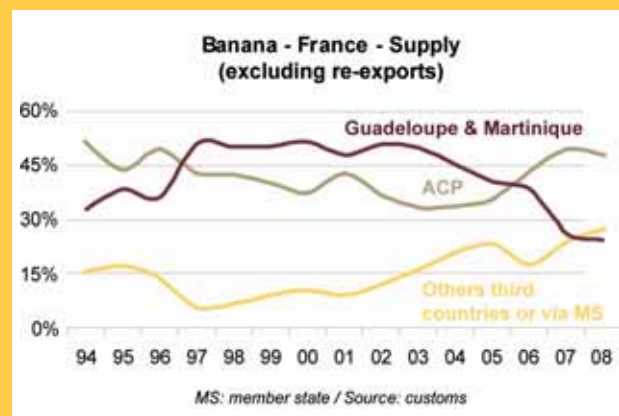
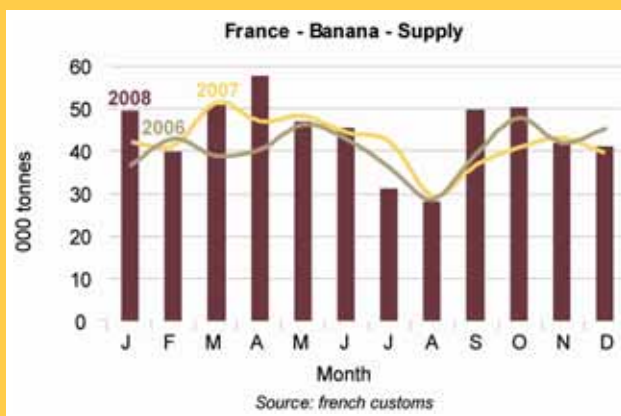
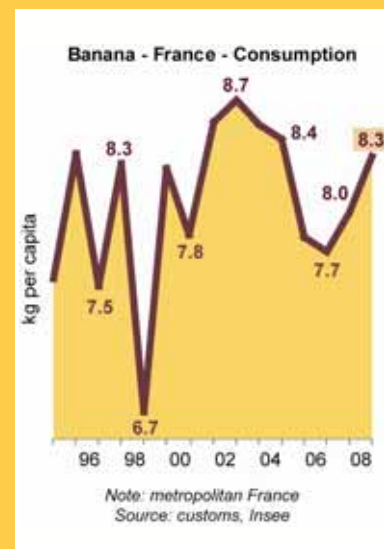
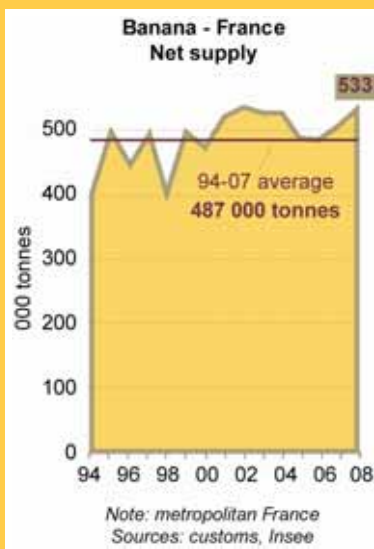
prices have remained stable (see *Fruitrop* 163, January 2009, pages 7-13). Supermarket promotion operations, very competitive retail prices and weaker competition from other fruits are among the reasons for this success.

Production in Martinique only returned to normal at the end of March (after the damage caused by Hurricane Dean in 2007) and some of its natural market is still in the hands of competitors—especially dollar banana producer countries. Considerable changes are seen when market shares by source are calculated, although this is a delicate operation because of the permeability of European frontiers. Indeed, not counting re-exports, dollar sources would seem to have achieved a hitherto unreached 28% market share, 4% more than in 2007. ACP producers, especially in Africa (Cameroon, Côte d'Ivoire and Ghana) display a small

2% fall to 48%. French production hit a historic low point at about 24%, in comparison with 26% in 2007 and 38% in 2006. The return to full production in the French West Indies should result in a more traditional situation.

Another noteworthy feature is that re-exports set a new record at 209 000 tonnes, that is to say 28% of gross supply (national production + imports). Italy, Spain and the Czech Republic account for nearly 60% of French re-exports.

The year 2008 was rich in restructuring in France and especially for ripening facilities (see *Fruitrop* 161, Nov. 2008, page 3). In 2009, everyone hopes that success will result from the setting up of the French banana interprofessional body, the only organisation able to confirm the exemplary trend seen on the French market in the last two years.



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crease in consumption while assuring sufficient benefit for all the stakeholders in the sector. In fact, this comment just describes what the market has accomplished in recent years. The

Banana Consumption per capita in 2008	
	kg/year
EU-27	10.8
EU-15	11.2
NMS-10	7.3
NMS-2 (Bulgaria, Romania)	5.2
NMS-12 (10 + 2)	6.7

Source: Cirad

recipe is as follows: a customs tariff of EUR176 per tonne for dollar suppliers, exemption from this for ACP suppliers and total freedom to import or export within or to the EU. These would

appear to be the ingredients required to ensure the harmonious growth of the European market.

The explanation might seem to be convincing. But the European market is not suspended in space and untouched by its environment. Here, supply is crucial in the classic supply and demand equation. Optimists and those in favour of customs dues think that the market is regulated solely by this tariff. And this would cause problems should it decrease, which is a possibility,



Banana — European Union — Evaluation of banana supplies — Tonnes

Year	Banana type or origin			Sub-total	Exports	Supplies
	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	754 216	797 269	2 578 827	4 130 312	6 020	4 124 292
2004	750 910	782 979	3 077 361	4 611 250	11 029	4 600 221
2005	648 395	763 696	2 959 463	4 371 554	4 970	4 366 584
2006	641 559	891 246	3 304 468	4 837 273	8 392	4 828 881
2007	551 798	843 089	3 835 869	5 230 756	9 270	5 221 486
2008	567 560	918 506	3 933 075	5 419 141	10 010	5 409 131

(1)

(2)

(2)

(3)

(1) 1988 to 1993 inclusive: Eurostat + European Commission data for Madeira and Greece. From 1994 onwards: supplementary aid data.

(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

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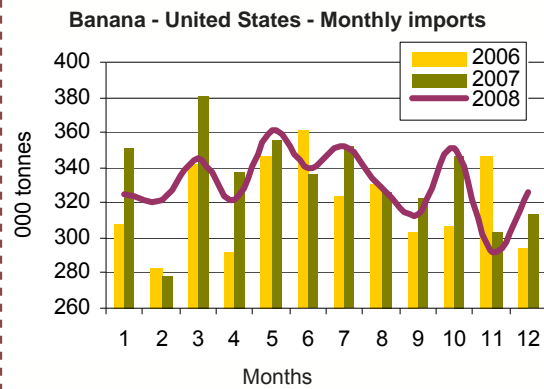


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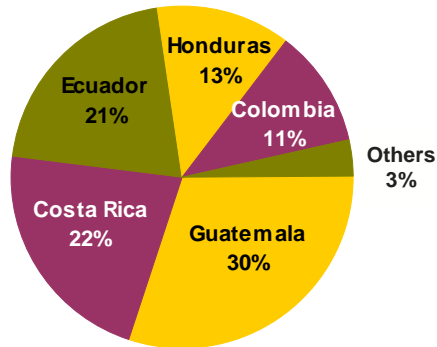
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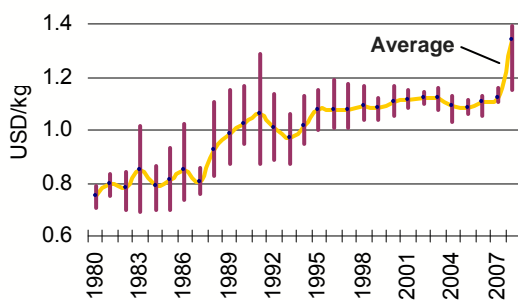
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Banana - United States - 2008 imports



Banana - United States - Retail price amplitude



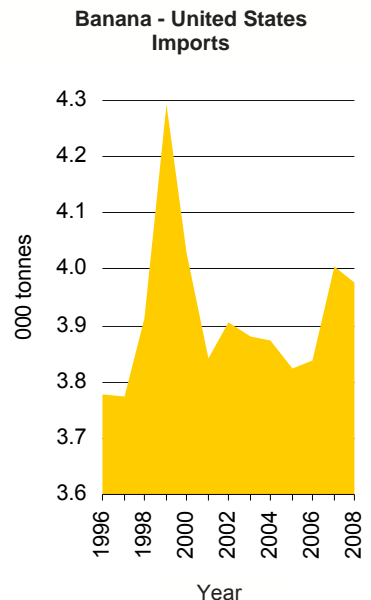
Source : Bureau of Labor Statistics

United States: a false start

Our satisfaction with last year was soon tempered by the January 2008 import statistics (- 7%). Fortunately, the overall balance for 2008 was not as disastrous as might be indicated by the January figures. However, a 1% decrease takes the total to 3 976 000 tonnes—the symbolic 4-million-tonne mark. The January 2009 figures confirm this downward trend with an 8% decrease!

Weather problems in Central and South America, exclusive supply zones for the USA, weighed heavily on the 2008 figures and those for the early months of 2009. This is all the more the case as certain countries such as Ecuador have intentionally redirected part of their export shipments to the EU. Ecuador is now only the third largest supplier of the US, behind Guatemala and Costa Rica but way ahead of Honduras and Colombia.

This tension as regards volumes has very serious repercussions on prices at all stages. Average import prices increased by 41% in 2008, reaching more than USD15 per box and even peaking at over USD22! Retail prices also increased to up to USD1.4 per kg, with a 19% increase in the annual average to USD1.34 per kg.



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Sigatoka leaf spot diseases: the oil problem

It's the usual story. For years, the EU has revised its lists of pesticides and associated substances. It is up to the companies that own them to prove that they are harmless. This is well worth it if the potential profits are greater than the considerable outlay for drawing up and defending a dossier. The company in question will therefore do everything in its power to show that its pesticide washes whiter, respects the environment, the ozone layer, biodiversity and (why not?) baby seals and Burgundy snails. There is no room for modesty and things do not improve with time. In contrast, each month products are removed from the EU's 'positive list' of approved substances and thus from the private specifications drawn from them and, in particular, the extremely hegemonic GlobalGap.

Few, except for the PIP (Plan Initiative Pesticides), have shown concern about the removal of numerous pesticides used for minor tropical crops, including many fruits. This will not be the case when banana producers all over the world become aware that the EU is in the process of cancelling the authorisation to use paraffin oils with physical pesticide properties. These oils do not have a toxicological classification in France and are in fact accepted by the EU for use in organic farming! So citrus growers, wine growers and orchard farmers will be extremely upset as they use these products widely. The oils are used pure or mixed with pesticides. Their fungistatic effects are essential tools in increasingly rational strategies for the control of Sigatoka leaf spot diseases - that are a serious threat to banana leaves. For lack of a qualified majority at a meeting of the Standing Committee on the Food Chain and Animal

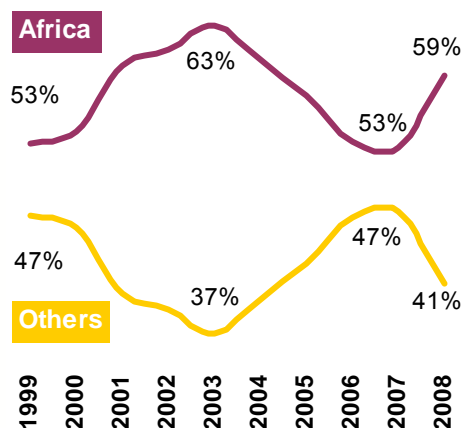
Health, the decision to withdraw these oils from Annex 1 has been postponed until a coming meeting of the Council of Ministers. Without immediate reactions from stakeholders (agroindustry, producers, operators, etc.), removal from the EU lists will be a serious blow to the industry, that is fighting hard against the disease. It will leave the sector without any real alternative other than weekly spraying of contact fungicides (1 kg active substance per spraying and up to 50 sprayings per year). This compares poorly with application of systemic fungicide at 100 g active substance per treatment with a dozen applications per year (see the article below on 'Banana pests and diseases').



© Luc de Launay

as early as this year. Others analyse the world situation and find that supply has not been normal for three years, even if 'normal' is difficult to define.

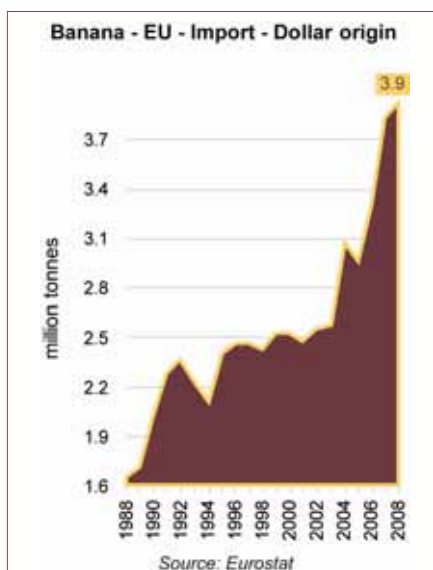
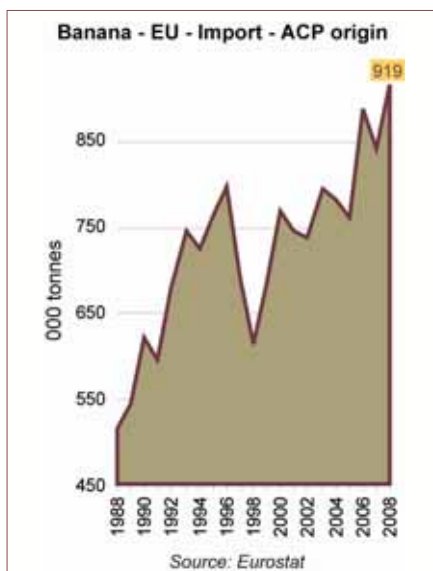
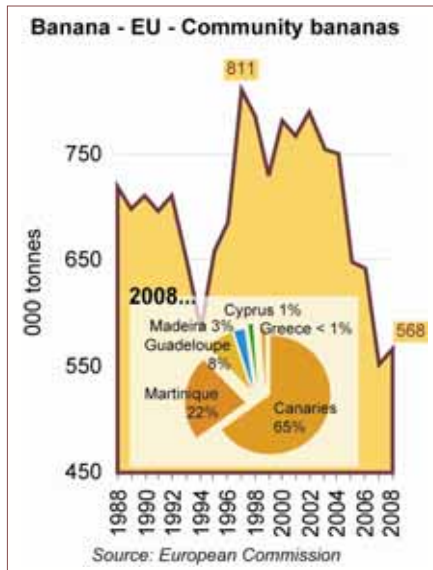
Banana - ACP imports by EU



deficit remains structural. The floods in Costa Rica in early 2009 will prove this truism once

again. But fear of emptiness and the prices fetched should encourage operators of all kinds to step up production. Brazil was expected but did not arrive. There has been talk of an avalanche from Africa for years, but we shall have to wait for Angola for a while. Mozambique has announced production on 3 000 ha, but for which market?

And what about demand? The year 2007 had been a historic one as American imports had increased for the first time in five years, accompanying the favourable trend in Europe. Russian consumption increased very strongly in 2006, with ample confirmation in 2007. An increase in consumption in the Mediterranean region and in the Near and Middle East is reported to have taken place although figures are not available for gauging its extent. What will happen to Europe's fine recipe is world con-



sumption slows and even returns to previous levels? The first data for 2009 show that volumes lagged in January. EU imports have decreased by 7% and US imports displayed the same trend with - 8%. The EU wiped out the excellent progress made in January 2008, practically tonne for tonne. So is this just a warning or a change in the market trend? A crisis in supply or in demand? Whatever it was, one or other of the driving forces of European dynamism broke down in January.

France as an example

Market balance is thus a delicate thing. Either you gamble on the misfortune of people in production zones or hope to see banana magically gain market shares in well-off Europe and the USA and among the poor in the South. This is both cynical and ridiculous. But there is a third pathway for banana operators, that of ground-work. The success of the Banana Group in the UK in the 1990s is known, as is the continued hold of Canary Island bananas on the Spanish market. Other fruit sectors have also shown the way, such as avocado in the United States. France is about to join the very select club of upstream and downstream operators who decide to act positively on their future by joining forces. The French banana interprofession is being built up at the initiative of French and African producers and their respective import structures. Ripeners and retail distributors are reported to be following movement as they are aware that they will all lose if market conditions continue to pauperise a fruit that is already by far the cheapest item on the fruit and vegetable shelves. It is not a question of 'managing' the market on a dangerous cartel basis but of stimulating it. It is a historical moment not only for France but also for the European market as a whole. How can it be imagined that France, the most difficult market and considered to be the most unruly in Europe and peopled with independent, undisciplined characters, would one day have its own interprofessional organisation? Sixteen years after the completion of the single European market, the setting up of the common market organisation of banana on 1 July 1993 and as a result the dissolution of the CIB (Conseil interprofessionnel de la banane), a body whose job had been for decades the organisation of a shared market for the happy few, the French banana sector has fresh ambitions for its market. This is positive and we hope to be able to report and applaud its first actions in a year's time ■

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Banana — EU-27 imports — 2008

	000 tonnes	AT	BE-LU	BG	CY	CZ	DE	DK	EE	ES	FI	FR	UK	EL	HU	IE	IT	LT	LV	MT	NL	PL	PT	RO	SE	SI	SK	UE-27	
Total 3rd country including ACP	3 096	1 448	370	20 891	70	12 196	959 164	14 550	0	126 591	619	282 326	880 173	16 009	1 060	43 412	569 873	3 518	0	214	70 854	39 638	111 522	103 392	85 270	57 839	934	4 851 581	
of which ACP	0	240 611	0	0	0	0	3 773	0	0	6 457	0	277 123	359 282	0	0	21 123	1 464	0	0	0	8 612	0	0	0	0	62	0	0	918 506
Ecuador	59	268 027	20 281	0	1 114	354 264	4 747	0	0	61 742	60	4 128	59 967	13 990	800	903	306 866	3 315	0	0	29 741	38 072	16 971	98 810	4 328	39 849	0	1 328 033	
Colombia	2 906	541 705	0	70	0	260 929	6 923	0	0	32 007	0	911	237 891	1 839	0	7 367	116 584	0	0	214	5 491	1 358	43 092	1 219	0	17 608	0	1 278 111	
Costa Rica	131	330 718	513	0	11 082	139 997	2 860	0	0	18 543	559	39	188 021	57	260	4 066	92 198	0	0	0	9 819	209	45 851	2 929	45 806	381	934	894 973	
Panama	0	8 687	0	0	0	194 118	0	0	0	2 836	0	0	946	120	0	40 352	203	0	0	0	8 764	3 088	434	35 039	0	0	0	294 588	
Cameroon	0	105 582	0	0	0	0	0	0	0	5 356	0	88 195	80 398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	279 530	
Côte d'Ivoire	0	99 517	0	0	0	0	0	0	0	1 101	0	82 008	33 816	0	0	140	0	0	0	0	0	0	0	0	0	0	0	216 583	
Dom. Rep.	0	30 251	0	0	0	3 731	0	0	0	0	0	285	126 263	0	0	1 323	0	0	0	0	8 550	0	0	0	62	0	0	170 464	
Belize	0	2 766	0	0	0	0	0	0	0	0	0	0	58 217	0	0	21 123	0	0	0	0	40	0	0	0	0	0	0	82 146	
Surinam	0	0	0	0	0	0	0	0	0	0	0	65 812	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65 812	
Brazil	0	19 380	0	0	0	0	613	0	0	4 985	0	17 126	0	0	0	12 291	0	0	0	0	1 257	0	2 503	0	0	0	0	58 154	
Ghana	0	2 426	0	0	0	0	0	0	0	0	0	40 818	2 707	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45 951	
St Lucia	0	0	0	0	0	0	0	0	0	0	0	0	38 512	0	0	39	0	0	0	0	0	0	0	0	0	0	0	38 512	
St Vincent	0	24 526	0	0	0	0	5 412	0	0	0	0	0	1 962	0	0	6 139	0	0	0	0	6 549	0	0	0	0	0	0	38 488	
Peru	0	13 442	0	0	0	0	0	0	0	0	0	4 357	0	0	0	3 775	0	0	0	0	17	0	0	0	0	0	0	23 954	
Honduras	0	0	0	0	0	0	17	0	0	0	0	10 448	0	0	0	3 775	0	0	0	0	0	0	0	0	35	0	0	14 275	
Guatemala	0	0	0	0	0	0	0	0	0	0	0	10 281	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10 281	
Dominica	0	0	0	0	0	0	0	0	0	0	0	8 975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8 975	
St Vincent	0	0	0	0	0	0	0	0	0	20	0	5	57	0	0	104	0	0	0	0	567	0	0	0	0	0	0	2 056	
Mexico	0	1 273	0	0	0	0	31	0	0	0	0	2	118	4	0	0	0	0	0	0	0	0	18	0	0	0	0	141	
United States	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	
Turkey	0	0	97	0	0	0	0	0	0	0	0	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	79	
Morocco	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73	
Brit. Virgin Isl.	0	0	0	0	0	0	0	0	0	0	0	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73	
Total Intra, incl.	117 610	38 186	14 650	3 702	135 200	428 864	84 442	13 297	56 811	56 143	286 906	71 036	65 454	104 186	10 181	134 024	21 911	15 453	4 727	88 344	203 043	51 796	14 322	105 074	2 750	69 680	2 197 792	73	
Total EU-15, incl.	115 524	37 154	12 683	3 702	118 982	426 630	84 442	10 898	56 811	56 001	286 446	71 036	64 808	104 186	10 181	120 811	19 856	10 322	3 686	88 133	192 802	51 789	7 448	105 074	2 691	47 633	2 077 160	160	
Belgium	25 031	3 408	269	0	32 038	320 626	7 645	251	5 340	13 123	123 193	42 150	16 817	23 510	198	25 673	8 217	1 179	0	54 758	94 879	28	289	4 732	61	24 785	828 201	828 201	
Germany	73 650	6 016	58	0	28 488	0	53 440	6 923	0	21 820	53 013	1 180	106	20 901	451	12 069	9 528	2 983	0	29 333	67 336	0	2 807	60 332	69	13 344	463 847	463 847	
Netherlands	15 166	12 646	289	156	20 748	46 608	4 062	704	9 526	1 480	35 472	11 926	172	1 327	182	16 134	863	3 760	221	0	12 904	17	1 160	17 907	544	438	214 413	214 413	
France	423	12 339	1 264	0	36 248	25 102	84	0	27 983	1	0	6 625	0	7 783	12	45 724	1 215	2 400	0	1 882	12 951	7 882	794	0	15	6 900	197 329	197 329	
Italy	1 208	1 187	4 147	1 158	1 277	25 979	4	0	1 736	0	16 833	212	47 608	5 333	0	12	0	0	0	3 465	1 232	3 386	776	1 975	0	1 071	2 086	120 685	
UK	0	365	19	5	62	79	144	0	1 047	0	47 810	0	0	0	9 338	57	0	0	0	490	463	0	0	7 715	0	0	0	67 595	
Spain	27	137	607	81	42	831	102	0	0	0	7 272	60	66	288	0	2 424	0	0	0	156	1 157	43 086	20	3	86	0	56 444	56 444	
Sweden	0	23	0	0	0	4 110	6 855	33	0	19 577	24	0	0	0	0	0	0	0	0	283	0	0	0	0	0	0	0	30 903	
Portugal	0	9	0	0	0	0	0	0	0	11 177	0	64	0	0	0	18 556	20	0	0	0	21	0	0	0	0	0	0	29 847	
Austria	0	561	0	0	0	78	3 278	0	0	0	1 460	0	0	12 206	0	172	0	0	0	0	4	0	19	0	846	60	18 682	18 682	
Finland	0	0	0	0	0	2	12 107	2 988	0	0	0	1 267	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16 363	
Denmark	0	239	0	0	0	4	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	14 384	0	14 629	14 629	
Greece	0	0	6 030	2 301	0	5	0	0	0	0	0	585	0	0	0	2	0	0	0	0	0	0	0	383	0	0	0	9 306	
Ireland	0	0	0	0	0	8	0	0	0	0	0	8 296	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8 305	
Luxembourg	19	224	0	0	0	0	0	0	0	0	0	39	271	0	0	0	0	0	0	0	0	0	0	0	0	0	0	612	
Total NMS, incl.	2 087	1 032	1 967	0	16 219	2 234	0	0	2 399	1	143	460	0	646	32 568	0	13 214	2 055	5 131	1 041	211	10 241	8	6 874	0	59	22 046	120 632	120 632
Czech Rep.	15	976	0	0	0	68	0	0	271	0	0	328	0	0	23 891	0	273	21	42	0	0	9 173	0	538	0	59	21 266	56 919	56 919
Slovakia	546	56	0	0	14 884	2	0	0	0	0	0	0	0	0	4 457	0	42	0	0	0	11	0	55	0	0	0	0	20 053	20 053
Slovenia	1 002	0	1 517	0	230	383	0	0	0	1	0	0	0	0	4 103														

Country codes according to the official EU norm / Source: Eurostat



Producer country sheet

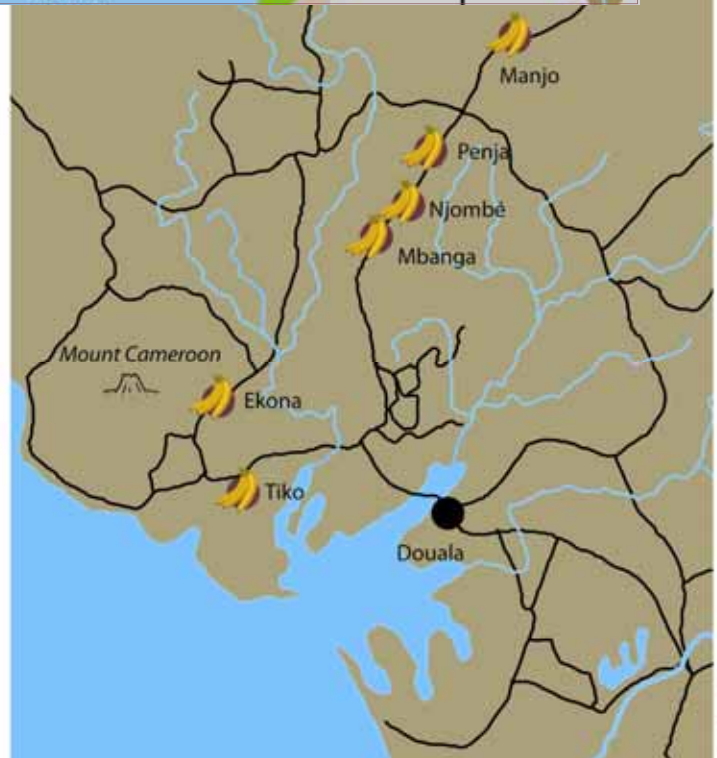
Banana in Cameroon

The first banana plantations were set out in 1907 in the western part of the country (British Cameroon) whereas exports from the eastern part of the country (French Cameroon) did not start until 1931. Fruits were shipped to Germany, the UK and France for many years. The evolution of production was strongly influenced by the troubles during the reunification process in the early 1960s. Panama disease appeared in 1954 and the spread of Sigatoka leaf spot, present since the 1950s, resulted in the disappearance of smaller farmers' cooperatives and dictated switches from 'Gros Michel' to 'Poyo' and then to 'Grande Naine', only completed in 1968. Not counting oil, banana is the second most important export in volume after timber and the third in value. Annual exports exceeded 100 000 tonnes in the early 1990s and have now reached 280 000 t. Practically all of this is shipped to the European market.



Production zone

The production zones are between the river Wouri and the volcanic range including mountains Cameroon, Kupe and Manengouba in the south-western and coastal provinces (Mungo and Fako departments). They are all within 150 km of the port of Douala and are on the Bafang road in the north (SPM and PHP) and the Tiko and Limbe road in the west (CDC). The Cameroonian banana belt has a tropical forest climate with a single, marked rainy season stretching practically from May to December. Insolation is weak as cloud cover is universal and so planting density must be kept low. Some of the land is very hilly, with no possibility of installing cableways, and some in high-land zones where the cycles are longer. The average temperature varies from 25 to 28°C, with strong daily amplitude in the highland areas. Winds can be strong in inter-season periods, with tornadoes causing crop losses of 10 to 15% per year. The physical and chemical characteristics of the soils are very varied.



Graphics: Chez Vincent



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Production

The area under banana totals 7 000 hectares. An increase has been announced. Means of production have been improved by investment by producers since the beginning of the 1990s, then helped by EU financial and technical assistance. The updating of production facilities is thus practically complete. The average yield was 35 tonnes per ha in 1994 and has now reached 40 t/ha, varying from 30 to 48 t/ha depending on the location and the investments made.

Black Sigatoka requires substantial control costs, with an average of more than 40 aerial sprayings per year.

The banana industry in Cameroon generates 11 500 direct jobs, that is to say an average of 1.65 persons per ha, and nearly 36 000 indirect jobs. Today, banana exports are shared between three companies:

- Société des Plantations de Mbanga (SPM) is a private group owned mainly by French and Danish interests, completed by private and public investors in Cameroon. It operates about 800 hectares in about 10 places, with growing annual production forming about 15% of the national total. This independent group started its banana operations in 1991;

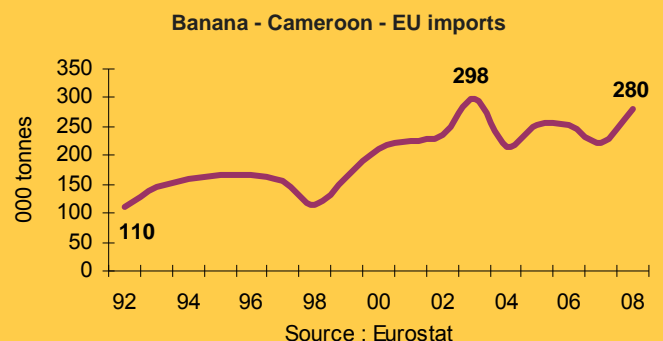
- Cameroon Development Corporation (CDC) is a state-owned company with headquarters in the English-speaking part of the country. One of the leading companies in the country, it is the largest employer (13 000 people) and one of the main exporters. It has slightly more than 3 000 hectares under banana and 37% of production. But the CDC also, and above all, produces palm oil and natural rubber. It also has tea plantations that were privatised recently. Technical management of the banana plantations has been entrusted to Del Monte on a contract basis since 1987;

- Plantations du Haut Penja (PHP) is private and a subsidiary of the Compagnie Fruitière group. It was formed by the merger/purchase of SPNP (Société des Plantations Nouvelles du Penja), SBM (Société des bananeraies de la M'Bomé) and PHP (Plantation du Haut Penja). It manages a production area of nearly 3 000 hectares with annual production covering 48% of national exports.

The plantations and packing stations have varying standards but many are in conformity with the various standards and certifications introduced since 2000, i.e. GlobalGap, ISO 14001 and Tesco Nature Choice.

Total exports

In 2008, Cameroon exported some 280 000 tonnes of banana to the EU in comparison with 220 000 in 2007. This is still less than the record 293 000 tonnes of 2003. Cameroon is a member of the ACP group and has had unlimited access to the European market since 1 January 2006, paying no customs dues. It is the leading ACP exporter, shipping 30% of Europe's ACP banana supply. Belgium is the main entry point (38%), followed by France (31%) and the United Kingdom (29%). Some fruits are delivered to Spain.



CARBAP

Cameroon hosts the Centre Africain de Recherches sur Bananiers et Plantains (CARBAP) whose vocation is regional. Its objectives are improvement and marketing of banana and plantain production in Central and West Africa. Funding is provided essentially by the European Union and by several research centres in both the North and the South that put scientists at its disposal. In addition to its research work, CARBAP is now also working on the dissemination of its results within the framework of development platforms sited in the various countries of the sub-region.

Logistics

A major handicap of the Douala fruit quay is the shallowness of the access channel, making port navigation risky and limiting stepping up to ships with larger capacity. In addition, it does not have a cold store. In spite of its age, it can handle two ships a week. Berthing time has decreased from 5 to 3 or even 2 days.

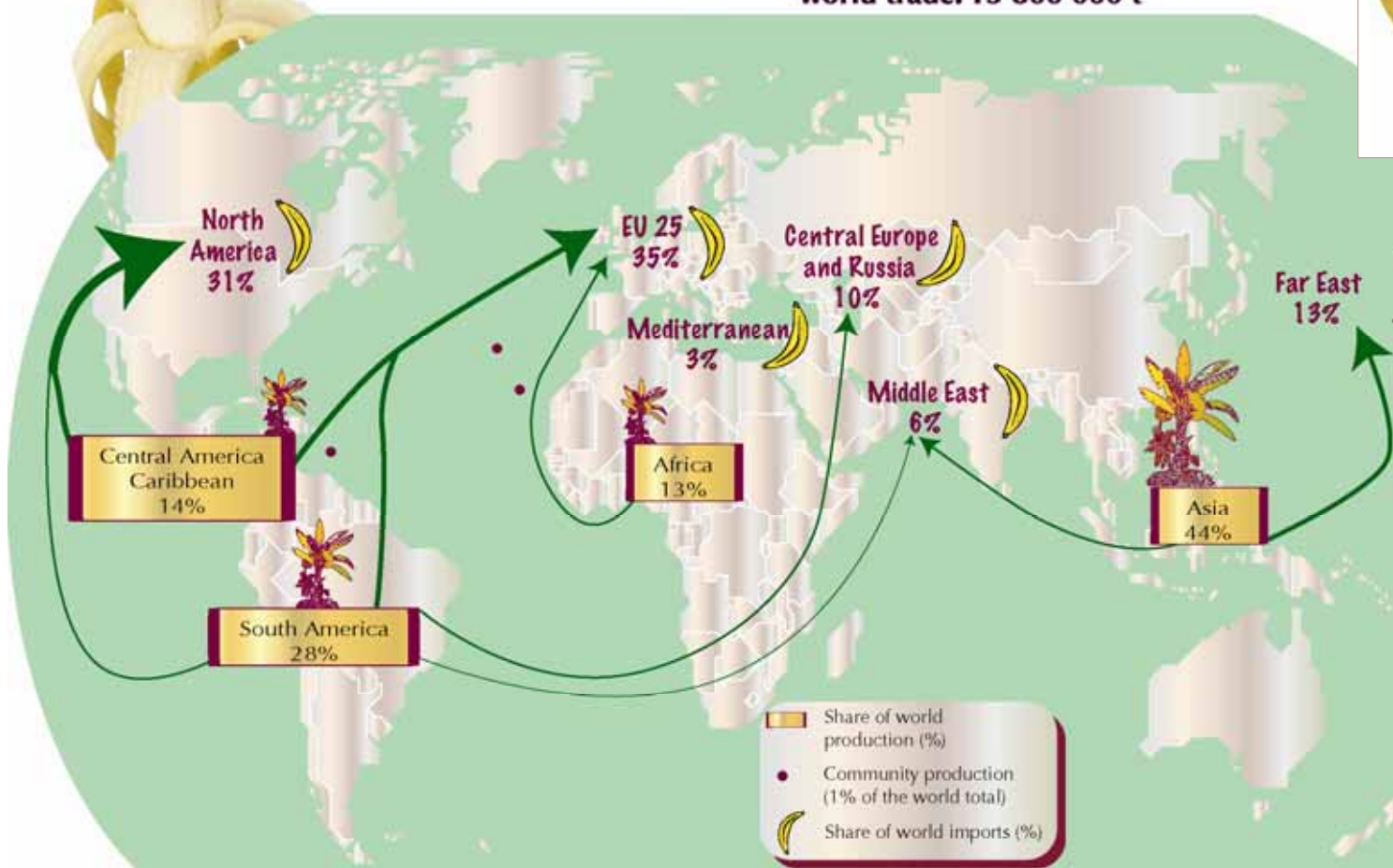
AEL (Africa Express Line), a subsidiary of the Compagnie Fruitière group, has developed shipment in refrigerated holds and handled most exports until 2008. This shipping company was founded in 2002 and operates a reefer fleet with weekly services and, depending on the year and the various rotations according to the volumes to be loaded, can put in at Tema, Abidjan, Dakar (9 days) and Agadir in Africa, and Portsmouth, Dover (15 days), Antwerp (17 days) and Port-Vendres (11 days) in Europe.

However, the recent emergence of the MAERSK and MSC companies has provided door-to-door container solutions with regular stops in southern (Algeciras in 15 days and Fos-sur-Mer in 17 days) and northern Europe (Antwerp in 15 days).

Dessert banana...

production: 61 000 000 t

world trade: 13 800 000 t



Banana — United States imports

tonnes	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total, incl.	4 291 425	4 030 618	3 840 624	3 906 920	3 879 151	3 872 826	3 824 401	3 839 476	4 003 800	3 976 167
Guatemala	501 918	688 448	832 106	925 216	934 136	1 020 765	1 029 280	912 902	1 093 391	1 188 724
Costa Rica	1 603 844	1 361 405	1 082 088	901 485	976 078	865 298	822 731	927 361	1 036 897	874 424
Ecuador	1 169 467	975 960	946 584	1 021 830	972 475	918 926	904 306	994 335	929 175	830 268
Honduras	83 668	275 603	381 540	449 171	432 145	507 914	453 011	422 905	482 732	503 810
Colombia	605 819	602 836	473 784	506 441	469 306	464 592	513 748	473 826	377 232	450 757
Mexico	140 802	85 123	63 809	42 339	35 197	33 586	33 796	38 573	31 508	66 330
Nicaragua	39 712	1 906	28 198	29 702	41 620	41 502	38 067	30 465	32 788	31 142
Peru	0	302	5 656	23 196	13 756	12 384	22 345	25 056	17 848	22 511
Panama	130 973	28 707	16 187	259	215	612	2 019	7 516	502	8 046
Dom. Rep.	11 733	6 437	7 355	3 573	2 136	5 201	4 437	6 222	1 720	112
Winwards	0	0	0	18	0	0	0	0	8	0

Source: US customs, code 0803002020 (excl. plantain)

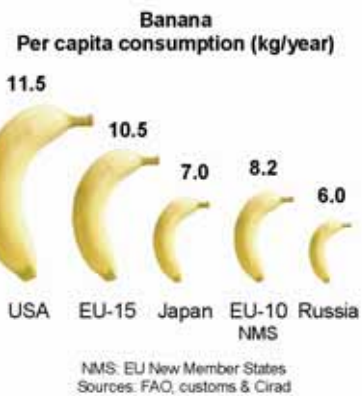
Banana — Japanese imports

tonnes	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total, incl.	983 204	1 078 655	990 554	936 272	986 643	1 026 014	1 066 873	1 043 634	970 594	1 092 738
Philippines	727 071	811 000	781 413	743 549	795 561	869 641	944 467	910 600	878 962	1 019 344
Ecuador	197 186	210 820	170 643	157 013	145 578	122 718	91 099	101 343	52 067	46 153
Taiwan	44 655	42 274	25 178	25 074	33 518	18 226	15 100	15 862	18 868	9 018
Peru	0	0	0	0	110	3 216	4 027	4 272	7 560	7 119
Mexico	1 722	1 394	2 044	2 562	3 057	3 303	3 739	3 948	4 611	5 411
Colombia	0	439	166	1 483	2 194	1 926	2 328	1 964	2 892	2 382
Thailand	900	1 332	1 513	1 252	1 793	2 204	1 794	2 373	2 089	2 279
China	8 939	3 428	5 740	3 814	2 736	3 609	2 844	1 580	2 249	810
Dominica	1 675	1 986	1 409	1 461	2 093	1 171	1 476	1 633	1 128	222

Source: Japanese customs, code 080300100

Banana - EU import by entry point





Banana World production — Tonnes			
	2006	Cavendish	Other dessert
World	46 620 128	12 339 269	58 959 397
India	7 358 600	2 019 00	9 377 600
Brazil	3 104 731	3 500 000	6 604 731
China	5 950 000	642 000	6 592 000
Ecuador	5 150 000	518 425	5 668 425
Philippines	3 300 000	993 000	4 293 000
Indonesia	1 790 000	887 608	2 677 608
Colombia	2 000 000	500 000	2 500 000
Costa Rica	2 080 000	133 618	2 213 618
Mexico	1 810 000	70 000	1 880 000
Guatemala	1 270 000	10 000	1 280 000
Egypt	875 999	1 000	876 999
Cameroon	600 000	260 000	860 000
Thailand	601 000	223 850	824 850
Bangladesh	555 000	210 710	765 710

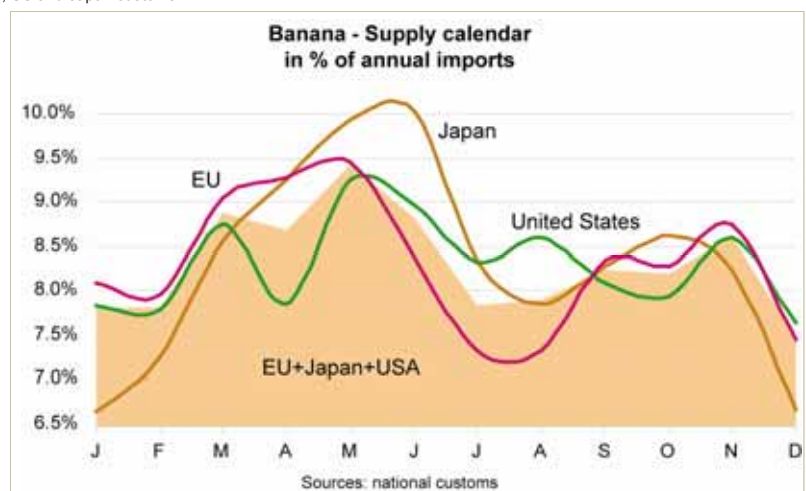
Banana World exports	
2006	tonnes
World	13 800 000
Ecuador	4 402 395
Costa Rica	1 961 102
Philippines	1 908 328
Colombia	1 519 388
Guatemala	943 616
Honduras	444 673
Panama	320 494
Canaries	294 131
Cameroon	260 000
Côte d'Ivoire	245 000
Martinique	219 556
Brazil	212 210
Dom. Rep.	200 000
Belize	73 207

Banana World imports	
2006	tonnes
World	13 800 000
EU-25, incl.	4 838 000
Belgium	1 141 026
United Kingdom	855 684
Germany	853 938
Italy	513 181
France	442 570
United States	3 839 467
Japan	1 043 634
Russia	858 124
Iran	450 860
Canada	449 000
China	429 000
Argentina	302 000
South Korea	254 000

Sources: Thierry Lescot, FAO, EU, US and Japan customs



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Banana — European Union imports																
000 tonnes	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total	3 612	3 414	3 810	3 954	3 902	3 796	3 931	4 070	3 973	4 073	4 121	4 609	4 371	4 838	5 231	5 419
Total EU, incl.	642	585	657	685	811	785	730	782	768	791	755	750	648	642	552	568
Canaries	331	322	369	346	404	437	362	398	421	407	401	418	345	348	358	371
Martinique	181	152	188	250	277	240	259	271	234	264	244	246	226	221	129	125
Guadeloupe	97	82	63	61	98	74	84	88	89	95	86	59	54	48	40	47
Madeira	26	26	34	24	28	30	22	22	21	22	21	21	14	15	17	18
Cyprus	-	-	-	-	-	-	-	-	-	-	-	3	6	7	5	4
Greece	7	3	3	4	4	4	3	3	3	3	3	3	3	3	3	3
Total dollar, incl.	2 220	2 102	2 387	2 466	2 395	2 393	2 520	2 528	2 475	2 555	2 579	3 074	2 959	3 290	3 842	3 933
Ecuador	605	549	632	686	738	568	695	674	705	829	800	993	1 059	1 026	1 184	1 328
Colombia	418	461	557	653	569	541	554	617	645	665	673	763	878	948	1 154	1 278
Costa Rica	480	622	564	604	603	640	663	657	634	686	725	840	623	825	970	895
Panama	413	299	416	311	358	417	422	389	348	307	303	368	281	311	354	295
Brazil	0	0	0	0	2	1	5	13	17	36	50	52	63	96	86	58
Peru	0	0	0	0	0	0	0	0	1	7	6	10	12	23	34	39
Honduras	194	27	56	114	70	151	68	108	106	20	11	18	19	18	30	24
Guatemala	27	20	58	62	58	61	42	30	3	0	2	2	3	27	19	14
Mexico	0	0	0	2	3	7	12	1	0	0	0	7	3	1	0	2
Total ACP, incl.	750	727	766	803	696	618	681	760	730	727	787	785	764	891	843	919
Cameroon	147	158	165	167	157	116	161	206	216	230	293	262	253	253	222	280
Côte d'Ivoire	161	149	160	181	166	158	192	200	218	211	202	211	184	222	189	217
Dom. Rep.	62	86	75	61	49	56	42	60	86	97	109	101	145	177	206	170
Belize	39	47	41	54	53	53	56	68	52	38	74	80	74	73	62	82
Surinam	28	33	28	26	29	21	39	34	29	7	0	19	35	45	59	66
Ghana	0	0	2	3	3	4	3	3	3	3	1	2	4	22	34	46
St Lucia	113	92	101	107	71	70	66	73	35	49	33	43	28	37	30	39
Dominica	53	43	33	39	35	27	28	28	18	17	10	12	12	13	7	10
Saint Vincent	58	32	48	44	30	39	38	43	31	33	21	24	15	17	14	9
Jamaica	77	76	84	89	77	62	52	41	43	41	42	29	12	32	18	0

Note: May to December only for Cyprus in 2004 / From 1995, EU-15 / From 2004 to 2006, EU-25 / Since 2007, EU-2007 / Source: Eurostat



**BANANA FROM
CÔTE D'IVOIRE**

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Producer country sheet

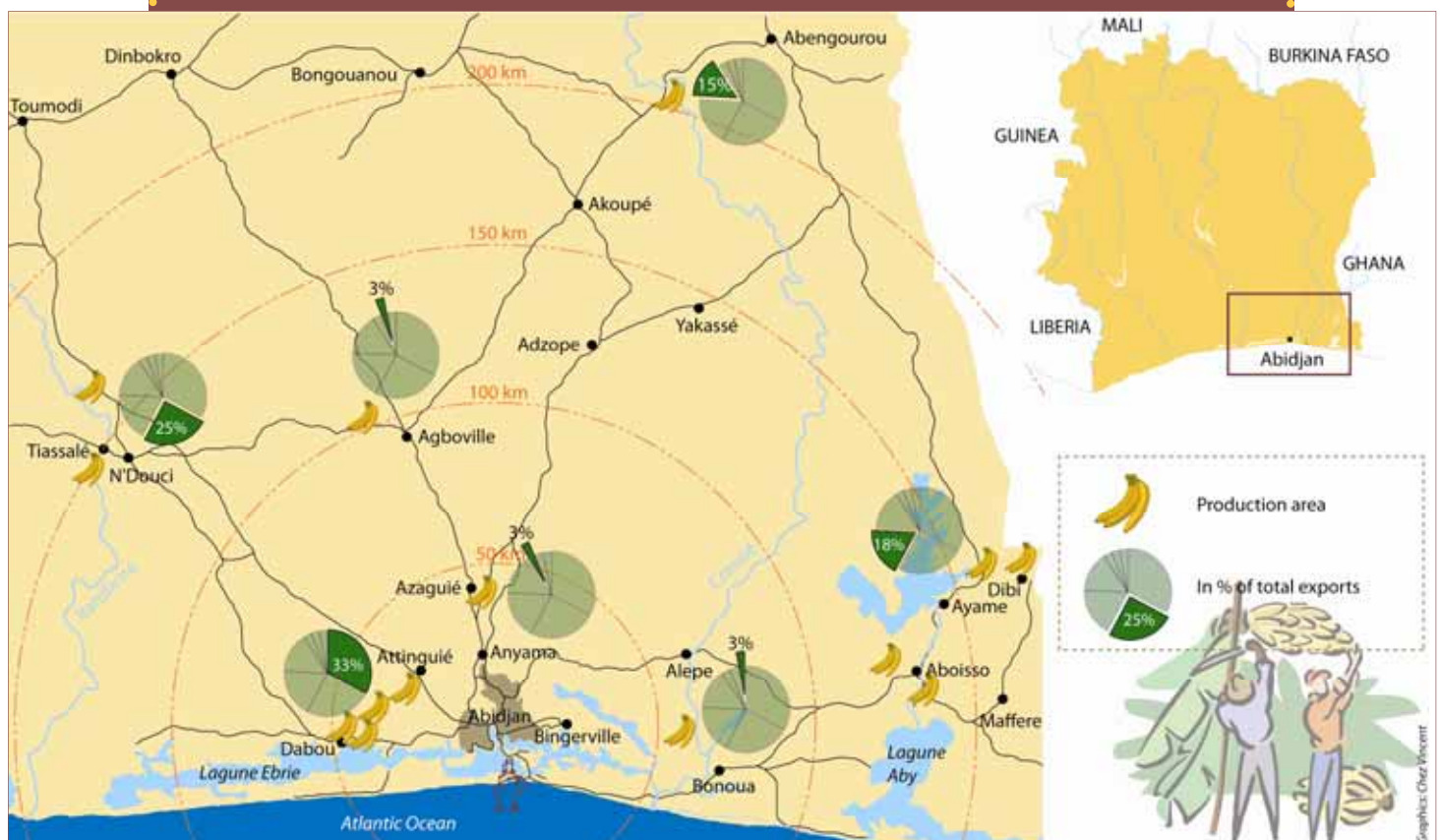
Banana in Côte d'Ivoire

The first bananas were exported from Côte d'Ivoire in 1930 but shipments did not really develop until after 1958, in particular thanks to growers who had suddenly left Guinea Conakry and came to settle in the Agnéby valley, in the peaty, floodable plains of the Niéké. Production increased very strongly from 1963 to 1980, with the first record set in 1972 with 160 000 tonnes. However, the spread of Yellow Sigatoka disease caused growers to abandon the 'Petite Naine' variety that had come from the Canary Islands via Guinea in 1902 and switch to 'Poyo'. Exports stagnated at between 120 000 and 140 000 tonnes in the 1970s and then decreased to between 80 000 and 100 000 tonnes in the 1980s. Practically all the small plantations disappeared, although there has been as many as 750. Various planters' groups, coop-

eratives and companies were set up and these sell their fruits to the importers of their choice. They are grouped in OCAB (Organisation Centrale des producteurs exportateurs d'Ananas et de Bananes) which represents them in contacts with national and international authorities and manages common interests. Côte d'Ivoire banana exports currently total an average of about 240 000 tonnes.

Production zone

The banana plantations are within a maximum of 200 km around Abidjan, the port where they are loaded for shipment. The banana growing area in Côte d'Ivoire has a tropical forest climate with two rainy seasons. The longest and most intense is centred on June and the shortest one peaks in October. They are separated by a short dry season with little sunshine (this totals 1 600 to 1 800 hours per year). The land is flat or has a very slight slope and so cableways can be installed in many places. Rainfall totals 1 400 mm per year in the northernmost zones and 1 900 mm further south and south-east. Nevertheless, irrigation is essential for at least 8 months of the year and all the plantations are equipped with irrigation systems. Average temperature is 26°C, with small daily amplitude. Winds can be strong during inter-season periods and especially at the end of the long dry season. It is estimated that tornadoes cause crop losses of 5 to 10% per year. Some more exposed plantations have invested in guying. Soils vary, being clayey, gravelly or peaty. About 30% of production land is in a polder situation and continuous pumping is required.





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Production

The area used totals 7 000 hectares, of which 5 500 ha is planted. The investments made by growers since the 1990s, subsequently aided by the setting up of financial and technical assistance from Europe, have resulted in improvement to joint and individual production facilities. The upgrading of production facilities is practically complete overall. The average yield has risen from 30 tonnes per ha in 1994 to 50 t/ha today, with variations from 25 to 70 t/ha according to location and the investments made.

Yellow Sigatoka disease—widespread from the 1950s onwards—has been gradually replaced by Black Sigatoka which has spread from the eastern part of the country. An average of 12 to 17 aerial sprayings are performed annually. Pests consist mainly of nematodes (1 to 2 control treatments per year) and banana borer weevils (0.8 to 1.5 treatments per year). The gradual introduction of tissue culture plants since the 1990s has resulted in healthy new replantings.

The banana industry in Côte d'Ivoire provides about 8 000 direct jobs, that is to say an average of 1.45 workers per ha and nearly 20 000 indirect jobs. Four production groups remain

today, spread over about 30 plantations ranging in size from 25 to 900 ha in single blocks:

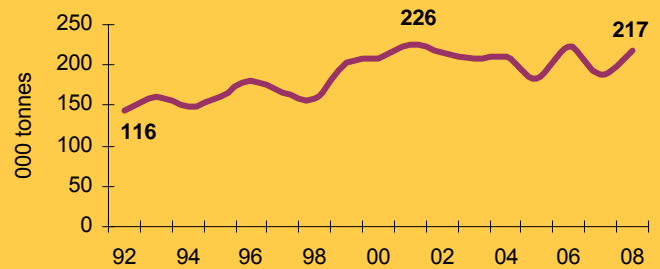
- SPD & Cie, independent company (7% of volumes);
- the EGLIN & SBM planting companies, subsidiaries of the Belgian group SIPEF (8%);
- the plantations of the SCAB group, subsidiaries of the French importer/riper Canavèse (17%);
- the SCB group, part of the Compagnie Fruitière group. SCB has its own plantations and manages production for several independent growers. It includes from this year the plantations of the CDBCI company, formerly a subsidiary of CHI-QUITA (total: 68% of volumes).

Plantations and packing stations are increasingly in conformity with the various standards and certifications introduced this decade, that is to say GlobalGap, ISO 14001 and Tesco Nature Choice.

Total exports

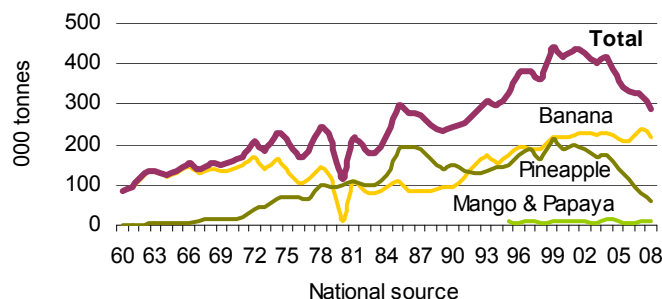
Since the beginning of the 2000s, Côte d'Ivoire has exported 210 000 to 250 000 tonnes of bananas annually. More than 90% of this is shipped to the EU, where it accounts for 24% of ACP supply, that is to say 4.5% (2008) of total European imports. EU entry points in 2008 were Belgium (46%), France (38%) and the United Kingdom (16%). Its ACP status currently enables Côte d'Ivoire to export unlimited volumes duty free to the EU. At the initiative in particular of SPD & Cie for Mali and Burkina Faso, Côte d'Ivoire supplies the sub-region and the Mediterranean region with some 24 000 tonnes a year (2006 figures). Bananas represent about 10% of the country's exports in terms of value.

Banana - Côte d'Ivoire - EU imports



Source : Eurostat

Fruits from Côte d'Ivoire - Exports



Logistics

Most of the access roads to the plantations are surfaced and in decent condition, with the exception of a few places in the extreme south-eastern part of the country where there are still laterite tracks. Transport of palettes to the port is thus handled with no major difficulty as a whole.

It is not possible to discuss bananas without mentioning the prime role played by pineapple in the synergy of export logistics in Côte d'Ivoire at a time when all producers loaded their produce on reefer ships managed first by the now defunct national company SITRAM, then by SITROCAB and, from 2003 to 2006, with the volumes shared with the AEL company. Now that the tonnages have been reduced (mainly in pineapple), producers still have two options:

- AEL (Africa Express Line), a subsidiary of the Compagnie Fruitière group, is a shipping company founded in January 2002. It operates a fleet of reefer ships running weekly services from the port of Abidjan; depending on the year and the various rotations according to the volumes to be loaded, they can put in at the African ports of Douala, Tema, Dakar (5 days) and Agadir and the European ports of Portsmouth, Dover, Antwerp (12 days) and Port-Vendres (11 days). Palettes are loaded on the fruit quay in Abidjan, which should soon be equipped with cold storage facilities.
- Other shipping companies have provided weekly container services since 2007; the main ones are CMA-DELMAS, MSC and MAERSK. Here, the palettes are packed in refrigerated containers at the production site and hauled to the Abidjan container terminal on lorries equipped with generators to supply the container refrigeration units. Power supply connection is possible in the port until loading on the container ships than serve southern and northern European ports.



Banana diseases and pests

Panama disease

Panama disease or Fusarium Wilt was first identified in 1874 in Australia. It is now observed in almost all tropical and subtropical banana production zones. It is caused by a soil fungus of a very common genus, *Fusarium oxysporum* sp. *cubense* (FOC).

Different races have been identified. Under certain conditions (soil type, climate, crop intensification, drainage, etc.) each can cause serious vascular damage to the different banana varietal groups, making them practically non-productive.

- Race 1 originated in Asia and spread widely via movement of plant material in the form of suckers when the major export banana cultivation areas were established in the early twentieth century. It caused by the progressive disappearance of production of the Gros Michel variety in the Caribbean and Latin America in the 1940s and 1950s,

when the variety formed the basis of international trade. Gros Michel was replaced in the industrial plantations by the resistant Cavendish varieties discovered in South-East Asia and that are now the fruits traded internationally. It should be noted that Gros Michel is still the reference for dessert banana consumption in most African and Latin American countries; production is still substantial at approximately 6 million tonnes per year. It appears that race 1 is not active in the areas in which it is cultivated extensively and combined with other varieties and other crops

(hence at low density). Experiments conducted in Colombia have shown that Panama disease gains importance when the growing of Gros Michel is intensified (density greater than 1 000 plants per ha).



Gros Michel

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Panama disease

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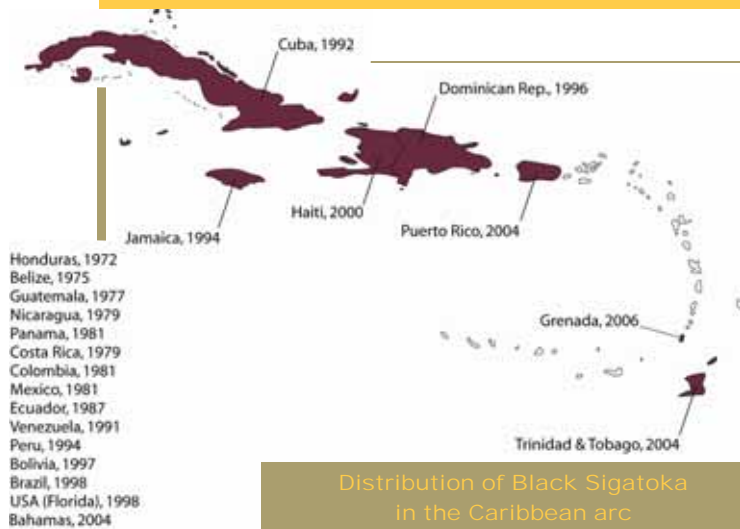
- Race 2 affects the Bluggoe subgroup (ABB, cooking bananas).
- Race 3 affects *Heliconia* spp. and sometimes Gros Michel.
- Race 4, identified in the Canary Islands in 1931, affects the Cavendish group sporadically and under certain environmental conditions but only in subtropical zones (Canary Islands, South Africa, Taiwan, Australia) where it is relatively well controlled by the appropriate cultural techniques (buffer zones, fallow, etc.).
- Race T4 was described recently (1995) and also affects Cavendish group varieties but only in a few tropical areas—Indonesia (Sumatra and Java) and Malaysia.

All the specialists agree that the main cause of the spread of the disease is the movement of plant material (suckers and corms) from susceptible, infected plantations. Contamination via the soil from an infected area is very slow.

Prevention and control

As for numerous soil pathogens, control methods are limited and consist essentially of keeping areas containing the outbreaks in quarantine. Not much international work is performed on this disease whose study is complicated. Control methods are not specific to bananas and are and will remain very limited. Conventional genetic improvement remains an important and as yet little-explored pathway.

International awareness of the importance of respecting rules for the movement of germplasm and the wide adoption of tissue culture plants by the banana industry should limit the present risks. The dispersion of race T4 is under surveillance. However, with strict control of germplasm movement and the surveillance and eradication of infected plants, the prospect of rapid spread of the disease is very improbable.



Sigatoka leaf streak diseases

Two main types of leaf streak disease endanger the banana industry: Black Sigatoka and Yellow Sigatoka. A new species called *Mycosphaerella eumusa* is even more aggressive than Black Sigatoka and seems to be spreading in Asia and the Indian Ocean. Black Sigatoka (also called black leaf streak disease or BLS) is caused by the fungal leaf parasite *Mycosphaerella fijiensis*.

Spread is from plant to plant in continental zones. The sea is a natural obstacle. Although the risk of natural dissemination of the spores of the fungus by wind cannot be ruled out, the spread of the disease from one zone to another is generally the result of uncontrolled movement of plant material. The disease is present in all the producer countries in Latin America, Africa and Asia. The Caribbean countries were long protected by their island geography. The new feature that strongly increases the risk for the Lesser Antilles is the spread of the disease in the Greater Antilles in Cuba, Jamaica, the Dominican Republic, Haiti, Puerto Rico, Grenada and Trinidad & Tobago. The fungus destroys the foliage of banana plants. The disease appears in the form of small black streaks that soon develop into necrotic patches. The spread of lesions causes the total destruction of banana leaves before the bunch is harvested, with the fruits being at an advanced stage of ripeness making them unsaleable.

The process is exactly the same as that of Yellow Sigatoka, another fungal disease observed for about 60 years in all the continents. This is caused by the fungus *Mycosphaerella musicola* and led to rational chemical control set up by professionals in Martinique and Guadeloupe. Spraying is performed in relation to surveillance of the disease. Today, Yellow Sigatoka is controlled with a small number of sprays (five to seven per year). There are fundamental differences between the two leaf streak diseases. Unlike Yellow Sigatoka, Black Sigatoka can infect both export banana and plantain. As it spreads rapidly, it is also more difficult to control. Depending on the country and control facilities and techniques, control requires from 12 to more than 50 sprays per year.

Two control strategies

The export banana plantations in the major Latin American producer countries form vast agro-industrial complexes in alluvial plains. Given the size of plantations (several hundred or even several thousand hectares), contamination from outside is weak. There are no nearby centres of infection. The

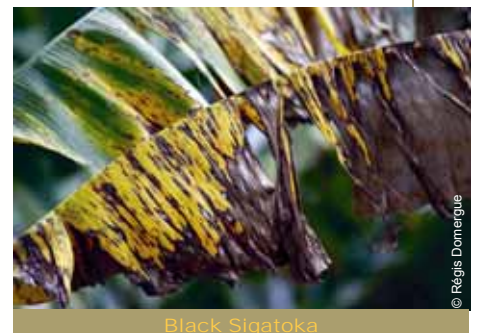
agroclimatic homogeneity makes it possible to organise and rationalise crop spraying for large complexes. The low cost of labour facilitates essential control work (regular defoliation).

In this context, the impact of spraying as a nuisance is not always taken into account by the large companies that do not hesitate to use systematic control strategies leading to more than 50 sprays per year. Application is at regular intervals and generally consists of contact fungicides (chlorothalonil, dithiocarbamate, etc.) that by definition are of low efficacy—treatment every 10 to 15 days—requiring a large number of sprays to control the disease. Systemic fungicides are sometimes used but always as a water-based emulsion.

CIRAD has developed a rational strategy using warning methods based either on disease monitoring in the plantation or on the observation of climatic descriptors (evaporation, temperature, etc.). It has been applied in particular in Guadeloupe, Martinique, Cameroon and Côte d'Ivoire. It consists of performing spraying only at the appropriate moment. The main objectives are:

- improving control efficacy while decreasing the number of sprays per year;
- limiting the risks of the selection of fungicide-resistant races;
- reducing pollution and increasing respect for 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, etc.) that are effective for a long time. Mixing them with a low volume (13 to 15 litres per ha) of petroleum oil (also fungistatic) extends the efficacy of each spray and therefore helps to reduce the number of sprays per year. These two types of leaf streak control strategy have similar efficacy. However, the consequences are totally different with regard to the appearance of resistance in the fungus.



The systemic fungicides available on the market have a single-site effect on the pathogen, enhancing the inducing of resistant fungal strains when these substances are used in excess. In Central America, resistance to benzimidazoles was observed only two years after their first utilisation. This led to greater use of contact products, with 15 to 40 kg active substance per hectare per year. Warning techniques and a reduced number of sprays resulted in the appearance of resistance phenomena in Guadeloupe, Martinique, Cameroon and Côte d'Ivoire only after 10 or even 15 years of use.

New control methods are essential

Present control strategies cannot be used indefinitely. Thought should soon be focused on the adopting of an overall approach combining new hybrids resistant to the leaf streak diseases and cropping systems that make it possible to conserve this resistance.

Bacterial diseases

Bacterial diseases are an increasing concern for growers because of the way in which they spread and the lack of resistant varieties.



Moko disease

Moko disease

caused by *Ralstonia solanacearum* (biovar 1 race 2) formerly *Pseudomonas solanacearum*

Two types of symptoms are observed depending on whether the bacterium is spread via the soil or by a machete or by insects that visit male flowers or their scars after abscission. Upward bacterial colonisation results first in chlorosis and the wilting of the three youngest leaves and then the death of the plant. A cross section of the pseudostem (or corm) reveals reddish-brown colouring of the

vascular vessels. The presence of abundant bacterial exudate is a further sign of bacterial infection. If the contaminated plant bears a fruit bunch, the bacterium colonises all the vascular bundles of the fruits via the rachis. Accumulation of ethylene may cause the premature yellowing of the fruits and cross sections display serious browning. When the bacterium is spread by a machete after the cutting of the pseudostem, the contaminated suckers blacken and become stunted in 2 to 4 weeks. The disease was described for the first time in Trinidad in 1910 and is still absent from the Lesser Antilles, except in Trinidad and Grenada. In contrast, it spread rapidly in the Amazon basin in Brazil and in eastern Peru, going as far as northern Guatemala and southern Mexico. It covers a

large geographic area. Moko disease spread to the Philippines in 1968 via plant material. There are no resistant varieties or chemical control methods. Only eradication and quarantine give results.

Bacterial wilt

Banana Xanthomonas Wilt (BXW), Banana Bacterial Wilt Disease (BBW), caused by *Xanthomonas campestris* pv. *musacearum*

The symptoms are observed above all on the emergence of spear leaves, especially at flowering. Flower bracts become discoloured and the male bud blackens and shrivels. The leaves yellow, wilt, blacken, dry and crumble (including the pseudostem). Yellow or brown vascular streaks are observed throughout the plant together with pale bacterial secretion on a section at the base of the pseudostem or at the corm. This causes bunches to wilt, with premature maturation and a reddish brown colour inside the fruit. The plant dies within a month of the appearance of any of these symptoms (one month after infection). The disease is spread by foraging insects, infected plant material (suckers, bunches and leaves), tools and man, and also by animals, run-off, rain-water splashes and wind. There are no resistant varieties. Control is by a six-month quarantine period and the destruction of infected plants and those nearby. Free movement of animals is forbidden. This wilt was observed and described in Enset in Ethiopia in about 1968 (this affected the staple foodstuff of 12 million people), and then in Uganda where it has spread since 2001 (75 km per year). Uganda is the second largest banana producer with 10.5 million tonnes (250 to 450 kg per person) and this had decreased by nearly 40% in 2006. Spread has been rapid, with the disease reaching the Congo in 2004, Rwanda in 2005 and Burundi, Tanzania and Kenya in 2006.



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Virus diseases

Virus diseases of banana (dessert and cooking fruits) have spread increasingly in recent years as a result mainly of the ease of plant movement and demand for diversification. They consist of banana bunchy top disease and mosaic diseases including banana mosaic, banana streak disease and bract mosaic. The economic damage varies, affecting all cultivated bananas and both large estates and village plantations. Banana bunchy top disease (caused by the banana bunchy top babuvirus, BBTV) can cause losses of 90 or even 100 percent of production. Banana streak disease (caused by the banana streak badnavirus, BSV) causes losses of 40 to 60 percent, and banana bract mosaic (caused by the banana bract mosaic potyvirus, BBrMV) results in losses of more than 40%.

Spread is either by vector from outbreaks or by the use of infected germplasm—suckers or tissue culture plants—or, in the special case of BSV, from so-called 'silent' bananas with a virus sequence incorporated in the genome of the species *Musa balbisiana* and capable of producing viral particles as a result of stress.

Banana bunchy top disease (BBTV)

The plants are markedly stunted and rosetted at the top. The narrow, erect, brittle leaves display strongly chlorotic borders. The characteristic symptom is the appearance of discontinuous dark green streaks along the pseudostem, the main leaf vein and the secondary veins. When the mother plant is infected, so are all the suckers. The most effective vector is the banana aphid *Pentalonia nigronervosa*.

Mosaic diseases

Banana mosaic caused by cucumber mosaic cucumovirus (CMV)

Infected plants display leaf chlorosis and mottling of the main vein and the pseudostem. Secondary infections may appear in the form of bacterial rots in the sheaths forming the pseudostem. The virus can be spread by a broad range of aphids. The disease can also be spread by pruning tools.

Banana streak disease (BSV)

The leaf lamina displays discontinuous yellow streaks that rapidly become necrotic. The main vein is unaffected. In severe forms of the disease, the cigar tip becomes necrotic and the plant dies. If the mother-plant is infected so are all the suckers.

The disease is transmitted by mealybugs—*Planococcus citri*, *Saccharicoccus sacchari* and *Dysmicoccus brevipes*. In recent years, BSV infections unrelated to external contamination have been described in various parts of the world. There are two different causes: tissue culture plants derived from micropropagated healthy interspecific hybrid varieties of banana and the hybrid progeny of crosses between healthy *Musa acuminata* (genome A) and *Musa balbisiana* (genome B) parents. Various abiotic stresses cause the appearance of the disease in these hybrids, correlated with the presence in the genome of the *M. balbisiana* parent of endogenous viral sequences of BSV containing all the information required to synthesise the infectious virus.

Banana bract mosaic (BBrMV)

The first stages of infection consist of greenish yellow streaks turning into brownish red necrosis on the leaf lamina and veins. Yellow mottling or whitish streaks are seen on the pseudostem according to the variety infected. Bract mosaic is the final symptom. The disease is transmitted to all the suckers by aphids (*Ropalosiphum madiis*, *Myzus persicae*).

Prevention and control

The only control method available today to fight these banana virus diseases is control of the vector and the use of healthy plant material. Indeed, there are no bananas with natural resistance to these diseases and no cure other than eradication after a virus attack.

The procedure to be followed is based mainly on the use of disease-free germplasm—suckers or tissue culture material screened for viruses—and the cutting back of weed growth where aphids multiply.



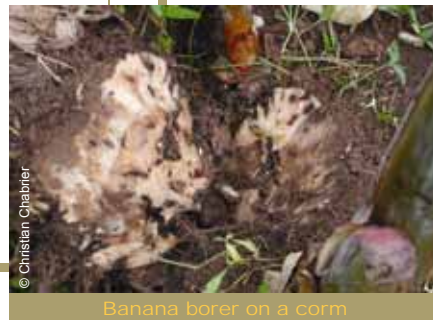
Banana streak disease

Banana borers

Originating in South-East Asia, the banana borer has spread to all subtropical and tropical banana and plantain production regions. The insect (*Cosmopolites sordidus*) is 9 to 16 mm long and 4 mm wide. It moves freely in the soil at the feet of banana plants or in plant debris. It is nocturnal and very sensitive to drying. The pest is spread mainly via infested plant material. The adults do no damage. The females lay eggs in the banana rhizome and the larvae feed on this, driving tunnels. These tunnels disturb water and mineral supply of plants, lengthen the production cycle, cause serious decreases in yield and weaken the anchorage of the plants, making them more sensitive to wind. Strong attacks can lead to the death of the plant. In addition to classic chemical treatment, the use of healthy planting material (tissue culture plants) used in clean soil (after fallows) is a method of borer control. New borer trapping methods using pheromones are available. A control system combining entomophagous nematodes and sordidin traps is being developed.

However, the banana borer remains a major pest constraint for banana crops—whether on industrial plantations or smallholdings. It seems fairly unlikely that improved varieties can be bred rapidly. Control at the farm scale based on the use of traps and the maintaining of low levels of inoculum

are being studied and may in time form an alternative to chemical control.



Banana borer on a corm

Nematodes



Nematode

Numerous nematode species parasitise banana roots and corms. Root knot nematodes (*Meloidogyne* spp.) and spiral nematodes (*Helicotylenchus* spp.) are found all over the world in all kinds of crop. However, the most damage is caused by the migrating nematodes *Pratylenchus* spp. and *Radopholus similis*. The latter species is found everywhere in the hottest

banana growing zones and especially in intensive plantations where it arrived via germplasm movements during the spread of the crop during the past two centuries. *Pratylenchus coffeae* is also present in the hottest zones but is generally indigenous and found mainly on plantain crops. *Pratylenchus goodeyi* prefers cooler areas and originated on the Africa plateaux. It is observed in certain subtropical zones such as the Canary Islands, for example.

Underground enemies!

Pratylenchus spp. and *Radopholus similis* are migratory endoparasites whose full biological cycle lasts for 20–25 days in root and corm tissues. Juvenile forms and females are always mobile and can leave the roots when conditions are no longer favourable. These migratory forms can then colonise other roots. As they move within and between cells, these nematodes feed on parenchyma cell cortical cytoplasm, destroying cell walls and creating tunnels that become necrotic and can extend to the whole of the cortex. Root and corm necrosis is accentuated by other pathogens (fungi and bacteria). In particular, fungi of the genus *Cylindrocladium* are strongly pathogenic and can cause lesions similar to those made by nematodes. The combination of the two

pests causes very serious damage. The destruction of underground tissue leads to a decrease in water and mineral nutrition resulting in slowed plant growth and development. This can lead to severe decrease in bunch weight and lengthen the period between harvests. Furthermore, destruction of the roots weakens the anchorage of the plants in the ground and increases the risk of toppling, especially during hurricane periods, with a strong economic impact.

Prevention and control

Control methods in intensive plantations are still largely dominated by application of chemicals (mainly organophosphorus compounds and carbamates) that carry substantial sanitary and environmental risks. For this reason, in spite of their efficacy and very easy application, their use will be increasingly limited in favour of alternative control measures. These include cultural practices improving fertility (tillage, irrigation, organic ameliorators, etc.) that indirectly improve plant tolerance to pest pressure. More direct methods such as the use of fallow and the planting of micropropagated bananas are now in common use and lead to a strong decrease in nematode populations (cf. Phytoma No. 584, July-August 2005).

These methods are widely used by growers in Martinique and Guadeloupe, where they have contributed to a 50-percent reduction in pesticide spraying in the past ten years.

Operations involving biological antagonists, root symbiots (mycorrhizal fungi) and especially genetic resistance may allow the setting up of increasingly effective integrated control strategies in the fairly near future. However, it is necessary to be aware that the great complexity of nematode populations makes delicate the development of these more closely targeted techniques. To be effective, they must be able to handle the diversity of cultural and ecological situations.



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Marie-José Rives, Fruidor

Pests



Flower thrips



Red rust thrips



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



Deightoniella speckle



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,
Marie-José Rives, Fruidor

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