

March 2009 - No. 165

# FR*ui*TROP

English version

CLOSE-UP:  
PINEAPPLE

CMO & banana: a  
compromise at any price

Citrus & exotics  
Monthly review

<http://passionfruit.cirad.fr>





**A** catastrophe has been forecast for so long and never happened on the pineapple market that it might be considered immunised against any change in trend. The 12% annual growth observed for more than a decade seems to have the nature of a constant in physics—unchanging and universal. So how should we understand the strong fall in import prices in Europe in 2008? Will the world economic downturn bring the pineapple market to its knees? In any case, new scope for growth must be found for today or tomorrow and, for the moment, there is nothing new in the east.

# Pineapple

A report by Denis Loeillet & Thierry Paqui

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## The fresh pineapple market

So far so good... or nearly

The pineapple saga has no secrets for FruiTrop readers. The reasons for the success that has quadrupled the world fresh pineapple market in less than 15 years are known. The success story is easily summarised: faultless organisation of production to the distribution stage, that of Del Monte in Costa Rica, set up to serve a major varietal innovation, MD-2 or 'Sweet'. To complete the picture, we can add a market leader in real difficulty—Côte d'Ivoire—and a market strongly awaiting something new.

Unfortunately for African suppliers, they were not responsible for the fantastic growth of European imports (see box). They did not participate in eight years of uninterrupted growth from 2001 to 2008. It is clear that the supplier countries that have driven the European and world markets for a decade are on the other side of the Atlantic, and the singular should really be used as Costa Rica is truly the leader. Considered as a 'market maker' by marketing theoreticians, it alone personifies the world pineapple market. In the decade from 1998 to 2008 (see box), Costa Rica multiplied its exports by 5.5, taking the total to 1.44 million metric tonnes in 2008. Its growth was even stronger in the

European Union, whose imports increased 8-fold during the same period from 79 000 tonnes in 1998 to 668 000 tonnes in 2008. Costa Rica has increased its share in the EU every year since 1987 without exception. Three pineapples in four eaten in this economic zone are from Costa Rica.



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The number of operators and sources involved in the production and sale of pineapples has increased considerably since the beginning of this modern fairytale. Del Monte, the precursor and inventor of the development model for the world pineapple market based on what it considered to be its own varietal innovation, MD-2, is no longer alone. The variety has been distributed widely, thus increasing supply. Beyond the positive effects on the creation of value for the country and its growers, one of the negative effects of this fast growth has been and still is the greater unevenness of the fruits marketed, leading to an overall fall in the average quality. The sector dynamics

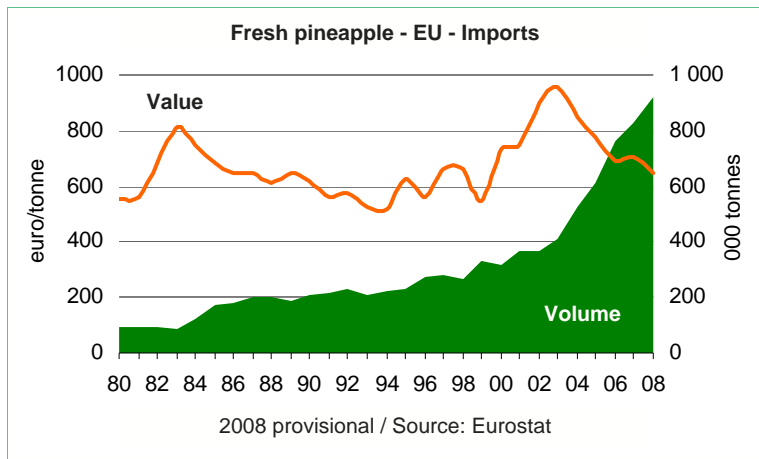
and financial returns, that Del Monte did not hide, gave appetising prospects to a fruit sector in search of better margins and a growing market. Many suppliers, especially in Latin America, have behaved as good 'market takers' and thought they could have a share of the feast. Many countries, such as Panama which declared pineapple to be a major national cause, launched development projects. Ecuador, Brazil, Honduras, Colombia, Guatemala, the Dominican Republic, etc. have thus gained a foothold in the world market. The whole question is that of knowing whether this strategy will continue to be a winning one much longer. While Del Monte built up the market by exploiting its technological innovation and maximising its profits for years, its competitors move with the wind. Because unlike the 'market maker', the 'market taker' buys and sells according to the prices given by the market. Del Monte and a few other sector heavyweights such as Dole have succeeded

Pineapple — World production and imports — Tonnes

	World production	Importations - En équivalent fruits frais				
		Concentrate	Single juice	Canned pineapple	Fresh pineapple	Total imports
1969-71 aver.	5 462 915	2	145 681	738 506	160 356	1 044 545
1979-81 aver.	9 775 626	3 042	342 479	982 024	365 659	1 693 204
1989-91 aver.	11 498 232	2 338 905	286 742	1 477 613	586 539	4 689 800
2000	15 097 558	1 850 544	485 560	1 693 091	1 051 523	5 080 718
2001	15 680 270	1 972 783	627 080	1 648 209	1 152 605	5 400 677
2002	15 800 617	3 037 896	423 297	1 663 795	1 315 833	6 440 821
2003	16 139 193	3 476 396	435 638	1 820 324	1 462 466	7 194 824
2004	16 713 553	3 347 365	445 556	1 887 859	1 708 114	7 388 894
2005	17 851 735	3 172 969	491 587	2 043 347	1 962 354	7 670 257
2006	19 038 106	3 484 438	525 283	2 211 427	2 293 695	8 514 844

Source: FAO, CIRAD





in keeping a good image with their clients. For the others, the effect of the 'we prefer the original to the copy' attitude is a handicap and a lower price is the last and only sales argument.

**Respecting logic:**  
increased volumes  
in exchange for a  
decrease in prices

A failure or break in the fresh pineapple market has been predicted for years. Might the poor 2008 season (see the next article) be a sign of this? Sales are increasing in volume but decreasing in unit value. Since the 2003 price peak of EUR955 per tonne, the customs value (CIF duty unpaid) of European imports fell steadily, with a low point at EUR646 per tonne in 2008, the worst figure since 1999—all in current euros. Market prices have displayed the same market trend. According to Cabinet Paqui (following articles), the price of a box of pineapples lost nearly 2 euros from 2007 to 2008, with the range changing from EUR8 to 10 per box to only EUR6 to 8 per box. Producers tell a different story as returns still seem to be very satisfactory and stable in comparison with 2007. The journal Reefer Trends reported that the FOB Costa Rica price is between USD4.75 and 5.25 per box, giving the producer a net return of 30 US cents per kg. It is true that the movement of exchange rates, and especially the colon against the euro, is very favourable for Latin American exporters. The steady increase of the European single currency against the Costa Rican currency is not

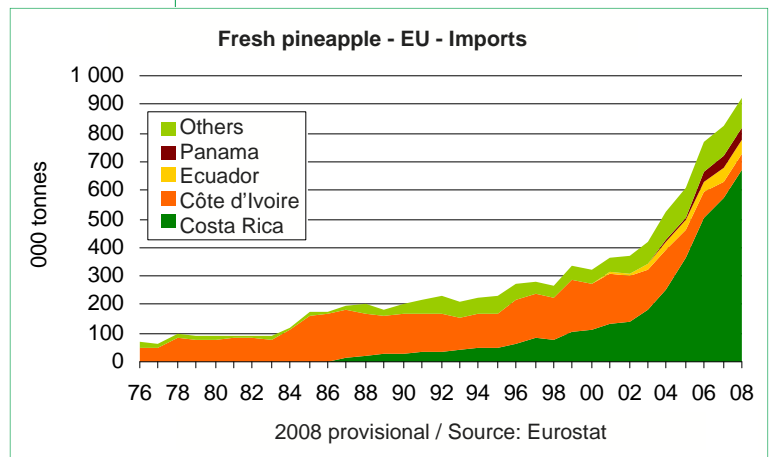
unrelated to resistance by local growers and exporters to a lower price in Europe. Increased intermediate costs have thus been partially absorbed. What is going to happen in the coming years, as a doubling of fertiliser prices has been announced for 2009?

Is the general increase in exports from other Latin American countries a result of the fall in the import price? While in April 2008 Ecuador predicted a two-figure increase in exports, it is reducing them by 15% to the United States and by 1% to the EU. The decrease on these two large markets has attained a total of 5 700 tonnes (- 7%). According to statements reported by Reefer Trends, the farm gate cost price for Ecuadorean producers is some USD3.80 per box. On a smaller scale, the decrease in exports is also affecting Honduras, which displayed a negative balance in 2008. Indeed, exports have been redirected to the United States (+ 12%) and shipments to the EU have been reduced by 14%. Guatemala has confirmed the decrease with - 8%, that is to

say a cumulated decrease of 2 500 tonnes shipped to the two markets. Finally, Brazil, a fruit Eldorado par excellence, also displays a 6% decrease whereas it had succeeded in starting from nothing in 2003 to become the fifth largest supply of the European market. Panama is one of the few sources to turn in positive results, thus confirming the development plan forecasts. It has announced a rapid doubling of the area under pineapple, which could thus increase to 2 000 ha.

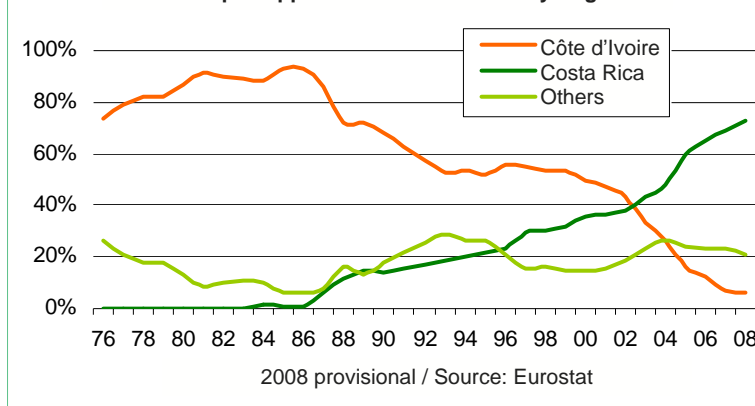
**2008, an unusual year or a year of transition?**

Might the market thus have attained a certain maturity in 2008? It is difficult to establish a relation of strict cause and effect between the





Fresh pineapple - EU - Market share by origin



stagnation or even reduction of market releases from the Latin American sources and the fall in the international price.

It would even be an exaggeration to conclude that all this poor performance is the result of a waning interest in pineapple. Indeed, the weather conditions in Brazil, as in many other Latin American countries, were a limiting factor in 2008. Rainfall, often causing flooding, was strong and recurrent in this part of the world. Quality was mediocre, in particular with poor size and colour. Meteorological constraints or a

change in trend? Given the rate of growth in Europe and even at the world scale, it is difficult to believe the oft-repeated theory of a pause or even a shrinking of the pineapple market. It increased overall in 2008 (+ 7.7%) thanks once again to Costa Rica alone, which increased its world market share in the process (76%) and did more than make up for the difficulties of its Latin American and African competitors.

Might the world pineapple market be a kind of Danaid pitcher with holes in it or a bottomless well? What are the current market growth factors now that the innovation phase is over? We can already say that its greatest merit is not the quality of shop pineapple displays. It is true that this is a subjective question for lack of comparable data. However, all observers have the feeling that the product—essentially 'Sweet'—has lost its aura. It has been replaced on the shelves by a fruit with little colour, sometimes even turning brown, whose freshness is sometimes doubtful. This is one of the effects of the multiplication of brands, operators and producers; they do not always have the resources, techniques or knowledge to produce a high-quality fruit and

Pineapple — EU Monthly imports in 2008 — Tonnes

	J	F	M	A	M	J	J	A	S	O	N	D	Total 2008	Total 2007
<b>Extra-EU, incl.</b>	<b>73 335</b>	<b>46 773</b>	<b>65 861</b>	<b>88 947</b>	<b>98 842</b>	<b>98 222</b>	<b>85 535</b>	<b>52 384</b>	<b>61 058</b>	<b>82 620</b>	<b>68 304</b>	<b>99 365</b>	<b>921 248</b>	<b>830 041</b>
Costa Rica	44 756	33 111	45 381	63 772	76 562	76 810	70 145	39 779	44 726	58 248	48 873	66 394	668 556	570 969
Côte d'Ivoire	9 820	3 237	5 282	5 491	4 274	3 803	2 693	2 353	3 181	3 939	4 093	10 735	58 902	59 253
Ecuador	3 473	2 424	3 180	4 566	4 088	3 940	3 355	3 350	4 018	7 613	3 732	4 572	48 309	49 260
Panama	2 405	2 884	3 863	4 052	4 377	2 688	3 103	1 753	2 504	3 821	2 714	4 707	38 870	37 624
Ghana	4 277	1 526	3 059	3 770	2 293	2 152	2 076	1 744	2 462	2 796	2 997	6 431	35 583	35 463
Brazil	3 349	1 083	900	2 931	2 917	1 233	1 113	1 584	1 900	2 088	2 705	2 870	24 673	26 367
Honduras	2 120	452	1 719	1 892	1 949	5 049	1 674	596	915	3 065	2 211	1 452	23 092	26 336
Cameroon	1 913	658	1 063	1 122	1 113	1 171	515	296	472	272	426	904	9 924	9 295
Thailand	314	476	396	245	130	304	220	281	218	120	92	164	2 960	3 697
Guatemala	262	294	358	360	280	274	248	367	160	116	0	200	2 918	3 763
Benin	190	158	175	159	133	148	81	95	184	161	126	241	1 851	1 874
South Africa	95	105	120	124	109	71	120	62	68	80	67	274	1 294	2 072
Togo	107	72	94	93	79	93	57	14	31	81	56	67	843	1 058
Vietnam	75	56	55	104	263	223	0	0	0	0	0	0	776	79
China	55	51	17	0	0	100	55	43	147	142	70	16	696	621
Mauritius	40	51	65	44	39	26	30	24	29	33	67	161	607	623
Uganda	38	37	42	43	34	27	24	20	26	31	22	40	383	404
Dom. Rep.	1	35	21	31	58	77	5	0	1	2	1	17	247	252
Guinea	19	40	25	29	48	7	0	0	0	0	11	23	200	133
Sri Lanka	16	19	8	21	40	8	11	17	9	10	17	15	190	123
Philippines	1	0	10	22	25	13	2	5	0	2	0	50	130	153
Colombia	4	0	0	0	0	3	0	0	7	0	0	27	41	76
<b>Intra-EU, incl.</b>	<b>38 744</b>	<b>32 466</b>	<b>33 932</b>	<b>43 551</b>	<b>45 874</b>	<b>47 530</b>	<b>43 166</b>	<b>32 200</b>	<b>29 264</b>	<b>30 774</b>	<b>35 463</b>	<b>49 009</b>	<b>461 974</b>	<b>472 461</b>
Netherlands	9 879	10 000	11 341	13 450	15 883	16 395	15 250	12 390	10 887	10 132	13 740	12 306	151 653	130 209
Belgium-Lux.	14 827	9 604	9 049	11 479	12 054	14 212	11 799	8 062	8 148	7 994	8 281	12 336	127 845	160 583
Germany	2 627	1 931	3 006	4 027	4 181	3 784	3 123	2 626	3 069	4 276	3 954	4 421	41 027	33 190
France	2 909	3 109	2 588	2 678	3 138	2 337	2 019	1 487	1 788	1 418	2 805	5 955	32 231	36 098

Source: Eurostat

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conserve this quality throughout the transport and distribution chain. One has the impression that the saying 'more quantity, less quality' comes into play when a product—especially a fruit—is democratised. Because pineapple has taken the gold medal for democratisation. The retail price has fallen strongly in recent years and promotion operations are more numerous, in low price supermarket chains as well.

The key factors in the development of the pineapple market would therefore be easier access, broader distribution, deseasonalisation and increased per capita consumption in the European member-states where the fruit is traditionally purchased.

Stretching the consumption period has happened. The time when as much as 30% of imports was eaten in December has gone. There is still a peak in the last month of the year but it has lost two-thirds of its intensity, now reaching less than 11% (December 2007 and 2008). Here, 2008 was very special as December was only just the month with the largest supplies as May and June each scored 10.7% of the annual total. One understands better why import prices fell to their lowest level at the end of the year. Analysis of seasonality reveals other interesting features such as great differences between the supply profiles of Costa Rica and Côte d'Ivoire. The former has always distributed its exports to the EU fairly evenly over the months. Con-

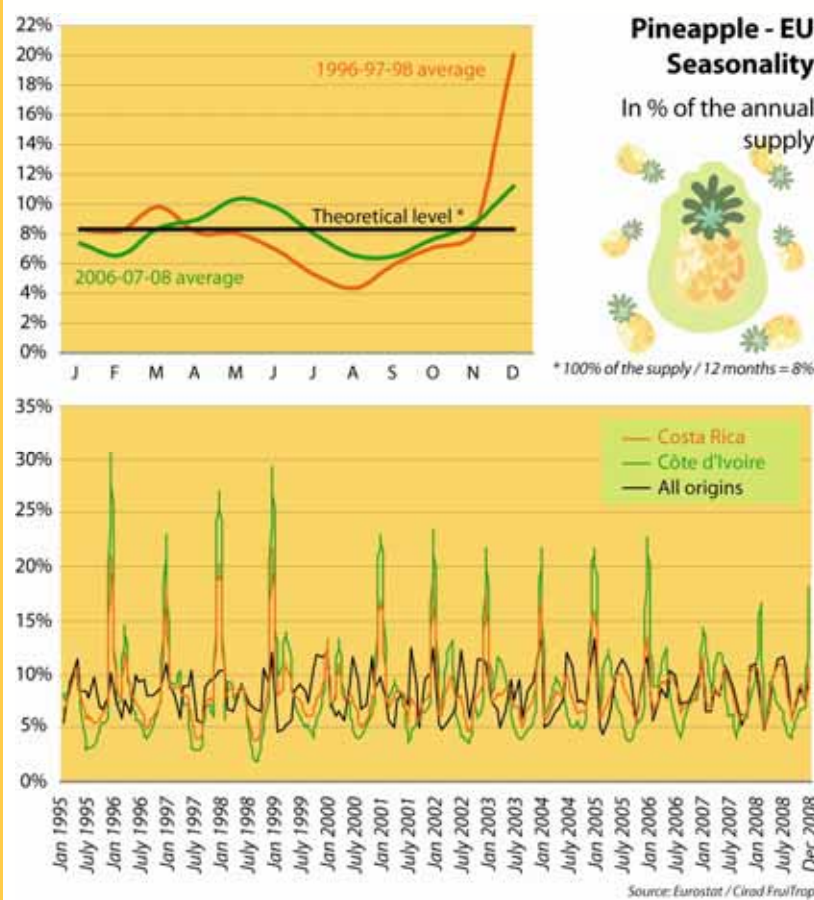
## Costa Rica in the forefront

Costa Rica-Pineapple, Pineapple-Costa Rica ... it is impossible to talk about one without bringing the other to mind. The hegemony of this Central American source with regard to the world fresh pineapple market is not weakening. It even strengthened in 2008. Costa Rica, the supplier of three

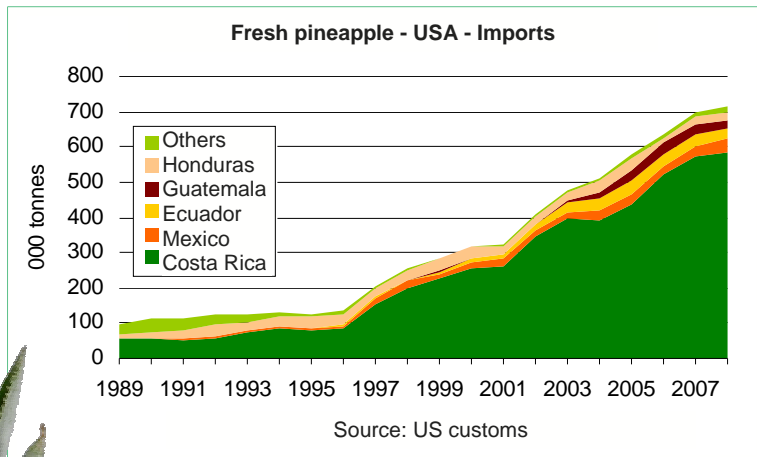
pineapples in four exported world-wide, further increased its market shares in Europe and the United States—two strongly growing markets. With exports totalling more than 1.5 million tonnes in 2008, the Costa Rican pineapple sector has now equalled the banana sector and even overtaken it in value! According to Reefer Trends, 45 000 ha of pineapple is in production in comparison with 12 500 ha in 2000. About 52% of the area is in the northern part of the country and 48% in the south.

The continuous growth of the pineapple sector in Costa Rica has been highlighted repeatedly for a long time. The export curve is a model of success. With the exception of an accidental downturn in 2000, growth has been uninterrupted since 1997 with the rate in two digits eight times in the last eleven years. It is difficult to find a weak point. One might just mention that growth in 2008 (+ 7%) was the smallest since 1997. Study of the export structure reveals a deep-seated change in the sector. The EU now forms the majority of target countries while the United States used to be the main outlet for Costa Rican pineapple. It must be added that the US market does not have the growth rates that it used to have and, in contrast, the EU is very active. Furthermore, it can be considered that the European Union is finally a clearance market, making a better or worse job of absorbing production peaks like those of spring 2008.

Finally, 2008 was the year in which Costa Rica—wishing to be at the forefront in environmental matters—was active in the question of pesticide residues. An enquiry performed by the national authorities in early 2008 led to the closing of a large plantation in April because of the pollution of the environment by pesticides. In early 2009, the largest production region in the country was obliged to suspend the extension of its plantings. On the subject of the environment again but from a different angle, Dole promoted its 'carbon neutral' plan for its pineapple and banana plantations in Costa Rica. Finally, 2008 was enlivened by the purchase of Caribana by Del Monte, which thus strengthened its leading position in Costa Rica with a further 11 million boxes of pineapples.







versely, Côte d'Ivoire has maintained a very marked seasonal pattern focused on the end of the year. In 2006 and 2007, this increase in shipments in December tended to be absorbed, with levels remaining average, but the trend was turned around completely in 2008.

### Overdose in the West

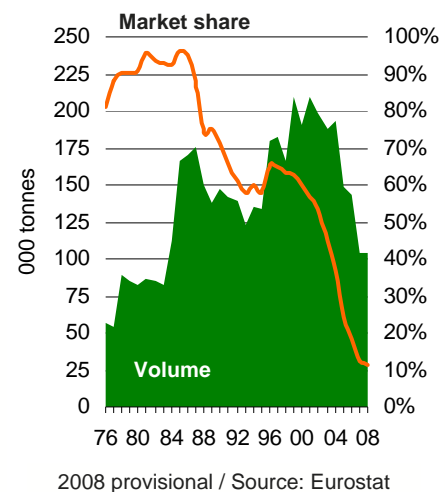
I have said that increased consumption in the EU was caused mainly, if not entirely, by a strengthening of the positions of the fruit on its traditional markets. Analysis of customs data is fairly convincing. To take just one example, net supply to the UK increased from 31 000 to 117 000 tonnes between 1999 and 2008. Germany, Spain, Portugal, Austria, etc. display strong upward trends. French customs data confirm the move. From 2005 to 2008, apparent consumption increased by more than 40%, that is to say a gain of 25 000 tonnes in three years. It was thought that the new member-states could be counted on but they seem insensitive to the exotic charm of pineapple. This difference in behaviour is worrying. Indeed, consumption in the West is not extensible. Price elasticity has already come fully into play as retail prices fell. To avoid continuing to destroy the value of the product and pauperise operators, new scope for growth must be found, in particular in the east. This is a major issue if world supply continues its strong growth.

The world economic downturn and its negative effects—that seem stronger in eastern Europe and Russia—mean that these countries cannot be counted on to continue growth of pineapple sales. They doubtless have more urgent matters to attend to. Indeed, the present economic slump is forcing both eastern European and western European consumers to reduce expenditure, as all over the world, and to concentrate on purchases considered to be essential. Unlike banana,

### Africa in the background

The situation of Côte d'Ivoire and Africa in general has worsened since it lost out at the end of the 1990s. The share of the three main African production sources (Côte d'Ivoire, Ghana and Cameroon) in the supplying of the EU decreased from 65% in 1996 — and even 96% in 1985 — to a small 11% in 2008. And it is not the meagre volumes from Benin, Togo or Guinea that are going to change the situation. Signs of optimism are rare. They have to be sought in 2008 EU import statistics. Côte d'Ivoire supply stabilised at a little less than 60 000 tonnes, putting an end to a long and uninterrupted decrease since 2001. Growth continued in Cameroon (mainly pineapple shipped by air) even if it did not do quite as well as the market: + 6% against + 11% for all origins. Ghana (the fifth-largest supplier of the European market) continued its slow decrease, with exports falling from 52 000 tonnes in 2004 to 35 500 tonnes in 2008.

**Fresh pineapple - EU  
Africa market share  
(Côte d'Ivoire, Ghana and Cameroon)**



considered to be the perfect anti-slump fruit because of its very low retail price, pineapple has yet to attain this status. And that's a good thing because everybody will be a loser when too much value has been wiped out and pineapples are sold in the same way that potatoes were sold yesterday. Although, we sometimes feel as if we had gone to the wrong shelf ... ■

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## 2008 season report Pineapple shipped by sea

A terrible year for 'Sweet'  
promising a gloomy future

Prices at the import stage on the four markets examined (France, Belgium, the Netherlands and Germany) remained fairly low. Average prices ranged between EUR6.00 and 8.00 per box for 'Sweet' and EUR6.00 to 7.00 or even 7.50 per box for 'Smooth Cayenne'.



© Régis Domergue

The market was fairly turbulent. Even though some sales of 'Sweet' and 'Smooth Cayenne' went beyond the averages mentioned, the season will be remembered for uneven quality ('Sweet') and fairly poor demand.

In comparison, the 'Sweet' market lost no less than 2 euros per box in comparison with the two preceding seasons (2006 and 2007), when prices were between EUR8.00 and 10.00 per box.

Given the large volumes of 'Sweet' marketed, appraising the pineapple season on the European markets comes down to examining this variety alone. Only the eastern

European markets are interested in 'Smooth Cayenne', together with the French market where there is a true flow of consumption.

Supply of 'Sweet' was irregular in quantity and quality throughout the season. It was also frequently unbalanced, with a high proportion of small fruits for which there was no demand.

### The high points of the season

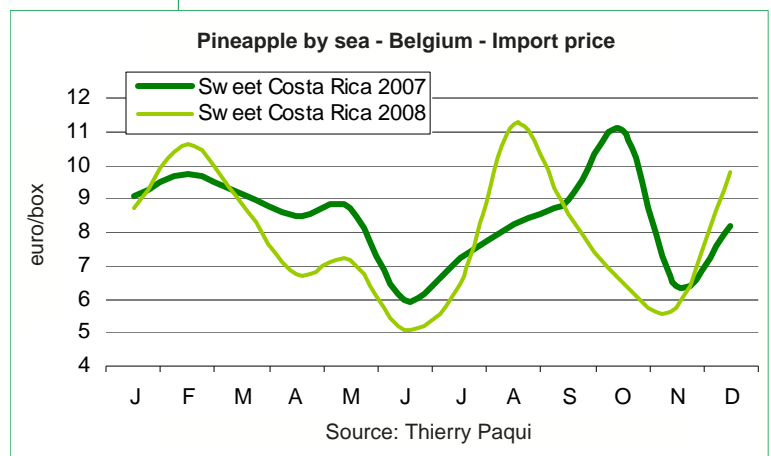
The situation was good on the European markets **from Weeks 4 to 12**. Average prices of 'Sweet' exceeded EUR8.00 per box. Supply was smaller than operators had expected, to the

extent that they sometimes found it difficult to find supplies for the various special offers that had been set up. But prices did not rocket. Averages had difficulty reaching EUR10 per box and staying there, but sales were fluid. Demand was not very dynamic and small Latin American supplies resulted in good sales during the nine weeks prior to Easter.

On the French market, this upward period also benefited sales of 'Smooth Cayenne' to a certain extent. They were fluid but it was difficult to reach averages of €8.50 per box during the period.

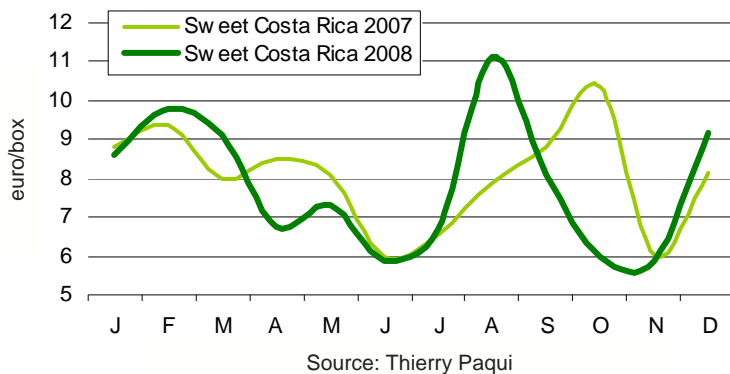
In contrast, the situation was catastrophic **from Weeks 21 to 29**. Fine weather started fairly early and demand soon turned to the season's fruits—available at low prices. This is when supply from Costa Rica increased strongly, with available volumes greatly exceeding demand. Quality problems also worsened in Costa Rican fruits. Prices for arriving goods fell to EUR4.00 per box. The markets were clogged and soon clearance sales were organised at even lower prices! Although shipments from Costa Rica started to decrease in Week 26, the effects on prices and demand were not felt until the end of Week 29.

The situation on the French market was hardly better for sales of 'Smooth Cayenne' although supply remained comparatively small. The availability of batches of 'Sweet', even of poorer quality, seriously affected 'Smooth Cayenne'





Pineapple by sea - The Netherlands - Import price



sales. Meanwhile, there was hardly any demand from the eastern European markets, where the season's fruits were also sought. Operators holding batches of 'Smooth Cayenne' had to clear them on a price after sale basis.

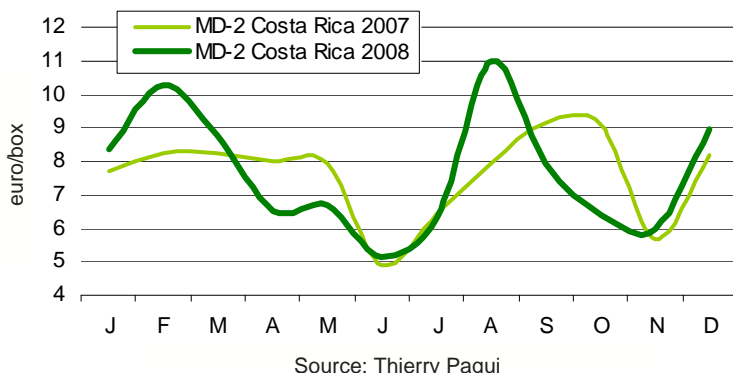
These transactions were sometimes concluded at less than EUR3.00 per box from Week 26.

Prices rose again in **Weeks 32 to 37**. Supply from Costa Rica was small and the operators who had made undertakings for promotion operations were frequently short of fruits. The dollar regained muscle during this period and it would seem that after suffering from the prices earned in Weeks 23 to 27 (EUR4.00 per box), Latin American operators had decided to 'recoup' by exporting to apparently more demand and higher profits in the USA. Averages exceeded EUR10.00 and oscillated between EUR12.00 and sometimes 13.00 per box. Demand and prices began to weaken again in Week 35.



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Pineapple by sea - Germany - Import price



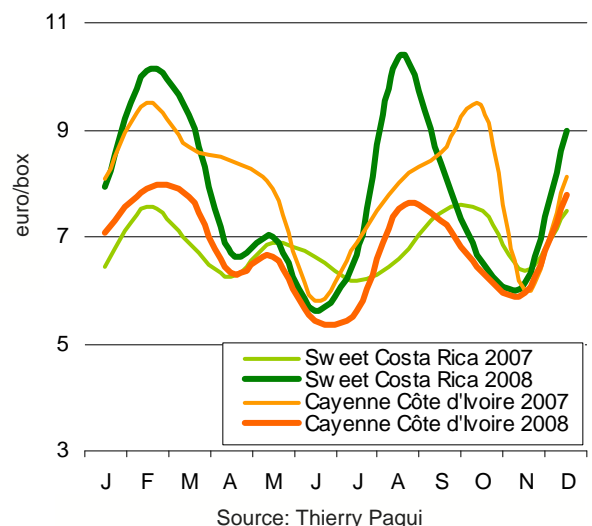
The rise in prices on the French market also benefited sales of 'Smooth Cayenne', although the price did not succeed in clearing an average of EUR8.50 per box.

Prices fell again **from Weeks 43 to 48**. Supply from Costa Rica was still small but demand on the European markets was even smaller and did not take the small volumes released. Clearance sales improved the situation from Week 47 onwards.

The situation for sales of 'Smooth Cayenne' on the French market was not as trying. Supply was very small and so sales of this fruit were a little less affected. Sales were very slow during the period but the impact of prices was felt in Weeks 46 and 47.

**The last four weeks of the year** were fairly good on the pineapple market. Latin American

Pineapple by sea - France - Import price



supply was smaller than expected and although demand was not exceptional fruits sold steadily, at least during the first two weeks of December. Demand then dipped but without resulting in a real fall in prices.

Sales of 'Smooth Cayenne' were better than they had been during the sale period in 2007. The eastern European markets were buying, allowing fluid sales, at least during the first three weeks of the month. In spite of a few problems here and there, the fruits were fairly well received and prices were satisfactory, without being exceptional. Above all, there were no particular quality problems related to the keeping quality of the fruits ■

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## Is 'Sweet' pineapple beginning to show signs of wear?

Before the introduction of the hybrid MD-2 (Extra Sweet Pineapple or 'Sweet') by Del Monte in 1996, the European pineapple market was mainly occupied by the two varieties 'Smooth Cayenne' and 'Champaka'. 'Smooth Cayenne' had the upper hand by a long way. The main exporter of the variety was Côte d'Ivoire, whose shipments to Europe in 1995 formed more than 52% of the volumes of pineapples imported, while Costa Rica, the main producer of 'Champaka', held only 22% of the market. Pineapple consumption seemed to have stuck at less than 300 000 tonnes, a threshold that operators hoped to clear one day. In short, the question was that of knowing how to maintain or increase market shares in relation to this threshold.

The arrival of 'Sweet' changed the situation completely. The market grew tremendously in terms of both consumption and the prices of 'Sweet'. In 2008, European pineapple imports exceeded 920 000 tonnes. Supplying 670 000 tonnes to the EU, Costa Rica now has more than 72% of this market. Numerous Latin American countries have also started producing 'Sweet'. 'Smooth Cayenne' now plays an entirely marginal role and is relegated to a niche market accounting for hardly more than 5% of pineapple sales.

More than the volumes taken by the European market, the interesting feature is the much higher price levels attained by 'Sweet'. It was always difficult to sell 'Smooth Cayenne' at steadily high prices. 'Sweet' supplied by Del Monte, the only supplier of the variety in the early years, is the star performer as regards both the volumes grown and the high prices attained. When it was launched, its price on the European markets was twice as high as

that of 'Smooth Cayenne'. The gap has now narrowed markedly at the import stage. Boxes of Del Monte brand 'Sweet' are nevertheless still EUR1.50 to 2.00 more expensive than other brands. In fact, these fruits have always sold at good prices thanks to a good marketing system and more even quality.

The strength and advantages of 'Sweet' for importers lie in the standardised fruit quality, although there have

often been exceptions in recent seasons. Indeed, the increase in production has meant that we have been able to observe a quality difference between produce from Latin American and Africa and between the brands available on the market. Given the heterogeneity of production processes from one country to another and from one grower to another, the fruits are of increasingly uneven quality and this has resulted in a fall in prices.

The great surprise during the last season was the large number of occasions on which quality problems were observed in leading brands. Supply from Costa Rica was very irregular in volume and quality and, given its importance and weight on the market, this had a direct impact on pineapple sales and on the prices of other brands at the import stage.

The irregular quality of Latin American supply did not make it easy to relaunch the market during certain periods. The main quality problems observed in 'Sweet' during the recent season involved lack of colour and poor keeping quality on the shelf. It is true that difficult weather (heavy rainfall in production zones) affected harvests. Nevertheless, the pineapples were more delicate and changed quickly, encouraging operators to lower prices in order to avoid having to manage stocks of poor fruits.

Some people think that these problems indicate a weakening of Latin American plant material. If this were to be the case, it could have serious long-term effects on consumption and prices. As some fourteen months elapse between planting and harvest and quality problems were reported throughout the year, it is hoped that solutions have been found at the production stage and that adjustments have been made. If not, the 2009 season may be another very difficult one.





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## 2008 season report Pineapple shipped by air

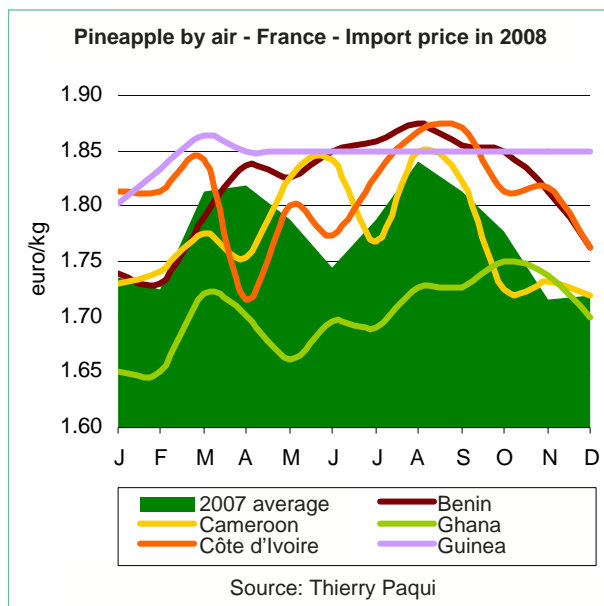
### Greater need for the professionalisation of operators

The French market for pineapple shipped by air freight was supplied from five sources. Fruits from Benin, Cameroon and Côte d'Ivoire are within the same price ranges, although of course there are a few differences according to the size of supply and fruit quality. Ghana and Guinea are in fairly different price ranges.

As during the preceding season, supply from Benin consisted of both 'Smooth Cayenne' and 'Sugarloaf' pineapples. The fruits shipped were generally appreciated for their taste qualities but quality and presentation were not always very regular. They frequently lacked colour and shine, not to mention the old problem of unattractive, poor quality packaging that does not give satisfactory protection for the fruits.



Overall, 'Sweet Cayenne' from Benin sold at an average price of between EUR1.70 and 1.85 per kg and sometimes reached EUR1.90.



The season was fairly regular except during two periods. In Weeks 9 and 10, very hot weather affected fruit, making them dull and lacking in sheen. The batches received were difficult to sell and prices fell markedly for a fortnight. The fall in prices in Weeks 49 and 50 was more the result of a general decrease in demand. Some importers decided to reduce or almost interrupt their shipments from Benin to 'catch up' on sales at the end of the year but this did not have the desired effect on either demand or prices. Indeed, exporters continued to deliver their fruits to other importers which did not help to unclog the market at a time (the Christmas season) when all operators hoped to achieve their best sales. The highest average prices were seen at times when supply from Benin was fairly small, that is to

say Easter, when demand is often very strong, and August when a distinct decrease in demand could be expected because a proportion of operators take a holiday then.

In spite of occasional quality problems, the batches of 'Sugarloaf' pineapple sold at between EUR1.90 and 2.00 per kg throughout the season. Purchasers of this variety are enthusiasts who are ready to pay more but soon turn away when quality starts to become less even.

Supply from Cameroon was the largest on the air pineapple market. These fruits also suffered from more quality problems as they were long affected by heavy rainfall in the production zones. Operators frequently reported considerable unevenness in the quality of supplies. However, average prices remained fairly similar to those of pineapple from Benin at between EUR1.70 and 1.85 per kg. However, given the volumes exported, a greater proportion of the fruits was in the EUR1.50 to 1.65 per kg range, strongly complicating the legibility of goods from Cameroon, as had been the case in 2007.



DHL air freight prices and the application of a new CFAF25 per kg airport tax led to fears of loss of competitiveness for pineapple from Cameroon. The best average prices were attained when supply from Cameroon was smaller. This was mainly during the Easter period, from the second half of May to the first week in June and the first half of September. The source also suffered from the congestion of the market at the beginning of December. The large supply volumes and the uneven quality of the produce available led some operators to lowering prices considerably in order to be 'clear' for Christmas.

The volumes from Côte d'Ivoire were not very large throughout the season. Fruits suffered from some concerns of keeping quality and colour, often as a result of rainfall in the production zones. The average price was affected but held at between EUR1.70 and 1.80 per kg, with some averages reaching EUR1.90. In contrast with the situation encountered by Benin and Cameroon, most of the volumes shipped by air came from an integrated structure with packing stations allowing some work on quality. However, as a result of the weather, quality did not match the investments and the efforts made at the production level. Exporters often chose to reduce their shipments considerably or to halt them temporarily while awaiting better quality fruits. This meant that pineapples from this source were available within fairly narrow price ranges, depending on the quality of arrivals. Sales were more difficult in April and at the end of the year when demand slumped and supply was large. However, prices remained at a fairly high level in July and September as supply was comparatively small.

Supply from Ghana consisted mainly of 'Smooth Cayenne', even though there were some seemingly occasional attempts at shipping 'Sugarloaf'. This source long suffered from a poor image with fruits that some operators said were too uneven to really gain a strong position on the air pineapple market. Ghana's great advantage has always been that freight costs are lower than for the other sources, and this has long encouraged operators working with these fruits to keep prices comparatively low. Supply from Ghana is now a little more segmented. The fruits on which stress is laid are clearly identified by strong packaging with bright colours, meaning that prices are a little higher than before while the other, small brands are less visible and continue to be at the lower end of the price range. Pineapple from Ghana was proposed at an average of EUR1.65 and EUR1.70 per kg throughout the season, in spite of occasional quality concerns (mainly lack of colour). Ghana even succeeded in maintaining a peak average of EUR1.75 per kg from the end of July to

## The 'Victoria' pineapple market

The 'Victoria' pineapple market is supplied with a degree of regularity from four sources—Réunion, Mauritius, Côte d'Ivoire and South Africa. The situation is somewhat delicate. Réunion and Mauritius supply the market with fruits shipped by air. The volume was fairly limited during the last season and the price range varied little. 'Victoria' seems to have suffered from a decrease in consumer enthusiasm. Sales were fluid but no more and fruits from Réunion continued to set the pace of the market as regards both quality and price. The greatest price fluctuation for pineapples from Réunion followed the large increase in supply at the end of the year, while demand remained comparatively stable.

Most of the batches arriving from Côte d'Ivoire and South Africa were shipped by sea, although consumers were not always informed of the difference. The South African fruits displayed more regular quality although volumes were smaller than those from Côte d'Ivoire.

Thus the situation often led to confusion at the expense of 'Victoria' shipped by air (more expensive); these were in competition with fruits shipped by sea. Under these conditions, it was difficult for 'Victoria' to assert an image of 'air' quality when overall supply was mixed.



nearly the end of November. Its low freight costs meant that it did not suffer too much from the difficult market conditions at the end of the year. Average selling price therefore remained steady at EUR1.70 per kg throughout December whereas that of fruits from other sources fluctuated and only gained ground during the last week of the month.

**Guinea** is somewhat of an exception. Most of its exports by air are handled by a single company that aims at a high-quality sales niche. For this, the company concentrates on presentation, strengthening of packaging materials, fairly closer mastery of production costs and finally integrated marketing of production. The comparatively small supply with fruits available at only certain periods during the season enabled the company to maintain fairly high prices at between EUR1.80 and 1.85 per kg, but this was justified by the high quality of the produce delivered to customers ■

**Thierry Paqui**, consultant  
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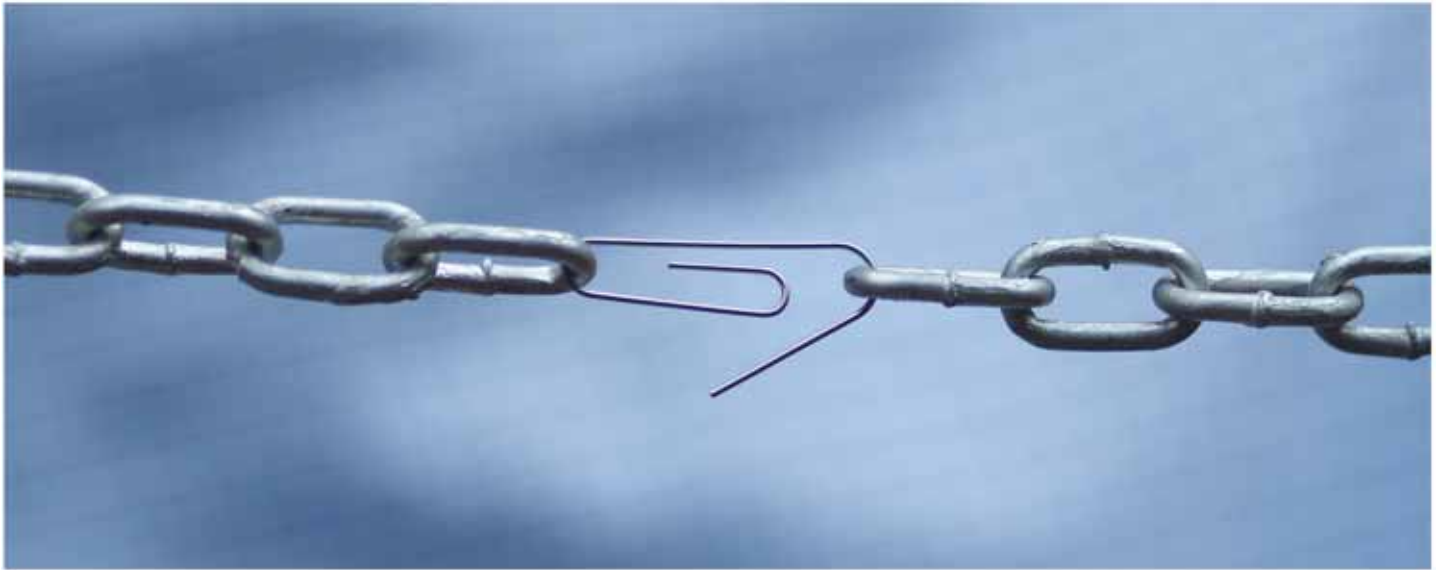
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## What future is there for the market for pineapple shipped by air?

The years go by and things are much the same for the air pineapple market. The increase in freight costs should be added to the problems of the irregular quality of the fruits delivered to the French market. Freight costs were already rising but the increase in 2008 caused by the increase in fuel prices did not follow the downward fluctuations. In addition, pressure on 'Sweet' pineapples that were available at very low prices during certain parts of the season had an impact on the sales of fruits shipped by air. In the long term, the question of the advantage for importers in continuing to work with certain sources or certain operators whose produce does not clearly stand out from that of fruits shipped by sea may well be asked. Indeed, some operators admit that they have lost clients to the benefit of 'Sweet' and not another source shipping pineapples by air. Might 'Sweet' shipped by sea form the next threat to air pineapple?

It is true that not all the sources are in the same situation. But the problem remains. Clients in Europe seeking pineapples shipped by air are ready to pay more because the means of transport used means that they expect a practically perfect fruit

with better organoleptic characteristics, good keeping quality and colour, well brushed and with as few spots and traces of rubbing as possible. Unfortunately, this is not often the case. The packaging should be added to this; although it is of no visual interest to the final consumer it is determinant in conserving fruit quality and for sales on wholesale markets and in specialised shops. Sources such as Ghana, Côte d'Ivoire and Guinea often supply fruits in stronger packaging than those from Benin and Cameroon.

Another difference is the condition of the fruits when they arrive at their destination. It is difficult to explain to operators in Benin and Cameroon, who often use very poor quality boxes, that not palletising fruits further affects quality on arrival: fruits may be bruised or crushed and the skin is sometimes seriously marked. This prevents good sale of the fruits while competing sources such as Côte d'Ivoire and Ghana palletise their shipments. It is true that this increases the cost price a little but it has advantages for sources that do not have strong boxes. In the case of Guinea, for example, there is no palletising at shipment but much investment has been made in strong packaging that means the fruits arrive in better condition.

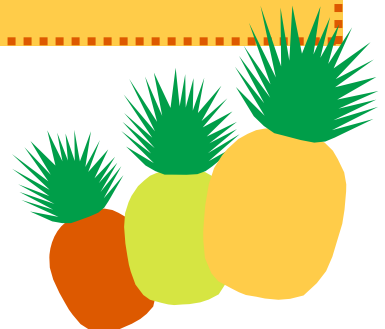
The increase in transport costs in 2008 affected all operators and especially those making shipments by air. However, there are situations that may in the long term be a real threat

to the air freight pineapple sector. In Cameroon, DHL, which freights most of the fruits, increased its rates considerably in 2008. However, exporters do not seem to be able to agree to try to negotiate better

freight conditions. Each one seems happy with the contract that he has obtained and hopes to benefit in the long term and increase his market share.

Likewise, it is difficult to understand how, with no economic logic, fruits of reasonably good quality from the same origin (Cameroon or Benin), display considerable differences in price at the import stage—sometimes as much as EUR0.20 to 0.30 per kg. It is possible that during certain rainy periods or with certain goods such as stored batches, it is necessary to reduce prices because the fruits are downgraded. But doing this systematically throughout the season may finally cause a real problem of survival of the sector and seems to be a commercial strategy that is strange, to say the least.

The sector seems to be becoming a little more fragile with the price after sale system that seems to have become the most common practice on the air-freighted pineapple market, and whose returns are often uncertain. With the economic downturn that started in September 2008, serious repercussions are to be feared with regard to the survival of certain operators.







production: 18 900 000 t  
world trade: 2 000 000 t



Pineapple — United States imports

tonnes	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<b>Total</b>	<b>203 993</b>	<b>252 848</b>	<b>283 097</b>	<b>318 837</b>	<b>321 299</b>	<b>405 714</b>	<b>476 660</b>	<b>511 050</b>	<b>577 792</b>	<b>634 069</b>	<b>696 820</b>	<b>713 584</b>
Costa Rica	154 183	200 899	226 029	257 783	261 199	344 731	399 826	392 323	438 954	522 520	574 954	583 916
Mexico	15 414	17 597	14 491	17 200	24 527	18 041	14 974	27 033	27 339	22 073	29 018	38 726
Ecuador	4 193	2 289	5 163	6 505	8 443	17 780	28 578	33 608	37 199	35 830	33 411	28 331
Guatemala	100	266	1 718	633	2 531	733	2 918	17 563	32 491	33 069	27 474	25 790
Honduras	24 680	26 950	33 555	32 841	20 122	20 629	24 728	34 419	32 988	12 685	20 160	22 620
Panama	256	136	0	125	255	422	482	1 762	3 774	3 373	7 754	9 254
Thailand	2 404	2 951	2 093	2 837	3 605	3 095	4 191	3 996	4 548	3 488	3 264	4 096
Others	2 763	1 760	48	913	617	284	962	347	458	1 032	786	851

Source: US customs

Pineapple — Japanese imports

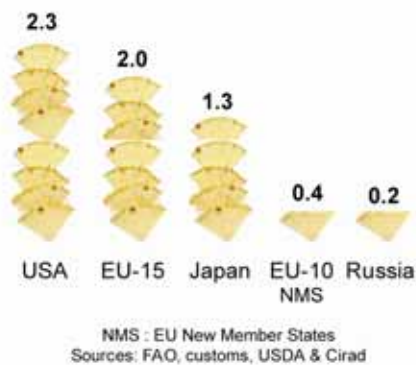
tonnes	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<b>Total, incl.</b>	<b>96 087</b>	<b>84 710</b>	<b>89 866</b>	<b>100 092</b>	<b>118 344</b>	<b>122 871</b>	<b>122 690</b>	<b>142 281</b>	<b>155 426</b>	<b>152 479</b>	<b>165 794</b>	<b>144 408</b>
Philippines	95 648	84 016	88 329	98 378	115 818	120 164	120 482	139 165	152 577	151 567	165 118	143 745
Taiwan	378	635	1 000	832	938	368	861	1 025	841	421	459	660
USA	1	12	0	0	533	1 138	579	1 786	1 751	385	16	0
China	28	30	261	416	533	730	596	263	252	106	167	0
Malaysia	0	0	0	274	255	197	0	19	0	0	0	0
Ecuador	0	0	0	0	26	3	0	0	0	0	0	0
Thailand	32	17	274	192	240	270	66	23	5	0	0	2

Source: Japanese customs (code 080430010)

Pineapple  
EU import entry points



### Pineapple Per capita consumption (kg/year)



### Pineapple World production

2007	tonnes
<b>World</b>	<b>18 930 000</b>
Brazil	2 666 358
Thailand	2 319 791
Philippines	1 900 000
Indonesia	1 500 000
China	1 440 000
India	1 308 000
Costa Rica	1 225 000
Nigeria	900 000
Mexico	635 000
Kenya	605 000
Vietnam	470 000
Colombia	410 000
Malaysia	360 000
Venezuela	360 000
Côte d'Ivoire	240 000

### Pineapple World exports\*

2007	tonnes
<b>World</b>	<b>2 000 000</b>
Costa Rica	1 346 326
Philippines	231 882
Ecuador	100 000
Honduras	70 000
Côte d'Ivoire	65 000
Panama	55 000
Ghana	40 000
Mexico	30 000
Guatemala	22 000
Malaysia	24 124
Brazil	22 700
United States	9 297
Cameroon	7 700
Thailand	6 771
Bolivia	4 717

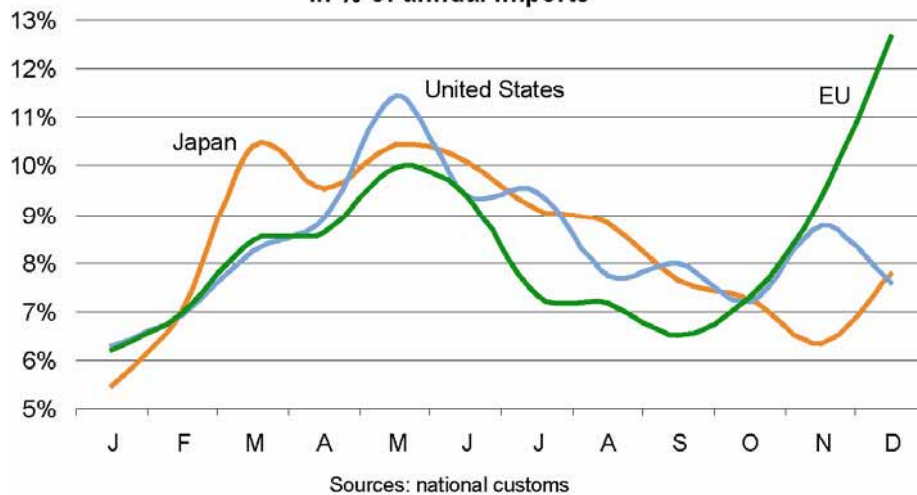
### Pineapple World imports

2007	tonnes
<b>World</b>	<b>2 000 000</b>
EU-27, incl.	830 041
Belgium	281 042
Netherlands	164 679
United Kingdom	106 568
Italy	85 450
Spain	68 678
United States	696 820
Japan	165 794
Canada*	100 000
South Korea*	60 000
Russia*	26 000
Singapore*	19 000
Switzerland	17 500
Chile	10 500
Argentina	10 000

\* Estimates / Sources: FAO, EU, US, Japanese customs



### Pineapple - Supply calendar in % of annual imports



### Pineapple — EU — Imports and re-export

tonnes	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<b>Total extra-EU, incl.</b>	<b>274 772</b>	<b>281 449</b>	<b>263 211</b>	<b>332 581</b>	<b>318 289</b>	<b>367 017</b>	<b>369 483</b>	<b>410 889</b>	<b>521 933</b>	<b>609 484</b>	<b>770 927</b>	<b>830 041</b>	<b>921 328</b>
Costa Rica	64 312	83 400	79 024	106 225	112 740	135 024	139 172	179 154	250 425	363 169	500 128	570 969	668 436
Côte d'Ivoire	153 943	154 295	141 580	177 775	158 163	174 505	160 537	135 686	136 009	99 685	94 427	59 253	58 863
Ecuador	22 191	23 912	18 968	25 659	29 321	32 590	35 745	43 093	51 421	44 984	36 570	49 260	48 632
Panama	133	16	521	1 233	348	3 564	7 823	19 575	27 521	32 598	31 394	37 624	38 846
Ghana	0	18	214	16	17	35	0	3 649	9 627	12 111	40 109	35 463	35 554
Brazil	10 289	10 005	9 602	6 370	5 176	9 111	13 385	13 329	17 571	25 275	26 578	26 367	24 673
Honduras	114	18	107	54	52	220	230	802	10 233	12 675	26 581	26 336	23 092
Cameroon	3 156	3 604	5 747	5 710	2 975	2 098	2 005	3 484	3 963	4 411	8 493	9 295	9 924
Thailand	74	8	12	9	31	73	471	570	3 476	3 255	3 359	3 697	2 965
Guatemala	2 389	2 502	3 043	3 543	4 641	5 030	5 326	4 855	4 560	4 604	4 678	3 763	2 918
Benin	565	556	747	1 404	1 154	844	1 625	2 158	1 772	1 985	3 037	1 874	1 851
South Africa	861	320	341	357	591	676	898	936	1 206	1 155	3 404	2 072	1 259
Others	25 359	12 685	12 890	10 489	8 201	12 305	15 431	16 696	20 919	18 617	6 108	14 035	2 623
<b>Total intra-EU, incl.</b>	<b>145 602</b>	<b>139 250</b>	<b>127 659</b>	<b>189 707</b>	<b>160 238</b>	<b>182 877</b>	<b>234 559</b>	<b>247 772</b>	<b>287 963</b>	<b>344 425</b>	<b>433 840</b>	<b>472 461</b>	<b>414 683</b>
Netherlands	11 189	11 387	11 174	22 137	14 011	24 081	26 145	34 814	56 760	81 661	139 341	130 209	138 995
Belgium	35 450	30 466	26 890	43 945	38 885	31 545	48 285	50 398	75 128	102 314	117 123	160 583	117 471
France	78 775	74 588	67 316	90 343	78 639	86 301	106 340	84 325	75 830	59 748	47 020	33 190	36 402
Germany	9 564	8 221	8 891	11 987	12 023	8 915	11 586	25 209	32 052	44 511	55 745	36 098	26 085
Spain	5 211	6 810	3 318	4 762	5 795	16 216	13 836	7 812	8 309	12 835	18 211	38 233	25 655
Portugal	36	1 050	437	796	2 014	3 786	17 597	27 692	24 965	20 151	14 486	26 786	24 733
Ireland	30	37	9	31	77	15	153	56	106	11 090	12 183	12 003	18 783

Source: Eurostat







### Producer country sheet

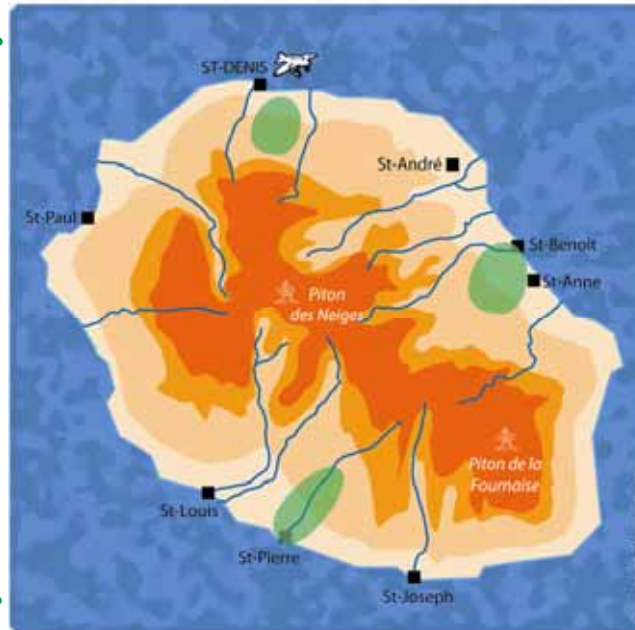
## 'Victoria' pineapple in Réunion

by Eric Imbert

*A traditional crop on the island, exports of 'Victoria' pineapple from Réunion developed in the 1980s within the framework of a programme launched by the authorities to diversify farming that was closely dependent on sugar cane. However, the European market is increasingly competitive and narrow for this high-quality product. Initiatives have been launched to differentiate Réunion fruits from those of competitors and to develop the processing sector on the island, while needs for agricultural diversification may increase in 2013 with the reform of the common market organisation of sugar.*

### Production zones

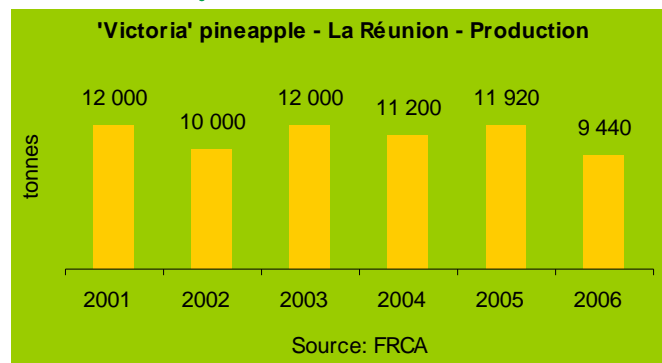
The plantations are in three main zones in the foothills of the two mountain ranges that form the greater part of the island. Pineapple is a traditional diversification crop that completes the incomes of market gardeners in the north. The plantations are concentrated at between 300 and 500 metres above sea level above Saint Denis and Sainte Marie on very steep land that is difficult to cultivate but with very good exposure to the sun. The zone is shrinking for reasons of urban pressure. Production is more commercial in the east in the Saint Benoît region.



Some sugar cane growers have diversified their operations to include pineapple by the reconversion of their good land at 50 to 450 metres above sea level at the end of the 1980s. Production is concentrated on exports in a zone with considerable precipitation and more moderate sunshine than in the rest of Réunion. The two systems described above coexist in the south-western part of the island. This zone has less rainfall and pineapple is found from sea level to an elevation of more than 750 m. This feature means that production can follow a different calendar to that of the other zones and ensure continuity in market supply.

### Production

'Victoria' pineapple was introduced in the island in the seventeenth century, and cultivation gradually developed to meet domestic market requirements, with about 150 hectares of plantations at the end of the 1980s. Subsequently, difficulties in the sugar sector—the pillar of the economy of the island—and state encouragement led some growers to diversify their activities. Thus the areas used for pineapple and other fruit and horticultural crops increased rapidly to better supply the domestic market and to develop an export sector with shipments to France and the EU. Pineapple plantations totalled some 400 ha in 2006, with production of about 16 000 t. The end of the guaranteed price of sugar in 2013 may well increase the need for cane growers to diversify and may cause renewed interest in pineapple and other fruits. With a domestic market with limited prospects for development, initiatives have emerged for the creation of alternative outlets, such as the differentiation of pineapples from Réunion and its export competitors and the development of a range of high-quality processed products. The main sanitary problem is black spot disease. The Chamber of Agriculture, CIRAD and the Regional Federation of Chambers of Agriculture provide technical assistance for the sector.



### Logistics

Transport is by air freight only. Sailing time to Europe is more than 30 days and this is not compatible with the transport of fresh produce.

## Outlets

Most production is sold on the domestic market, mainly through 'bazardiers'. These are local traders who sometimes buy the harvest on the plants and resell to roadside sellers—an entirely informal channel. Export volumes are modest. The processing phase is currently developing, with industrialists trying to make the most of the taste strong points of 'Victoria' from Réunion to create high-quality innovative products. A production unit manufacturing cubes and 'carpaccio' slices has started up and the upgrading of an existing juice factory is being examined.



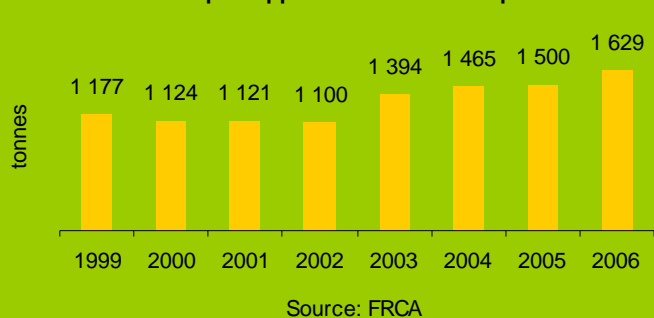
## Total exports

The export sector established in the 1980s to supply the EU is a complementary outlet for production. The volumes exported increased considerably in the 1990s

but tend to peak at between 1 500 and 2 000 tonnes per year. Cost price is high, especially as air freight must be used. The 'Victoria' market is thus still fairly narrow and seasonal (Christmas and New Year). In addition, the market shares of Réunion fruits are threatened by increasing competition from sources where labour is cheaper (Côte d'Ivoire, Ghana and South Africa). To resist on the market, a number of growers have grouped in the Syndicat Qualité Fruits Réunion to segment the 'Victoria' market and ensure the recognition of the distinctive qualities of the fruits grown on the island. The procedure resulted in the obtaining of a 'Label Rouge' in 2006. This market

segment is increasing in volume but still very limited. Four cooperatives or producers' groups and two private exporters supply the European market.

'Victoria' pineapple - La Réunion - Exports



## Specifications of the 'Label Rouge' for 'Victoria de la Réunion'

Registered in 2006, the specifications of 'Label Rouge' Victoria pineapples have three levels of criteria.

- The fruit: it must weigh a minimum of 550 g and be sold whole and fresh. Colour must be at least level M2 (75 % of the surface is yellow). The proportions must be balanced, with a straight, green, fresh and healthy crown with a height proportional to the fruit. Finally, a minimum sugar content is guaranteed.

- Cultural practices: the fields for 'Label Rouge' production are identified in order to guarantee fruit quality and traceability and are monitored by a Syndicat Qualité Fruits technician to set up and ensure the respect of the good agricultural practices defined by the group. These practices are aimed at maintaining soil structure and fertility, providing fertilisation to match plant requirements, cultivation in a single cycle and a calendar restriction to forbid the harvesting of fruits during periods when pressure from black spot disease is strongest. Finally, transport of fruits to the packing station must be in boxes only to prevent any risk of bruising.

- Services provided: these include the harvesting date and a best before date so that a maximum period between harvesting and shipping means that consumers have a fresh fruit of high quality. Each fruit is labelled individually and bears a batch number to ensure full traceability. Controls are performed and recorded to ensure high fruit quality. Shipment must be by air only.







## Pineapple growing

- This article is drawn from three main sources:
- 'Crop management sequence - Pineapple', PIP, 52 pages. [www.coleacp.org](http://www.coleacp.org)
- 'L'ananas', Alain Guyot, ISTOM lectures
- 'L'ananas, sa culture, ses produits', Claude Py & Claude Teisson, 568 pages, Maisonneuve et Larose

reducing growth but still surviving;

- the base of the leaves is the most efficient zone for uptake of nutrients and it responds well to foliar fertilisation;
- flowering is induced by low temperatures and short days and is erratic under natural conditions. This gives rise to the most remarkable feature of cultivation—flowering induced artificially by a cultural operation.

Growers can thus—almost at their wish—control harvest date and yield as fruit weight depends on the size of the plant at the moment at which flowering is induced artificially. Fruit quality is determined essentially by sugar content and acidity and varies considerably according to weather conditions and the fertilisation applied. In simple terms, nitrogen nutrition determines weight and potassium nutrition determines quality. It is an extremely heterogeneous compound fruit whose base is always at a later stage of development than the upper part. Pineapple is not climacteric and after harvesting the main change in the fruit is a gradual loss of its qualities. This deterioration must therefore be limited in the fresh fruit packing and transport chain—fast transport and sales with no breaks in the cold chain. When the fruit is processed, this must be performed as quickly as possible.

### Cultivation

- Soil: alluvial or volcanic at an elevation of less than 600 metres. Deep soil. Good drainage. Gentle slopes (less than 4%). As 'Sweet' is susceptible to Phytophthora (a fungal disease), the ideal soil pH range is 5.0 to 6.5.
- Plants: 50 000 to 70 000 plants per hectare. The quality of planting material is of fundamental importance: genetically pure 'Sweet' material with no defects (spines, diseases, etc.), of uniform size (calibrated in 100 g categories), propagules must be as heavy as possible to shorten the cultivation period (but not too heavy as natural flowering should be avoided) and treated with registered pesticides to prevent the spread of pests and diseases.
- Post-harvest: 'Sweet' is susceptible to bruising.
- Nutrition: fertiliser is applied by spraying every two weeks. The fertilisation programme starts after the harvest.
- Weeds: these can reduce yields and harbour pests and diseases that attack planted fields if they are not eradicated in time.

long and 7 cm broad. Their appearance indicates the state of health of the plant and growth vigour;

### Cycle of the plant

Pineapple displays three main phases:

- the vegetative phase from planting to the differentiation of the inflorescence (flowering);
- the fruiting phase running from differentiation to harvesting of the fruits;
- the sucker growth phase: from fruit harvesting to the destruction of the plant.

The parts of an adult pineapple plant are as follows:

- stalk: a short club-shaped stem that contains starch reserves and has a fibrous structure that makes mechanical destruction difficult;
- leaves: with a maximum of 70 to 80, these can be more than 1 m

- fruit: a compound fruit that is the equivalent of a fused, compressed bunch. Its weight depends on plant size at floral induction and the nutritional state of the plant at that stage. It is determined first of all by the number of eyes;
- crown: a leafy part topping the fruit;
- roots: underground and aerial. The underground roots are fragile and the slightest discontinuity of the soil profile strongly disturbs growth. The roots are put out in the first month after planting. They then just lengthen and no new root emission takes place before the fourth or fifth month;
- shoots: these are of two types—slips, that grow on the stalk beneath the fruit and true shoots that grow at the leaf insertion point on the stalk.

## Control of flowering

When the plant reaches the appropriate stage of development it becomes sensitive to climatic factors and meteorological factors (day-length, decrease of minimum temperature and cloud cover) that determine the differentiation of the inflorescence. Natural flowering then occurs that is not compatible with the commercial management of a plantation. Floral induction treatment (FIT) consists of changing the natural cycle of the plant for the following purposes:

- homogenisation of flowering;
- control of production;
- control of average fruit weight;
- harvest planning.

The date of FIT is determined according to:

- the harvest date desired;

- the FIT to harvest time for the period (historical or calculated from the sums of temperatures);
- plant weight (a good indicator being the weight of leaf 'D') that determines that of the fruit.

Three floral induction substances are used:

- acetylene in calcium carbide form: grains are placed in the centre of the floral rosette or mixed with water to make an acetylene solution;
- ethylene gas: less dangerous than acetylene, treatment with an ethylene solution can be mechanised;
- ethephon (Ethrel®): this is an ethylene generator. It is much easier to use than the first two alternatives but the results are often mediocre, especially in very hot conditions.

## Protection from sunscald

This seasonal phenomenon occurs above all during very sunny periods. Fruits that have lodged, whose stalks are too long or that have a deficient leaf system are those most exposed to sunscald. Several protective methods can be used: tying the leaves in a bunch over the fruit or the whole crop ridge, mulching with grass, lifting up lodged fruits.

Sunscald



Photos © Claude Teisson

## Ethephon

Ethephon is widely used around the world on flower, grain and fruit crops. France alone has no less than 24 registered uses in fruit growth, flowering and maturation processes.

Ethephon is registered for two specific uses in pineapple growing: for triggering the flowering process (floral induction treatment) and the regulation of fruit ripening (degreening). In both cases, the ethylene released by the product acts on physiological mechanisms.

Pineapple possesses the feature of being able to flower on request and floral induction is generally performed using gaseous ethylene dissolved in water. As application is a large operation, the process is generally used only on mechanised plantations. Another method used on small non-mechanised holdings is calcium carbide. However, this is somewhat dangerous as the acetylene gas released is inflammable and even explosive if it comes into contact with copper.




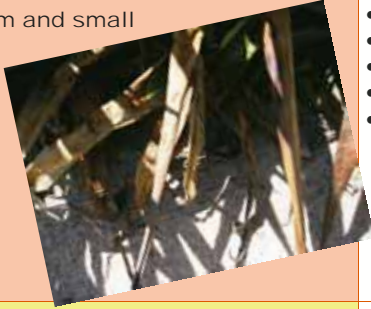
The product that is easiest to use is Ethephon, even though it is less effective on varieties such as 'Smooth Cayenne' and MD-2, more popularly known as 'Sweet'.

## Degreening treatment

This is performed by application of Ethrel and is to achieve homogeneous fruit colour and reduce the number of picking operations. Ethrel releases ethylene as it breaks down. It does not have an effect on all maturation phenomena but mainly targets colour. It must be applied fairly close to natural fruit maturity in order to be effective with no major disadvantages. Fruits treated in this way are easy to recognise as their colour is not scaled from bottom to top but uniform in the whole shell.



## Nutritional deficiency

	Required amounts	Symptoms	Critical level and analysis
<b>NITROGEN</b>	High 	<ul style="list-style-type: none"> <li>Pale colour. General yellowing of leaves.</li> <li>Older leaves show first symptoms.</li> <li>Reddish edges.</li> <li>Narrow leaves.</li> <li>Poor and stunted growth.</li> <li>Delayed fruiting.</li> </ul>	Deficiency detected by visual observations. <b>Critical level:</b> 0.10 % dry weight. Sample the centre portion of the D leaf for analysis.
<b>POTASSIUM</b>	High 	<ul style="list-style-type: none"> <li>In young plants leaves have dark green colour.</li> <li>In older plants leaves are yellow.</li> <li>Crown growth is excessive.</li> <li>Siamese crowns are produced.</li> <li>Slow growth of slips.</li> <li>Tips of old leaves die off.</li> </ul>	<b>Critical level:</b> 0.3% dry weight. Sample the basal portion of the D leaf for chemical analysis.
<b>CALCIUM</b>	It is required in large amounts when used as an amendment to the soil, but not in direct foliar sprays to the plant except for planting material production.	<ul style="list-style-type: none"> <li>Growth is stunted.</li> <li>Corky leaves.</li> <li>Short leaves.</li> <li>Stems are malformed.</li> <li>Fruit is abnormal (Siamese, multiple, fasciated).</li> <li>Plant has yucca appearance.</li> </ul>	<b>Critical level:</b> 0.010% fresh weight. Sample the basal portion of the D leaf for analysis because the colour of the leaves is not a key guide in determining deficiencies. Check pH of soil periodically.
<b>MAGNESIUM</b>	Medium 	<ul style="list-style-type: none"> <li>Older leaves have bright yellow colouring.</li> <li>There are less leaves per plant.</li> <li>Leaves are weak and necrotic.</li> <li>Plants have short stems.</li> <li>Appearance of leaves resembles sunburn.</li> <li>Poor root system.</li> <li>Poor fruit development.</li> </ul>	<b>Critical level:</b> 0.025% fresh weight. Sample the basal portion of the D leaf. Visual symptoms are difficult to observe and laboratory analyses are necessary to assess deficiencies.
<b>IRON</b>	Small	<ul style="list-style-type: none"> <li>Leaves are yellowish with green mottling.</li> <li>Tips of leaves become necrotic.</li> <li>Fruit is small.</li> <li>Fruit has red skin and is hard.</li> <li>Crowns have yellowish colour.</li> <li>Fruit shows cracks.</li> </ul>	<b>Critical level:</b> 3 ppm fresh tissue. Sample the middle portion of D leaf. Visual symptoms are used as a diagnosis for deficiencies and laboratory analysis is not always representative of the deficiency.
<b>PHOSPHORUS</b>	Medium and small 	<ul style="list-style-type: none"> <li>Poor root growth.</li> <li>Delayed growth.</li> <li>Older leaves have purple/red colouring.</li> <li>Leaves have yellow edges.</li> <li>Poor fruit development.</li> </ul>	Visual symptoms are rarely observed with normal fertiliser practice. The symptoms can be noticed only when the deficiencies are severe. For this reason leaf tissue analysis is required for diagnosis. <b>Critical level:</b> 0.020 % fresh weight. Sample: basal portion of the D leaf. Excess of phosphorus can reduce plant growth.
<b>ZINC</b>	Small	<ul style="list-style-type: none"> <li>Crooked neck on young plants.</li> <li>The heart leaf becomes hard and brittle.</li> <li>Blisters appear on the upper surface of leaves.</li> <li>The crowns are small and rosette.</li> <li>The plants become bunched.</li> </ul>	<b>Critical level:</b> Only the sampling of the tip of the stem will provide a reliable indication of the zinc content. Leaf analysis is not reliable. Look for visual symptoms.
<b>BORON</b>	Small	<ul style="list-style-type: none"> <li>Peel will develop corky tissue.</li> <li>Corky flesh develops on and in between eyes.</li> <li>Cracks develop on and between fruitlets.</li> </ul>	<b>Critical level:</b> The symptoms are unknown. Deficient plants will not have any symptoms in leaves, stems or roots. Check fruit visually for symptoms of deficiency.

Source: PIP

© Photos Claude Teisson



## The main pineapple varieties

'Smooth Cayenne' was for a long time practically the only variety exported fresh and canned. The Hawaiian hybrid 'MD-2' took over its position on the fresh pineapple market, mainly as a result of its extraordinary capacity for withstanding cold and transport. The robustness of this fruit after harvesting was hitherto unknown and is opening up new prospects in the breeding of new varieties by hybridisation. Other varieties with good taste qualities are preferred on domestic markets but do not keep at all well: 'Perola' in Brazil and 'Queen' in Asia and the Indian Ocean.

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### 'Sweet'

**Leaf edges:** spines occur irregularly along both margins  
**Fruit shape:** cylindrical  
**Fruit colour:** green & yellow  
**Fruit eye diameter:** medium  
**Fruit eye profile:** flat  
**Flesh colour:** yellow  
**Flesh firmness:** medium  
**Flesh texture:** smooth  
**Weight without crown:** 1 300 g

**Height without crown:** 143.4 mm  
**Diameter:** 115.7 mm  
**°Brix :** between 12.8 and 13.7  
**Acidity (meq%ml):** between 6.15 and 10.10  
**Sugar/acid ratio:** between 1.31 and 2.11  
**Flesh maturity homogeneity from the bottom to the top:** homogeneous  
**Agronomic potential:** high yielding. Maturation more rapid than Smooth Cayenne (- 4 to - 5 days)  
**Susceptibility:** low susceptibility to core rot, very susceptible to *Phytophthora*, average susceptibility to soil pests  
**Post-harvest potential:** good, not susceptible to internal browning

### 'Smooth Cayenne'

**Leaf edges:** spines behind tip only  
**Fruit shape:** cylindrical  
**Fruit colour:** green & yellow  
**Fruit eye diameter:** medium  
**Fruit eye profile:** slightly prominent  
**Flesh colour:** pale yellow  
**Flesh firmness:** medium  
**Flesh texture:** smooth  
**Weight without crown:** 1 410 g

**Height without crown:** 148.2 mm  
**Diameter:** 120.7 mm  
**°Brix :** between 14.5 and 16.5  
**Acidity (meq%ml):** between 13.5 and 15.0  
**Sugar/acid ratio:** between 1.0 and 1.2  
**Flesh maturity homogeneity from the bottom to the top:** with a gradient  
**Agronomic potential:** high yielding  
**Susceptibility:** susceptible to core rot, susceptible to *Phytophthora*, susceptible to soil pests  
**Post-harvest potential:** good, susceptible to internal browning



### 'Victoria'

**Leaf edges:** spines along all margins  
**Fruit shape:** trapezoid  
**Fruit colour:** golden yellow  
**Fruit eye diameter:** small  
**Fruit eye profile:** prominent  
**Flesh colour:** yellow  
**Flesh firmness:** medium  
**Flesh texture:** crisp  
**Weight without crown:** 1 200 g



**Height without crown:** 171.6 mm  
**Diameter:** 107.6 mm  
**°Brix :** 14.8  
**Acidity (meq%ml):** 10.9  
**Sugar/acid ratio:** 1.36  
**Flesh maturity homogeneity from the bottom to the top:** with a medium gradient  
**Agronomic potential:** good yielding. Maturation more rapid than Smooth Cayenne (- 10 to - 15 days)  
**Susceptibility:** very susceptible to core rot, susceptible to *Phytophthora*, susceptible to soil pests  
**Post-harvest potential:** very susceptible to internal browning

Note: under production conditions in Martinique, source CIRAD





# Pineapple quality defects

Photos © Patrick Fournier, Pierre Gerbaud,  
Horta Gabon



Internal browning



Internal browning



*Thielaviopsis paradoxa*



*Thielaviopsis paradoxa*  
on a lateral blemish



Beginning of *Thielaviopsis paradoxa*  
on peduncle



Sunscald on 'Victoria'



Sunscald on 'Victoria'



Over-ripeness



Scales



Attack by insects



Crack  
malformation or deformity



Colour variation  
in the same batch



Damaged, scorched crown



Crown too long  
and crushed by box lid





Beginning of internal browning



Beginning of internal browning  
in 'Victoria'



*Thielaviopsis paradoxa*



*Thielaviopsis paradoxa*  
external appearance



Beginning of *Thielaviopsis paradoxa*  
on a blemish



Pulp deterioration  
in 'Sugarloaf'



Translucent



Mould (*Penicillium*)  
on peduncle after transport



Mould after transport



Micro-bruising



Dry bracts  
on 'Victoria'



Peduncle cut  
irregularity



Irregular crown size



Poorly reduced crown



Double crown