

Banana



Russia and the European Union have saved the international banana market from over-production. Although this is a somewhat succinct verdict, it nevertheless indicates the role played by these two import zones in the dynamics of this market. In 2006, they took 500 000 tonnes more banana than in 2005. A sign of world-wide improvement, banana consumption in the United States has even stabilised after dwindling for years. The 2006 regulation year was also rich in events. The EU brought its reformed external regulations into force on 1 January with a single tariff of EUR 176 per tonne. It was also a year of negotiations aimed at an in-depth modification of the support regime for European producers from 1 January 2007. They were awarded EUR 280 million per year. Ecuador, the big loser on the European market, initiated proceedings against the EU at the WTO and seeks support from Latin American producer countries. Costa Rica will not join in as it seems delighted with the short-term evolution of the European market. The ACP banana producing countries in Africa and the Caribbean have resolutely opted for the organic and fair trade segment. More generally, the ACP countries are preparing intense negotiation in 2007 (economic partnership agreements, EPA) and are afraid once again that their status of privileged origin might be eroded. They suspect that the European Commission would like to settle the banana dispute at their expense.

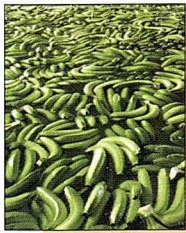
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Banana in Europe

To all malcontents...

The EU market supply balance for 2006 will give food for thought to all the malcontents who considered that banana consumption had reached a peak and that nothing could make things move. To judge by the statistics provided by Eurostat, EU-25 consumed 460 000 tonnes more bananas than in 2005. In 2006, more than 4.8 million tonnes of the fruit was swallowed by the 450 million strong population of the EU in comparison with a little less than 4.4 million in 2005. This growth (+ 11%) was both extraordinary and unex-

pected and took per capita consumption to 10.6 kg per year. This is exactly 1 kg more than in 2005. There has never been such a strong increase in the EU for a constant number of members. It is all the more astonishing as the opposite trend is observed on other fresh fruit markets where consumption is stabilising at best.

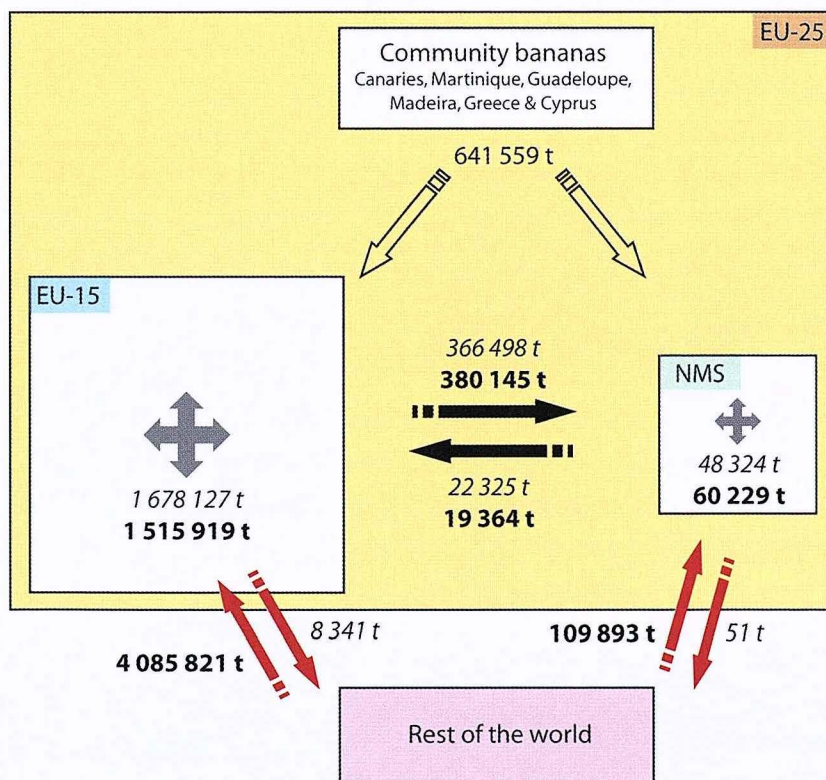
Two features may account for this very strong increase. The first is a catching-up effect. Indeed, the European supply policy set up on the

EU production

The expected recovery of community production did not happen in 2006. European production decreased for the fourth year running and was hardly more than 640 000 tonnes. This is far from the absolute record of 810 537 tonnes in 1997. Production is stabilising or possibly improving in the Canary islands (the leading European producer), Madeira, Greece and Cyprus. In contrast, supplies from Martinique and especially Guadeloupe are decreasing. The latter has reached a new historical floor at 48 000 tonnes.

The market share of European production has fallen to 13.3%, a decrease of 1.5% in comparison with 2005. APEB, grouping European banana producers, has just issued a remainder of its objectives for the coming years: 'limiting our production to today's level, developing a strong quality and environmental policy and ensuring for our European consumers the greatest transparency and the greatest reliability in food hygiene and the traceability of our production' (*Trait d'Union* No 171). This strategy is facilitated by the reform of the support system for European producers that was negotiated in 2006 and came into force of 1 January 2007.

Banana - EU-25 supply - 2006

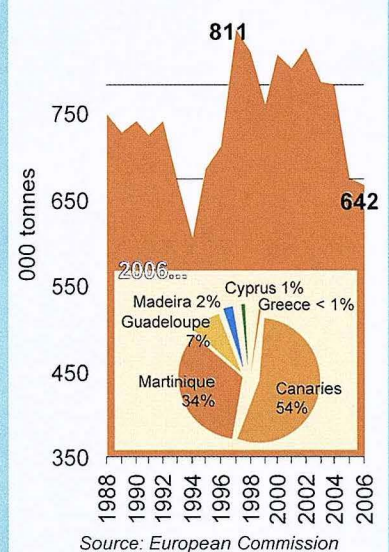


Legend

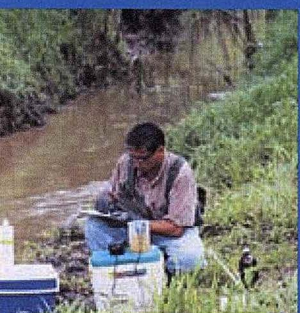
- Imports, exports & re-exports
 - Supply of community bananas
 - Trade between EU-15 and the NMS
 - Intra-EU trade between EU-15 states or between NMS
- 22 325 t | Italics: data based on EU exports
19 364 t | Bold: data based on EU imports

Source: Eurostat, Cirad

Community bananas



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observed in 2005. The second reason is the major change in the regulations related to the common market organisation of bananas in 2006. The old quota systems was removed on 1 January 2006 and replaced by a tariff-only system. Imports from non-ACP third countries are no longer regulated by quotas but subject to the payment of customs dues of EUR 176 per tonne. ACP suppliers have to juggle with an undersized duty-free quota (775 000 tonnes) managed by a bi-monthly system of issue of import

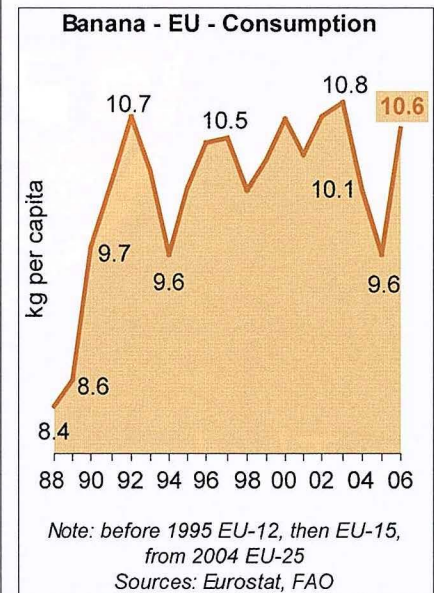
increase in the quantities available world-wide following the return to full production in Costa Rica, certain ACP countries in the West Indies (Jamaica and St Lucia) and in Côte d'Ivoire. The Dominican Republic, Surinam, Ghana, Brazil and Peru also made substantial contributions to the unprecedented increase in imports.

Promise kept

As we have already reported (**Fruitrop** 143, pages 2 and 3), 2006 made it possible to verify the respect of the dogma laid down by the WTO, with the tariff-only regime 'at least

joining of the new member countries (NMCs) in 2004 had restricted and reduced the volumes reaching the market via quotas that were all subsequently seen to be a bit small with regard to consumption by the NMCs. In fact, a 240 000-tonne decrease in total supplies was

certificates and the common regime consisting of the tariff of EUR 176 per tonne. This liberalisation of the European market soon led to an increase in shipments from practically all supplier countries. The 'catching-up' and 'liberalisation' effects were cumulated with an

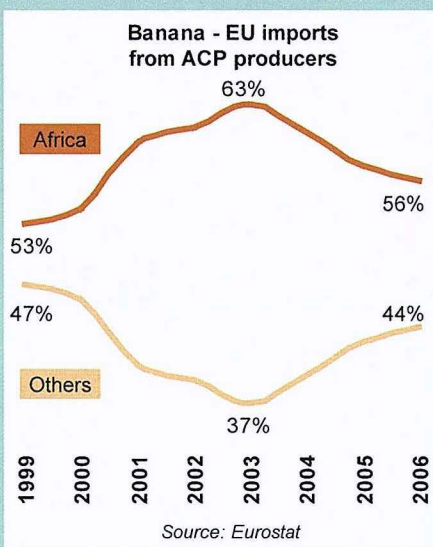


ACP production

For the first time in its history, the ACP producer group sold more than 900 000 tonnes of banana on the EU market. It improved its market share by 1.2% to 18.7% thanks to an increase of 140 000 tonnes in shipments. ACP producers exceeded their duty-free quota by 131 000 tonnes; this affected their competitiveness by obliging them to pay the full EUR 176 per tonne customs tariff.

West Indian ACP producers confirmed their recovery, enhanced of course by the return of production in Jamaica and St Lucia, but above all thanks to the continued strong development of the Dominican Republic which is confirming its position as world leader on the organic and fair trade banana market

and the results of the re-launching of banana exports from Surinam. In the ACP group, the West Indian share



rose to 44% in 2006. But Africa did not do badly either. Cameroon maintained the same level of shipments as in the two preceding years, but this was less than the magnificent performance of 2003. Côte d'Ivoire succeeded in breaking its record, shipping 228 000 tonnes against a background of difficult political conditions. Exports from Ghana, the newcomer, are already running at more than 24 000 tonnes.

All eyes are on the ACP group. For the Latin American producer countries and especially Ecuador it is the perfect expiatory victim that shows how stimulating the European system is for the ACP countries. It remains to be proved that ACP growth is at the expense of dollar suppliers but Ecuador sees this as just a detail...





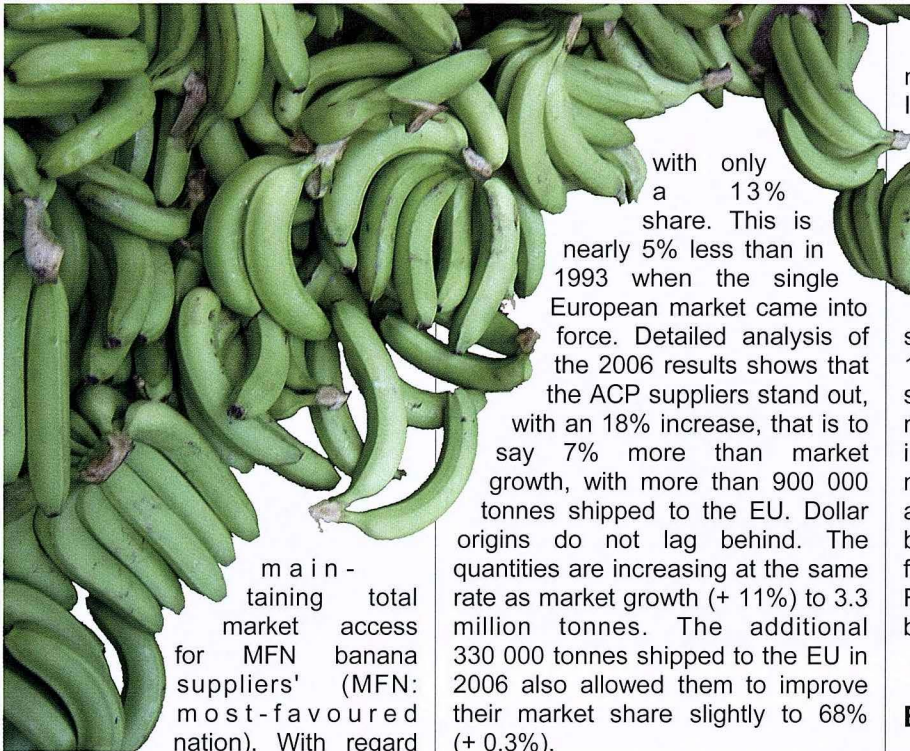
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main -
taining total
market access
for MFN banana
suppliers' (MFN:
most-favoured
nation). With regard
to the quantities imported, whether in
market share or volume, the new
supply regime was more than
convincing in its beneficial effects for
third countries, including ACP
countries. Third countries have never
held such a large market share in
Europe at 87%! This increase in
imports has been entirely at the
expense of community production,

with only
a 13%
share. This is
nearly 5% less than in
1993 when the single
European market came into
force. Detailed analysis of
the 2006 results shows that
the ACP suppliers stand out,
with an 18% increase, that is to
say 7% more than market
growth, with more than 900 000
tonnes shipped to the EU. Dollar
origins do not lag behind. The
quantities are increasing at the same
rate as market growth (+ 11%) to 3.3
million tonnes. The additional
330 000 tonnes shipped to the EU in
2006 also allowed them to improve
their market share slightly to 68%
(+ 0.3%).

The increase in imports from third
countries was marked above all from
May onwards. The first four months
of the year were marked by hesita-
tion resulting in growth of only just
50 000 t. Subsequently, an extra
50 000 t found takers every month
until the end of the year. Only
Ecuador shipped less and less to the

EU as the months went by. ACP
releases were governed by the bi-
monthly issuing of import certificates.
Indeed, ACP banana operators had
to juggle with three systems here
too—first come first served to
105 000 tonnes per two-month
period, using the certificates
gained on the basis of imports
made in past years (historical
references) and, when the two
systems are exhausted, paying EUR
176 per tonne. As the first-come-first-
served system is managed on a bi-
monthly basis, it is in operators'
interest to concentrate their ship-
ments to the EU in the early weeks,
as the quantities allocated will soon
be exhausted. For example, exports
from Côte d'Ivoire or the Dominican
Republic are often performed at the
beginning of the two-month period.

Ever-increasing uncertainty

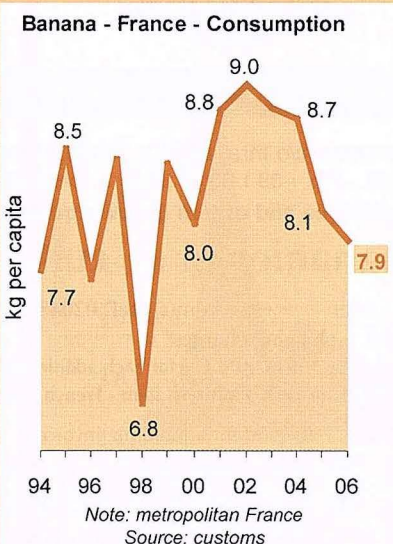
The impact of the increase in these
volumes on the value of the Euro-
pean banana market received
extensive coverage in the February
2007 issue of *Fruitrop* (No 142,
pages 6 to 9). Market volatility has
increased considerably. The removal
of its structure—that some call
liberalisation—has had devastating
effects. Opportunist and unmethodi-
cal market releases of fruits from
Guatemala from April onwards are a
good example of the destabilisation
that is now a constant threat to the
European market. It has become an
unpredictable market where on the
one hand operators may behave
irrationally or like sheep and on the
other where the large retail chains
have considerable weight in negotia-
tions.

The European market was long
extremely dependent on reforms of
the common market organisation
(CMO) of bananas. Operators had to
manage the uncertainty in the
regulations resulted in repeated
complaints to the WTO and inces-
sant multilateral negotiations. They
now have to handle commercial
uncertainty and this seems more
dangerous for individual sales
accounts. In the first case, the value-
added of the goods was relatively
well protected, but the opposite can
now be feared. The destruction of
value or even the pauperisation of
the industry is a threat. The most

French market

French consumption has moved
away from the European trend. It
remained stable in 2006 at 8 kg per
person whereas it had reached
some 9 kg in 2002. The market
totals about 487 000 tonnes. This is
40 000 tonnes less than in 2004 and
practically the same as in 2005. The
stability in comparison with 2005
hides major changes in market
supply structure. Strong pressure is
felt from ACP suppliers who
achieved a 44% market share in
comparison with 36% in 2005. In
contrast with what might be imag-
ined, pressure from dollar bananas
(including volumes arriving via an

EU member country) has decreased a little. The share returned to 18%
after a peak at 24% in 2005. France is confirming its position as a re-
shipping hub in Europe. One banana in four, that is to say some 160 000
tonnes, goes on to other member-countries. This is a lot but nonetheless
far from the 196 000 tonnes re-shipped in 2004.



Cet ouvrage propose des modes de gestion technique et agronomique pour une culture durable de la banane. Après un rappel des connaissances sur la plante, les contraintes parasitaires et l'évolution économique récente de ce produit, l'auteur présente les concepts de culture raisonnée et de banane biologique. En tenant compte des évolutions récentes tant dans les domaines phytosanitaires et agronomiques que dans ceux de la fertilisation et de l'irrigation, il développe ensuite tous les aspects de la production : les conditions de mise en culture pour réduire les intrants et donc la pollution ; les pratiques optimales pour obtenir une productivité satisfaisante ; les opérations de conditionnement nécessaires pour garantir la qualité des fruits ; les techniques d'aide à la décision pour raisonner les pratiques culturales.

The banane and its cultivation

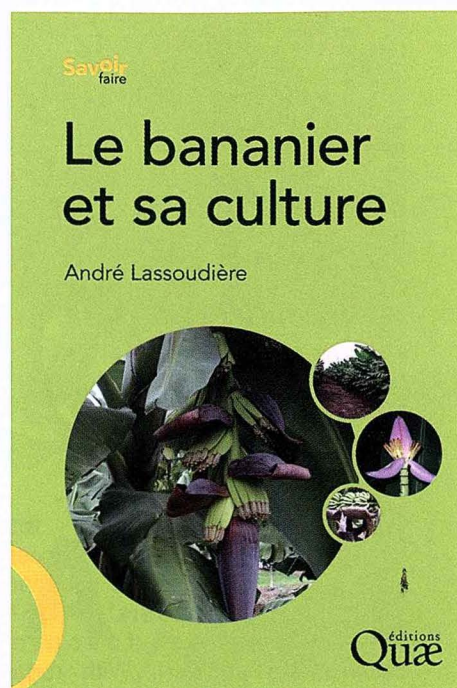
This book proposes technical and agricultural management systems for sustainable banana farming. After providing an overview of existing knowledge about the plant, parasitic constraints and the recent economic development of this product, the author presents the concepts of integrated and organic banana farming. Taking recent developments into account in the areas of plant health and agriculture, as well as those of fertilisation and irrigation, he then focuses on the different aspects of production: cropping conditions conducive to reducing inputs and, therefore, pollution; optimum practices to obtain satisfactory productivity levels; packaging operations necessary to ensure fruit quality; decision-making techniques for integrated cultural practices.

The author

André Lassoudière, engineer at CIRAD since 1967, has worked both as a researcher in the area of banana production, as well as an advisor to planters and professional organisations in the sector. In addition to his extended stays in Côte d'Ivoire, Cameroon and the French West Indies, he has carried out many expert missions throughout the world.

The summary

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Remerciements
Partie I. Connaissance du bananier
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Partie III. Parasites et ravageurs
Partie IV. Culture du bananier
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Partie VI. La gestion technique de l'exploitation
Conclusion. Les systèmes de culture durables de la banane
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Glossaire
Abréviations et sigles



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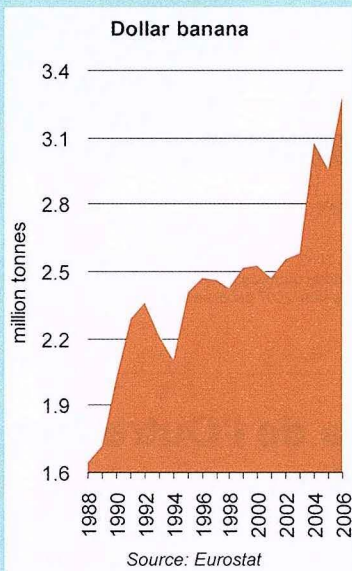
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Dollar origins

Costa Rica was clearly the winner in 2006. With nearly 825 000 tonnes put on the market (+ 32%), it returned to the highest levels of 2004 just before climatic catastrophes hit the production zone. Whereas some suppliers such as Colombia and Ecuador chose between the American and European markets, Costa Rica gained on both fronts (+ 13% in exports to the USA). Colombia increased its exports to the EU by nearly 60 000 tonnes but lost 40 000 tonnes in shipments to the USA. Ecuador considers that it was hard done by in Europe (- 40 000 tonnes) and increased exports to



the USA by 90 000 tonnes. Panama increased its shipments, with all the fruits going to Europe. For reasons of commercial opportunism, Guatemala shipped large quantities to Europe in mid-year but remained concentrated above all on the United States. Honduras continued its slow decline and Venezuela reduced shipments slightly, remaining focused on Europe. Two supplier countries—Brazil and Peru—are gaining ground but for different reasons. The former is quietly approaching sales of 100 000 tonnes in Europe and is now the fifth largest non-ACP supplier. Its development is based on the projects of large transnational corporations. Peru is continuing to invest in the organic and fair trade segments, somewhat like the Dominican Republic among ACP origins.

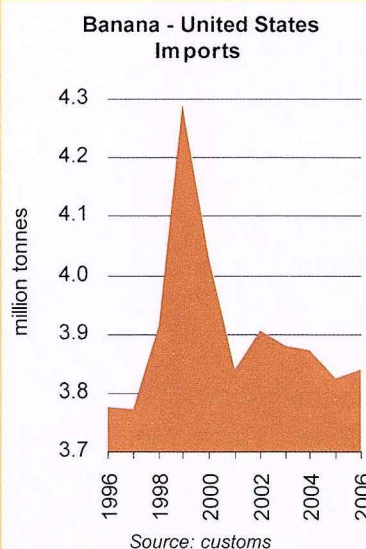


vulnerable supply origins are trying to set up alternative strategies. The Caribbean ACP countries, in conjunction with several British distributors, are turning to fair trade and community producers are defending their positions on the domestic market by controlling market release and vigorous promotion of their advantages.

So who was the big winner in 2006? Consumers to a certain extent,

distributors with no doubt and certainly the member states. The revenue from customs dues exceeded EUR 600 million in 2006. This is nearly 400 million more than in 2005! This is enough to set up fine development projects on community ■

Denis Loeillet, Cirad
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**US market**

The US market performed very well in 2006, with the quantities imported remaining stable. It might seem paradoxical to praise such a trend but indeed there is satisfaction. Consumption has decreased since the early 2000s. Consumption support policies, in particular via the IBA (International Banana Association), had no effects. For years, diets of the Atkins type damaged the nutritional image of banana. Does 2006 mark the beginning of a reversal in trend? One might believe this in the light of the first results from 2007 that confirm and amplify the favourable movement. Indeed, imports displayed a 6.4% net increase in the first two months of the year. Consumption is around 11.5 kg per

capita, putting the USA in the leading group of developed countries. Ecuador (+ 90 000 t) remained the leading supplier in 2006, just ahead of Costa Rica, which strongly reinforced its positions (+ 105 000 t). In contrast, Guatemalan exports (- 116 000 t) plummeted, with exporters preferring to ship some quantities to Europe. Exports from Colombia and Honduras decreased by 30 000 to 40 000 tonnes in each case.

Banana — European Union to 25 — 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	763 966	2 405 180	3 827 352	43 082	3 784 270
1996	684 605	800 074	2 471 263	3 955 942	30 598	3 925 344
1997	810 537	693 054	2 464 412	3 968 003	16 571	3 951 432
1998	786 232	615 596	2 426 419	3 828 247	26 448	3 801 799
1999	729 303	675 993	2 522 455	3 927 751	27 359	3 900 392
2000	782 176	756 808	2 528 170	4 067 154	35 327	4 031 827
2001	767 268	728 776	2 474 665	3 970 709	34 284	3 936 425
2002	790 622	726 452	2 554 508	4 071 582	8 011	4 063 571
2003	754 216	786 798	2 578 827	4 119 841	6 020	4 113 821
2004	750 910	782 598	3 073 764	4 607 272	11 029	4 596 243
2005	648 395	764 357	2 959 464	4 372 216	4 970	4 367 246
2006	641 559	905 692	3 290 022	4 837 273	8 392	4 828 881

(1)

(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-25 member countries and then exported outside EU-25.

General note: before 1994: dessert bananas + plantains / From 1994 onwards: dessert bananas. Before 1995: EU-12 / From 1995 to 2003: EU-15 / Then from 2004 onwards: EU-25. 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. Publication of the results in the supplement to *Info Banane* 2007 published by CIRAD for ODEADOM.

Source: Eurostat, European Commission / Processing: Cirad Market News Service



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Tonnes	FR	BE-LU	NL	DE	IT	UK	IE	DK	GR	PT	ES	SE	FI	AT	PL	HU	CZ	SK	SI	EE	LV	LT	CY	MT	EU-25
Total 3rd count.	173 597	1 155 525	159 642	853 938	513 201	855 684	40 752	9 115	43 827	104 783	75 635	96 034	17	4 072	61 413	5 904	5 965	66	29 534	89	4 814	269	0	1 840	4 195 714
of which ACP	172 555	240 415	834	114	10 240	466 454	2 939	1	11	8 810	2 442	0	0	0	475	162	0	0	242	0	0	0	0	0	905 692
Ecuador	21	224 179	9 018	288 465	296 634	4 285	582	2 798	36 439	24 438	67 160	6 764	17	99	49 107	1 794	21	0	9 236	0	4 774	110	0	508	1 026 447
Colombia	752	402 380	86 512	226 457	66 300	97 793	2 850	5 237	0	27 029	1 149	968	0	3 870	3 140	2 285	379	0	19 339	0	40	104	0	1 332	947 915
Costa Rica	111	181 244	35 108	159 817	101 755	195 269	29 002	1 078	5 763	35 149	4 118	64 227	0	103	5 049	1 156	5 338	0	284	0	0	21	0	0	824 590
Panama	0	55 072	653	166 678	23 061	24 751	3 876	0	1 595	7 250	0	24 075	0	0	3 642	0	228	0	293	89	0	0	0	0	311 260
Cameroon	18 186	120 432	0	0	0	115 736	0	0	0	4 765	0	0	0	0	0	0	0	0	242	0	0	0	0	0	259 360
Côte d'Ivoire	100 450	82 298	0	0	20	38 986	0	0	0	3 410	2 442	0	0	0	0	162	0	0	0	0	0	0	0	0	227 767
Dominican Rep.	0	24 742	737	88	10 220	140 970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	176 756
Brazil	0	10 360	1 019	7 924	14 854	58 578	0	0	20	2 088	651	0	0	0	0	0	0	0	100	0	0	0	0	0	95 595
Belize	0	0	0	0	0	70 268	2 939	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73 207
Suriname	44 660	0	0	0	0	0	0	0	11	0	0	0	0	0	475	0	0	0	0	0	0	0	0	0	45 146
St Lucia	0	0	0	0	0	36 726	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36 726
Jamaica	0	1 529	0	0	0	30 334	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31 863
Guatemala	0	0	22 364	61	0	3 205	1 504	0	0	0	0	0	0	0	0	285	0	0	0	0	0	0	0	0	27 418
Ghana	9 259	11 357	97	0	0	2 843	0	0	0	635	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24 190
Peru	1	14 179	3 978	4 396	0	0	0	0	0	20	95	0	0	0	0	0	0	0	0	0	0	33	0	0	22 703
Honduras	0	18 390	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18 390
St Vincent	0	0	0	0	0	17 239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17 239
Venezuela	140	9 124	0	0	0	5 311	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14 575
Dominica	0	0	0	0	0	13 298	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13 298
Mexico	17	181	139	0	359	19	0	0	0	0	21	0	0	0	0	223	0	66	0	0	0	0	0	0	1 024
Total intra, incl.	234 704	25 349	119 779	444 656	140 112	68 841	10 810	78 257	53 202	38 019	57 563	92 033	63 363	126 722	181 113	60 411	125 088	66 387	6 621	14 196	19 320	21 884	2 858	2 725	1 993 784
Total EU-15, incl.	233 467	25 015	118 965	428 826	126 715	68 839	10 810	78 248	52 803	38 019	57 531	92 033	61 326	123 323	165 849	52 458	95 628	24 682	6 621	7 603	11 470	10 251	2 858	2 725	1 896 064
Belig.-Lux.	143 083	0	78 165	293 618	25 207	26 752	450	2 604	418	6 390	10 729	7 053	6 361	27 857	48 461	22 516	11 853	8 905	1 180	2 615	885	1 123	0	0	726 224
Germany	36 131	2 740	34 341	0	19 610	254	516	50 394	20	228	0	34 965	14 949	77 192	88 286	20 679	38 945	13 262	1	4 704	9 436	2 446	0	0	449 100
Netherlands	13 528	9 009	0	56 109	43 158	19 637	136	18 006	49	216	11 023	29 789	19 379	17 407	12 759	1 349	16 236	280	481	123	1 129	6 240	2	25	276 067
France	0	8 551	970	51 031	23 514	13 514	1 153	104	0	8 659	26 946	1	2	456	12 979	936	22 706	856	19	0	0	422	0	0	172 818
Italy	23 706	2 310	4 080	21 513	0	48	16	823	52 317	7 715	945	0	0	411	2 903	2 104	5 083	976	4 518	52	21	0	0	0	133 083
Portugal	5 395	0	0	1	14 228	1 189	0	0	0	0	7 703	0	0	0	0	0	0	0	0	0	0	0	0	0	28 515
Sweden	0	0	584	786	0	0	0	5 921	0	0	0	0	20 636	0	0	0	0	0	0	21	0	21	0	0	27 970
United Kingdom	8 631	0	657	297	766	0	8 539	393	0	0	184	3 478	0	0	0	164	0	0	0	0	0	0	0	0	23 108
Spain	2 093	1 306	94	2 950	109	298	0	4	0	14 811	0	0	0	0	56	0	60	20	0	0	0	0	0	0	21 800
Denmark	0	1 097	16	237	0	0	0	0	0	0	1	14 592	0	0	0	0	0	0	0	0	0	0	0	0	15 943
Austria	832	0	0	2 218	123	0	0	0	0	0	0	0	0	0	5	4 709	745	383	422	0	0	0	0	0	9 437
Ireland	21	0	0	1	0	7 127	0	0	0	0	0	0	0	0	401	0	0	0	0	0	0	0	0	25	7 575
Finland	0	0	0	65	0	0	0	0	0	0	0	2 156	0	0	0	0	0	0	0	88	0	0	0	0	2 309
Greece	0	0	40	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 048
Luxembourg	47	1	19	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69
Total NMS, incl.	1 237	167	407	7 915	6 699	1	0	5	200	0	16	0	1 018	1 700	7 632	3 977	14 730	20 852	0	3 297	3 925	5 817	0	0	79 593
Czech Rep.	877	42	0	1 913	0	0	0	0	0	0	0	0	0	128	5 882	95	0	19 076	0	0	395	251	0	0	28 658
Poland	255	125	387	5 534	359	1	0	0	0	0	16	0	0	918	0	817	8 771	1 705	0	0	3 497	2 480	0	0	24 864
Slovakia	9	0	0	0	0	0	0	0	0	0	0	0	0	559	303	2 060	5 861	0	0	0	0	0	0	0	8 792
Slovenia	96	0	0	2	6 340	0	0	0	0	0	0	0	0	95	0	865	19	0	0	0	0	0	0	0	7 416
Lithuania	0	0	20	82	0	0	0	0	0	0	0	0	20	0	1 124	0	0	0	0	2 764	0	2 994	0	0	7 005
Estonia	0	0	0	0	0	0	0	5	0	0	0	0	998	0	323	0	0	0	0	0	0	92	0	0	1 418
Latvia	0	0	0	277	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	533	33	0	0	0	843
Malta	0	0	0	0	0	0	0	0	200	0	0	0	0	0	0	139	60	0	0	0	0	0	0	0	399
Hungary	0	0	0	107	0	0	0	0	0	0	0	0	0	0	0	0	19	72	0	0	0	0	0	0	197

Source: Eurostat



Banana in Russia

A star in the hands of a few czars

Banana imports in Russia had levelled out in recent years but now seem to be growing strongly since the beginning of 2007. Given the remaining scope for development and solid economic growth, this trend is probably not conjunctural and is playing a structuring role on the world market by helping to maintain good prices on the open market.

A fruit market boom

Russian consumer interest in fruits is clearly increasing. The banking crisis at the end of the 1990s that strongly hit a fruit and vegetable import sector that was still in its infancy is a thing of the past. The volumes imported, dipping below the million-tonne mark in 1999, attained nearly 3.5m tonnes in 2005, giving an annual growth rate of 24%!

Banana in the number 1 spot of the imported fruit hit parade

This was a period during which banana consolidated its position as the leading imported fruit. The volume reached 860 000 t in 2005, an increase of nearly 500 000 t since 1999. It took Russia five years to become the fourth-largest import market in the world after the EU, the United States and Japan. The volumes shipped to these countries form 6% of world trade and are the equivalent of the annual average consumption of a country like Great Britain, the second largest market in EU-25.

Apple, Russian consumers' favourite fruit, is only in second position in imports because domestic production is large in the orchards in the Kras-

nodar, Volgograd and Samara regions. Orange comes third with slightly less than 400 000 t.

Strong return to growth in 2007 after a period of stability

It is true that the period 2003-2006 was marked by the comparative stagnation of banana imports. However, the first 2007 figures seem to indicate that growth is back and that a new record may be set. Volumes to mid-May exceed 23 million boxes, i.e. about 425 000 t, an increase of nearly 40% in comparison with 2005 and 2006.

Is this increase a flash in the pan? Probably not as it seems to have solid foundations—strong economic growth devoted largely to consumption and the generalisation of modern trading that means banana is



© Cabinet Levesque

Russia — Fresh fruit imports — Tonnes

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Banana	397 224	378 049	660 647	477 115	377 891	502 950	612 210	649 959	802 073	858 124	863 503
Pip fruits and stone fruits	474 916	550 371	533 966	530 619	255 817	341 514	531 304	612 371	929 427	1 150 208	1 238 107
Apple	407 695	427 999	356 990	358 760	154 270	200 139	324 595	362 071	608 299	705 277	723 580
Pear and quince	48 570	86 914	137 478	122 784	70 617	76 808	132 058	162 010	210 600	260 103	313 390
Peach and nectarine	12 232	27 080	26 729	23 448	22 576	37 161	46 303	61 684	52 905	76 787	100 569
Apricot	729	3 073	6 558	11 493	4 295	10 215	12 066	13 787	11 958	22 869	32 923
Cherry	203	959	911	3 609	849	5 818	4 244	4 123	17 032	30 248	33 786
Plum	5 487	4 345	5 299	10 524	3 210	11 373	12 038	8 696	28 633	54 924	33 859
Exotic fruits	7 033	12 823	9 839	11 638	4 856	5 387	13 994	19 727	23 045	29 592	28 101
Avocado	130	336	477	950	825	385	689	1 057	1 106	1 669	2 369
Pineapple	6 526	11 640	8 357	10 651	4 012	4 967	13 251	18 596	21 831	25 189	22 870
Others	378	847	1 005	37	19	35	54	74	108	2 734	2 862
Citrus	381 069	378 967	555 328	541 746	282 277	472 114	561 904	701 276	780 175	853 276	951 849
Easy peelers	56 603	89 284	147 884	135 709	65 385	113 502	131 206	162 526	188 495	243 514	335 351
Grapefruit	14 516	13 063	16 295	18 155	4 456	13 826	21 933	33 025	32 449	44 762	45 593
Lemon	71 678	64 905	112 841	96 439	51 735	95 140	135 364	144 020	155 443	166 322	179 773
Orange	238 272	211 715	278 309	291 443	160 700	249 646	273 401	361 705	403 788	398 678	391 132
Others	28 504	102 725	115 100	66 141	23 789	79 397	122 643	125 645	188 441	303 175	348 694
Fig	1	132	7	1 443	1 544	3 051	2 777	2 385	5 316	293	327
Kiwi	6 824	10 828	22 306	17 032	5 218	4 033	20 292	20 776	25 652	37 679	43 519
Grapes	21 220	91 227	91 308	44 806	16 314	71 545	97 788	99 747	154 472	257 551	291 163
Strawberry and other berries	459	537	1 478	2 860	713	768	1 786	2 737	3 001	7 652	13 685
Total	1 288 747	1 422 934	1 874 880	1 627 259	944 630	1 401 361	1 842 055	2 108 978	2 723 161	3 194 375	3 430 254

Source: FAO



Russia — Banana imports — Tonnes

	1998	1999	2000	2001	2002	2003	2004	2005
Ecuador	306 491	240 970	442 890	567 996	592 235	723 274	789 176	791 057
Colombia	98 630	89 306	22 771	20 935	15 712	21 231	39 323	28 005
Philippines	7 524	3 700	2 921	14 215	13 892	20 824	22 485	20 806
Costa Rica	44 757	32 024	4 200	-	933	17 469	989	15 468
Panama	4 817	10 360	15 738	2 412	5 430	7 239	3 905	3 948
China	786	506	754	814	504	822	2 131	2 284
Honduras	10 179	-	891	1 464	14 695	7 458	-	1 915
Guatemala	-	-	9 158	-	2 411	71	-	18
Vietnam	1 682	969	2 507	1 371	1 256	1 293	-	-
Others	2 249	56	1 120	3 003	2 891	2 392	115	2
Total	477 115	377 891	502 950	612 210	649 959	802 073	858 124	863 503

Source: FAO

available in parts of the country not covered until now.

Buoyant economic growth

Economic growth of between 6.4 and 7.4% per year since 2003 is certainly a factor in the boom. Average annual income per person is still increasing more strongly than inflation, which is nevertheless one of the scourges of the Russian economy. It is true that the average income is still comparatively low (a little less than USD 7 000 per capita in 2006), but the proportion available for consumption is much larger than in most developed countries. Taxes are low, the proportion of owned homes is high and the Russians—still intimidated by the 1998 banking crisis, have few debts. As a result, development of the retail trade is even stronger than economic growth and runs at some 10 to 12% per year.

Commercial structures are growing strongly, and not only in large urban centres

The rapid increase in the number of modern retailing facilities encourages this spending fever, especially as the Soviet state shops are not very far in the past. Supermarket chains were marginal until 2004 outside the large urban centres St Petersburg and Moscow but are now spreading in the provinces. Cities with populations of 300 000 to 500 000 habitants have been targeted since 2005-2006 by leading groups in the country such as Piaterotchka, the German chain Metro and the Turkish company

Ramstor. Kopeika and Perekrestoc have already moved into provincial urban centres with populations of over 50 000. The market share of modern retailing thus quadrupled from 2003 to 2006, increasing from 8 to 32% at the expense of open-air markets and specialised kiosks. The phenomenon may accelerate as world leaders like Wal-Mart and Carrefour seem to have plans to set up shop in Russia.

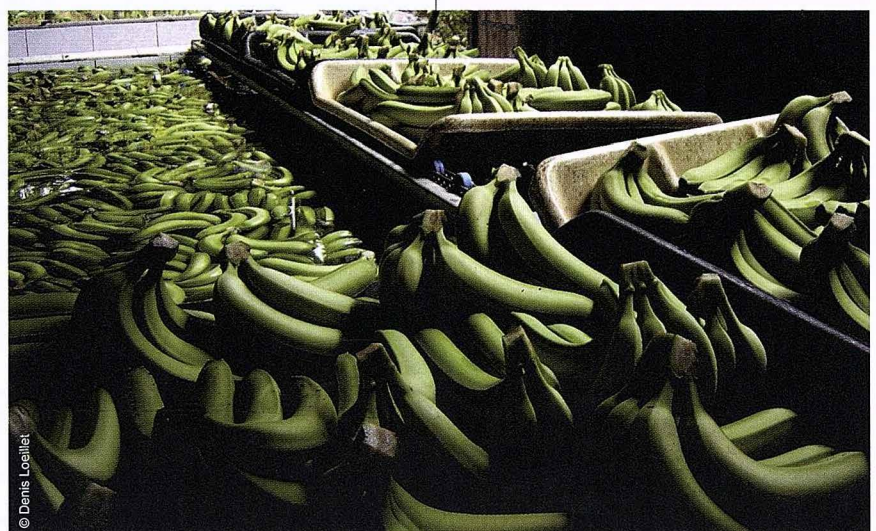
Banana is going beyond large urban centres

Banana is no longer reserved for the large metropolises in the north-west especially as in parallel road infrastructure has been modernised and developed and importers have established national networks of cold stores fed by vast fleets of refrigerated lorries. Banana is now available in most of the 'fertile triangle', the zone consisting of the European part

of Russia and south-west Siberia where three-quarters of the population live.

Enthusiasm for fruit and vegetables and other 'healthy' foods

Another consequence of the rise in the standard of living is that quality products and especially those with a good health image are tending to replace standard products. A survey conducted by the Nielsen Group in 2004 showed that the consumption of fresh dairy products and fruit and vegetables had increased distinctly since the early 2000s at the expense of meats, sausages, pasta and butter. Banana is benefiting considerably from this trend and in just a few years the status of the fruit has changed from that of exotic during the Soviet era to that of a basic fruit today. Costing about USD1 per kg at the retail stage, it is the most acces-



Logistics, a key feature and perhaps a limiting factor in the medium term

Russia is a vast country but its western seaboard is limited. However, most of the population lives in the western part of the country. Importers therefore have a limited choice of available ports. Some 90% of banana imports are unloaded in St Petersburg, located close to the large consumption areas. However, 'ice class' ships with strengthened hulls are required in the Baltic in the winter. But the ice ship fleet is growing old. Many of the 'Sun' family used by Sunway are more than 25 years old, and the same applies to the 'Crystal' used by JFC and the 'Baltic' that belong to Sorus—often more than 30 years old. Is a shipping capacity shortage approaching that might bridle market growth in the future? It seems that there is no reason for alarm even if there are currently no large-scale plans for building these expensive ships for the moment. Technical solutions do exist for adapting conventional reefer ships to the constraints of the Baltic by strengthening their hulls. Furthermore, the development of the banana market is giving these players financial resources and scope for credit. The alternative of making more use of the port of Novorossiysk in the Black Sea does not have great credibility. Only 10% of banana imports arrive there. It is true that access to it is easy in the winter but it is much further from the major urban centres than St Petersburg and its ageing installations mean that unloading takes much longer.



sible of the fruits sold during the autumn-winter period.

A very concentrated market

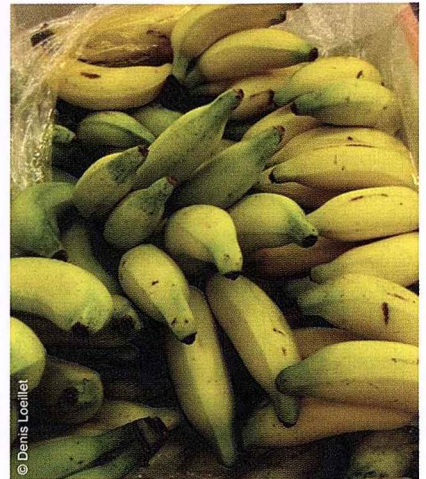
Who are the stakeholders in this development? The Russian market mirrors the world market, being concentrated in the hands of a very limited number of players. But unlike the United States, Italy or northern Europe, the market is not dominated by a handful of well-known multinational corporations but by local stakeholders. Three importers alone control about 70% of the quantities sold: JFC, the largest, followed by Sorus and Sunway. Five other operators—Palmar, New Trading System, Optifood, Fruit Brothers and Banana Exchange—share the rest of the market.

Marked vertical integration by the 3 leading importers

Vertical integration is one of the keys of the success of the three main operators. All have their own sea freight capacity. The fleets run by these operators total some 25 to 30 vessels and this is an undeniable advantage in the light of the share of freight in cost price: Guayaquil-Saint Petersburg is currently available at USD 6 or 7 per box on the spot market, that is to say about 50% of the CIF price. Furthermore, sea freight prices have tended to increase strongly in recent years for reasons of lack of capacity and increased bunkerage costs, accentuated in the case of delivery to the port of St Petersburg by the need to use rare—and costly—special ships during the winter (see box on logistics).

The other importers do not own shipping and group to purchase the capacity they need from a specialised charterer (generally the Baltic Shipping company).

These major importers have also invested very heavily in their own production facilities. According to professional sources, JFC, Sunway/SWT Trade and Sorus/Banafresh



possess a total of some 6 000 to 6 500 ha of banana plantations. But this figure seems far from final and purchases of banana plantations are in full swing. JFC and Sorus have gone further in integration. In addition to their plantations and packing stations, they own their own aerial crop spraying companies and bunch bag manufacturers. One operator is reported to be negotiating the purchase of a box factory.

This strategy is aimed not only at ensuring an even and satisfactory level of fruit quality. It also assures minimum supplies to fill a proportion of the ships. Furthermore, it provides good information about the production situation so that goods can be purchased at the best price as, according to professional sources, the plantations owned by these companies appear to cover only 25 to 30% of their requirements. This is also one of the reasons why Russian importers have chosen to set up in Ecuador. The fruits are competitive in terms of both price and quality and there is also a free market allowing the purchase of large quantities of goods.

Ecuador, leading supplier of the Russian market

Ecuador supplied two-thirds of Russian market requirements at the end of 2000 and has since strengthened its leading position. It has had a market share of over 90% since 2001. Shipments from Colombia and Costa Rica are merely complementary (20 000 to 40 000 t per year). However, supplies from these

Russia — Characteristics of the main importers

	JFC	Sunway	Sorus
Sales (2005 - Uralsib Corp.) - million USD	363	241	
Sales (1st half of 2006 - Uralsib Corp.) - million USD	196.3		140.2
Date founded	1994	1993	1994
Subsidiaries in Russia (2006)	10	9	17 (9 wholly owned)
Share of imported fruits market (2004 - Rosbank)	17%	12%	9%
Share of Russian banana market (1st half of 2006 - Uralsib Corp.)	27%	23%	23%
Ripening capacity (2006 - Rosbank) – in boxes per week	210 000	170 000	110 000
Main clients	supermarkets	supermarkets	wholesalers
Logistics/transport	7 owned ships 'Crystal' + 2 time charters (2006)	4 ships (2006) 'Sun'	12 ships (2006)
Logistics subsidiary		Farnell World Inc.	Saptari
Subsidiary in Ecuador	JFC Ecuador SA	SWT trader SA	Banafresh
Date of establishment in Ecuador	2000	2000	2000
Brand	Bonanza	Sunway	Don Carlos, Dorita
Date of first plantation	2004	December 2005	2004
Plantation area	4 000 ha (2007)	1 000 ha (2006)	1 200 ha (2006)
Exports in 2006 (million boxes - AEBE)	11.8	10.2	10.2
Export ranking and % of total (2006)	6th (4.85%)	8th (4.19%)	7th (4.21%)

Source: Cirad

countries could increase significantly in the near future because some Russian operators seem to wish to diversify their sources of supply. Projects for setting up operations in these countries appear to be in the planning stage. In addition, 20 000 to 22 000 t from the Philippines complete supplies in the eastern fringe of Russia.

Structuring effects on the world market...

This developing industry has consequences on the world market. The

cumulated volume handled by Russian operators forms a large proportion of Ecuadorean exports (over 16% counting just the three leaders and Banana Exchange), placing them in third position among the leading players in the country, just behind Noboa and Ubesa. Furthermore, whether they are integrated or not, they purchase all or part of their supplies on the open market and thus contribute to its balance. This is one of the factors that account for the very good behaviour of Ecuadorean spot prices since the beginning of the year. As an illustration of this, the search for

the last volumes needed to fill the ships due to sail to St Petersburg generally leads to the rocketing of prices on Thursdays in the port of Guayaquil.

This suction effect is definitely not conjunctural and should increase as the market has an enormous potential for development. Consumption is currently only 6 kg per person per year. This is 40% less than in the EU and Russia has a population of nearly 140 million.

...but this might be a dash of cold water for the EU market!

Positive effects can thus be observed but also the rise of new players on the EU market. Sorus has clearly announced its intentions and is setting up a subsidiary in the north of the Netherlands. This is called Green Group and its business is the development of the Dorita brand of EurepGAP Ecuadorean banana in western Europe. Might a Siberian wind be blowing in the direction of the EU banana market? ■

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Banana in the Windward Islands

Second wind?

In 2006, the 18 banana-producing ACP countries (of a total of 79 ACP countries) shipped slightly more than 900 000 t of bananas to Europe, representing 18.8% of supplies. The Windward Islands (Dominica, St Lucia, St Vincent and Grenada) shipped only 7.4% of this with a little more than 67 000 t, that is to say a third of their 1993 production that then formed nearly 25% of ACP tonnage. The largest volumes grown and exported by the Windwards in the last two decades date back to before the CMO banana came into force in 1993, with a peak in 1990 with 277 530

t. The decline of the sector in the islands had a negative impact on their GNP. Meanwhile, their governments included diversification as a priority in their rural development plans.

These islands are all exposed to hurricanes and seismic activity to varying degrees. They also suffer

from deforestation (except Dominica where the forest is protected) and increasing shortage of water necessitating the installation of irrigation systems.

All the islands have a shortage of skilled agricultural workers, mainly because of serious competition from the building and tourist industries with the boom in holiday building

operations and services. In addition, young farmers have lost confidence in banana growing, a fairly arduous task with returns that have dwindled for the last ten years. This shortage of labour is

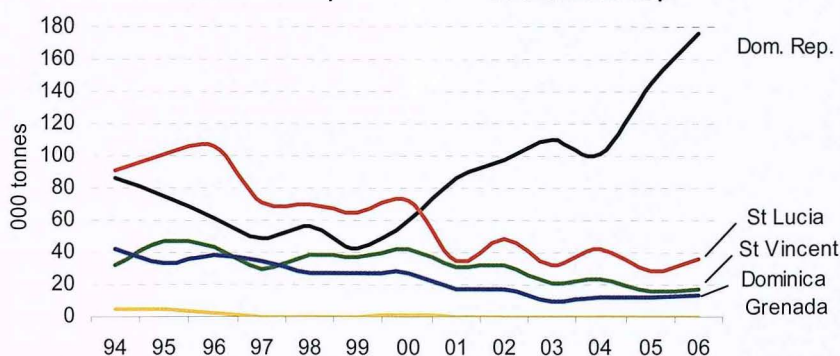
worse on packing days and growers sometimes group together. This means spreading cutting over a period of several days and this may affect fruit quality.

Today, the bulk of the banana crop is grown on small or very small plantations. The few old industrial plantations that had belonged to the state



© Charles DeWitt

Banana - EU Imports from WI & Dominican Rep.



Source: Eurostat

or to Geest have been divided into small or very small units and average yields are very small.

All these cumulated factors—meteorological problems, inadequate irrigation, division of plantations, shortage of labour, Black Sigatoka disease and Moko disease in Grenada, etc. — have led to the tonnages seen today.

In general, technical facilities from production to sea freight and on to marketing are fairly similar in all the islands as all the operators belong to WIBDECO.

European assistance for ACP suppliers

The European market has been regulated since 1993 par the common market organisation (CMO) of banana that awards privileged access to the ACP countries, traditional banana suppliers. Banana-producing ACP states vary considerably in both location and crop size. Their production is exported to Europe in view of the historical links between these states and the various countries of Europe, now operating within the framework of ACP-EU relations. This special access has been changed substantially in time. It was based on a duty-free quota combined with a WTO derogation and the provision of temporary technical and financial aid to enable them to adapt to new market conditions and to support the diversification of non-competitive growers.

First, Article 186 of the Lomé IV Convention awarded compensation for loss of income for certain agricultural products via funds distributed using the EDF's STABEX mechanism from 1995 onwards. Financial and technical aid was provided for these producers from 1999 onwards by the special framework of assistance (SFA). A total of nearly EUR 400m was allocated in all to the Windward Islands from 1994 onwards, that is to say an average of EUR 33m per year.

Relations between the ACP countries and the EU will be governed by economic partnership agreements from 1 January 2008. These agreements are still being negotiated but the ACP countries see that their market position is becoming more fragile and are paying attention to their future status on a European market undergoing a liberalisation process.

Tonnages stabilising

There have been no shipments from Grenada to Europe since 2005. Otherwise, exports have stabilised recently at a low level, with a slight increase for St Lucia and Dominica and a tiny one for St Vincent during the past four years. Simultaneously, the number of members of producers' groups has fallen each year and the areas under banana have decreased. This means that a core of active growers remains and is seeking progress, with improved yields and production techniques (introduction of tissue culture plants, irrigation, response to market demand with certification and numerous product references, etc.). This stabilising is encouraging for governments, especially as it is essential to maintain tonnage above the level at which sea freight could be called into question ■

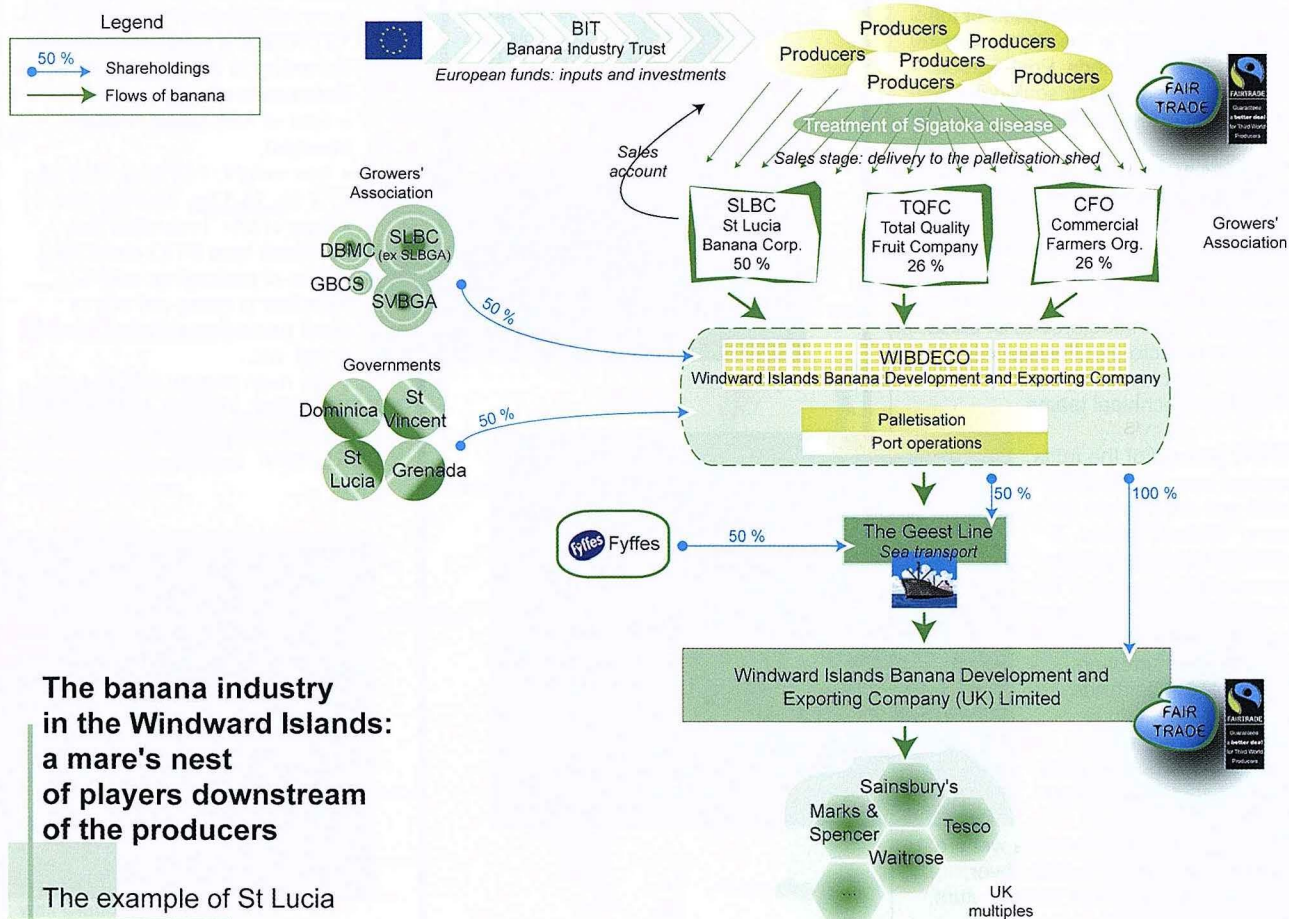
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Windward Islands — Banana production

Estimates	Dominica	St Lucia	St Vincent	Grenada
Areas recorded (ha)	1 000	2 500	1 500	n.a.
Functional irrigated area (ha)	15	130	450	30
Number of growers exporting in 2006	800	1 500	1 550	n.a.
Average area (ha)	2.70	2.05	1.06	n.a.
Average yield (tonnes per ha)	15.5	15.0	13.5	n.a.
Production exported to the EU in 2006	13 298	36 726	17 239	0

Source: producers groups and WIBDECO



Production

Replanting with tissue culture plant material has been widely introduced. There is little or no agricultural mechanisation. Deep drainage is inadequate. Zones equipped with irrigation are in the minority (EU projects are still being implemented) since the end of the 1990s. In addition, irrigation equipment is expensive. Pesticides and fertilisers are sold by companies wholly or partly controlled by the state at comparatively high prices and with no competition on the market.

There is little placing of fertiliser or use of pesticides. Numerous plantations display symptoms of nutrient and water stress. Spraying to control Yellow Sigatoka in all the islands and Black Sigatoka in Grenada are performed on a mutual basis by ground teams. No aerial spraying has been carried out for several years because of the small areas and the fact that production zones are scattered.

Harvesting is performed with dehanding in the field and then transport in plastic trays carried by hand with protection between bunches by old plastic bunch bagging. Little fruit washing is performed because of the shortage of water in the numerous isolated packing sheds. Post-harvest treatment is reduced to soaking in a fungicide mix in a tank.

The fruits are packed in small-capacity individual artisanal packing stations and 600 x 400 multipack boxes are generally used. Some purchasers require the use of IFCO type plastic crates. Cardboard packing material is imported or manufactured in St Lucia (at the only factory in the region). Quality control is handled by WIBDECO technical teams.

Ninety percent of the fruits packed bear the fairtrade label and are marked as being 'ethically grown'. A national fairtrade committee operates in each of the three producer islands and is closely involved in the supervision of growers assembled in 'fairtrade groups'. Motivation is strong and two-fold: obtaining the bonus, even if this is decreasing (USD1 per box instead of USD1.75 until 2005) and the welfare services provided (medical cover, improvement of school infrastructure, etc.).



Logistics

Palettisation is performed either in group packing centres or directly at the port of shipment. The work is done by teams of WIBDECO employees in the presence of group technicians and fairtrade representatives.

Sea transport is handled entirely by the Geest Line company that runs weekly return trips from the Windward Islands and other Caribbean countries to Europe and mainly to Portsmouth in the UK, where the bananas are unloaded. The company has four insulated ships for this, chartered from the Seatrade company.

Some of the palettes of banana are packed in the hold and the rest are in refrigerated containers on the decks. The ships are filled to a maximum on the Caribbean-European route by loading bananas in the Dominican Republic.



Marketing

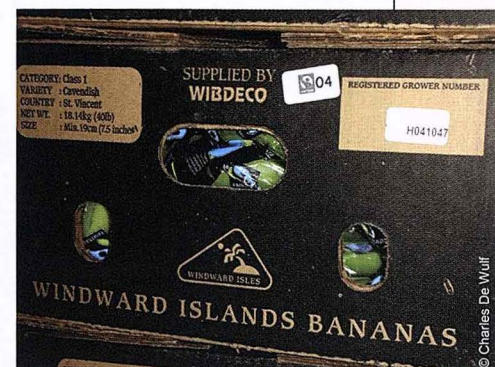
The fruits are purchased from growers on delivery to the palettisation shed by WIBDECO (Windward Islands Banana Development and Exporting Company), the sole sales agent since January 1995. WIBDECO handles marketing on the British and European markets. Founded in 1994, it is 50% owned by the four countries and 50% by producers' groups in proportion to the volumes they exported in 1992-1994, before their partial privatisation. The sales office is Fareham, Hampshire, UK, with representatives in each island and regional management based in Castries. The company's technical services provide operational support for growers. There is close interaction between producers' groups, states, the shipping line and the sale office.

The British supermarket chains, the Windward Islands' traditional clients, are obviously closely followed with regard to requests for various packaging that are passed on to producers via WIBDECO and the groups. The

technical departments have up to 19 packaging references running according to the retail chain.

References are by:

- type of fruit: small, medium, standard;
- box weight: 14.74 kg, 15.2 kg, 17.7 kg, 18.1 kg, 18.5 kg, etc.;
- type of box: reversible box, multipack box, IFCO crate, etc.;
- type of packaging: one complete polybag per box or small packages of hands, sealed or not, etc.;
- the main chains: ASDA, M&S, SAINSBURY, TESCO, WAITROSE;
- certification: FAIRTRADE, TNC, EUREPGAP, organic, etc.



Windward Islands

Dominica

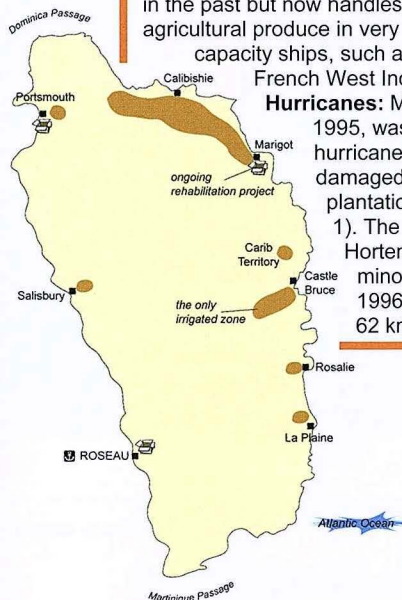
Population: 68 910.
Working population: agriculture 40%, industry 32%, services 28%.
Unemployment: 23%.
Area: 754 sq. km.

Production: eastern (Castle Bruce) and northern coastal strips, around Marigot and between Marigot and Portsmouth. Very little banana is grown on the leeward coast.

Producers' group: DBPL (Dominica Banana Producers Limited), resulting from the privatisation of the Dominica Banana Marketing Corporation in 1994.

Port used for exports: Roseau in the south. Portsmouth, in the north, was used in the past but now handles only other agricultural produce in very small capacity ships, such as citrus for the French West Indies.

Hurricanes: Marilyn, in 1995, was the last hurricane to have damaged banana plantations (category 1). The tropical storm Hortense caused minor damage in 1996 (100 kph at 62 km).



St Vincent

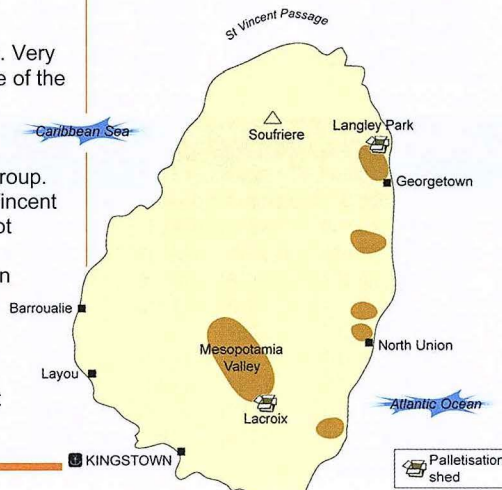
Population: 117 848.
Working population: agriculture 10%, industry 26%, services 64%.
Unemployment: 15%.
Area: 389 sq. km.

Production: eastern coastal strip. Very little banana is grown in the centre of the island (Mesopotamia Valley) that was nevertheless the main traditional cultivation area, and none on the other islands in the group.

Producers' group: SVBGA (St Vincent Banana Growers' Association), not privatised.

Port used for exports: Kingstown

Hurricanes: Allen (category 4) caused serious damage in 1980. Since then the island has only experienced tropical storms that caused less damage; the last was Claudette in July 2003.



St Lucia

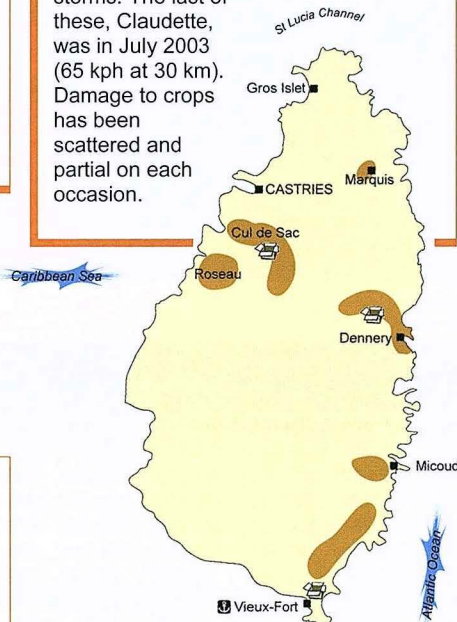
Population: 168 458.
Working population: agriculture 21.7%, industry 24.7%, services 53.6%.
Unemployment: 20%.
Area: 616 sq. km.

Production: between Roseau, Cul-de-sac (west and centre) and Dennery, around Micoud and as far as Vieux-Fort (east and south).

Producers' groups: SLBC (St Lucia Banana Corporation) resulting from the privatisation in 1998 of SLBGA, the only group that existed at the time, accounts for about 50% of volumes, TQFC (Total Quality Fruit Company) has 26% and CFO (Commercial Farmers Organization) 24%.

Port used for exports: Vieux-Fort in the south of the island.

Hurricanes: After Allen (category 4) in 1980, that caused extensive damage, St Lucia has only been hit by tropical storms. The last of these, Claudette, was in July 2003 (65 kph at 30 km). Damage to crops has been scattered and partial on each occasion.



Grenada

Population: 89 703
Working population: agriculture 5.4%, industry 18%, services 76.6%.
Unemployment: 12.5%.
Area: 344 sq. km.

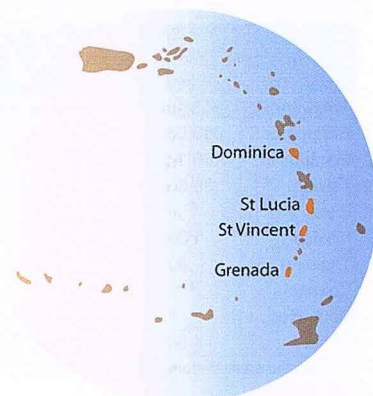
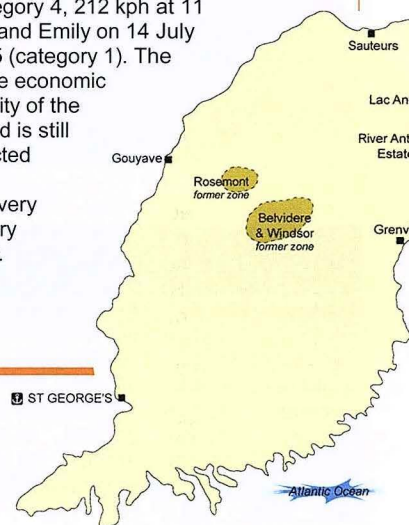
Production: a very small number of scattered growers in the east of the island. One industrial type plantation (30 ha), focused on organic production, remains in the north. The crop is currently sold locally or regionally (Trinidad & Tobago and Barbados).

Producers' group: GBCS (Grenada Banana Co-operative Society), not privatised and not active since 2005 when exports to Europe ceased.

Port used for exports: exports to Europe stopped in 2005 but Geest Line ships nevertheless call in at St George's to unload imported freight. Regional exports are also from this port via other shipping lines.

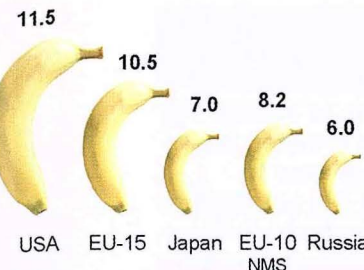
Diseases: Black Sigatoka and Moko disease are present.

Hurricanes: two serious hurricanes wiped out banana production and seriously damaged nutmeg production, which has experienced difficulties in recovering whereas the crop generated an excellent agricultural income (second largest producer after Indonesia): Ivan on 8 September 2004 (category 4, 212 kph at 11 km) and Emily on 14 July 2005 (category 1). The entire economic activity of the island is still affected and recovery is very slow.

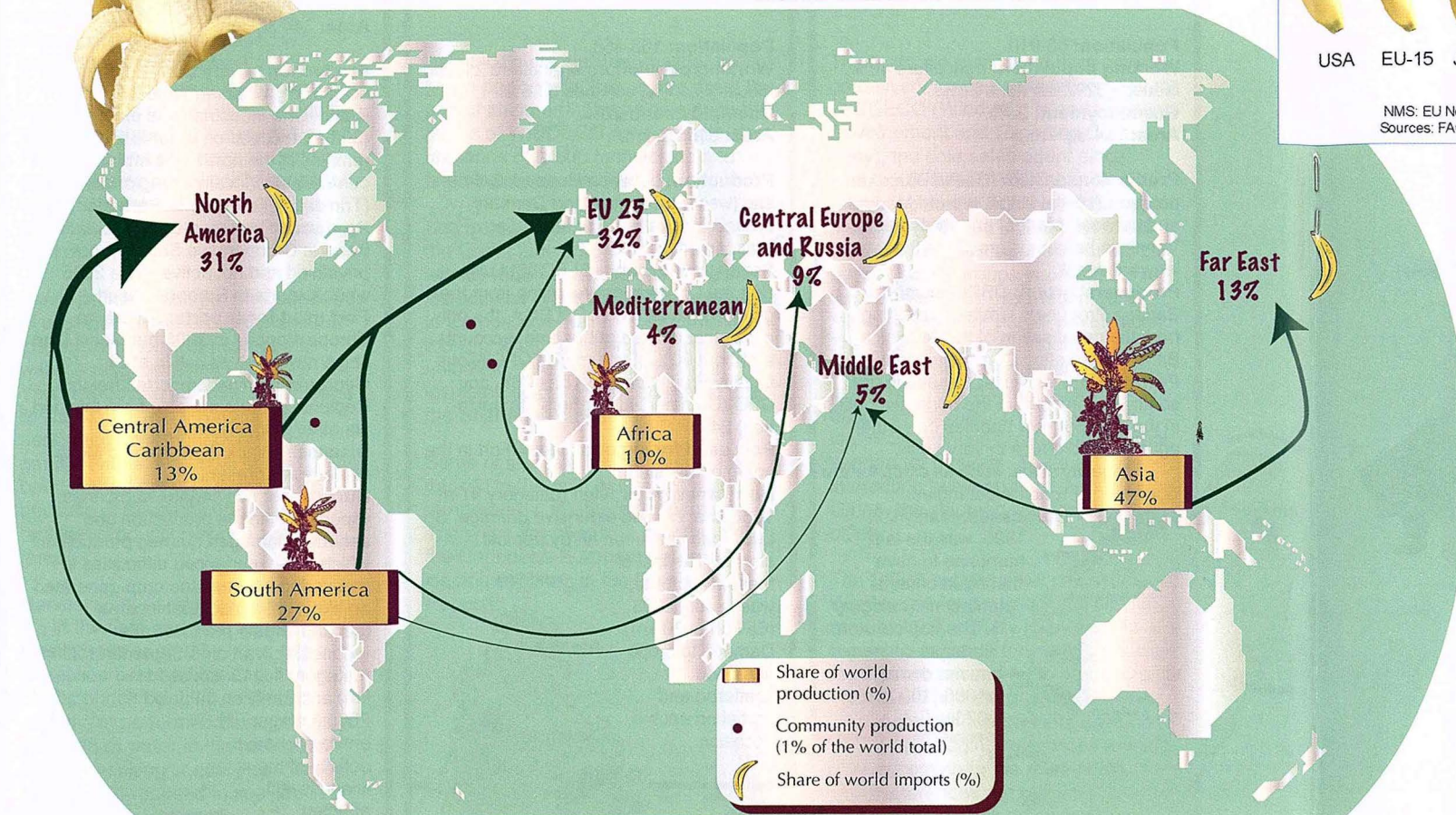


Dessert banana...

production: 61 000 000 t
world trade: 13 800 000 t

Banana
Per capita consumption (kg/year)

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

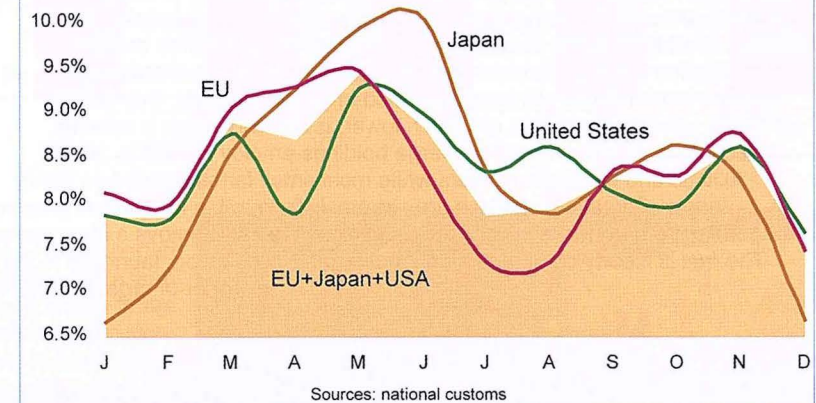


Banana — World production Tonnes			
2005	Cavendish	Other dessert	Total
World	47 618 503	13 250 000	60 868
India	10 570 000	2 900 000	13 470
Brazil	2 719 470	3 500 000	6 219 470
China	5 619 000	450 000	6 069 000
Ecuador	5 400 000	477 830	5 877 830
Philippines	2 899 000	800 000	3 699 000
Colombia	2 000 000	500 000	2 500 000
Indonesia	1 500 000	870 312	2 370 312
Costa Rica	1 780 000	440 000	2 220 000
Mexico	1 644 610	70 000	1 714 610
Guatemala	1 320 000	10 000	1 330 000
Egypt	875 999	1 000	876 999
Thailand	601 000	223 525	824 525
Cameroon	530 000	260 000	790 000
Honduras	680 000	25 000	705 000

Sources: FAO, Thierry Lescot

Banana — World exports	
2005	tonnes
World	13 804 118
Ecuador	4 653 900
Philippines	1 908 328
Costa Rica	1 601 762
Colombia	1 516 504
Guatemala	1 129 500
Honduras	507 900
Panama	377 312
Canaries	291 969
Cameroon	257 500
Martinique	225 087
Brazil	212 000
Côte d'Ivoire	210 900
Dominican Rep.	149 111
Belize	76 300

Banana — World imports	
2005	tonnes
World	13 722 508
EU 25, incl.	4 366 000
Belgium	954 563
UK	739 548
Germany	665 099
Italy	447 822
France	429 073
United States	3 824 401
Japan	1 026 014
Russia	858 124
Canada	449 000
China	355 700
Argentina	303 373
Iran	270 949
South Korea	210 109

Banana - Supply calendar
in % of annual imports

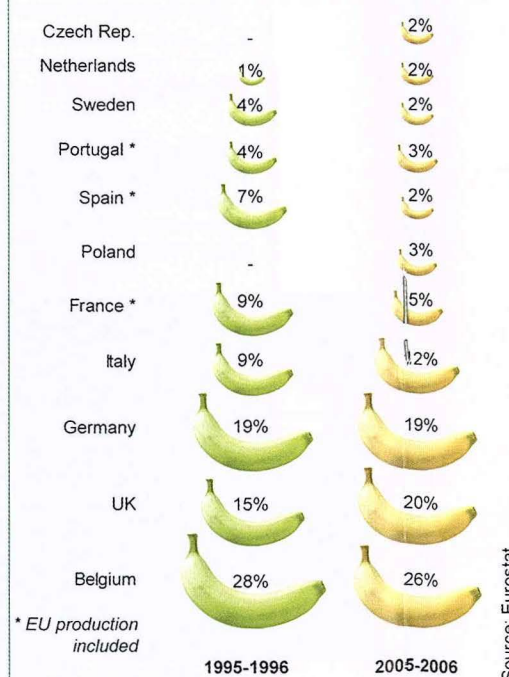
Banana — United States imports										
tonnes	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total, incl.	3 772 694	3 913 322	4 291 425	4 030 618	3 840 624	3 906 920	3 879 151	3 872 826	3 824 409	3 839 476
Ecuador	873 193	1 080 124	1 169 467	975 960	946 584	1 021 830	972 475	918 926	904 306	994 335
Costa Rica	954 056	1 090 973	1 603 844	1 361 405	1 082 088	901 485	976 078	865 298	822 731	927 361
Guatemala	462 682	654 617	501 918	688 448	832 106	925 216	934 136	1 020 765	1 029 280	912 902
Colombia	466 136	415 116	605 819	602 836	473 784	506 441	469 306	464 592	513 748	473 826
Honduras	563 960	377 009	83 668	275 603	381 540	449 171	432 145	507 914	453 011	422 905
Mexico	202 368	220 582	140 802	85 123	63 809	42 339	35 197	33 586	33 796	38 573
Nicaragua	21 938	58 355	39 712	1 906	28 198	29 702	41 620	41 502	38 067	30 465
Peru	-	-	-	302	5 656	23 196	13 756	12 384	22 345	25 056
Panama	214 776	5 391	130 973	28 707	16 187	259	215	612	2 019	7 516
Dom. Rep.	8 140	6 387	11 733	6 437	7 355	3 573	2 136	5 201	4 437	6 222
Venezuela	5 438	4 519	3 471	3 852	3 283	3 684	1 930	2 008	670	317

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

Banana — Japanese imports										
tonnes	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total, incl.	885 140	864 853	983 204	1 078 655	990 554	936 272	986 643	1 026 014	1 066 873	1 043 634
Philippines	653 045	620 342	727 071	811 000	781 413	743 549	795 561	869 641	944 467	910 600
Ecuador	186 141	158 117	197 186	210 820	170 643	157 013	145 578	122 718	91 099	101 343
Taiwan	36 339	56 240	44 655	42 274	25 178	25 074	33 518	18 226	15 100	15 862
Peru	-	-	-	-	-	-	110	3 216	4 027	4 272
Mexico	1 391	1 798	1 722	1 394	2 044	2 562	3 057	3 303	3 739	3 948
Thailand	825	675	900	1 332	1 513	1 252	1 793	2 204	1 794	2 373
Colombia	-	-	-	439	166	1 483	2 194	1 926	2 328	1 964
Dom. Rep.	-	670	1 675	1 986	1 409	1 461	2 093	1 171	1 476	1 633
China	4 685	6 440	8 939	3 428	5 740	3 814	2 736	3 609	2 844	1 580

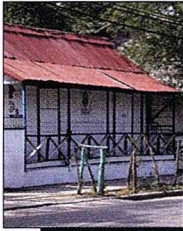
Source: Japanese customs, code 080300100

Banana - EU import by entry points



Banana — European Union imports																
000 tonnes	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total	3 573	3 751	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
Total EU, incl.	699	705	642	585	657	685	811	785	730	782	768	791	755	750	648	642
Canaries	354	349	331	322	369	346	404	437	362	398	421	407	401	418	345	348
Martinique	186	198	181	152	188	250	277	240	259	271	234	264	244	246	226	221
Guadeloupe	109	115	97	82	63	61	98	74	84	88	89	95	86	59	54	48
Madeira	32	35	26	26	34	24	28	30	22	22	21	22	21	21	14	15
Cyprus	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6	7
Greece	18	8	7	3	3	4	4	4	3	3	3	3	3	3	3	3
Total dollar, incl.	2 286	2 367	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
Ecuador	578	675	605	549	632	686	738	568	695	674	705	829	800	993	1 059	1 026
Colombia	495	500	418	461	557	653	569	541	554	617	645	665	673	763	878	948
Costa Rica	528	452	480	622	564	604	603	640	663	657	634	686	725	840	623	825
Panama	469	471	413	299	416	311	358	417	422	389	348	307	303	368	281	311
Brazil	0	0	0	0	0	0	2	1	5	13	17	36	50	52	63	96
Guatemala	12	33	27	20	58	62	58	61	42	30	3	0	2	2	3	27
Peru	0	0	0	0	0	0	0	0	0	0	1	7	6	10	12	23
Honduras	138	195	194	27	56	114	70	151	68	108	106	20	11	18	19	18
Venezuela	0	0	0	1	13	18	30	30	42	18	12	9	12	23	17	15
Total ACP, incl.	588	679	750	727	766	803	696	618	681	760	730	727	787	785	764	906
Cameroon	115	110	147	158	165	167	157	116	161	206	216	230	293	262	253	259
Côte d'Ivoire	116	144	161	149	160	181	166	158	192	200	218	211	202	211	184	228
Dominican Rep.	10	38	62	86	75	61	49	56	42	60	86	97	109	101	145	177
Belize	20	28	39	47	41	54	53	53	56	68	52	38	74	80	74	73
Suriname	28	30	28	33	28	26	29	21	39	34	29	7	0	19	35	45
St Lucia	100	122	113	92	101	107	71	70	66	73	35	49	33	43	28	36
Jamaica	70	75	77	76	84	89	77	62	52	41	43	41	42	29	12	32
Ghana	0	0	0	0	2	3	3	4	3	3	3	3	1	2	4	24
St Vincent	62	71	58	32	48	44	30	39	38	43	31	33	21	24	15	17
Dominica	54	52	53	43	33	39	35	27	28	28	18	17	10	12	12	13

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



Producer country sheet

Banana in the Dominican Republic

The banana industry in the Dominican Republic expanded explosively after the Lomé (1989) and Marrakesh (1995) agreements that granted preferential access for its exports to the EU. The opening of the European market resulted in soaring exports of Dominican bananas to Europe. These increased from 1 500 t in 1990 to 63 000 t in 2000 and have now reached nearly 200 000 t (CEI-RD, 2006). The overall trend on the world banana market since 2000 has been for prices to fall as a result of excessively large supplies. The

Dominican Republic succeeds by taking position on the organic and fairtrade niche markets. It is still the leading exporter of organic bananas to the European Union.

Production zone

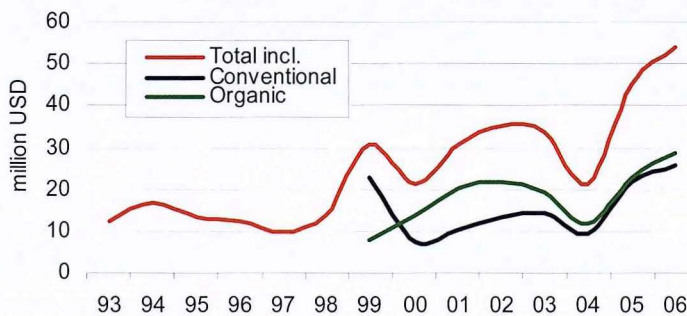
The plantations (Cavendish) are estimated to total 10 000 ha and are found mainly in two regions. In the north, some 7 000 ha of banana plantations are in Mao, Monte Cristi and Santiago provinces, accounting for more than 80% of national export dessert banana production. The fruits are grown by small and medium-sized growers and on large estates, three of which also operate as exporters. In the south, an organised majority of small growers supply nearly 20 000 t of dessert banana annually. Farming systems vary strongly from one holding to another. In addition to the area, the main distinguishing features are the irrigation techniques used and management of labour. Dominican banana production is still based on flood irrigation systems. Sub-foliar sprinkling, where water costs are much lower, is still very much a minority technique. Medium-sized and large holdings employ 20 000 to 30 000 fulltime and seasonal workers while most small farms depend on family

labour. Climatic conditions are extremely favourable for banana growing with very low pest and disease pressure (Black Sigatoka, nematodes, etc.) and the Dominican Republic enjoys a clear comparative advantage in organic banana production.

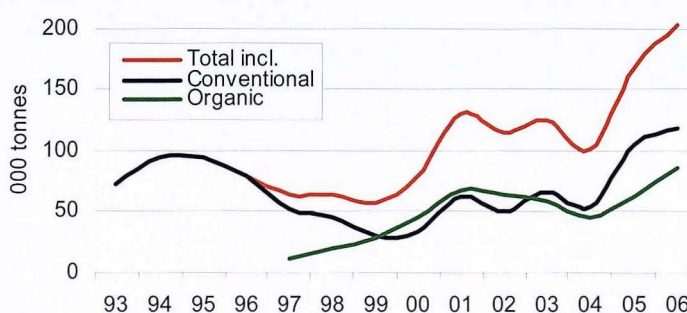
The fruit is clearly dominant in national organic production, launched in the mid-1990s and the country is the world's leading exporter of organic banana to the EU, shipping more than 86 000 t in 2006.



Banana - Dominican Rep. - Exports in value (FOB)



Banana - Dominican Rep. - Exports in volume



Exports

In 2006, exports were made up of 58% conventional bananas and 42% organic bananas while the proportions were reversed at production (44% and 56% respectively). The organic certification bodies in the Dominican Republic are BCS Öko Garantie (Germany), IMO (Switzerland), Suelo y Salud (of Italian origin) and Control Union Peru. The large operators appear to call mainly on the services of BCS Öko Garantie while IMO seems to be more 'specialised' in certification for small producers organisations. In addition to organic certification (EU, US and Japanese standards), Control Union also handles EUREPGAP and Tesco Natural Choice control and certification operations. Finally, only 30% of the boxes of bananas shipped to the European Union bear the fairtrade label although FLO has already certified 800 small growers and one large planter, totalling 70% of the profession. More than 90% of total volumes of dessert bananas are exported to the EU. The remaining 10% go to the USA and, to a lesser degree, to Japan. Dominican bananas target mainly the organic niche market and are closely dependent on the marked seasonal features of the European market. Fruits are exported by four main operators. The two largest are in the north of the country and between them handle about 85% of total exports.

Dominican Republic — Conventional and organic banana exports														
Tonnes	1993*	1994*	1995*	1996*	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Conventional					51 879	45 052	29 664	33 926	63 204	51 152	66 571	54 964	104 242	117 811
Organic	72 704	95 128	94 202	80 207	12 000	20 000	28 363	45 568	66 967	63 790	58 460	45 845	62 814	86 283
Total	72 704	95 128	94 202	80 207	63 879	65 052	58 027	79 493	130 172	114 942	125 030	100 808	167 056	204 094

* Pre-1997 CEI-RD statistics do not distinguish between organic and conventional banana. However, organic farming systems developed from 1994 onwards; the proportion of organic bananas exported was considered to be negligible.

Dominican Republic — Conventional and organic banana exports by destination														
	2002		2003		2004		2005		2006		2002-06 average		Variation in %	
	conv.	org.	conv.	org.	conv.	org.	conv.	org.	conv.	org.	conv.	org.	conv.	org.
Total	49 049	65 609	66 571	60 091	54 964	47 082	104 242	66 322	117 811	86 283	78 527	62 641	100.0	100
UK	32 341	23 738	34 686	25 717	38 941	23 749	75 131	51 851	83 655	43 729	52 951	31 321	67.4	50
Belgium	7 794	21 213	22 791	24 415	5 997	15 547	15 701	5 595	11 839	14 402	12 824	16 234	16.3	25.9
Italy	4 136	3 783	5 042	297	6 044	148	6 811	255	9 703	1 020	6 347	1 101	8.1	1.8
Germany	691	7 613	1 182	3 589	63	664	0	0	2 494	10 630	886	4 499	1.1	7.2
USA	145	3 292	527	2 053	174	3 913	283	2 967	579	6 585	342	3 762	0.4	6.0
Japan	0	1 498	76	1 711	158	1 018	781	755	668	1 000	337	1 196	0.4	1.9
Sweden	50	1 687	38	1 032	209	1 487	133	1 107	82	4 784	102	2 019	0.1	3.2
Holland	60	516	164	724	3	199	0	141	94	1 010	64	518	0.1	0.8
Switzerland	0	2 137	4	125	1	0	0	54	123	1 621	26	787	0.0	1.3
France	46	24	64	0	0	180	0	0	0	1	22	41	0.0	0.1
Others	3 786	110	1 996	427	3 374	177	5 401	3 599	8 574	1 500	4 626	1 162	5.9	1.9

Source: FAO

Logistics

Boxed bananas are transported overland to the port in refrigerated containers. The port of Manzanillo handles more than 80% of export movements of banana shipped mainly to the European Union (Antwerp, Portsmouth, Rotterdam, Zeebrugge, etc.). Sailing time from Manzanillo to Portsmouth is 8 or 9 days.

Dominican Republic Volumes exported by point of shipment				
	2005	Variation (%)	2006	Variation (%)
Total	167 056	100.0	204 094	100.0
Manzanillo	105 540	63.2	172 059	84.3
Haina Oriental	54 252	32.5	20 108	9.9
Jimani	2 900	1.7	4 843	2.4
Caucedo	158	0.1	492	0.2
Airports	136	0.1	14	0.0
Others	4 070	2.4	6 578	3.2

Source: CEI-RD



FAIRTRADE AND ORGANIC FRUIT

For more information: www.okefruit.com



The genetic diversity of banana

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 seminferous 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 seminferous 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 feedstuff, 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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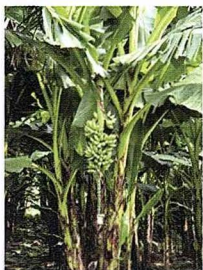
Banana — Estimated world production in 2005

Tonnes	Cooking bananas		Dessert bananas		Total
	Plantain AAB group	Highland bananas + ABB group + others	Cavendish	Gros Michel + others	
North America	0	9 000	10 000	100	19 100
South America	5 947 703	737 120	11 338 510	5 076 430	23 099 763
Central America	980 703	117 000	6 107 938	602 000	7 807 641
Caribbean	897 994	804 056	1 284 257	427 253	3 413 560
West and Central Africa	8 035 702	987 145	2 071 687	481 083	11 575 617
East Africa	1 196 871	14 056 285	1 961 106	721 560	17 935 822
North Africa & Middle East	3	3 030	1 615 160	1 078	1 619 271
Asia	1 067 020	10 068 640	22 537 590	5 875 327	39 548 577
Oceania	1 381	824 900	296 905	65 164	1 188 350
Europe	1	5	395 350	5	395 361
World total	18 127 378	27 607 181	47 618 503	13 250 000	106 603 062

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

The main banana groups and subgroups				
Group	Subgroup	Cultivar (representative)	Fruit type	Distribution
AA	Sucrier	Pisang Mas, Frayssinette, Figue Sucrée	dessert-sweet	World-wide
	Pisang Lilin	Pisang Lilin	dessert	Indonesia, Malaysia
	Lakatan	Pisang Berangan, Lakatan	dessert	Indonesia, Malaysia, Philippines
AAA	Cavendish	Lacatan, Poyo, Williams, Grande Naine, Petite Naine	dessert	World-wide, exporting countries
	Gros-Michel	Gros-Michel, Highgate, Cocos	dessert	World-wide
	Figue-Rose	Figue-Rose rose, Figue-Rose verte	dessert	World-wide
	Mutika Lujugira	Intuntu, Mujuba	beer - cooking	Central and East Africa, Colombia
	Ibota	Yangambi km5	dessert	Indonesia, Africa
AB	Ney Poovan	Safet Velchi, Sukari	dessert - acidulous	India, East Africa
AAB	Figue-Pomme	Maçà, Silk	dessert - acidulous	World-wide
	Pome	Prata	dessert - acidulous	India, Malaysia, Australia, W. Africa, Brazil
	Mysore	Pisang Ceylan	dessert - acidulous	India
	Pisang Kelat	Pisang Kelat	dessert	India, Malaysia
	Pisang Rajah	Pisang Rajah Bulu	cooking	Malaysia, Indonesia
	Plantain	French, Corne, Faux Corne	cooking	Central & West Africa, Latin Am., Caribbean
	Maia Maoli/ Popoulou	Popoulou	cooking	Pacific
	Laknao	Laknao	cooking	Philippines
	Pisang Nangka	Pisang Nangka	cooking	Malaysia
ABB	Bluggoe	Bluggoe, Matavia, Poteau, Cacambou	cooking	World-wide
	Pelipita	Pelipita	cooking	Philippines, Latin America
	Pisang Awak	Fougamou	dessert	India, Thailand, Philippines, East Africa
	Peyan		cooking	Philippines, Thailand
	Saba	Saba	cooking	Philippines, Indonesia, Malaysia

Source: Cirad



AA - Sucrier



AAA - Cavendish



AAA - Gros Michel



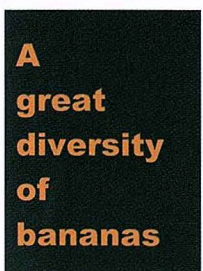
AAA - Figue rose



AAA - Mutika Lujugira



AB - Ney Poovan



AAB - Figue Pomme



AAB - Pome



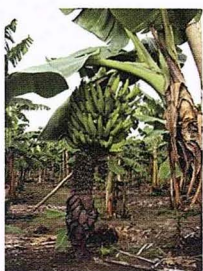
AAB - Mysore



AAB - Pisang Kelat



AAB - Pisang Rajah



AAB - Plantain



AAB - Popoulou



AAB - Laknao

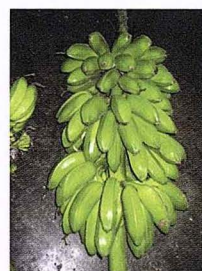


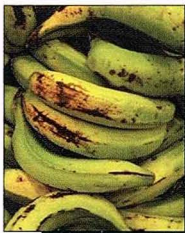
ABB - Bluggoe



ABB - Pelipita



ABB - Saba



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).



Panama disease

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).
- Race 2 affects the Bluggoe subgroup (ABB, cooking bananas).
- Race 3 affects *Heliconia* spp. and sometimes Gros Michel.

Different races have been identified. Under certain conditions (soil type, climate, crop intensification, drainage, etc.) each can cause serious vascular damage to the different

- 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.

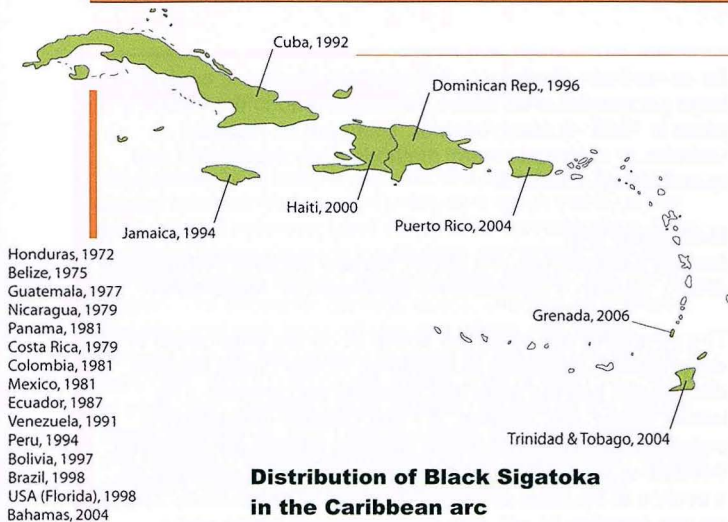
Prevention and control

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.



Gros Michel



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 deleafing).

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.



Black Sigatoka

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

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

Moko disease

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*

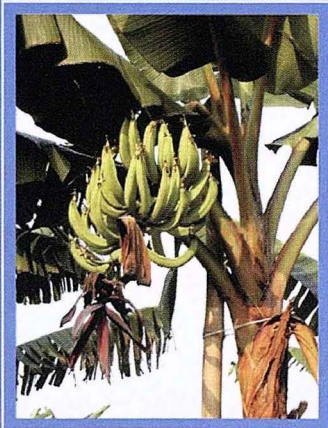
The symptoms are observed above all on the emergence of spear leaves, especially at flowering. Flower bracts become discoloured and the male bud blackens and shrivels. The leaves yellow, wilt, blacken, dry and crumble (including the pseudostem). Yellow or brown vascular streaks are observed throughout 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, BBBrMV) 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*.



Banana streak disease

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 infec-

tions 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 (BBBrMV)

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 borer

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

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.

Nematode

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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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.



Ripe-fruit anthracnose

- 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.



Wound anthracnose

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.



Crown rots

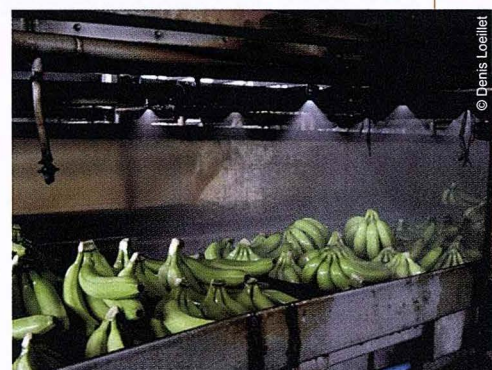
The fungi that cause post-harvest diseases are widespread in banana plantations and hence on bunches if these are not protected. In other words, control of infection begins when the inflorescence shoots at the top of the leaf cluster.

Anthrachnose 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.



Treatment by swabbing

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.



Treatment by spraying

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.



Healthy crown