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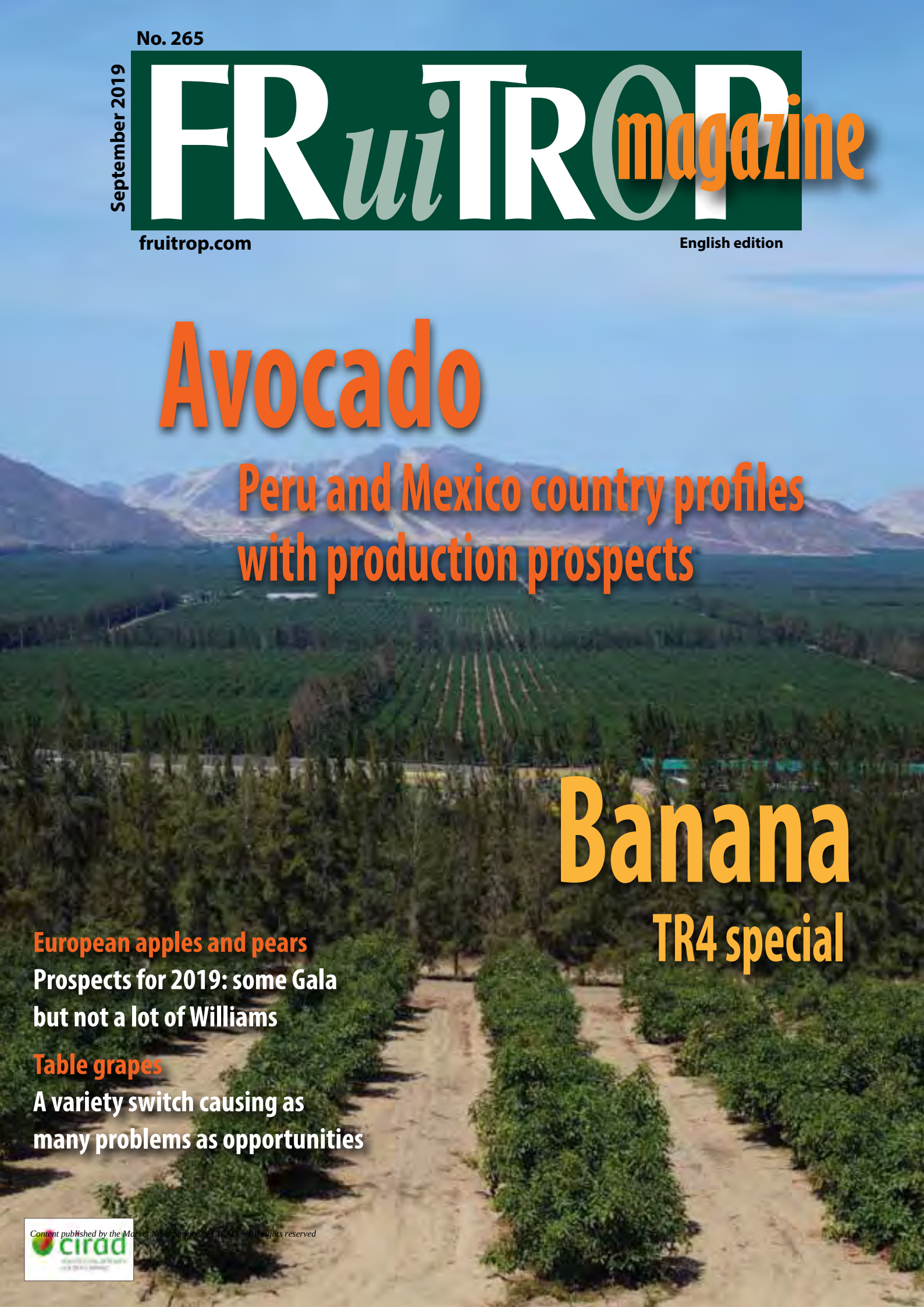

Avocado

Peru and Mexico country profiles with production prospects

Banana

TR4 special

European apples and pears
Prospects for 2019: some Gala but not a lot of Williams

Table grapes
A variety switch causing as many problems as opportunities

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Growers at heart

Editorial

Banana hogging the fruit media limelight

This summer's saga of course revolved around the detection, for the first time on the South American continent (North-East Colombia, to be precise), of fusarium wilt Tropical Race 4. This edition of **FruiTrop** publishes an initial memorandum drawn up by CIRAD's researchers on this disease and its consequences (downloadable for free in French, English and Spanish at fruitrop.com). It comes a terrible blow to the entire world banana sector. The time has come to strengthen biosecurity policies, since if there is just one lesson to take away, it is that we need to pull out all the stops to prevent the arrival of the disease. While we know how to guard against the disease, there are no solutions for getting rid of it. Another highlight of the banana news is the Abidjan Appeal (21 September 2019), which enabled ACP banana producers, mistreated for years by the EU through its commercial negotiations with the dollar banana suppliers, to make themselves heard. Providing a total of one million tonnes of bananas consumed on the European market (Côte d'Ivoire, Cameroon, Ghana, Dominican Republic and Belize), and counting on the very involved political support of their governments and the presence of observers from the Canaries, they sent a powerful signal to the European Commission. They called for an end to the progressive lowering of customs duty to 75 euros/tonne for the dollar banana, the implementation of an effective monitoring system on the European banana markets, and the renewal of an aid programme for the ACP industries. We are now expecting European producers to follow in their footsteps, initially at the European Parliament on 9 October. Fundamentally, the two claims are practically identical, except in terms of support for production, with the Europeans preferring a specific mechanism (POSEI). The futures of the two main procurement sources are objectively linked. Their degree of influence over the reform (or otherwise) of the organisation of the European market is one of the challenges for the months ahead. The pressure placed on European decision-makers (Member States and European institutions) will be proportional to the individual or joint actions that they decide to take. Undoubtedly, this is the final chance to put a stop to the dreadful liberal drain dating back to the 2000s, when globalisation and deregulation were inherently wonderful.

Denis Lœillet

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Contents

Close-up Avocado

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Banana

prepared by Denis Lœillet




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EU banana supply: big downturn in June.

We need to go back to 2015 to see such a low supply level to the EU in June: barely 480 000 tonnes (- 8 %). We should note that this follows two record months (April and May) of more than 600 000 t each. Over twelve months (July 2018-June 2019), the market tallied up 6 452 000 t, very slightly down on the previous period. For the 1st half of 2019, the supply (across all origins) dropped back slightly below 3.4 million tonnes (3 374 000 t exactly). The dollar group registered a poor performance, with a fall of 3.3 % from the 1st half of 2018, though it remained 3 % above the three-year average. Among the major origins, Ecuador, Costa Rica, Peru and to a lesser degree Colombia scaled back their shipments. Conversely, Panama and above all Guatemala set new records month after month (+ 97 % for Guatemala). For the ACP origins, the results from Africa (- 4 %) were still very much defined by the Cameroonian shortfall. Surinam continued to fall, as did Saint Lucia. Belize confirmed a fine recovery. Côte d'Ivoire achieved a moderate rise. It was the Dominican Republic which saw the biggest increase (+ 29 %), thereby returning to similar levels to 2016 (pre-floods). European production was back on an upturn, especially thanks to French production. The situation was very mixed for the Canaries, with a production shortfall at the beginning of the year, and a surge in the supply in Q2.

Source: CIRAD

Banana – EU – Supply from January to June 2019 (provisional)

000 tonnes	2017	2018	2019	2019/2018 difference
EU-28 - Supply	**3 328**	**3 413**	**3 374**	**- 1.1 %**
Total import, incl.	**3 027**	**3 129**	**3 068**	**- 2.0 %**
MFN	2 470	2 605	2 520	- 3.3 %
ACP Africa	334	313	300	- 4.1 %
ACP others	224	212	248	+ 17.0 %
Total EU production, incl.	**301**	**284**	**307**	**+ 8.0 %**
Martinique	61	62	78	+ 24.7 %
Guadeloupe	24	10	20	+ 99.2 %
Canaries	205	202	199	- 1.3 %

Sources: CIRAD, EUROSTAT (excl. EU local production)

Photos © Carolina Dawson

Banana – USA – Supply from January to June 2019 (provisional)

000 tonnes	2017	2018	2019	2019/2018 difference
Import USA	**2 456**	**2 428**	**2 357**	**- 3 %**
of which organic	214	238	219	- 8 %
Re-exports to Canada	294	292	294	+ 1 %
Net supply	2 163	2 136	2 062	- 3 %

Source: US Customs

USA banana supply: on the wane.

Banana consumption in the USA fell by 3.5 % in the 1st half of 2019. Apart from April, every month was down on 2018. Nonetheless, over twelve months (July 2018-June 2019), the damage was limited to approximately - 2 %. Over the 1st half, we can note a very marked fall from Costa Rica and Colombia, and a smaller one from Guatemala and Ecuador. Just three origins emerged unscathed: Honduras, Mexico and Peru. Relatively speaking, the organic segment was hardest hit by this fall, with a downturn of more than 8 %. Its market share (for USA + Canada) slipped down to 9.3 %.

Source: CIRAD

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Ecuadorian banana: growth focused on Asia.

After setting an export record in 2018 (340 million boxes across all destinations), Ecuador, the world number one banana exporter, continued its surge over the first eight months of 2019. While the growth rate seems less frenetic than in the past (+ 2 % rise from January to late August compared to the same period in 2018), this additional 100 000 tonnes shows the remarkable resilience of the Ecuadorian production sector, especially in spite of the El Niño phenomenon which brought some floods in March 2019. This is the result of structural growth in production (new plantations entering production, some of which in organic), coupled with productivity gains and the State setting up flood prevention infrastructures.

Paradoxically, over the first seven months of the year, volumes aimed at Ecuador's main outlets registered performances bucking the general upward trend of 2019. There was no sign of growth on the US market, where Ecuadorian volumes remained practically the same as in 2018, or in Russia where they decreased by 1 %. Worse still, in the EU, the main market for the Ecuadorian banana, the origin was down by 7 %. This can probably be blamed on fewer contracts being signed for 2019, due to the fall in prices condemned by the main exporter countries in late 2018, and the rise of competing origins with low-cost strategies (Guatemala and Panama).

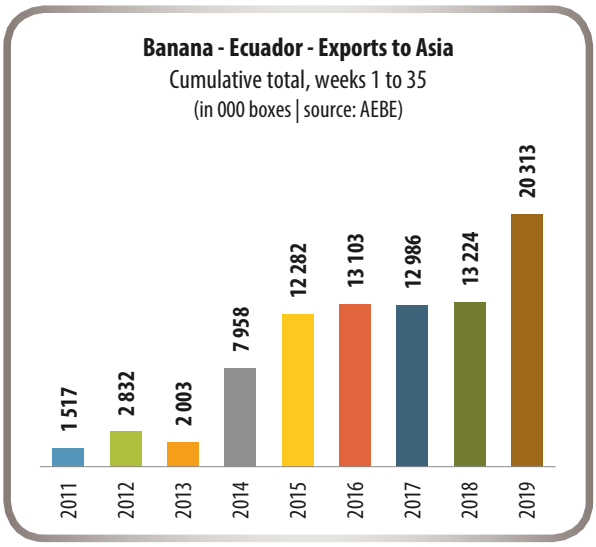
So the search for alternative outlets proved to be vital for the Ecuadorian giant, which saved its skin thanks among other things to Asia's growing appetite. Over the first eight months of 2019, Ecuador was up by more than 50 % on 2018 in Asia, i.e. an increase of more than 130 000 t. We might even conclude that the entire growth in exports was focused on the Asian markets. We should emphasise that the sudden awakening of the Chinese market observed in 2018 is continuing, and even intensifying. Ecuador is also on a marked rise to the Middle East and North Africa (especially Algeria).

Source: CIRAD

Rainforest Alliance: to be completed...

"Patience and time do more than strength or passion", as the great French writer La Fontaine said. And patience is what will be required to bring about a genuine realisation. As proof, I present the recent release by the Action Alliance For Sustainable Bananas (https://www.bananenbuendnis.org/en/ra_consultation/), expressly requesting that the specifications for the Rain Forest Alliance banana – the world's most widespread certification – require a little more in the way of social and environmental aspects. To put things simply, the German organisation is calling for an end to the con artistry. It proposes five points: establishing a minimum guaranteed price, granting children an entitlement to education, promoting biodiversity, reducing pesticide use, and finally taking biosecurity measures (e.g. TR4). These five themes relate to the social fundamentals: revenue, education and health in the broad sense for populations (including local residents) and ecosystems. Implicitly, we might expect that members of the ABNB (which include the transnational Fyffes) would want to go beyond the performance bond, and move onto factors actually affecting the most fragile populations in the industry; in summary, to bring about positive life-changing effects on the populations, rather than undertaking mere communication action! The first publications on the theme "beyond performance alone, toward impact" were published by CIRAD and IRSTEA in the early 2000s. In 2016, the UNFSS (United Nations Forum on Sustainability Standards) insisted on this, recommending certifiers get together to be "able to generate impacts". Realistically, this realisation will be a very, very long process, but I want to believe that there is no possible way back, and that the agricultural industries, in both the North and South, will become increasingly virtuous... or cease to exist.

Source: Denis Lœillet



Spanish vegetables: initial info on the 2019-20 campaign.

The very first info on the 2019-20 Almería campaign points to overall stability in vegetable surface areas, according to seed producers, with an ongoing transfer between species in view of the results from previous years. The balance of the 2018-19 Almería campaign is deemed acceptable by the professional organisation COEXPHAL, with overall turnover (T/O) for the Almería production zone up by 3 % on 2017-18. And while certain products suffered from poor conditions in the spring, leading to a 32 % fall in T/O for the watermelon (+ 10 % in terms of volume, and - 38 % in terms of price), others are doing not so badly, such as the tomato with a 10 % increase in T/O (- 2 % in terms of volume, and + 12 % in terms of value), but above all the courgette with a 25 % rise in T/O (+ 28 % in terms of volume, and - 2 % in terms of price). The cucumber campaign was uneven, but in the end it was down by just 1 % (+ 2 % in terms of volume, and - 1 % in terms of price). Results were rather satisfactory for the pepper and aubergine, with T/O increases of 7 % and 8 % respectively. Nonetheless, the association has reiterated that increasing production costs are curtailing producers' results. Hence this year another expansion in surface areas is expected in this zone of 8 to 10 % for the pepper, as well as for the courgette and aubergine. Conversely, there could be another production fall for the tomato, of approximately 10 %, especially in the loose segment but also small sizes, given the labour-intensiveness of these products compared to other greenhouse forms. Producers are concerned at the drought, which could cause adverse consequences for the crops. Finally, we should highlight how early planting was this year, brought forward to early July or even late June for the first pepper crops, so as to generate revenue quicker. Furthermore, producers remain concerned at the prospect of Brexit. Hence Canarian producers, fearful of no longer receiving POSEI aid to export to this destination, which takes in 50 % of tonnages, have opted to take pre-emptive action by scaling back their production. The level could fall by 15 % in the course of this campaign for the tomato, while the number of cucumber producers could undergo a threefold decrease.

Source: Infofruit

© Régis Domergue

European table grape: 2019 campaign delayed.

This year's European grape campaign has sustained a ten-day delay because of the cold weather in May. It started in late August, with the Italia variety in Sicily, and is not set to start in Puglia until in early September. There are already fairly big Red Globe and seedless volumes (25 to 30 % of production as opposed to 40 % for Italia). Muscat volumes are surging in South-East France, but are barely getting started in Chasselas. There is a good supply level from Murcia, with seedless grapes still making progress (proliferation of planting, 15 % of surface areas of partner companies have been converted, i.e. 900 ha). The campaign has started in Valencia with the Ideal variety supplementing the Red Globe supply. Italy, in France and Spain should have a normal potential, since weather conditions were favourable to flowering in all the production zones, without any major climate incidents. The sugar content is high because of the heat. Exports remain boosted by the progress made by seedless varieties aimed at Northern Europe. Last year Spanish shipments to the United Kingdom set a new record, but Brexit is concerning operators with a view to the coming campaigns.

Source: Infofruit

Table grape – Europe – Production

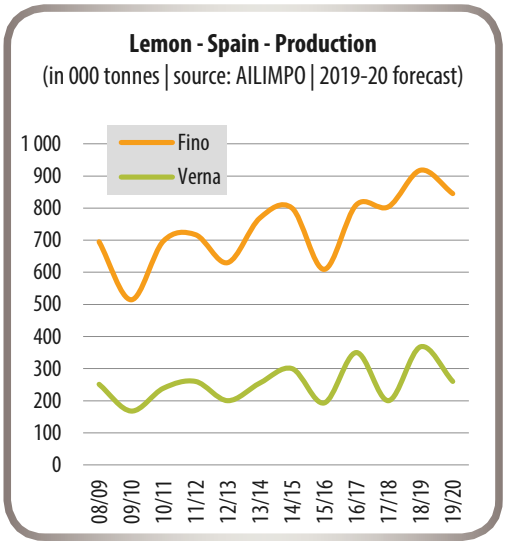
in tonnes	2018
Italy	1 028 107
Spain	272 833
France	40 794

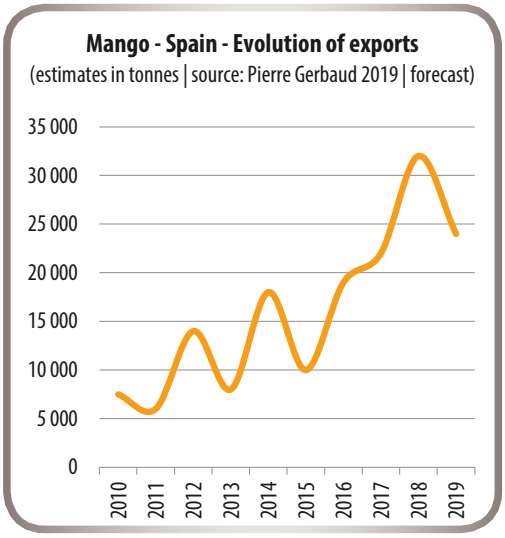
Sources: ISMEA, SAA, MARM

Spanish lemon: production falling but maintaining a good level.

2018-19 was a record season in terms of production. Despite a 14 % fall, the 2019-20 harvest is maintaining a very good level (4 % above average) with an expected 1.1 million tonnes. The big rise in surface areas registered in recent seasons is helping mitigate the alternate bearing phenomenon (4 million trees planted between 2011 and 2018, 80 % as part of expansions). The supply level will continue to decline. It will remain high in the first part of the season (good Primofiore production in the early-season segment), and then ebb with a more moderate supply of this same variety during the second part of the season, before dropping into a significant shortfall for the end-of-season cultivar Verna (6 % below average).

Source: AILIMPO





Spanish mango: 2019 set for a leaner campaign.

The Spanish mango shipment campaign began in late August with quantities still below par. The campaign should be smaller, with volumes down 20 to 30 % in the Osteen variety, the spearhead of Spanish production. This fall is apparently attributable to the weather conditions and to the alternate bearing phenomenon in the orchards. The increase in volumes of this variety will probably arrive in mid-September, and continue until late October. Some batches of Tommy Atkins and Irwin are already supplying certain European markets. Kent, also registering a drop in quantity, should be available in late September-early October. The Keitt supply is anticipated in October and November. In October, the Spanish range should be enriched with some batches of Palmer.

According to the Málaga Young Growers' Association, annual mango consumption in Spain has gone up from 0.210 g to 0.580 g/capita over the past five years.

Source: Pierre Gerbaud

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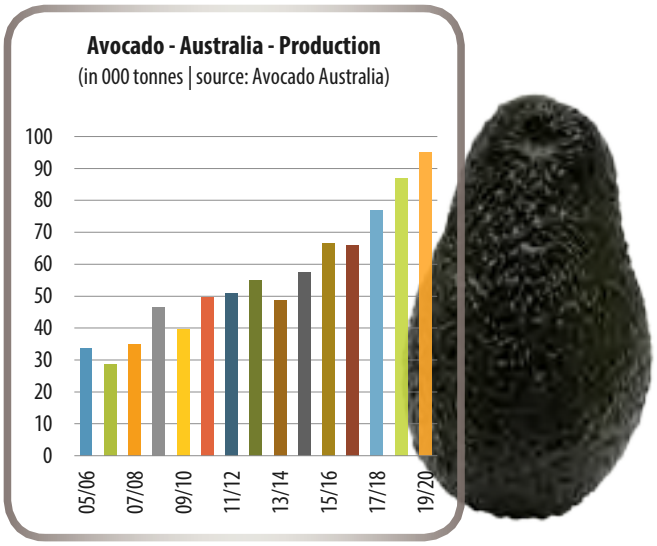
Australian avocado: record harvest in 2019-20.

Australian production will continue to come to the fore in 2019-20, with an expected harvest of 95 000 t (+ 9 % on 2018-19). An expanding cultivation area is behind this dynamic, which is not set to slack off over the coming years. The number of trees planted has doubled in the past six years, reaching 6 million; production should hit the 115 000-t mark in 2025. The bulk of the harvest will still be aimed at the local market, still growing but where annual consumption had already reached 3.5 kg/capita in 2017-18. So the exports sector will need to step up from the minor leagues (1 500 to 2 500 t in recent seasons, primarily aimed at Malaysia and Singapore).

Source: Avocado Australia



Guacamole: beware of counterfeits!

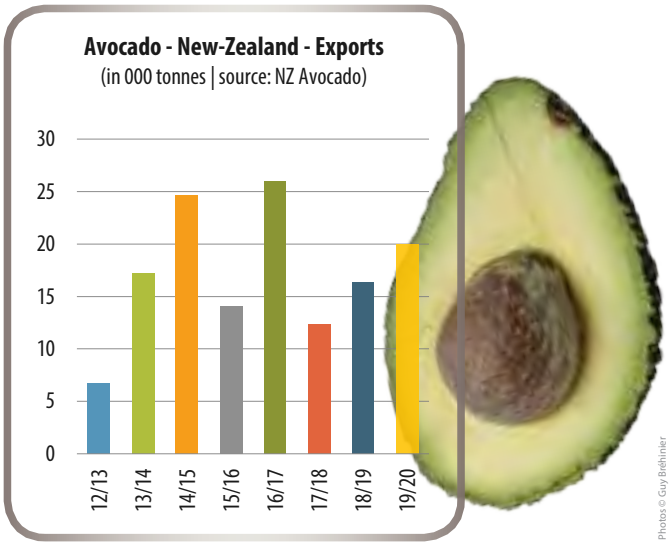
Guacamole is all the rage, delicious and full of nutritional virtues. But in the face of the rising prices of the highly sought-after avocado, caterers are ripping customers off, now replacing its precious pulp with marrow, or even broccoli or peas. The phenomenon has been reported in the USA and has now, in the utmost outrage, reached Mexico itself! Fake guacamole is even knocking on our doors, with the boom on the web of more or less appetising ersatz recipes. In short, "the butter of the gods" is being transformed into common margarine. Success does lead to copies and imitation. The giants of the luxury sector know this, and now so too do avocado producers.

Sources: Slate, ABC

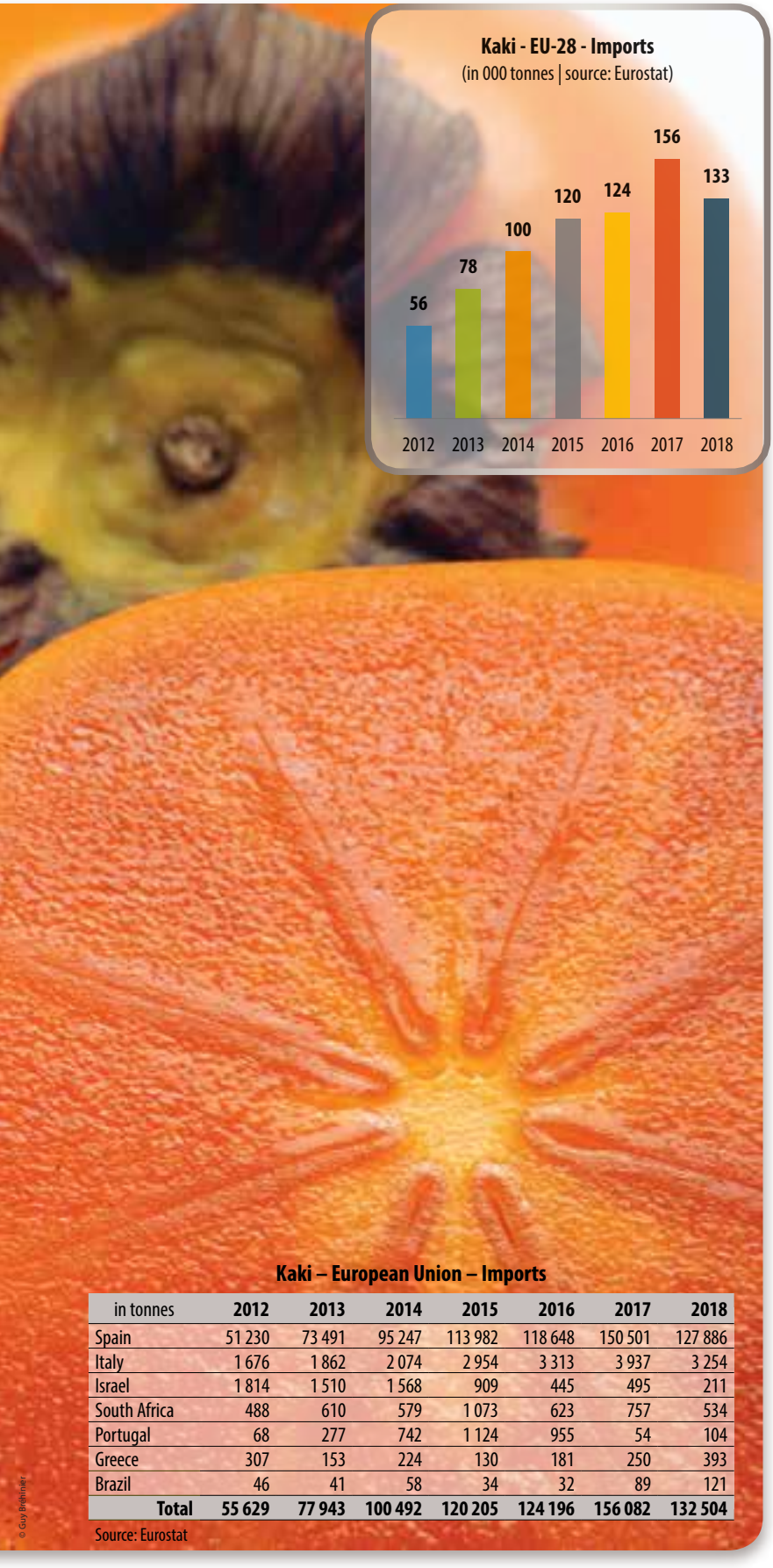
New Zealand avocado: harvest almost record in 2019-20.

New Zealand too could have enjoyed a record season in 2019-20, but the period from October to November, crucial for fruit-setting, was very rainy. Hence with just over 20 000 t expected, the export potential climbed by approximately 25 % from last year's lean season, though it remained well short of the 2016-17 record. As regards the outlets, the surge of Australian production is changing the hand. Still 70-80 % dependent on this neighbouring market, New Zealand needs to diversify its customer portfolio, and in particular is targeting Asia (Japan, South Korea, Thailand, Singapore and China). The objective is for their market share to reach 50 % by 2023.

Source: NZ Avocado



Photos © Guy Brehinier



© Guy Bréhinier

Kaki – European Union – Imports

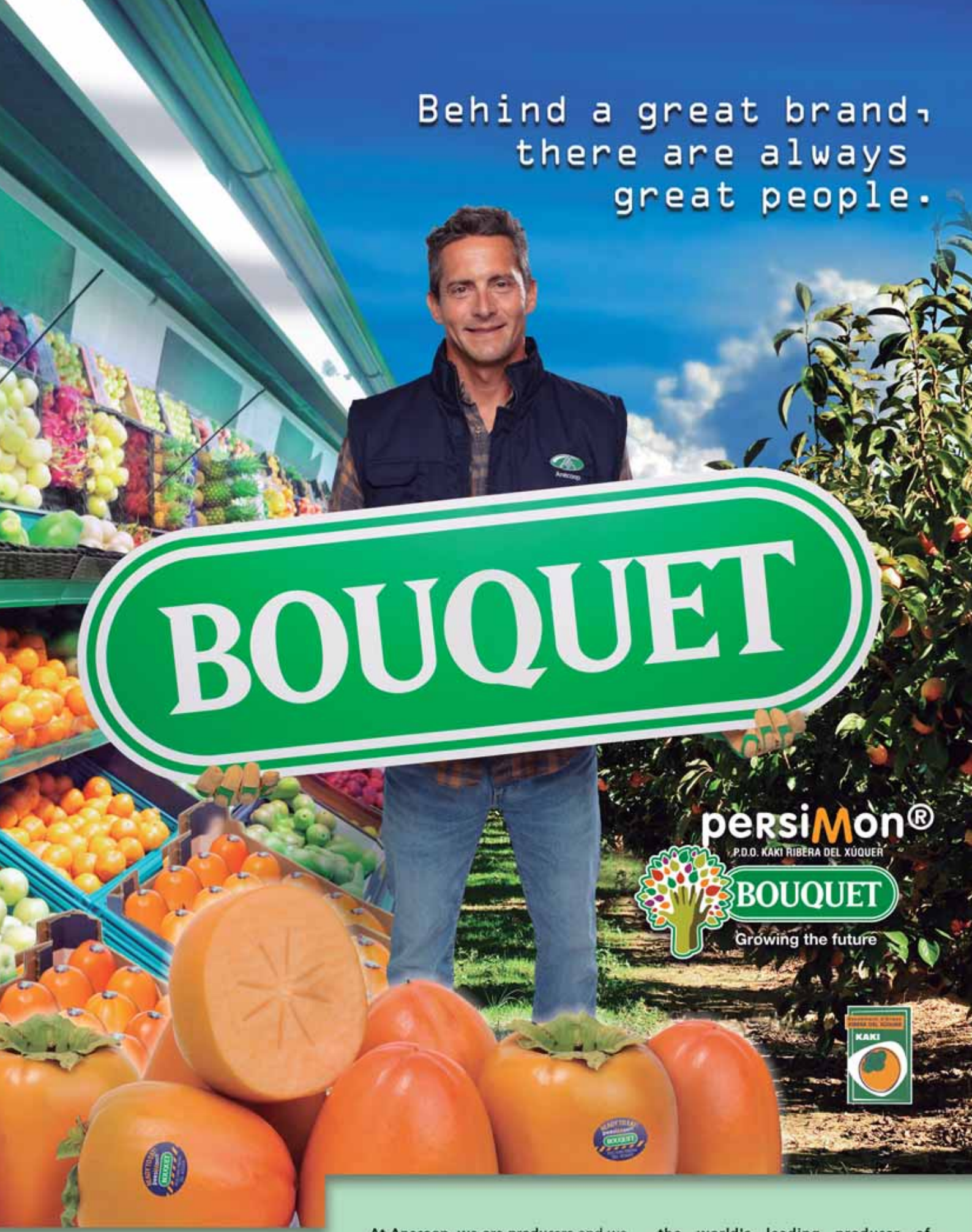
in tonnes	2012	2013	2014	2015	2016	2017	2018
Spain	51 230	73 491	95 247	113 982	118 648	150 501	127 886
Italy	1 676	1 862	2 074	2 954	3 313	3 937	3 254
Israel	1 814	1 510	1 568	909	445	495	211
South Africa	488	610	579	1 073	623	757	534
Portugal	68	277	742	1 124	955	54	104
Greece	307	153	224	130	181	250	393
Brazil	46	41	58	34	32	89	121
Total	**55 629**	**77 943**	**100 492**	**120 205**	**124 196**	**156 082**	**132 504**

Source: Eurostat

Spanish Persimmon kaki: some fine prospects.

The Spanish Persimmon kaki campaign is in the starting blocks. The climate conditions were favourable this year in the absence of major weather incidents. Trading should start around the end of September, and extend into February with a high potential. Surface areas are constantly expanding in the Valencia zone (approximately + 50 % per year), where the bulk of volumes are packed; this region was awarded the appellation "Ribera del Xúquer" in 2009. This production began its rise to the fore in the 1980s when producers adopted a method eliminating astringency without waiting for the kaki to over-ripen (several hours' treatment in a saturated CO_2 atmosphere), rather than planting low-astringency "kaki apple" varieties such as Fuyu or Sharon. Known as Persimmon, this Spanish kaki has a firm and crunchy flesh. This crop has won over many producers, and progress has further gathered pace in recent years with the replacement of orange orchards by persimmon plantations. Volumes are seeing big increases, with the young orchards entering production, and could reach a potential of 500 000 t in 2020. For now, the Anecoop cooperatives group is already expecting a record harvest this year, which should achieve twice or even 2.5 times the tonnage of two years ago, i.e. more than 300 000 t, after a 2018 campaign cut short by hail. Consumption has also been up in many countries, especially in Eastern Europe. Poland, the Czech Republic and Slovakia are registering big demand, while consumption never fails to disappoint in Germany, the main destination for the Spanish Persimmon kaki, while many other countries such as France are seeing rises. The recent switch to sales by the kilo (in punnets) has also made the product more accessible to consumers, while the marketing campaigns are boosting purchases. Hence Anecoop should repeat its tasting events in the supermarket sector and at wholesale markets (Rungis and Lyon in France), and has once more scheduled a TV campaign to boost mid-season sales (between week 43 and week 46). The brand also has a social media profile (Facebook, Instagram, LinkedIn). Its range is expanding a little more every year, and is now set to extend into the private label segment. The kaki is also already available in organic form (300 t on the French market last year, from Solagora), and since last year in zero pesticide residue form from Anecoop.

Source: Infofruit



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European apples and pears

Prospects for 2019
Some Gala but not a lot of Williams

The European apples and pears forecasts were unveiled in early August at the 43rd Prognosfruit conference, which was held in Belgium. Unsurprisingly, they reflected the expected swing in apple production, after the record harvest registered in Eastern Europe in 2018, but also pointed to an average harvest for the pear, set for a shortfall mainly in Southern Europe.

© Régis Domergue

Apple – EU-28 – Harvest forecast

in 000 tonnes	2019	2019 compared to	
		2018	5-year average
Western Europe	**6 786**	**- 1 %**	**+ 3 %**
Italy	2 195	- 3 %	0 %
France	1 652	+ 12 %	+ 10 %
Germany	912	- 17 %	- 5 %
Spain	542	+ 14 %	+ 11 %
Portugal	307	+ 15 %	+ 6 %
Netherlands	285	+ 7 %	- 5 %
Greece	275	- 9 %	+ 8 %
Belgium	229	- 1 %	- 1 %
United Kingdom	210	- 4 %	- 8 %
Austria	144	- 22 %	+ 10 %
Sweden	20	- 38 %	- 7 %
Denmark	15	- 38 %	- 36 %
Eastern Europe	**3 770**	**- 41 %**	**- 28 %**
Poland	2 710	- 44 %	- 30 %
Hungary	452	- 42 %	- 31 %
Romania	319	- 25 %	- 6 %
Czech Rep.	113	- 22 %	- 16 %
Croatia	60	- 30 %	- 14 %
Slovenia	47	- 30 %	+ 3 %
Slovakia	36	- 18 %	+ 11 %
Lithuania	22	- 65 %	- 53 %
Latvia	11	- 21 %	+ 10 %
Total	**10 556**	**- 20 %**	**- 11 %**

Source: WAPA

Apple – EU-28 – Harvest forecast by variety

in 000 tonnes	2019	2019 compared to	
		2018	5-year average
Golden Delicious	2 327	- 3 %	- 2 %
Gala	1 467	+ 1 %	+ 9 %
Red Delicious	656	- 11 %	+ 1 %
Idared	552	- 53 %	- 46 %
Shampion	466	- 18 %	- 7 %
Jonagold	431	- 25 %	- 21 %
Granny Smith	377	- 4 %	- 2 %
Elstar	355	- 1 %	- 3 %
Fuji	332	+ 14 %	+ 9 %
Cripps Pink	299	+ 9 %	+ 16 %
Braeburn	294	- 6 %	- 2 %
Jonagored	228	- 60 %	- 53 %
Pinova	151	- 3 %	+ 39 %
Gloster	146	- 23 %	- 22 %
Grey Russet	129	- 9 %	+ 9 %
Jonathan	95	- 42 %	- 35 %
Boskoop	59	- 11 %	- 11 %
Morgendurf/ Imperatore	57	- 2 %	+ 1 %
Cox Orange	16	- 30 %	- 42 %

Source: WAPA

Slightly more apples in Western Europe

So the pressure should ease slightly from 2018-19. Indeed the European harvest is set to be more in line with average for the season. It should be around 10 million tonnes, i.e. slightly below the three-year average (- 8 %), and well below the 2018 campaign, which was a record (- 20 %). Nonetheless, the trend taking shape above all reflects the big production fall expected in all the East European Member States (3.77 million tonnes, i.e. 28 % below the 3-year average), and in particular the downturn in Poland after a record year (2.71 million tonnes, i.e. - 31 %). Things are completely different in Western Europe, which is set for a bumper harvest (6.78 million tonnes), with Southern Europe returning to production, especially France (1.65 million tonnes, i.e. + 12 %), and Italy albeit with slightly smaller production than last year (2.15 million tonnes, i.e. + 6 %), as well as Spain (542 000 t, i.e. + 12 %) and Portugal (307 000 t, i.e. + 9 %). And while other countries in this zone are anticipating a downturn from 2018, the production should in most cases be at least average for the season, if not higher. Hence there should for example be a normal harvest for Germany (912 000 t), although it will be 17 % less than in 2018.

Good volumes for seasonal varieties

This dichotomy should also be found in terms of varieties. Hence some will be in shortfall, especially the Jonagold/ Jonagored group (960 000 t, i.e. 31 % below the 3-year average), as well as Idared (924 000 t, i.e. - 40 %). Like last year, the Gala harvest should reach its optimum, without exceeding it (1.46 million tonnes, i.e. + 9 %). Similarly, while a downturn in quantities from last year is expected for most bicoloured apples, tonnages should nonetheless be above average, especially for Braeburn (294 000 t, i.e. + 4 %) or Fuji (332 000 t, i.e. + 15 %). Cripps Pink (nearly 300 000 t, i.e. + 13 %) and the modern varieties (377 000 t, i.e. + 48 %) should start climbing once again. There should be a good production level for Golden (2.32 million tonnes, i.e. + 4 %). Granny volumes will in principle be stable (377 000 t, i.e. - 1 %).

And less pears in the Southern Europe

Unlike the apple, the season could be marked by a fairly pronounced shortfall in Southern Europe, mainly for summer pears, but also autumn-winter pears. Hence the harvest could barely reach 2 million tonnes Europe-wide (-14 % on 2018 and 9 % below the 3-year average). This fall is above all attributable to Italy, where production is expected to be lean (511 000 t, i.e. - 29 %), which the country has not seen in twenty years. The shortfall could also be fairly marked in France (115 000 t, i.e. 15 % below average). However the harvest should be normal in Portugal (152 000 t, i.e. - 1 %) and Spain, since while this origin is back in production after last year's downturn, the harvest should be around average for the season (311 000 t, i.e. - 1 %). Similarly, production should be moderate in Benelux (331 000 t in Belgium and 379 000 t in the Netherlands), though slightly below last year's good levels.

Pear – EU-28 – Harvest forecast

in 000 tonnes	2019	2019 compared to	
		2018	5-year average
Western Europe	**1 916**	**- 14 %**	**- 13 %**
Italy	511	- 30 %	- 30 %
Spain	311	+ 4 %	- 8 %
Netherlands	379	- 6 %	+ 5 %
Belgium	331	- 10 %	- 5 %
Portugal	152	- 6 %	- 5 %
France	115	- 14 %	- 17 %
United Kingdom	20	- 13 %	- 17 %
Germany	37	- 18 %	- 3 %
Eastern Europe	**131**	**- 10 %**	**+ 5 %**
Poland	70	0 %	+ 19 %
Hungary	32	- 16 %	- 13 %
Romania	17	- 19 %	+ 8 %
Total	**2 047**	**- 14 %**	**- 12 %**

Source: WAPA

Providing relief for the early and mid-season

It is above all the summer varieties which will be in short supply: this will be the case for Guyot/Limonera (56 000 t, i.e. 8 % below the 3-year average), Blanquilla (39 000 t, i.e. - 5 %), Coscia (66 000, i.e. - 8 %) and above all Williams (230 000 t, i.e. - 13 %). The autumn varieties seem to be less affected, with a fairly sound harvest expected for Conference (910 000 t, i.e. - 1 %) or Rocha (152 000, i.e. - 1 %), although we should highlight the big shortfall expected for Abate (211 000 t, i.e. - 34 %), and to a lesser degree for Comice (62 000 t, i.e. - 16 %) ■

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Pear – EU-28 – Harvest forecast by variety

in 000 tonnes	2019	2019 compared to	
		2018	5-year average
Conference	910	- 8 %	- 3 %
William BC	230	- 15 %	- 15 %
Abate Fetel	211	- 34 %	- 35 %
Rocha	152	- 6 %	- 5 %
Coscia-Ercollini	66	- 6 %	- 9 %
Comice	62	- 24 %	- 23 %
Guyot/Limonera	56	- 3 %	- 13 %
Blanquilla	39	- 3 %	- 10 %
Kaiser	21	- 53 %	- 49 %
Passe-Crassane	7	- 30 %	- 34 %
Durondeau	3	- 25 %	- 25 %
Others	290	- 12 %	- 6 %

Source: WAPA

A variety switch causing as many problems as opportunities

The table grape business had a watershed moment approximately five years ago, when there was an explosion of new varieties released to producers all over the world by major breeders IFG, SNFL, Grapa Varieties and Sun World Innovations. Much as though the established commodity apple varieties Golden Delicious, Braeburn and Granny Smith have been superceded by Gala, Jazz, Pink Lady et al., 'public' stock varieties Thompson and Flame Seedless are being grubbed in favour of the licensed Sweet Globe, Arra15, Sable and Scarlotta. However it appears that the switch is causing almost as many problems as it has created opportunities.

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The first of these relates to recognition. In contrast to apples or potatoes, where consumers can readily identify the varieties on supermarket shelves, supermarkets classify grapes (in the United Kingdom) into generic white seedless, red seedless and black seedless (and mixed). In the two decades since deregulation of the South African deciduous industry, the once prevalent black and white seeded varieties have been replaced by seedless varieties and have either disappeared or been left occupy a top-end niche. Red Globe is the only commercially viable seeded variety traded worldwide.

While the newly bred varieties may be bigger, sweeter and have longer shelf lives, consumers tend not to distinguish between one coloured seedless variety and another. While this categorization makes life easier for the retailers, which are now able to stock black, white and red seedless year-round for the first time, the grape category in absolute terms has stagnated. The major markets of the US and EU are mature and supply chain stakeholders are struggling to agree on how best to increase demand. In the developed markets, there is not enough retail shelf space to stock more than one red/white/black variety with a similar price point at any one time. In other words, while consumers differentiate between a highly priced bi-coloured Honeycrisp apple and a stock Gala, they aren't even offered the choice between a Thompson Seedless and an Autumn King.

Aside from the varietal simplification into three categories, the major issue behind the stagnation in consumption is that of consistency, whether it be in terms of trade flow, sizing/appearance and/or eating quality. The inaugural Global Grape Summit, which was held in London at the end of May, heard that a Cotton Candy crop in California may behave very differently when exposed to climate, sunlight and soil conditions in Chile, South Africa and Italy, for example.

Retailers would argue that in order for a single grape variety to gain the recognition of a Pink Lady, similar criteria on all the above would need to be met. This is significantly more difficult for grapes principally because seasonality for grapes is so short: while apples have a long shelf life and can also be supplied out of Controlled Atmosphere storage, table grapes are less robust. The 12-month supply continuity of Jazz apples to retail, for example, can be achieved by a single country in each hemisphere. In contrast, the supply of Thompson Seedless to the EU would need to start in Namibia, move to South Africa, then go to Peru or Chile followed by India, then Egypt followed by Italy and then Greece followed by Brazil until Namibia is ready again!

But seasonality is not the only issue. Retailers claim that if consumers are disappointed by the eating experience, they won't return to the category for an average of 6 weeks. While the same is true for other royalty and non-royalty bearing fruit types, the variation on grapes is perceived as more extreme. The greater the availability of a proliferation of substitute fruit types to consumers at a similar price point, such as berries, makes the task for shippers even more difficult.

Producers at the Summit said they believed that breeders should take more responsibility in helping producers overcome such difficulties. The problem is that the commercial

focus of the breeders is elsewhere and specifically volume related: the greater the number of licensees, the higher the production volume of proprietorial varieties and therefore the higher the royalty bearing premium.

Despite being the risk-takers in the equation, the licensees have no control over the commercial decisions made by the breeders. Given that the initial investment required for a commercial volume of a certain variety is significant, the risk factor is high - not least because there is no absolute guarantee that the variety put in the ground will be successful!

Likewise with which varieties are developed and then released. The 85 varieties patented in the US and made available over the past 5 years have fragmented the market. While each variety may have unique characteristics, not all of them will be the next Sweet Celebration. Much depends on retail preference. And yet it is the growers and not the retailers who have to navigate this minefield. The market is unforgiving - if producers back the wrong horse, some will be over-exposed and go under. If so, industry rationalisation is the inevitable consequence. There are anecdotal reports that the process has already started to take place.

It would be simplistic and wrong to lay the responsibility for the travails of the producer exclusively at the door of the breeders. Without equally heavy investment in R&D, the above-mentioned royalty-bearing varieties would never have been brought to market. In an ideal commercial environment, there would be a balance: in other words it would not just be the market that determined varietal success or failure. In such a scenario, all supply side stakeholders would be profitable enough to re-invest in developing the category and keeping consumers satisfied. It is, after all, not in the breeders' commercial interest that producers should fail, as the loss of a customer would compromise revenue streams.

The breeders also have their own issues: at the Summit the four above-mentioned chose to announce they are to form an association to cooperate in stopping ongoing attempts to appropriate proprietary plant material and infringe their Intellectual Property rights. The joint release said that: "The Breeders Alliance was created to assist its members in their separate enforcement activities by collectively monitoring and surveilling key wholesale and retail markets for the sale of suspected fruit mislabeled, counterfeit and/or infringing on its members' plant variety rights, trademark rights and other proprietary interests."

It continued: "Our ability to continue investing in highly capital-intensive and long-term fruit breeding programs is at risk as infringement and the sale of counterfeit fruit grows. Furthermore, we aim to protect the interests of both our *bona fide* licensees, who find themselves disadvantaged in the market by the activities of these unlicensed growers, and the retailers and supermarkets who might be at risk from selling fruit from illegal or unlicensed producers. The formation of The Breeders Alliance is designed to bring leading fruit breeders together, to raise our collective consciousness and that of the entire supply chain, and to stem this illegal activity." ■

Richard Bright, Reefer Trends
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Avocado

A report by
Eric Imbert

Contents

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Avocado
World market – Review of summer 2018 and winter 2018-19

A campaign rich in lessons for the EU market

by **Eric Imbert**, CIRAD
eric.imbert@cirad.fr

Despite its "feel good" aspect, an avocado campaign review indisputably has a somewhat daunting side, for both the reader and the author alike. It is a surprise to observe that good news too can be tiresome, when it is unsurprising. And it is no surprise that the avocado market again performed like no other fruit market during the 2018 summer season and the 2018-19 winter season. Nonetheless, this is not just any review, since to freely paraphrase Seneca, the past can sometimes provide counsel for the future. Hence this 2018-19 campaign is rich in lessons as to the future development of the EC market.

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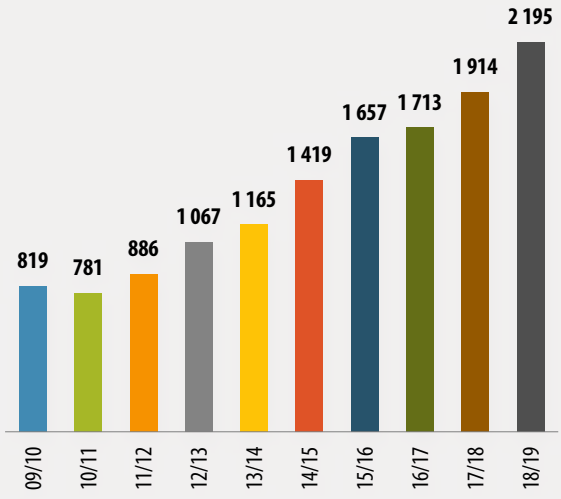
World trade in better shape than ever

After a close call in 2017-18, the 2.0-million tonnes mark was literally smashed to pieces in 2018-19. Worldwide trade volumes reached 2.2 million tonnes, excluding locally consumed production. Annual growth was in excess of 15 %, thanks to an excellent world production level. It was the Southern Hemisphere countries supplying the counter-season market which supplied nearly two-thirds of the additional 300 000 t placed on the market between 2017-18 and 2018-19. Peru strengthened its position as the world number two exporter, with shipments exploding up by nearly 45 % from the 2017 season, to reach 360 000 t. Furthermore, South Africa and Kenya revealed their true export capacity, the big expansion in surface areas in both these countries having gone rather unnoticed in particular because of climate problems during the previous campaigns. Exports from suppliers supplying the winter market had a much more modest rise, with the two leaders obtaining slightly smaller volumes than in 2017-18. The production of the Mexican colossus, which is hard to evaluate, probably dropped back below the 2.0-million tonnes mark, after the great surge in volumes the previous season. The supply available was particularly limited in June, pushing prices up to historic levels. The Chilean harvest too seems to have been slightly in shortfall (210 000 t in 2018-19, as opposed to 225 000 t in 2017-18). The growth in volumes exported during the winter season should be credited to the main Mediterranean suppliers (positive alternate bearing swing in Spain and in Israel, against a background of expanding surface areas), Jalisco and Colombia (large surface areas planted in recent years coming into their prime).

Avocado - World imports
Summer: year Y
Winter: year Y/year Y+1
(in 000 tonnes | various Customs sources)



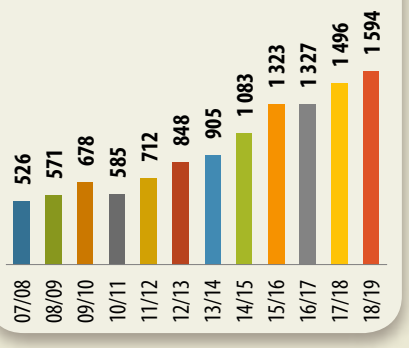
Avocado World Market

Main suppliers export dynamic

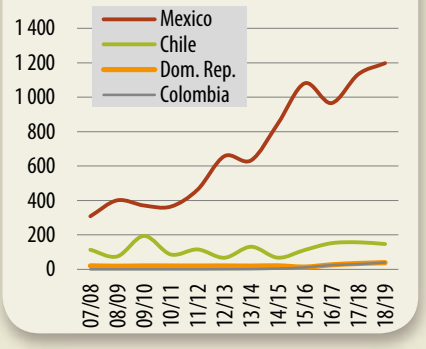
WINTER SEASON: 1 594 000 tonnes – 75 % of world market

Export calendar mainly centred on autumn and winter

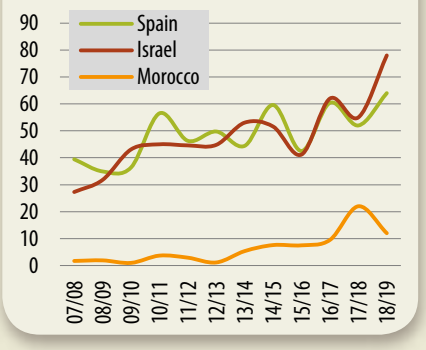
Avocado - World exports in winter season
(in 000 tonnes | professional sources)



Avocado - Latin America exports in winter season
(in 000 tonnes | professional sources)



Avocado - Mediterranean exports in winter season (in 000 tonnes | professional sources)



Avocado – World – Exports

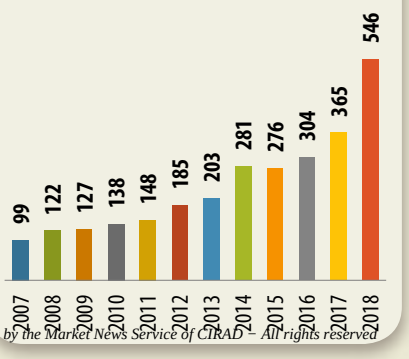
in 000 tonnes	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
Total	**624**	**624**	**693**	**805**	**724**	**860**	**1 033**	**1 108**	**1 364**	**1 599**	**1 631**	**1 861**	**2 140**
Total winter season, incl.	**539**	**526**	**571**	**678**	**585**	**712**	**848**	**905**	**1 083**	**1 323**	**1 327**	**1 496**	**1 594**
Latin America	**439.8**	**442.6**	**494.2**	**585.2**	**470.5**	**597.7**	**745.2**	**784.8**	**939.6**	**1 217.6**	**1 169.3**	**1 354.7**	**1 424.0**
Mexico	256.2	308.4	401.0	370.9	364.5	462.7	657.4	633.4	847.1	1 081.0	966.0	1 134	1 198
Chile	166.1	113.7	74.9	194.4	86.4	115.7	67.5	131.3	67.6	112.5	152.0	157	147
Dominican Rep.	17.5	20.5	18.3	19.8	19.5	19.2	19.8	18.9	20.4	13.2	26.3	34	39
Colombia		0.0	0.0	0.1	0.1	0.0	0.5	1.2	4.5	10.9	25.0	30	40
Mediterranean	**94.0**	**68.4**	**68.6**	**80.5**	**105.2**	**93.8**	**95.7**	**102.9**	**118.8**	**91.2**	**131.9**	**129.0**	**154.0**
Spain	35.5	39.4	34.9	36.4	56.5	46.3	49.8	44.4	59.6	42.5	60.4	52	64
Israel	58.5	27.3	31.8	43.1	45.0	44.6	44.8	53.1	51.6	41.2	62.0	55	78
Morocco		1.7	1.9	1.0	3.7	2.9	1.1	5.4	7.6	7.5	9.5	22	12
New Zealand	**5.5**	**14.5**	**7.7**	**12.4**	**9.6**	**20.4**	**6.7**	**17.3**	**24.7**	**14.0**	**26.0**	**12**	**16**
Total summer season, incl.	**85**	**99**	**122**	**127**	**138**	**148**	**185**	**203**	**281**	**276**	**304**	**365**	**546**
Latin America	**33.2**	**39.1**	**53.1**	**51.3**	**62.2**	**84.7**	**87.8**	**118.9**	**184.9**	**178.9**	**199.1**	**254.0**	**367.1**
Peru	31.7	37.6	51.3	48.3	59.5	81.4	83.6	114.5	179.0	174.3	194.1	246.0	360.0
Brazil	1.4	1.5	1.8	2.9	2.7	3.3	4.3	4.3	5.8	4.6	5.0	8.0	7.1
Africa	**49.1**	**53.3**	**66.9**	**57.8**	**68.0**	**49.7**	**74.7**	**72.4**	**87.8**	**84.5**	**96.5**	**94.0**	**171.0**
South Africa	35.8	37.6	51.2	38.8	47.8	27.6	50.3	46.4	60.2	50.1	57.4	43.0	90.0
Kenya	13.2	15.7	15.7	19.1	20.2	22.0	23.8	25.0	25.7	31.2	35.1	47.0	75.0
Tanzania				0.0	0.0	0.1	0.6	1.0	1.9	3.2	4.0	4.0	6.0
California	**2.3**	**6.1**	**2.4**	**17.4**	**8.1**	**13.9**	**22.5**	**11.5**	**8.4**	**12.8**	**8.0**	**17.0**	**7.8**

Source: Customs

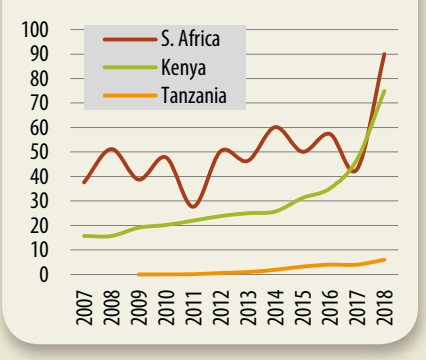
SUMMER SEASON: 546 000 tonnes – 25 % of world market

Export calendar mainly centred on spring and summer

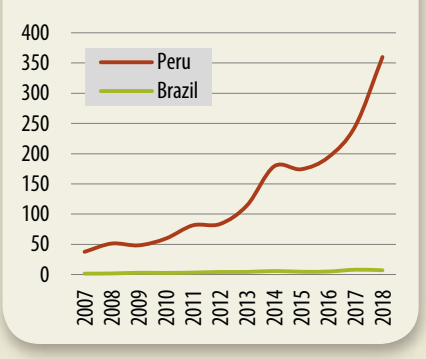
Avocado - World exports in summer season
(in 000 tonnes | professional sources)



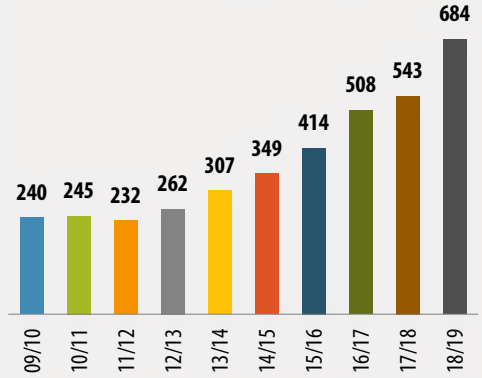
Avocado - Africa exports in summer season
(in 000 tonnes | professional sources)



Avocado - Latin America exports in summer season (in 000 tonnes | professional sources)



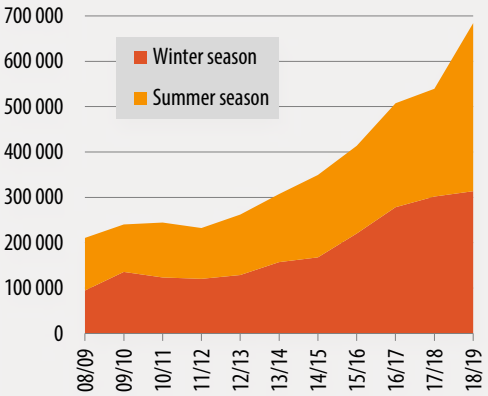
Avocado - EU-28 - Imports
Summer season: year Y + Spanish shipments
Winter season: year Y/year Y+1
(in 000 tonnes | source: Eurostat)



Spectacular growth in the European market

It is the European Union which saw the most spectacular development. The supply to the world's number two market approached 700 000 t, i.e. leaping up by more than 140 000 t and 26 % from the previous season. The shock was all the greater since there was a big imbalance in the distribution of these additional volumes over time, the supply rising by 55 % during the summer season. Hence this was real crash test, from which we must draw a few lessons. First of all we need to highlight the exceptional behaviour of prices during this period. *Fluctuat nec mergitur*: while the campaign average price saw a big fall, it nonetheless maintained a decent level thanks to the steadfastness of demand. What market other than the avocado could have withstood such an influx of volumes without collapsing?

Avocado - EU-28 - Supply
(in 000 tonnes | source: Eurostat)



Avocado – European Union – Supply

in tonnes	2011	2012	2013	2014	2015	2016	2017	2018
Total	**232 436**	**262 115**	**307 358**	**349 426**	**413 717**	**507 582**	**542 656**	**684 232**
Total N. Hemisphere, incl.	**120 414**	**128 824**	**157 266**	**167 741**	**220 318**	**278 351**	**305 045**	**313 643**
Chile	32 637	41 074	62 968	42 797	78 244	90 138	92 467	87 571
Mexico	2 909	9 085	6 293	12 918	45 593	36 884	60 993	47 561
Spain	38 900	38 500	36 700	50 600	37 700	55 200	48 600	57 000
Israel	40 448	35 175	42 844	46 086	34 995	56 600	41 567	60 101
Colombia	121	486	1 142	3 740	11 189	24 024	29 752	38 000
Morocco	2 803	840	4 766	7 798	7 115	9 552	21 746	11 237
Dominican Rep.	1 467	2 503	1 810	3 034	4 445	5 527	7 345	8 657
Portugal	-	-	-	-	-	-	1 440	3 032
Others	1 129	1 161	743	768	1 037	426	1 135	484
Total S. Hemisphere, incl.	**112 021**	**133 291**	**150 092**	**181 686**	**193 399**	**229 231**	**237 611**	**370 589**
Peru	66 155	62 618	86 260	101 971	114 321	144 367	157 744	228 769
Southern Africa*	27 375	49 083	45 165	56 713	50 962	54 095	43 984	87 127
Kenya	15 028	17 078	13 313	15 604	20 728	23 444	25 425	41 525
Brazil	3 006	3 959	3 928	5 265	3 535	3 908	7 189	6 680
Tanzania	6	133	968	1 643	3 278	2 948	2 987	6 244
Others	451	420	458	490	575	470	283	244

* South Africa, Zimbabwe, Swaziland | Source: Eurostat

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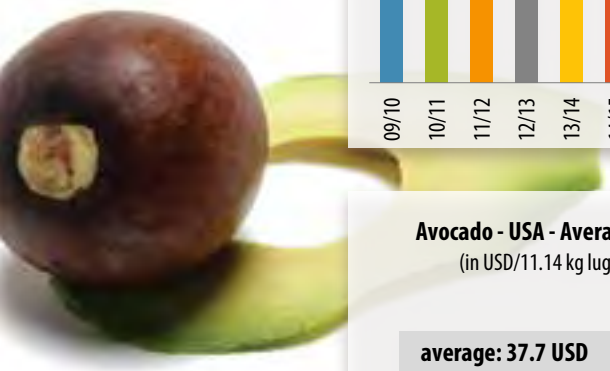

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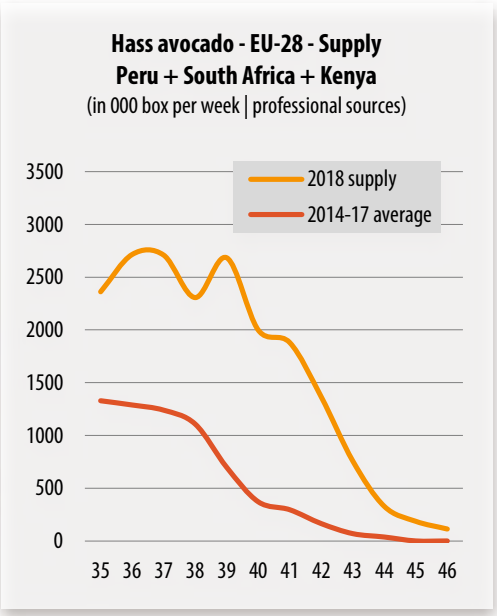
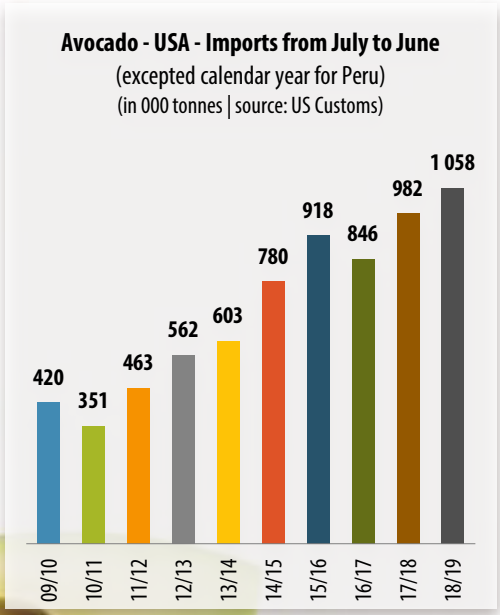
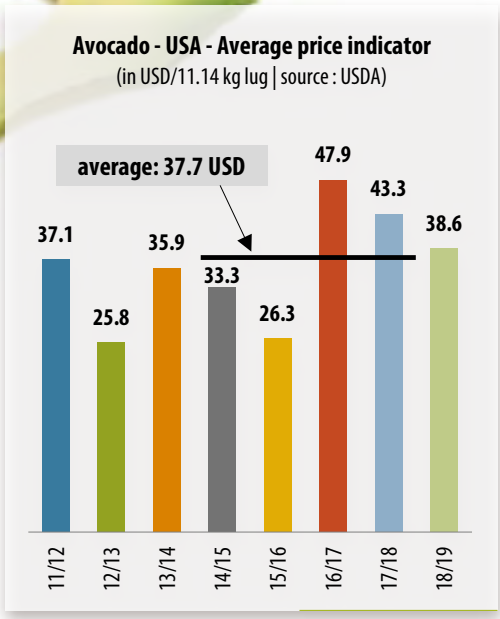




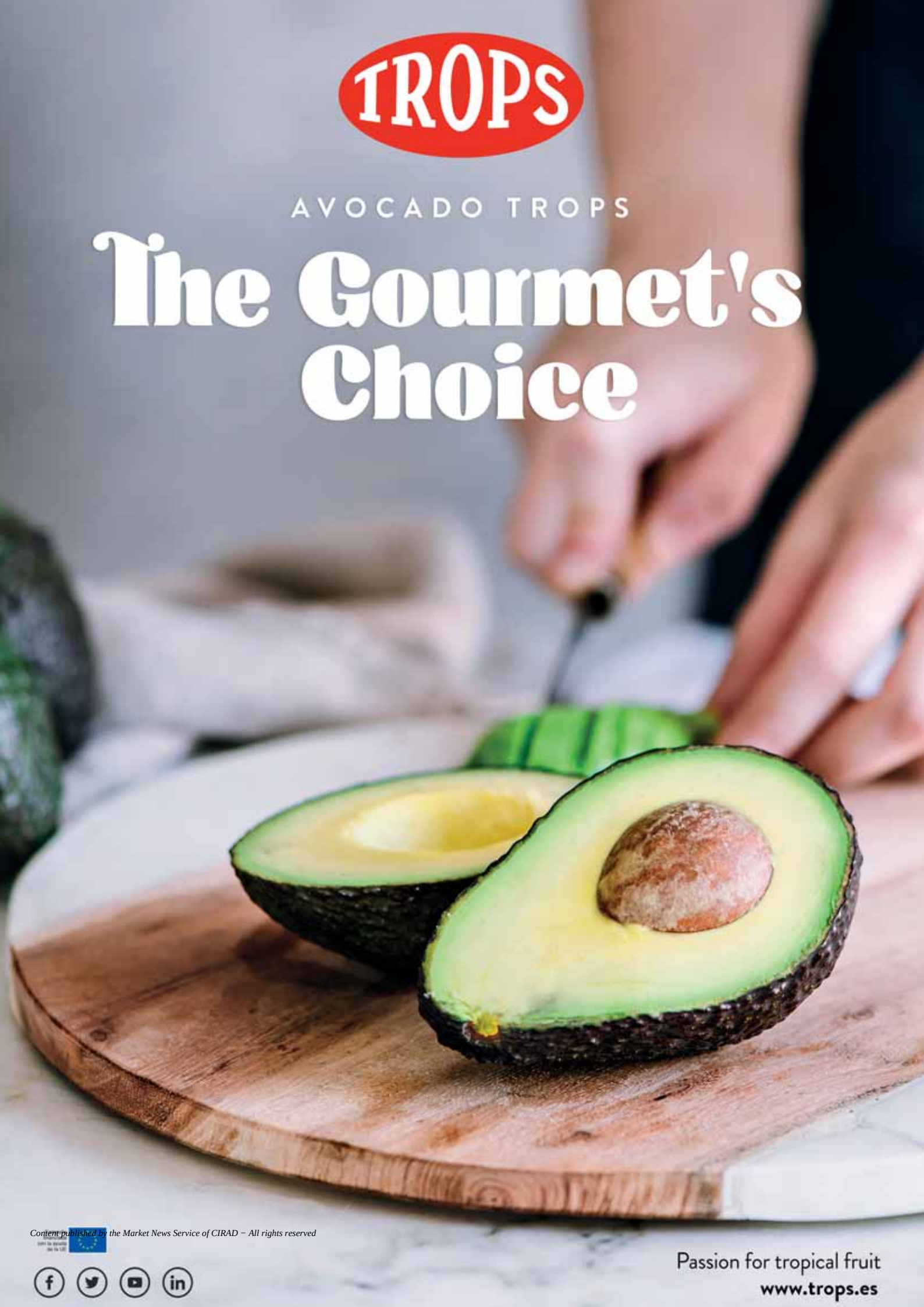


Structural changes to highlight

Most of all, we should look at the boom in supply, the indisputably structural character of which must not be questioned because of the atypical summer campaign which has just drawn to a close. This influx of volumes, not only Peruvian but also from origins such as Kenya or South Africa, whose potential has been revealed, is bound to recur. It is causing a considerable extension of the summer season (period of approximately one month, centred on the beginning of October). This extension is pushing back the start of the winter season, and so concentrating the volumes entering the market. It is pure mathematics: dividing this lost month's supply over the remaining six months (schematically from mid-October to mid-April) equates to increasing the monthly volumes entering the market by nearly 17 % – of course without counting the increase in supply from the suppliers present at this period. Hence prices also went down during the winter season, despite incoming shipments rising by just 3 %.

Not enough fruit to satisfy the US market

The world number one market did not perform as well as the EU-28. True, the 8 % growth in imports is not to be sniffed at, and indeed it helped the market exceed for the first time the symbolic one-million tonnes mark, and by a considerable margin. Nonetheless, there is a clear difference from the European Union's 26 % rise. There is no sign of any slowdown in demand, but rather the consequences of a particularly big fruit shortage at the end of the season (Mexican season winding down early, so much so that the market ended up practically empty in June). The HAB consumption statistics show that the Americans are just as avocado-hungry (12 to 32 % growth from Q3 2018 to Q1 2019, before the supply shortage kicked in). The small net-bagged fruits market segment is continuing to go wonderfully well. According to the latest statistics from the HAB, it doubled in volume between Q1 2017 and Q1 2019. It is now, by far, the number one segment for the avocado, representing 40 % of total market volumes. Prices varied widely in the face of such irregular volumes, with our indicator ranging from less than 23 USD per 11.14-kg lug in early December to nearly 85 USD at the end of June. Our campaign average price indicator is at a level close to the four-year average, and to last season's average.



Passion for tropical fruit

www.trops.es

Peruvian Hass consolidating its hold in the USA

Needless to say, Mexico continued to reign supreme in terms of supply. However, its reputation in terms of supply reliability, already dented in 2017-18, continued to deteriorate. There was another blockage of exports by a limited but active fraction of producers from Michoacán in November 2018, while the anti-Mexican imports policy of the Trump presidency increasingly appears to be a threat (spectre of extra taxation of Mexican Hass). Should we see a link? Peru, which struggled to find its place on the market in the first few years after the borders were opened up, is now well received. This is attested to by the steady rise in imports from this origin, which reached a record level of 81 000 t in 2018 despite a bumper Californian campaign. This is good news for the EC market, not having to bear the full weight of the Peruvian exports now on the surge. Conversely, the opening up of the market to Colombian Hass has remained theoretical, the stringency of the sanitary protocol limiting imports to less than 1 000 t.

Avocado – United States – Evolution of consumption in 2018-19 compared to 2017-18

Q3	Q4	Q1
+ 36 %	+ 32 %	+ 16 %

Source: HAB - Avoscore card

Avocado – United States – Supply

in tonnes	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Total	**351 120**	**462 777**	**561 892**	**603 160**	**780 412**	**917 667**	**846 414**	**982 227**	**1 058 092**
Mexico	281 672	360 924	515 143	512 276	686 404	853 617	764 680	862 596	917 730
Peru	137	9 157	15 860	21 617	64 448	46 284	31 573	64 420	81 893
Chile	54 355	74 701	14 721	53 305	10 600	10 362	29 354	29 454	28 001
Dominican Rep.	14 956	17 204	16 150	15 958	15 548	7 393	20 805	25 757	29 560
Colombia	-	-	-	-	-	-	-	-	889
Others	-	791	18	4	3 412	11	2	-	19

Source: US Customs

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Other world markets continuing to rise, albeit in small steps

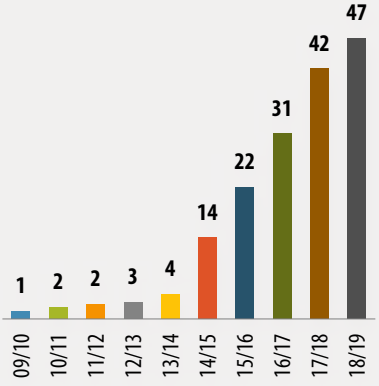
What about the dynamic of the world's other markets? Canada, the world number three importer, saw its volumes continue to rise, to reach 93 000 t. Japan, next in the rankings, has awoken after a long period of lethargy. Incoming shipments reached 76 000 t, after a long-standing ceiling of between 55 000 and 65 000 t. In both these cases we must highlight the consumption boosting work carried out by Mexico, which controls more than 90 % of these two country's supplies. The Chinese market also continued to rise, with imports now approaching 50 000 t. However, growth has distinctly slowed down (12 %, a level well below the 35 to 60 % registered for the past three years and the 15 % average growth on the world market in 2018-19). Exports from Mexico and Chile to this country registered a downturn in 2018-19 for the first time. Is this due to the downturn in production, or should we put it down to the reality of a market with high potentiality, but also very hard to operate on (long transport time and very high cosmetic requirements, considerably increasing the commercial risk)? South Korean imports remained practically stable and close to 10 000 t, after doubling in 2017-18.

Avocado – China + Hong Kong – Imports

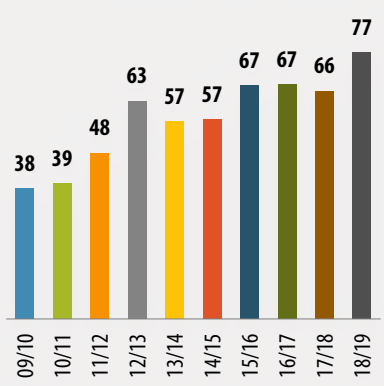
in tonnes	2014-15	2015-16	2016-17	2017-18	2018-19
Total	**13 629**	**22 165**	**31 068**	**41 971**	**47 127**
Chile*	1 092	5 783	13 405	15 029	13 616
Mexico*	10 794	14 223	10 919	17 690	13 952
United States	243	1 052	644	1 084	1 011
Peru	1 154	520	2 802	6 437	17 073
Others	346	587	3 298	1 731	1 475

* Estimated according to exporting country Customs
Sources: Trademap, National Customs

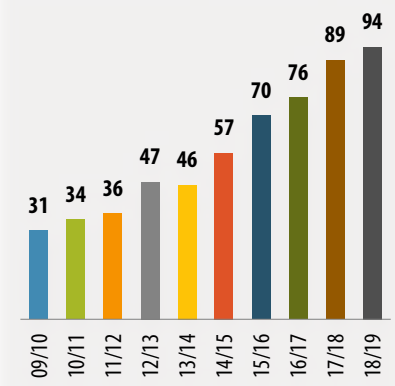
Avocado - China + Hong Kong
Imports from July to June
(except calendar year for Peru)
(in 000 tonnes | source: Trademap)



Avocado - Japan
Imports from July to June
(except calendar year for Peru)
(in 000 tonnes | source: Japanese Customs)

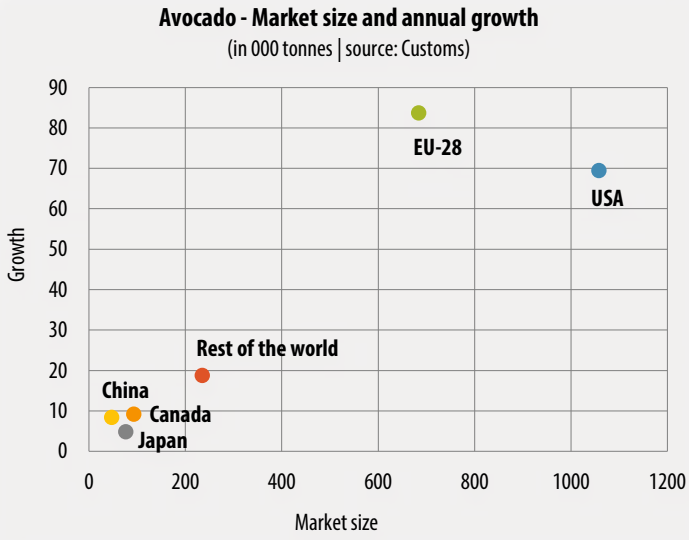


Avocado - Canada
Imports from July to June
(except calendar year for Peru)
(in 000 tonnes | sources: Trademap, other Customs)



World market still highly bipolare

One observation is unavoidable after this overview of the minor markets: the world avocado trade remains highly bipolar. It remains 80 % concentrated between the USA and the EU. Could another locomotive capable of driving world growth emerge? There is no real sign of any in 2018-19, although the lukewarm review of this campaign is partly due to the slight production downturn from big international trade players such as Mexico and Chile. We cannot help but observe that over a longer period of four years, it has still been the world's top two markets taking in three-quarters of growth in world production. Over this same period, the most significant outsiders such as Canada, Japan and China, increased from 5 000 to 10 000 t/year on average, while the world harvest rose by nearly 200 000 t. Promotion efforts must also be stepped up on these markets, which are necessary levers for growth, while world production is undergoing a step change ■



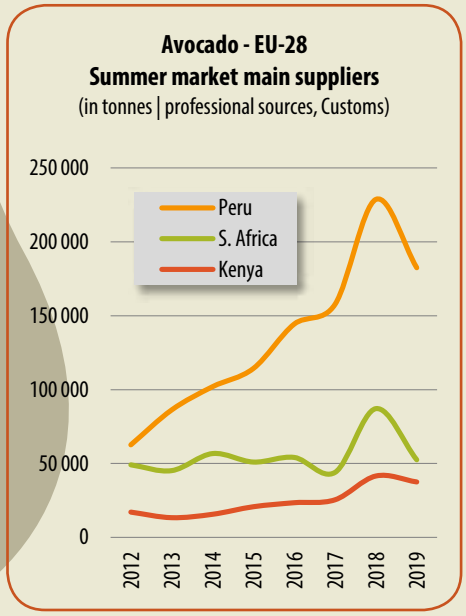
Avocado – EU 2019 summer campaign

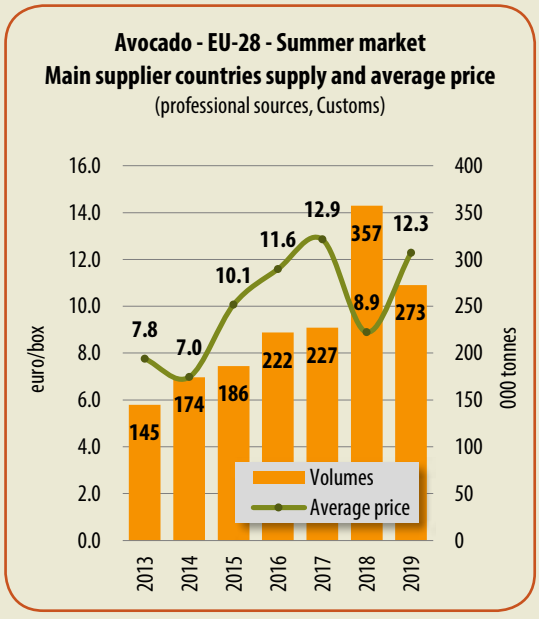
A fine year… which needs to be harnessed!

The 2019 summer campaign lived up to its promises! As predicted, the supply level was considerably below last season's massive figures (- 24 %, i.e. nearly 85 000 t lighter). Nonetheless, it was far from trifling. The 2019 summer campaign is the second biggest ever. According to our estimate, based on professional figures, the cumulative total of Peruvian, South African and Kenyan volumes should be around 270 000 to 275 000 t. Peruvian volumes exported to the EU-28 are down by approximately 20 %, since the harvest was smaller and the US market was highly attractive (stable shipments to this destination). There is a more marked downturn from South Africa (- 40 %), because of a clear fall in production and logistical difficulties. Kenyan shipments, harder to detect with precision, also seem to have dropped despite a fairly explosive start to the campaign (- 10 % according to the still very partial customs data).

Also as predicted, the incoming shipments schedule was considerably different to previous years. The supply was distinctly bigger than previous years from the beginning of the season to mid-May (Olmos cultivation area in Peru coming into its prime, and early Kenyan supply). Conversely, there was a significant decline thereafter, avoiding the deadly gargantuan late May-early June peak. It was Peru which was behind this atypical fall in supply. On the one hand, the exports source shifted to the Chavimochic and Lima valley production centres, which had a big shortfall this season. On the other hand, Peruvian professionals took advantage of the US market being more open and lucrative than usual (lean production in California, and big supply shortfall of Mexican fruit during the latter part of the season). Hence volumes available on the EC market then dropped to a moderate level, distinctly lower than in 2018, before temporarily rallying in August. The end of the campaign returned to its traditional schedule, i.e. during September.

As regards price, conversely, things were better than predicted! Despite the magnitude of the supply (second biggest ever summer campaign despite a distinct fall from the 2018 season), our campaign average price indicator should be between 12 and 12.5 euro/box. This is the second best performance after the 2017 season, when the supply was 50 000 t smaller. We need to appreciate this great year, since those to come are set to be much more heavily laden, barring major climate vagaries. Summer 2020 should be a heavy campaign (positive alternate bearing phenomenon in Peru and South Africa, with in addition many young orchards entering production and coming into their prime, not to mention additional volumes from Kenya and the outsiders i.e. Brazil, Tanzania and Mozambique). Furthermore, although Jalisco will probably not yet have access to it, the US market should be distinctly less open than in 2019, with a positive alternate bearing phenomenon for Mexican and Californian production. In this context, the campaign could be as long as in 2018, which did have some impact on the winter season.







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Avocado
EU consumption in 2018-19

A revealing campaign

by **Eric Imbert**, CIRAD
eric.imbert@cirad.fr

Campaigns with high supply levels are always the most instructive. They shed light on the real scale of the growth dynamics. The 2018-19 campaign was one such: there were very big summer volumes in the 2018 summer season, followed by average volumes packed into a short period during the 2018-19 winter season, while retail prices saw an unprecedented fall. In the face of this tense context the response of the various markets varied greatly.

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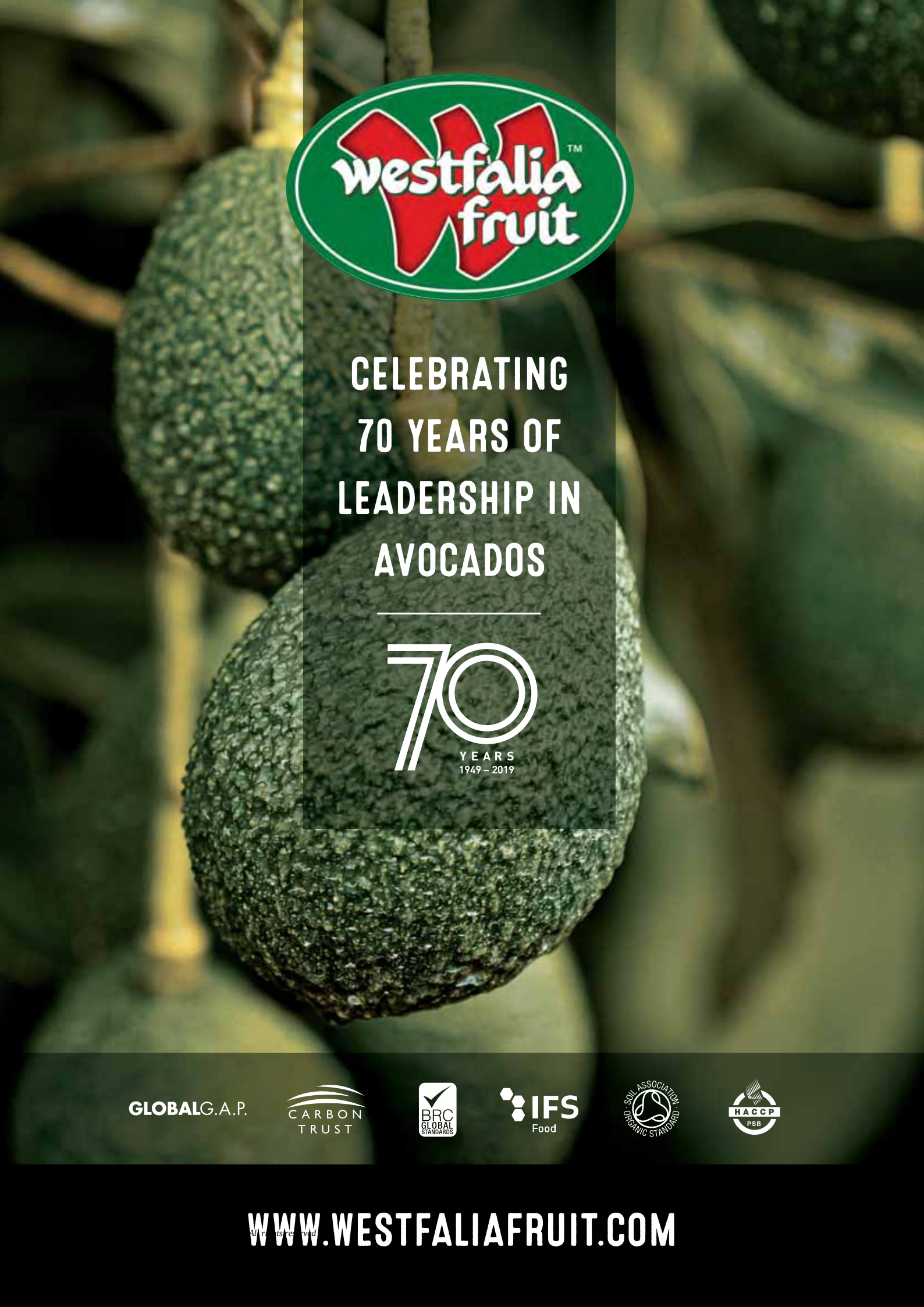
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French market further out in front than ever

Credit where credit is due! The French market, Europe's number one in terms of volumes, achieved the biggest rise in 2018-19. Consumption increased by 17 % from 2017-18, reaching 2.2 kg per capita. So this is a strong and recurrent dynamic, with volumes taken in gaining nearly 650 g in the space of just two seasons. The avocado is winning over a growing number of consumers, as the slight but steady rise in the product's penetration rate shows (purchased by 73.6 % of households in 2018, i.e. + 1.5 % per year on 2016).

Avocado — Consumption in Europe (June 2018 to May 2019)

	Estimated marketed volume in 2018-19 (t)*	Population in millions	Consumption per capita (g)	2018-19 compared to	
				2017-18	2013-14
EU-28 + Norway	**636 119**	**524.9**	**1 212**	**19%**	**+ 111 %**
EU-15 + Norway	**567 318**	**413.7**	**1 371**	**17%**	**+ 104 %**
France	144 996	66.9	2 167	+ 17 %	+ 64 %
United Kingdom	105 633	66.3	1 593	+ 9 %	+ 145 %
Germany	82 327	82.8	994	+ 29 %	+ 204 %
Scandinavia	**57 879**	**26.7**	**2 168**	**+ 9 %**	**+ 32 %**
Sweden	20 923	10.1	2 072	+ 6 %	+ 5 %
Denmark	15 602	5.8	2 690	+ 18 %	+ 79 %
Norway (non-EU)	13 447	5.3	2 537	+ 9 %	+ 36 %
Finland	7 906	5.5	1 437	+ 3 %	+ 52 %
Spain	72 122	46.7	1 544	+ 42 %	+ 19 %
Netherlands	40 000	17.2	2 326	NA	+ 48 %
Italy	22 340	60.5	369	+ 29 %	+ 248 %
Belgium	11 013	11.4	966	- 11 %	+ 113 %
Austria	9 195	8.8	1 045	+ 23 %	+ 168 %
Greece	7 080	10.7	662	0 %	+ 92 %
Ireland	7 198	4.8	1 500	+ 10 %	+ 224 %
Portugal	6 650	10.3	646	- 18 %	- 12 %
Luxembourg	885	0.6	1 475	+ 31 %	+ 232 %
NMS Eastern Europe	**53 272**	**102.7**	**519**	**+ 42 %**	**+ 228 %**
Poland	20 796	38.0	547	+ 52 %	+ 340 %
Baltic States	7 779	6.1	1 275	+ 23 %	+ 61 %
Romania	8 224	19.5	422	+ 28 %	+ 344 %
Czech Republic	4 948	10.6	467	+ 49 %	+ 260 %
Hungary	3 305	9.8	337	+ 32 %	+ 152 %
Slovakia	2 892	5.4	536	+ 42 %	+ 381 %
Bulgaria	2 510	7.1	356	+ 42 %	+ 364 %
Croatia	1 379	4.1	336	+ 64 %	+ 438 %
Slovenia	1 440	2.1	686	+ 137 %	+ 86 %
Switzerland (non-EU)	15 528	8.5	1 827	+ 4 %	+ 78 %

* Import-export+production | professional sources, Eurostat

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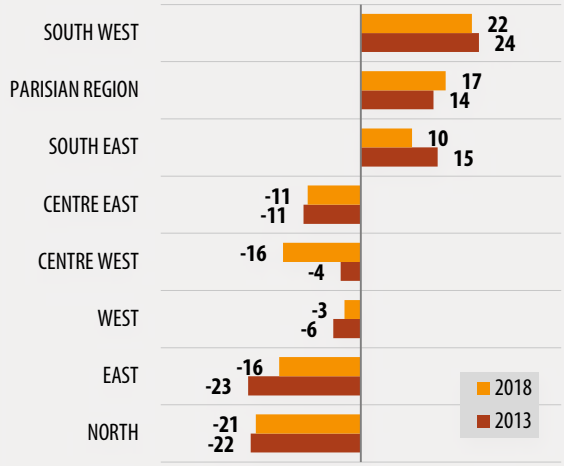
An increasingly elitist and ageing product

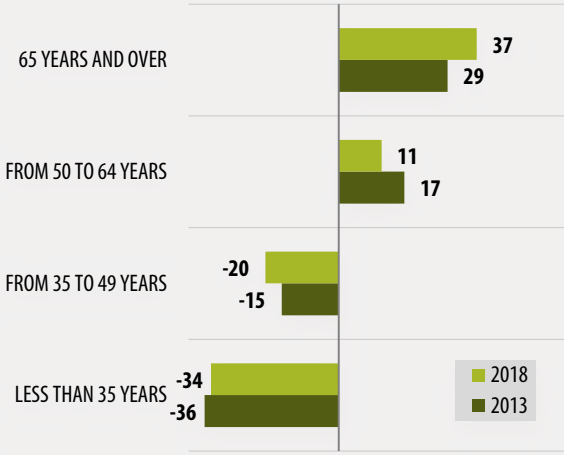
The standard profile of the French avocado consumer has remained unchanged, with revenue and geographic location remaining the crucial factors in purchase level. Households with high/above-average income are increasingly big consumers (+ 29 % and + 7 % respectively above average consumption), with the most modest section of the population conversely consuming less and less (stable among average/below-average income households at 94 % of average consumption, but this falls to 74 % among the least well-off). Meanwhile, it is the higher age brackets which are the big consumers (37 % above average for those aged 65 or above, and + 11 % for 50-64), though the decline among young people is tending to stabilise (80 % of average consumption for 35 to 49 year-olds, and 66 % among the under-25s). The geographic variable also plays an important role, very probably for climate reasons. This product, still used almost entirely as a cold starter or in the form of guacamole in France, has distinctly a higher consumption in the South (26 % above average in the South-West, still the country's number one consumption region, and 11 % above average in the South-East). The Parisian region is also a big consumer (albeit falling to 13 % above average), though clearly for non-climate reasons (high average income level and "trendy" aspect of the product). Among the low-consuming regions, the downward trend is continuing in the Centre-West region, with volumes per capita now equivalent to 84 % of the country's average consumption (losing 10 points in five years). At the back of the pack, consumption is stabilising at a low level in the East, also at 84 % of the national average consumption, though the North is continuing to sink (79 %).


© Guy Bichinier

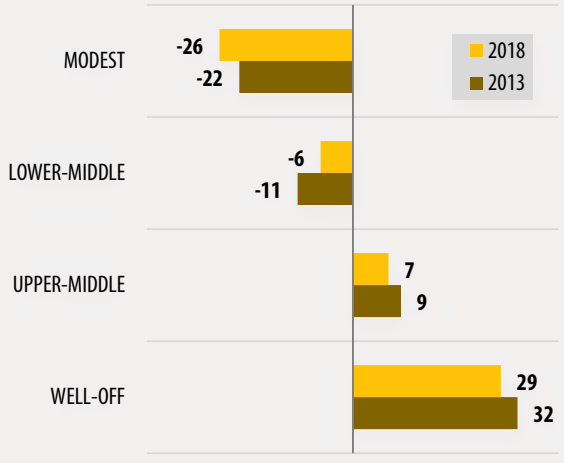
Avocado - France - Average consumption by région
(in % | source: Kantar)



Avocado - France - Average consumption by age group
(in % | source: Kantar)



Avocado - France - Average consumption by social category (in % | source: Kantar)



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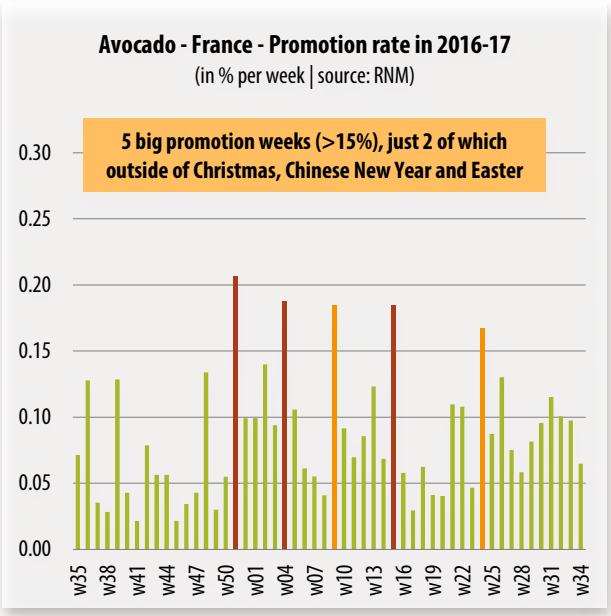
Avocado - France - Retail price and large retailer margin
(in euro/kg | source: RNM)

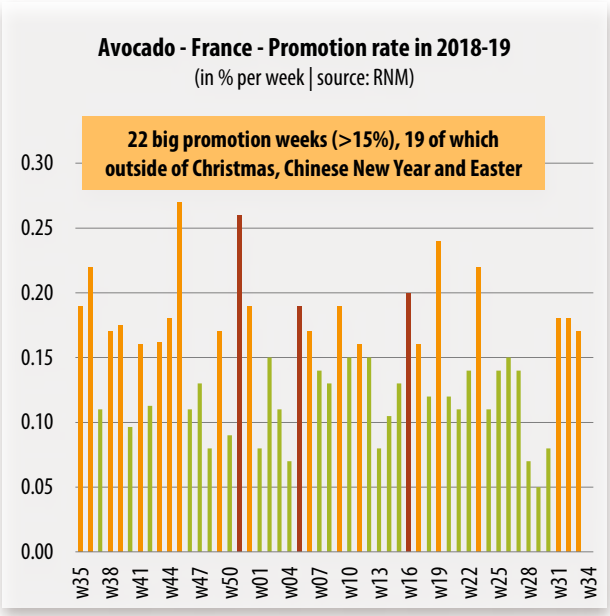
French supermarket sector putting its own house in order

The supermarket sector did rather well in 2018-19, lest we forget! Promotions went well (22 weeks with more than 15 % of stores implementing promotions, as opposed to 15 weeks in 2017-18, and 1 to 7 weeks the previous three seasons). The calendar for these promotions is also heading in the right direction. The regular seasonal promotion periods for exotics remain intensely worked (week before Christmas, before Chinese New Year and before Easter). However, one-off promotions helping desaturate the market are increasingly common (e.g. five weeks of intense activity in June-July 2018 when the market was drooping under the weight of the Peruvian supply). So the sector is putting its own house in order, since while the price tags did follow the falls at the import stage, the supermarkets' margin continued to widen. Despite these "efforts", the drop in the supermarket sector's market share is continuing (4 % loss since 2012, reaching 51 % in 2018). Conversely, the discounters are soaring (+ 5 % over the same period, to more than 17 %). So the avocado is following to the letter the general trends in food distribution. Conversely, the downturn in open-air market sales and specialist stores is more atypical, a surprising development for this product where professional advice is often sought. Are prices now reaching levels deemed prohibitive by consumers at this type of outlet, positioned in the top-end segment?

Avocado - France - Promotion rate in 2016-17
(in % per week | source: RNM)



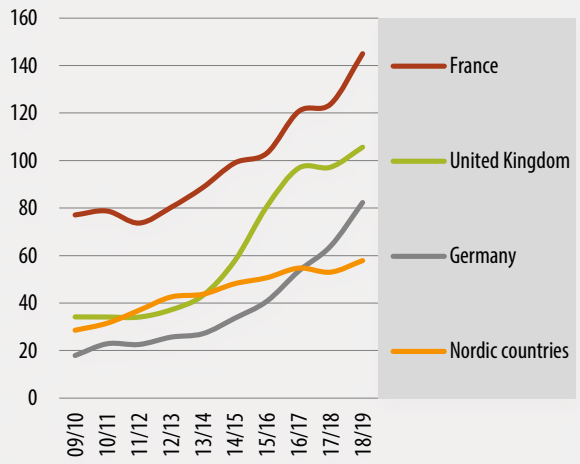
Avocado - France - Promotion rate in 2018-19
(in % per week | source: RNM)



UK market on a recurring run of poor form

Is the historical number two driving force of the EC market breaking down? After a perfectly stable 2017-18 season, breaking with a long period of strong growth, there was only a very slight upturn in 2018-19. The 9 % registered equates to barely half the average growth for the EU-28. Nonetheless incoming volumes exceeded the symbolic 100 000-t threshold. The weakness of sterling seems to be the main factor behind this poor performance, weighing down on retail prices and reducing the attractiveness of the market. This downturn, seemingly well-established, is raising questions as to the development of this driving market, on the eve of the implementation of what will probably be a hard Brexit, potentially weighing down even heavier on the exchange rate. The Irish market saw growth as limited as its British counterpart.

Avocado - EU-28 - Consumption in main markets
(in 000 tonnes | source: Eurostat)




© Carolina Dawson

Germany: a rise of nearly 30 %!

Conversely, Germany continued to make giant strides forward. This country recorded the biggest percentage among the big EU-28 markets, with a growth rate of 27 % from last season. Consumption was in excess of 80 000 t, a level comparable to France six years ago, and to the UK three years ago. Hence consumption per capita has reached the symbolic one-kilo mark. The percentage of households purchasing it continued to rise in 2018, at a similar tempo to other years (approximately + 3 %/year). Nonetheless it remains very low, at approximately 35 %. So this market is a long way off reaching its limits! The Austrian market remained in the footsteps of the German market, also registering a big rise (+ 23 %).

Nordic countries picking up a bit

A slight recovery in the consumption dynamic in the Nordic countries is cause for good cheer. Practically stable at between 50 000 and 55 000 t since 2014-15, consumption volumes saw a slight rise in 2018-19 (approximately + 5 000 t from 2017-18 and + 3 000 t from the consumption record set in 2016-17). Nonetheless, we should make no mistake over the nature of this movement: it is very probably enabled by the fall in import prices, rather than the resumption of a natural market growth movement. It is for the Danish market that exhibited the strongest demand elasticity, with a rise of 18 % from 2017-18. This broke the 2.5 kg per capita ceiling (see **FruiTrop 263**). Norway and Sweden saw less strong increases (+ 9 % on 2017-18, half the European average rate). As for Finland, its dynamic remained practically zero, despite consumption well below the regional level (barely more than 1.4 kg/capita, as opposed to 2.1 for the Nordic countries as a whole).


© Eric Imbert

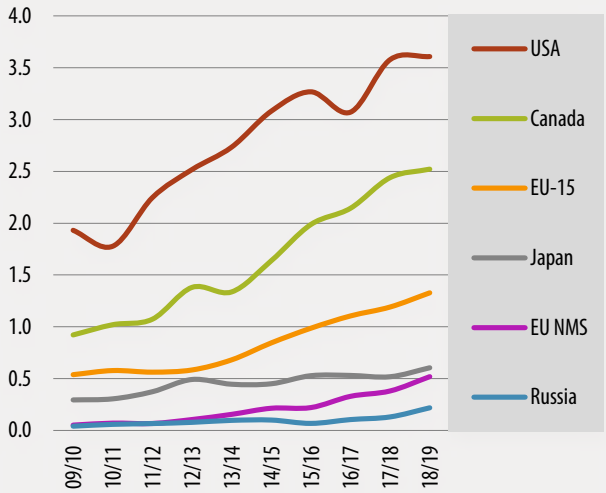
Italy: Hass, a young prodigy!

2018-19 undeniably brought avocado fever to the Italian market. Consumption increased by 29 % from 2017-18. In the space of five years, Italy has been transformed, changing both in terms of varietal range (from tropical avocado to Hass) and scale (from a micromarket of barely more than 6 000 t in 2013-14 to a significant market of 22 000 t in 2018-19). So there are very big growth margins for this big country, with a population of more than 60 million, and with consumption per capita barely in excess of 350 g.

A positive balance, and yet…

The balance for the 2018-19 campaign is mainly reassuring. True, the recurrently flat UK market is raising questions. However France remains a powerful driving force for EC market growth. Its development over the coming campaigns will bear close watching, with the consumption level per capita now high by EU-28 standards (2.2 kg per capita, while the EC's top consumers, with much more diverse modes of consumption, have plateaued out at 2.5-2.6 kg). Germany is continuing to make big strides forward, and has a large reservoir for growth, while Italy appears to be becoming a large-scale hub. This campaign also demonstrated that the consumption glass ceiling of 2.5 kg/capita, in place for the past several years on certain Nordic markets, could be shaken, albeit by playing on the price variable. Will the industry manage to get together to finance a less value-destroying mode of growth, based on strengthening WAO promotion actions by the 2020 summer campaign, when the supply level is set to start to see a big shift? ■

Avocado - World - Consumption in main markets
(in kg/capita | various sources)



Avocado

Forecast for the 2019-20 European market winter campaign

A rerun of 2018-19?

by **Eric Imbert**, CIRAD
eric.imbert@cirad.fr

This is what the supply prospects, very similar to last campaign, might lead us to believe. Yet the distribution of volumes over time and the sizing will definitely be a game changer. FruiTrop offers this comprehensive review for each supplier country.

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CHILE
Stable production… but size matters


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The Chilean harvest, previously with a marked alternate bearing effect, seems to be trying to stabilise. Once again this season, it should be around 200 000 to 210 000 t. However, use of the conditional is essential. The structural problem of drought is more acute than ever, with the current spell on its way to becoming the worst for the past fifty years. By way of example, less than 70 mm of rain has fallen on Santiago since the beginning of January, a level less than half the average for the past four years. Hence the fruit sizing is abnormally small for operators with limited means of irrigation. There are some possibilities of making good this shortfall, albeit relatively limited (less than one quarter of the annual rainfall in September/October, with the end of the year being completely dry, generally speaking). So the export potential, which can currently be estimated at a similar level to the 145 000 to 155 000 t from previous seasons, could be revised downward. Some operators are already talking about a 10 to 15 % downturn. Another consequence of this drought is that the dry matter content is already high. Hence the campaign could be cut short, and concentrated mainly from September to January. The distribution of volumes between export markets should remain in step with recent seasons, which have seen little variation (60 % for the EU, 20 % for the USA and 20 % for Asia and South America). However, will the US market be as open as in 2018-19, with Michoacán set for a record season?

Avocado — Chile — Exports

in tonnes	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
EU-28	42 571	64 247	43 481	79 421	91 385	93 496	88 200
USA	14 710	53 297	12 341	11 428	29 204	29 389	27 999
Central Am.	8 888	11 735	9 943	15 762	17 397	15 801	16 328
Japan + Asia	1 283	1 978	1 877	5 878	13 594	15 147	13 734
Total	**67 452**	**131 257**	**67 643**	**112 489**	**151 580**	**157 111**	**146 994**

Source: Chilean Customs

CHILE:
Nearly 29 000 ha of Hass
World No. 3 exporter

Avocado — Colombia — Exports

in tonnes	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19*
EU-28	508	1 173	3 050	11 691	22 045	31 403	38 000
USA	-	-	-	-	-	89	899
Others	30	38	1 450	100	292	607	1 500
Total	**538**	**1 211**	**4 500**	**11 791**	**22 337**	**28 500**	**40 400**

* Estimate / Source: DIAN


© J. Camilo Perez

COLOMBIA:
Nearly 18 000 ha of Hass
World No. 9 exporter

COLOMBIA
The star of the 2020s

If Peru was the outstanding origin of the world avocado trade over the past decade, Colombia will indisputably stamp its mark on the coming years. Production will continue to rise in 2019-20, with an estimated increase of approximately 30 % according to professionals. Large surface areas of young orchards are entering into production or coming into their prime. Furthermore, the climate conditions have been favourable and the rising technical level is having a positive impact on yields. This better command of cropping practices should also make for bigger fruit sizing (which should nonetheless be around the low average mark). Exports will culminate from November to April/May. They will remain practically exclusively focused on the EC market. In June 2019, the US sanitary authorities approved an easing of the sanitary protocol for orchards aimed at supplying this market (shorter approval time for quarantine pest-free zones, new buffer zone management strategy, etc.). Nonetheless, these changes should only bear fruit in the medium term, with shipments to the United States remaining limited in 2019-20 (less than 1 000 t in 2018-19). The Colombian industry has managed to open up the doors to a number of diversification markets in recent months (Kuwait, Argentina, Japan and very recently China). Shipments to these destinations should nonetheless remain moderate.

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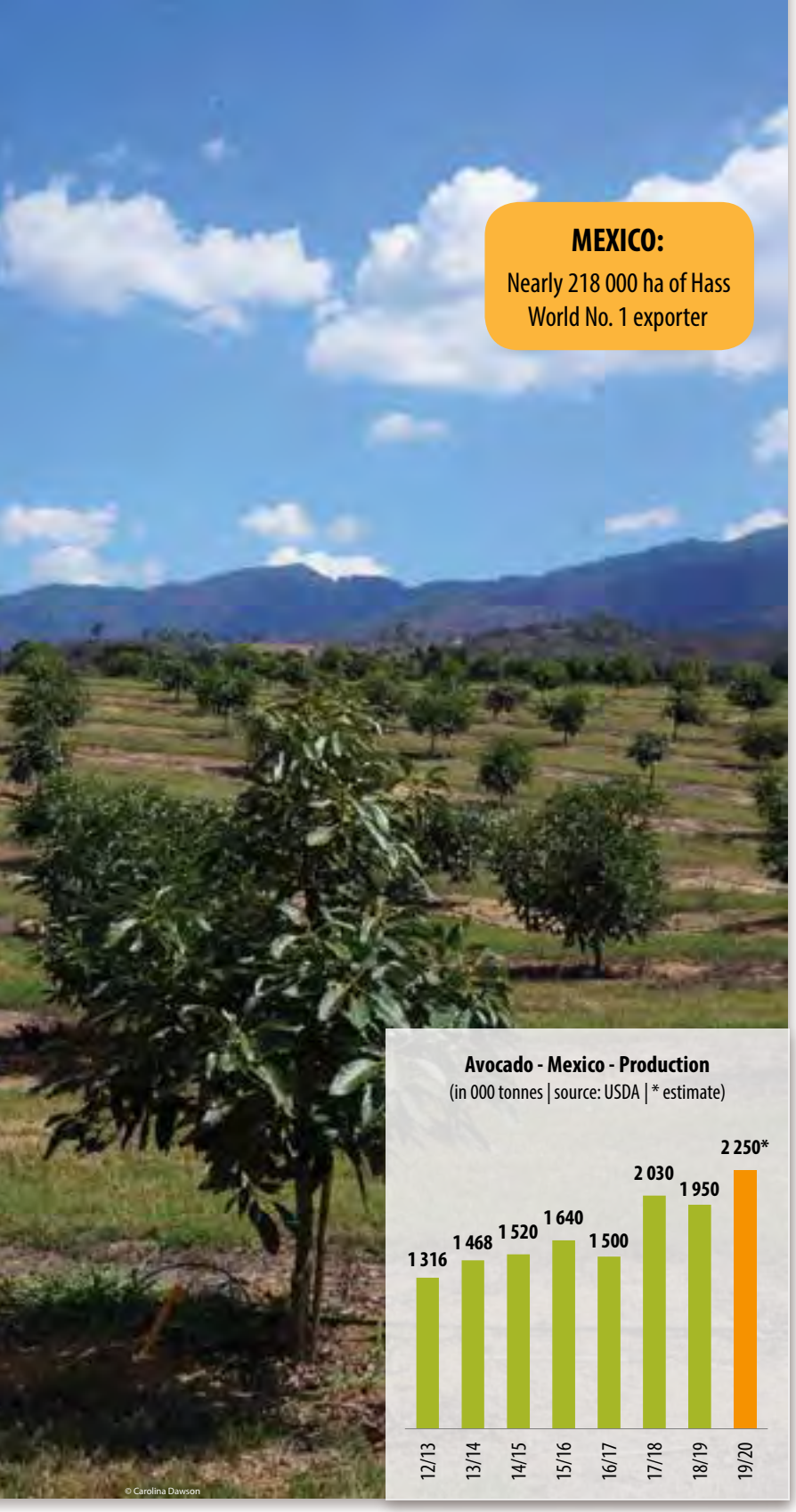


Avocado - Mexico - Production
(in 000 tonnes | source: USDA | * estimate)

Avocado — Mexico — Exports

in tonnes	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
USA	522 488	516 085	693 344	862 457	759 318	861 393	938 953
Canada	35 044	33 632	44 958	62 148	71 607	83 346	88 854
Japan	55 883	51 626	53 175	64 864	62 459	60 455	69 960
EU	9 137	5 690	12 996	47 689	38 768	62 146	48 348
Others	34 893	26 386	42 597	44 092	33 820	66 306	51 465
Total	**657 445**	**633 418**	**847 070**	**1 081 250**	**965 972**	**1 133 646**	**1 197 580**

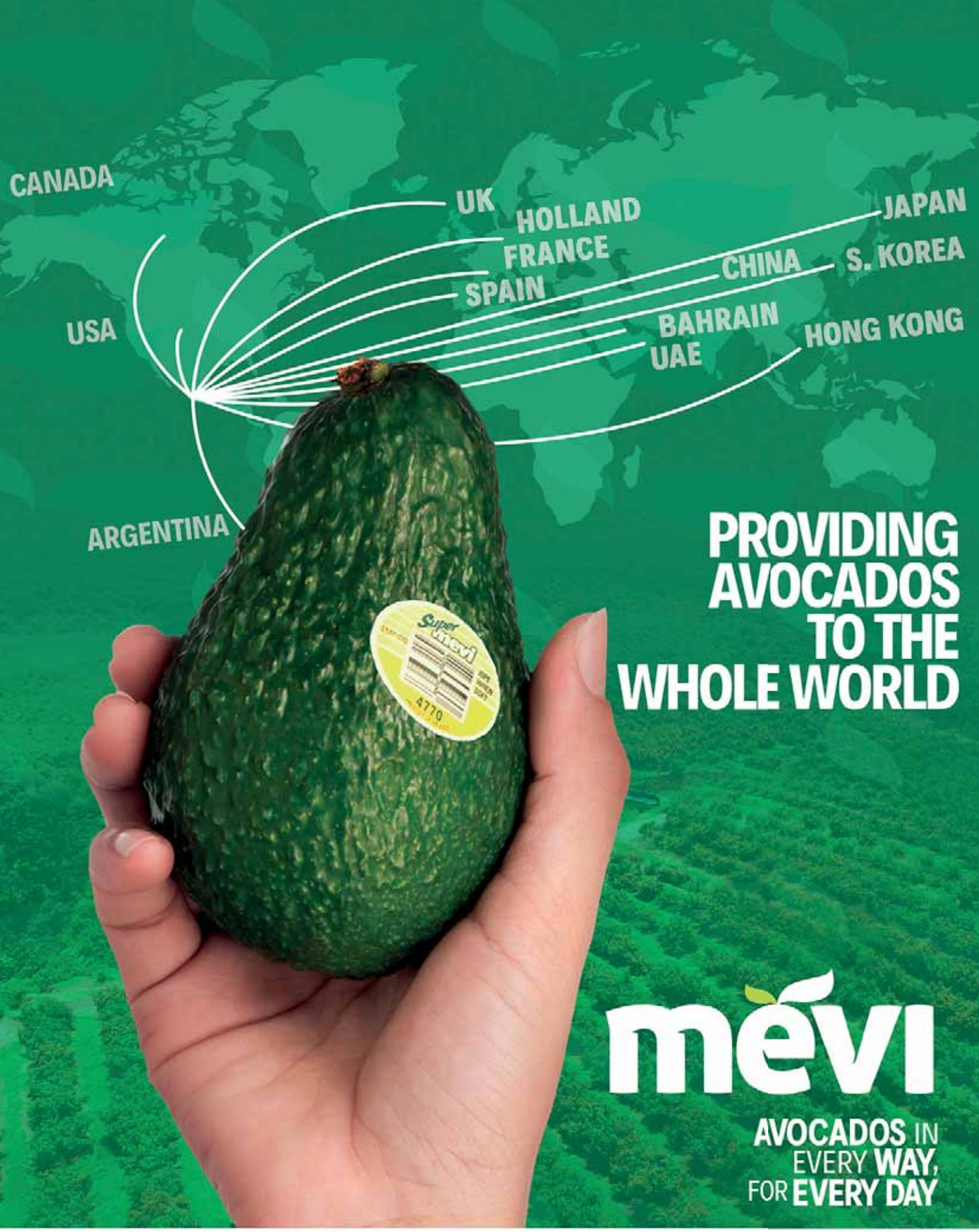
Source: Mexican Customs

JALISCO
Another game changer for the EU

Jalisco's very steep production growth is also likely to be a game changer in the medium term or even the short term. This Mexican State is already a supplier to be reckoned with, shipping estimated volumes to the EU-28 over the course of 2018 of more than 27 000 t (i.e. more than half of the Mexican supply, and just under 5 % of the total annual market supply). These shipments will continue to rise in 2019-20 (approximately + 10 to + 20 %, depending on the operators), thanks to the expanding cultivation area. The campaign has a started with a bang, with export volumes across all destinations up by 30 % from 2018-19 during the first two months (July and August). The fruit sizing should be slightly down from 2018-19, but will maintain a good level and will probably be a major draw factor (more than 50 % of the supply comprises fruit ranging from size 12 to 20 inclusive). This campaign will probably not provide a happy epilogue to the saga of the Jalisco avocado's attempts to make it onto the US market. The political context, with relations still very tense between Mexico and the USA, does not provide any glimpse of a breakthrough in the short term (some professionals reckon that they will need to wait for the next US Presidentials, in November 2020).

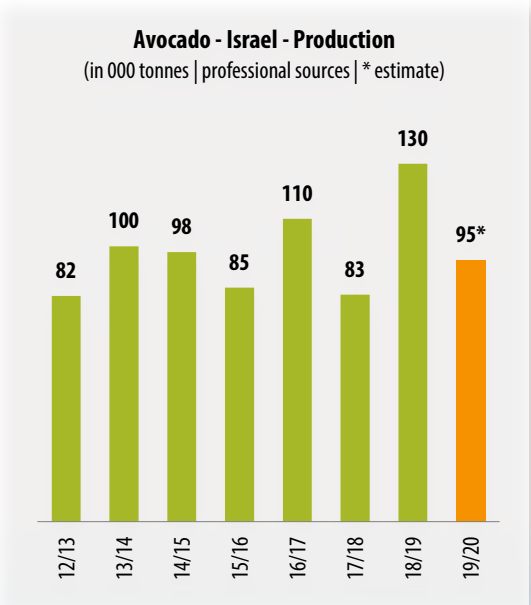
MICHOACAN
A record season, with the USA set to feast

Michoacán reportedly has a record harvest, after a 2018-19 season marked by a negative bearing swing. According to the initial estimate by MHAIA, there could be an increase of around 15 to 20 % (study based on the production from the "aventajada" and "marceña" flowering periods). The main beneficiary of this boom will of course be the USA. The APEAM's projected volumes are reckoning on shipments to his market in excess of one million tonnes (+ 14 % on 2018-19). What about the volumes aimed at the EC market? This is a tough question to answer. However, we must consider that Michoacán now provides only top-up volumes to Europe (probably 20 000 to 25 000 t in 2018-19, i.e. less than Jalisco). A rise is more than probable given the open market context.



ISRAEL
Negative bearing swing

Mediterranean production will not enjoy the same momentum as Jalisco or Colombia. A big downturn in the harvest is expected for Israel (25 to 35 % according to estimates). This is due in part to a highly marked alternate bearing swing, due to last year's record harvest and a late trading calendar which drew even more on the trees' carbon reserves. A heatwave which hit during the second half of May also led to major physiological droppage. There was a particularly significant fall for Ettinger and Hass. The sizing should be somewhat bigger than last season, as rainfall levels have been good since last autumn (by way of example, more than 600 mm in Jerusalem, as opposed to 300 to 400 mm the two previous seasons). Exports will remain focused on the EU-28 (75-80 %). However, the local market could be highly attractive compared to the EC market, the euro having lost more than 7 % against the shekel since the start of the year.



ISRAEL:
Nearly 10 000 ha
(48 % green varieties and 52 % Hass)
World No. 5 exporter

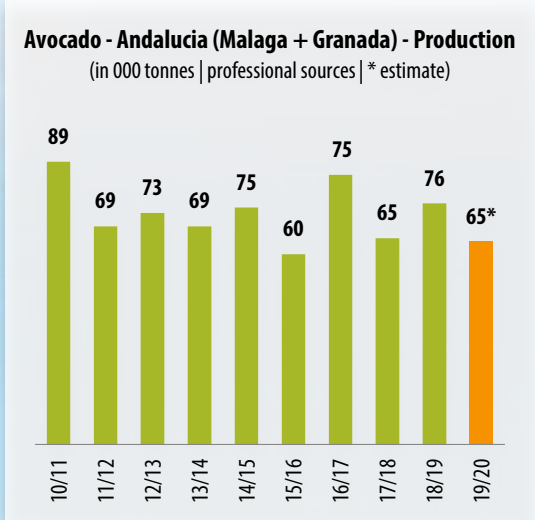
Avocado — Israel — Exports

in tonnes	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
EU-28	35 117	42 844	46 086	34 995	56 600	41 567	60 101
Others	8 177	10 100	9 888	6 224	11 773	12 945	17 688
Total	**43 294**	**52 944**	**55 975**	**42 067**	**68 373**	**54 512**	**77 789**

Professional sources and Eurostat

SPAIN
Negative bearing swing too

Spanish production too will see a negative bearing swing, after a record 2018-19 season. The downturn is estimated at between 12 and 20 %, depending on the source. Green varieties, which now represent just 15 % or so of production, are apparently more affected than Hass. The sizing is set to be similar to 2018-19. The decent level of water reserves at the beginning of the season has helped make up for the abnormally low precipitation registered in recent months. Nonetheless, the Viñuela reservoir, which supplies the bulk of the orchards in the Málaga/ Granada zone, is at just 35 % capacity (as opposed to the ten-year average of 57 %). More severe irrigation quotas might be implemented if it does not rain shortly.



MOROCCO
Partial recovery

2018-19 was a difficult season for the Moroccan industry, as the negative bearing swing and the chergui (hot wind coming in from the Sahara) halved exports. Things are auguring better for the 2019-20 season, though export potential will nonetheless not make a complete recovery. Rainfall was below normal, and above all last season's heatwave affected the structure of certain orchards (some trees requiring regenerative pruning). Hence shipments should only regain an average level (13 000 to 15 000 t), with normal sizing. A large proportion of the producers should start the season early, as the previous one hit their pockets hard.

MOROCCO:
Nearly 6 000 ha of Hass
World No. 10 exporter

Avocado — Morocco — Exports

in tonnes	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
EU-28	840	4 766	7 293	7 141	9 237	21 983	11 237
Others	317	562	301	131	423	-237	163
Total	**1 157**	**5 328**	**7 594**	**7 272**	**9 660**	**21 746**	**11 400**

Sources: Comtrade, Eurostat

Avocado — Spain — Exports

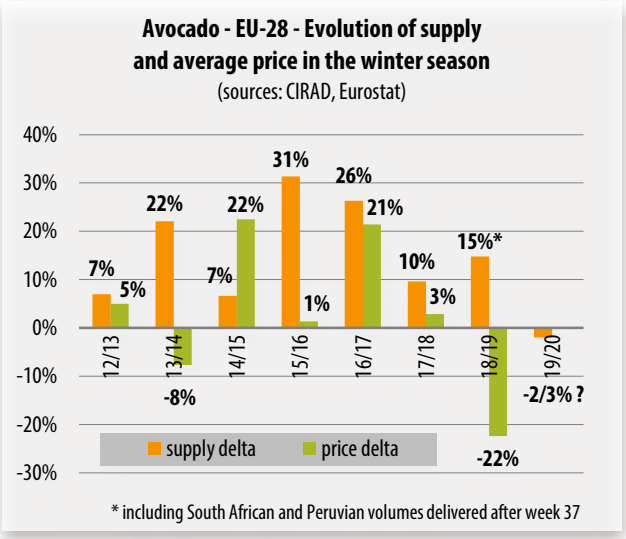
in tonnes	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Intra EU-28	38 500	36700	50 600	37 600	54 600	48 600	57 000
Extra EU-28	7 700	3100	4 000	2 900	5 800	3 718	3 718
Total	**46 200**	**39 800**	**54 600**	**40 500**	**60 400**	**52 318**	**63 800**

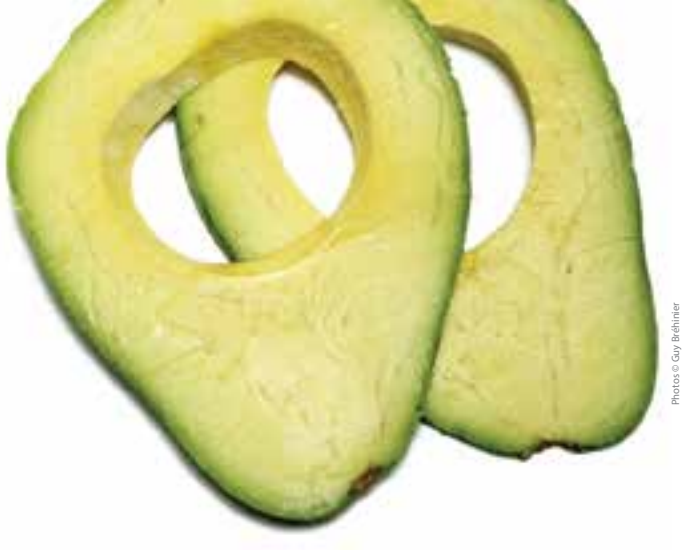
Professional sources and Eurostat

SPAIN:
Nearly 14 000 ha
World No. 7 exporter

A considerable supply shortfall, due to a longer trading calendar

If the hypotheses set out above prove correct, the overall supply should be similar to 2018-19. Our projection, which assumes a somewhat optimistic scenario of stable Chilean shipments, reckons on volumes of approximately 273 000 t (excluding Michoacán), a figure down slightly, by approximately 4 %. However, we must highlight a very important point relating to the trading calendar. The summer campaign underwent a steep decline from mid-September, i.e. practically one month earlier than in 2018. Hence volumes on the market during the 2019-20 winter season now starting will be spread over seven months rather than six, as was the case in 2018-19. Consequently, while the overall supply expected for the season is similar to 2018-19, the monthly supply level will be down by nearly 15 %. The increasing Peruvian shipments from hyper-early zones (Sierra) should only mitigate the shortfall in February/March (surface areas estimated at between 2 000 and 4 000 ha of orchards with moderate productivity – see HAB/CIRAD file – World avocado production prospects "The avocado in Peru"), given the very probable tidal wave from Olmos, which will mark the start of the summer season during the second half of April.





Photos © Guy Bréhinier

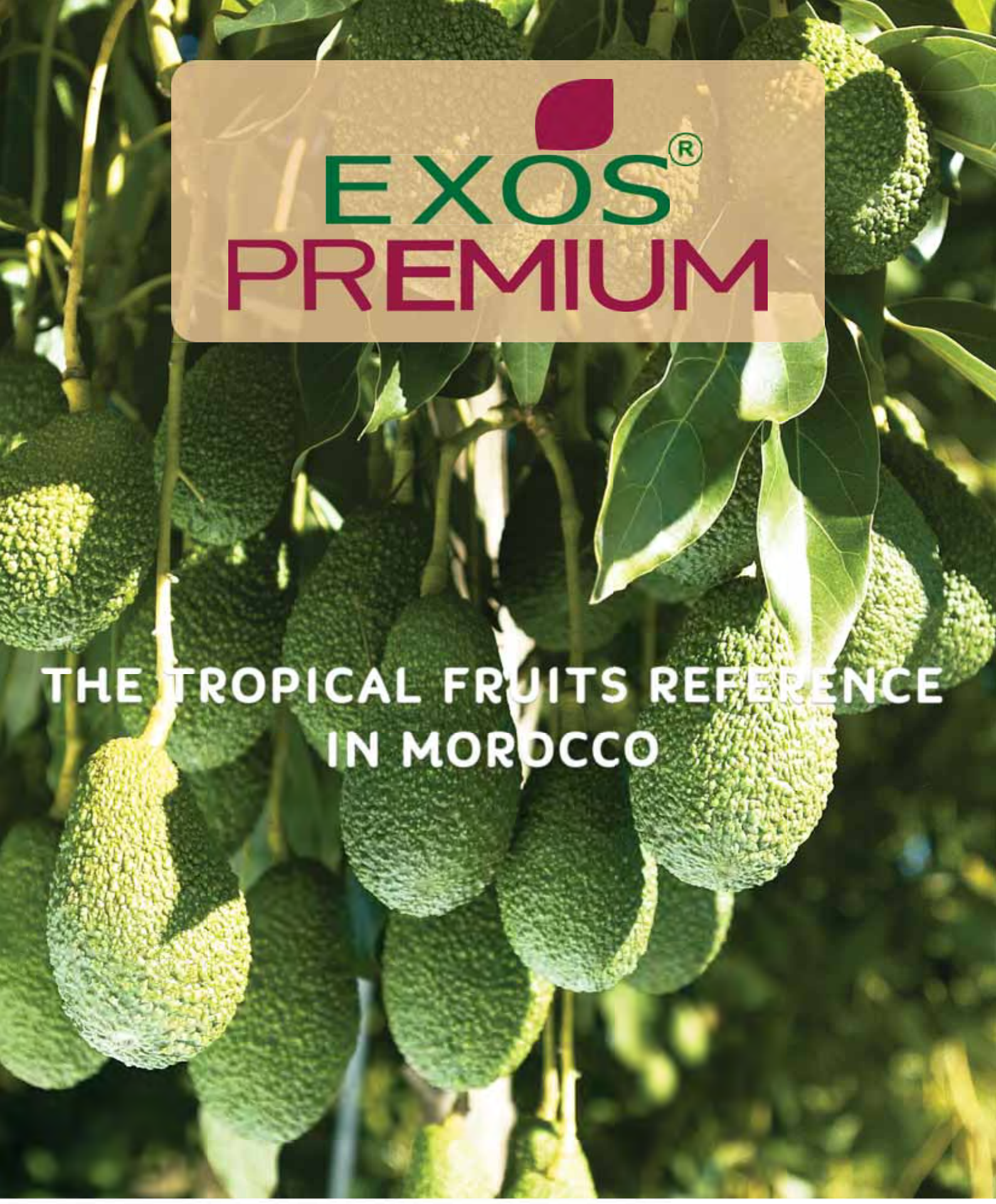
Avocado — Supply trend in 2019-20

in tonnes	2018-19 production	2018-19 export	of which to EU-28	Trend 2019-20 / 2018-19
Chile	210 000	147 000	87 571	- 5 %
Israel	95 000	77 800	60 101	- 25 to - 35 %
Spain		63 800	57 000	- 15 to - 20 %
Morocco		11 400	11 237	+ 23 %
Colombia		40 000	38 000	+ 30 %
Jalisco		90 708	30 000	+ 10 to + 15 %
Total, 6 suppliers		**430 708**	**283 909**	**- 4 %**
Michoacán		**1 106 872**	**17 600**	**+ 15 to + 20 %**
			Total EU-28	**- 2 to - 3???**

Professional sources

Campaign average price high, but with a very wide range

Sizing will be another major distinguishing point from the last campaign. Small-sized fruit appears to be abundant this season. This clearly applies to Chile. The Colombian profile should remain mainly focused on small fruit, although a bit of a rise is expected. Hence while the campaign average price for Hass should be at a considerably higher level than last season, prices are set for a big differential between large and medium fruit, and the small-sized fruit abounding this season. Rates should be very high until early November (Chile and Mexico/Jalisco with the stage to themselves), and then dip in November (Colombian supply increasing, Mediterranean beginning its campaign). The pressure on small sizes should be fairly high (in particular on the Scandinavian markets) during this period of large Colombian and Chilean volumes. Rates should recover at a fairly early stage in the year, with the Chilean campaign winding down early to give way to the Mediterranean supply mostly in shortfall. There could be an abrupt shift in the supply tempo in the second half of April, with the start of a very busy summer season (positive bearing swing, and effect of expanding cultivation area in South Africa and Peru), in a less open US market context (positive bearing swing in California).



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Concentration of volumes on the continent

The effects of Brexit could appear during this 2019-20 campaign, whatever the UK's departure scenario from the EU-28. On the one hand, the lack of appeal of the British market due to the weakness of sterling should prevail (see consumption article). On the other hand, certain chains have already announced that they would pass on to the consumer any customs duty charged on avocado imports. Such a backward step would have an effect on consumption, especially since retail prices are already set to be high given the probable supply level. So these two factors could contribute to some of the volumes ordinarily earmarked for the United Kingdom being switched to the Continent.


© Carolina Dawson

Growth rate in the Mediterranean still high

This campaign of stagnation – at best – for volumes bound for the EC market should not lead us to forget the massive surface area expansion trends, which are continuing or even gathering pace. In Israel, the annual planting rate has now been around 1 000 ha since 2018 and 2019 (as opposed to 300 to 500 ha approximately until 2017). The cultivation area exceeded the symbolic 10 000 ha threshold. Planting is continuing in the traditional zones (coastal plain, West Galilee and Eastern valleys), though the majority of developments are now taking place in the western Negev (near the Gaza Strip). Similarly, the planting rate is maintaining a high and stable level in Spain (estimated between 500 and 600 ha). There too, the majority of new plantations are being established outside of the historic Málaga/Granada region. The Huelva, Valencia and Cadiz centres are forging ahead, with fairly different production systems (large projects under the initiative of cooperatives or private players in Huelva, and smaller orchards in the Valencia region). There is a large development potential (more than 10 000 ha of suitable land in the Huelva region for example), while the crisis that has struck citrus growing is encouraging growers to convert. Portugal too is in the process of becoming a significant player. Exports, still limited at present (approximately 2 000 to 3 000 t in 2018-19), should be between 10 000 and 15 000 t within four to five years' time. Conversely, the planting rate has been significantly curbed in Morocco. Investment in Hass plantations now seems more risky in certain zones, after the extreme climate episodes that have occurred in recent years.

Explosion in surface areas in Latin America

While there is nothing trivial about the planting of new orchards in the Mediterranean, growth is on a completely different scale in Latin America. The enormous orchards of Michoacán (more than 170 000 ha) and Jalisco (more than 26 000 ha) are continuing to come into their prime (see HAB/CIRAD file – World avocado production prospects "World avocado production prospects "The avocado in Mexico"). Furthermore, the planting rate is still high, although there is a perceptible downturn due to lack of quality land and/or water (3 000 ha for Jalisco and 10 000 ha for Michoacán on average in recent years). Hence production, which was approximately 2 million tonnes in 2018-19, could increase by approximately 800 000 t by 2023 (nearly 300 000 t of which for Jalisco, which very directly affects the EC market). Furthermore, surface areas in Colombia are booming – and this is no cliché. According to professional sources, the cultivation area, which already covers approximately 18 000 ha, should practically double in the short term. Approximately 15 000 ha has been sold for the purpose of developing avocado orchards in the past twelve months, following a wave of unprecedented investment from mainly foreign investors (especially Peruvian, Chilean and Mexican). Hence the cultivation area should exceed 30 000 ha early in the next decade. Only Chile should continue to see its surface areas practically stagnant, at approximately 29 000-30 000 ha, despite a slight upturn in planting on the coast of the Valparaiso region (San Antonio), and zones in the O'Higgins region enjoying a favourable microclimate ■

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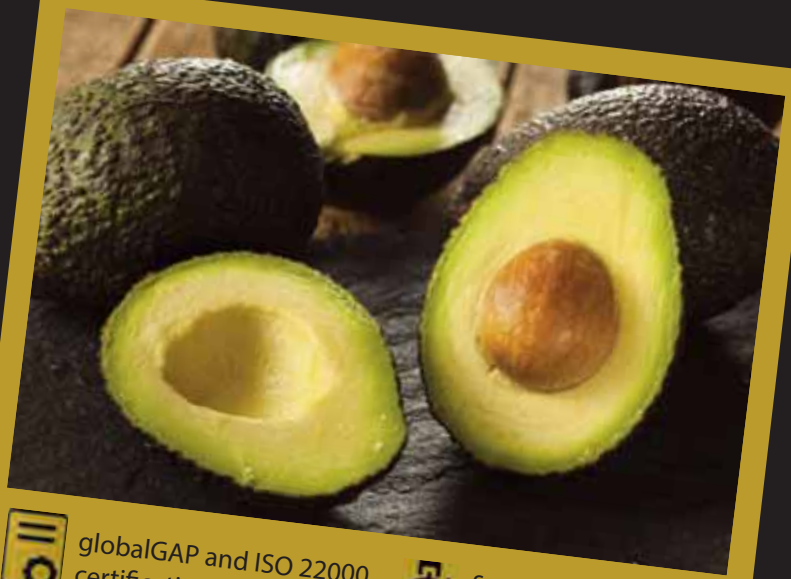

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The Peru and Mexico files in the "World avocado production prospects" collection, presented below, are the fruit of a partnership between the Hass Avocado Board and the CIRAD Market News Service.

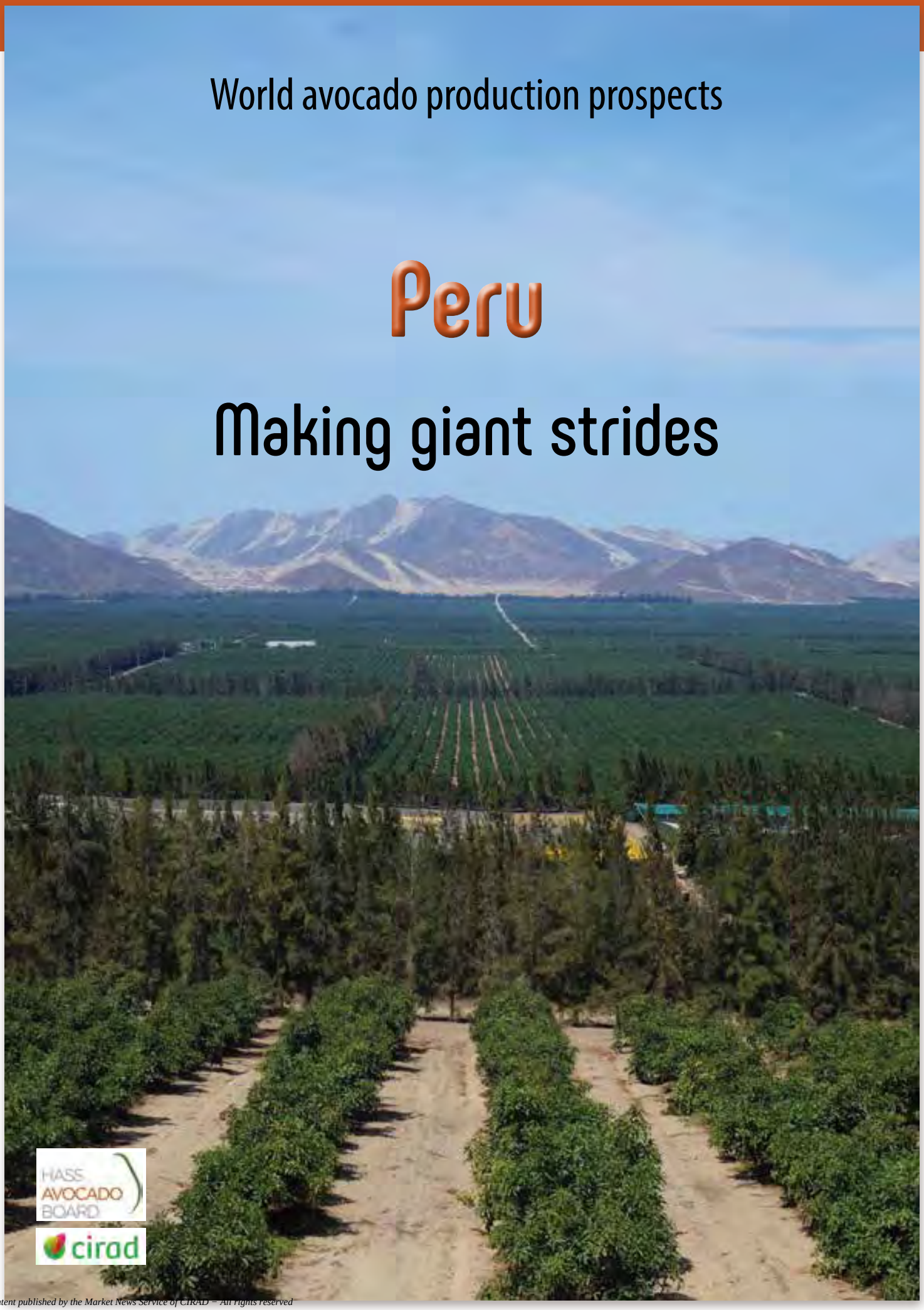
The editorial team would like to thank all the professionals who have contributed to drawing up this country profile

Photo credits: Carolina Dawson, Eric Imbert, Guy Bréhinier

World avocado production prospects

Peru

Making giant strides



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The avocado in Peru

Within the space of a decade, Peru has become the world number two Hass avocado exporter, with volumes aimed at the international market in excess of 350 000 t in 2019. This success story is based on a hyper-competitive production model, in large part thanks to the highly particular pedoclimatic conditions prevailing on the Peruvian coast and to the irrigation infrastructures set up from the mid-1990s onward. The cultivation area, which covered more than 31 000 ha as at the end of 2018, should continue to expand, albeit it at a more moderate rate in the years to come.

World avocado production prospects – PERU 1

History of the industry and production systems

Introduced to Peru in the 15th Century, the avocado is a major and traditional crop. Its production, amounting to around 100 000 t, was sold only on the local market until the mid-1990s. It was based solely on mediocre quality native varieties, and to a lesser degree Fuerte. From then on, a massive agri-business boom came into play, the avocado was one of the most emblematic crops of this development. The stabilisation of the political situation after a long period of crisis (armed conflict between the terrorist movement "Shining Path" and the State) and measures to promote foreign investment created favourable conditions for harnessing the great agricultural potential of the coastal strip, extending all the way down the country.

True, this zone does have a desert climate – an anomaly given the country's equatorial latitude – due to the presence of the Andes mountain range, which acts as a wall blocking rain from the East, and to the Humboldt cold current, which maintains a high-pressure zone offshore. However, it is a vast open greenhouse, since temperatures are very steady, with no marked extremes, and optimal for photosynthesis. Most of all, large-scale water projects have been set up, making it possible to take advantage of the abundant high-quality water reserves from the mountain range, and overcome the almost complete lack of precipitation.

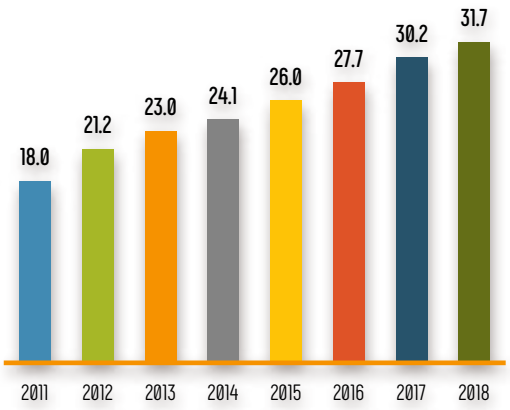
So agri-business took off. Investors initially focused on crops such as asparagus or peppers, which enabled them to acquire a good technical command of large-scale horticultural crops for export, in such a particular pedoclimatic context. On the strength of this experience, large industrial Hass avocado plantations started to appear, drawing inspiration from the success of the Chilean model. They are now benchmarks in terms of competitiveness, within large-scale industrial production systems, and highly capital-intensive. Yields are among the highest in the world, at both the production stage (15 to 20 t/ha) and packing stage (sorting discards of around just 8 %). In parallel, production costs are highly competitive (5 000 to 7 000 USD/ha barring harvesting), the prices and availability of the main production factors being good (net minimum salary approximately 350 USD/month for labour), and the phytosanitary pressure is low (dry climate, virgin ecosystems, no *Phytophthora* in these sandy soils).

However, recurrent extreme climate events (El Niño, La Niña) adversely affect production and infrastructures.

Current cultivation surface area and location

Hass surface areas have undergone exponential growth, especially since the opening up of the US market in 2011. The cultivation area, covering approximately 100 ha in 1994, had by the end of 2018 risen to 31 000 ha. It is mainly concentrated in the 2 000 km dry coastal strip from Chiclayo in the north to Arequipa in the south. There are four major zones, distinguishable by their production system. From north to south, we have the Olmos irrigated area (Department of Lambayeque), the Chavimochic irrigated area (Department of La Libertad), the low-lying valleys of the Departments of Lima (especially Barranca on the River Pativilca, Huaura on the river of the same name, Huaral on the River Chancay, Cañete on the river of the same name, Chincha on the River Matagente) and Ancash (Casma on the river of the same name and Chimbote on the River Lacramarca), and the Sierra (the western foothills of the mountain range, mainly in the south of the Departments of Huancavelica, Arequipa, Cuzco, Ayacucho and Ica). Approximately 60 % of the production comes from ProHass members, which provides both technical support and marketing assistance.

Hass avocado from Peru - Evolution of planted areas
(areas at the end of the year in 000 ha | source: ProHass)

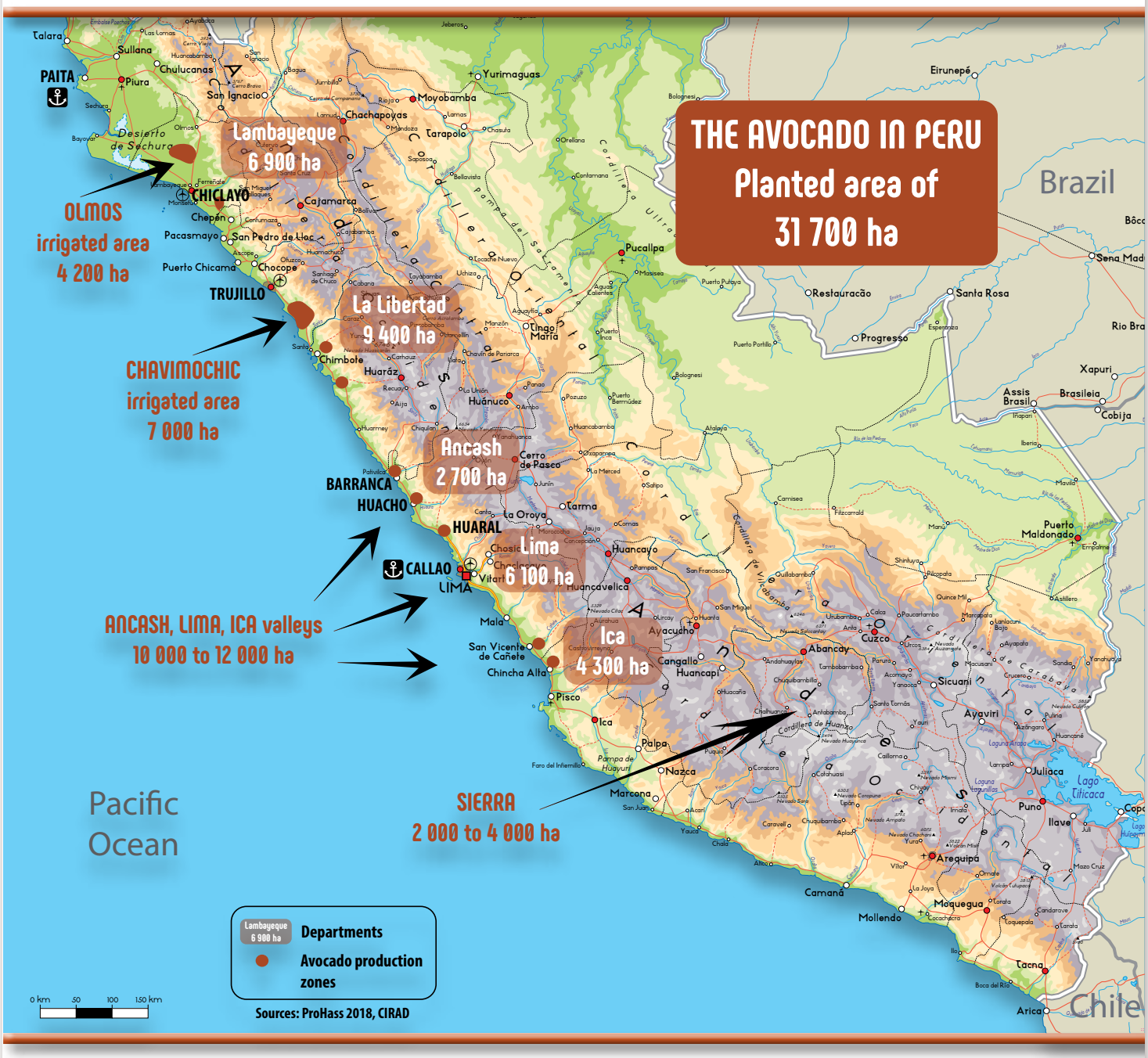


Peru in a few figures:

- **Population:** 32 million inhabitants in 2017 (60 % on the coast, 9 million of which in Lima)
- **GNI/capita:** 5 960 USD/year (Source: World Bank - 2017)
- **Agriculture:** 6.9 % of GDP (Industry 36 %)
- **Value of agricultural exports:** 6.5 billion USD (Source: World Bank - 2018)

Main export agricultural products: (source: Agrodata Peru - 2018)

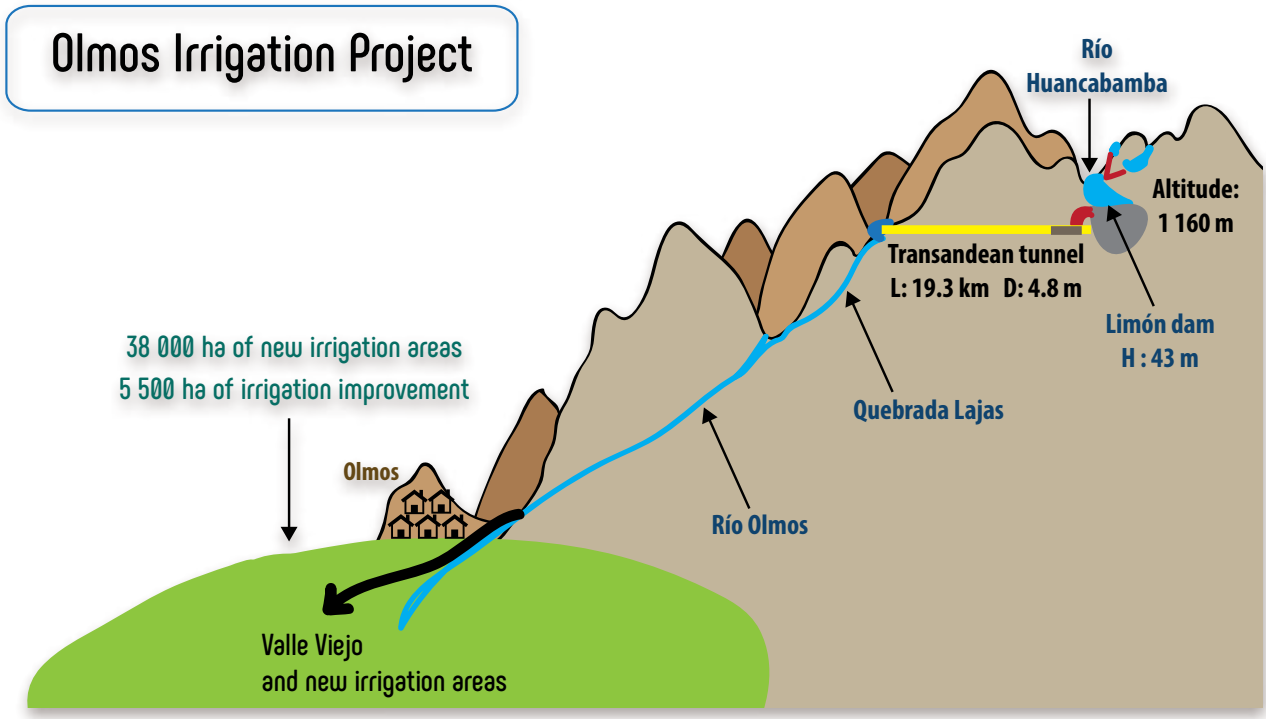
- **Grape:** 815 million USD
- **Avocado:** 720 million USD
- **Coffee:** 680 million USD
- **Blueberry:** 554 million USD
- **Asparagus** (fresh and processed): 516 million USD



Olmos zone

This recently developed irrigation area is particularly attractive since it combines ease of farming (vast area of flat land) and an early production calendar, enabling Peru to expand its trading window. The average fruit sizing is nonetheless smaller than in the rest of the country, and water availability is a factor limiting expansion of surface areas.

This 38 000 ha irrigated area, very recently developed (2014), is situated in the north of the country, north-east of Chiclayo. It was set up in a desert zone with very poor soil (practically exclusively sandy, with the exception of the southern part where some clay can be found), and completely virgin in terms of agriculture due to its very high aridity (mean rainfall of 20 mm in a normal year). Conversely, the climate conditions are highly favourable for growing the avocado, and similar to those of a natural greenhouse, with minima of generally around 13°C and maxima sometimes on the high side (up to 34°C). This high climate potential could be harnessed thanks to the development of a hyper-tech and completely original cropping system, and to major private investment in large-scale waterworks. The area is supplied by the abundant runoff from the River Huancabamba, which discharges into the River Amazon. This water, captured from the eastern slope of the mountain range at the Limón dam, crosses the Andes via a tunnel around twenty kilometres long to the western side, emerging at the Palo Verde dam, which is the start point of an underground network supplying the area. Although its turbidity means that a sedimentation process is required, it has excellent chemical quality.



Strengths:

- High production potential (climate conditions, high technical level, intensive cropping system).
- Easily farmed zone (terrain, desert).
- Low sanitary pressure (new ecosystem).
- Big social externalities in a particularly deprived zone.

Challenges:

- Water availability a limiting factor, extreme temperatures.
- Sizing medium to small.
- Lack of knowledge on the sustainability of the technical system.
- Lack of packing and export infrastructures (ports distant, and road network deficient) or mistrust of existing ones.

The area is dedicated to industrial and export crops. All the plots, ranging from 250 to 1 000 ha, have been sold. However, approximately 30 % of surface areas remain undeveloped, as the water quotas of 10 000 m^3 per hectare allocated by the National Water Authority (ANA) are insufficient to cover the requirements of the vast majority of crops present (the water from plots left unused is employed to supply the planted areas). The avocado is the number two crop in the zone (4 200 ha as at the end of 2018), behind sugar cane (10 900 ha) and ahead of the blueberry (1 400 ha). Eventually there should be a very good productivity level, thanks to the climate conditions and to the vigorous rootstocks used (non-clonal, but generally Zutano or West Indian). The extreme vigour of the young orchards meant yields of 10 t/ha from the second year, with the objective of achieving 20 to 25 t/ha upon maturity from the fifth year. Furthermore, the early production calendar is particularly advantageous (dry matter content reaching 23 % in early/mid-April for Hass). Conversely, unlike the country's other production zones, the sizing is medium to small (size 20/22 predominant, i.e. approximately 185-200 g per fruit). Water is an important limiting factor, with the quota of 10 000 m^3/ha less than the estimated requirements of 14 000-15 000 m^3/ha with the micro-irrigation systems used by all the producers (minimum of 12 000 m^3/ha with the most economic production system, combining mulching and techniques promoting deep rooting). Large-capacity reservoirs mean that strategic stocks can be built up during periods when the water requirement is smallest, in anticipation of a fall in water resources during the dry season (April to October). The wind is also a constraint, with wind-breaks needing to be set up.

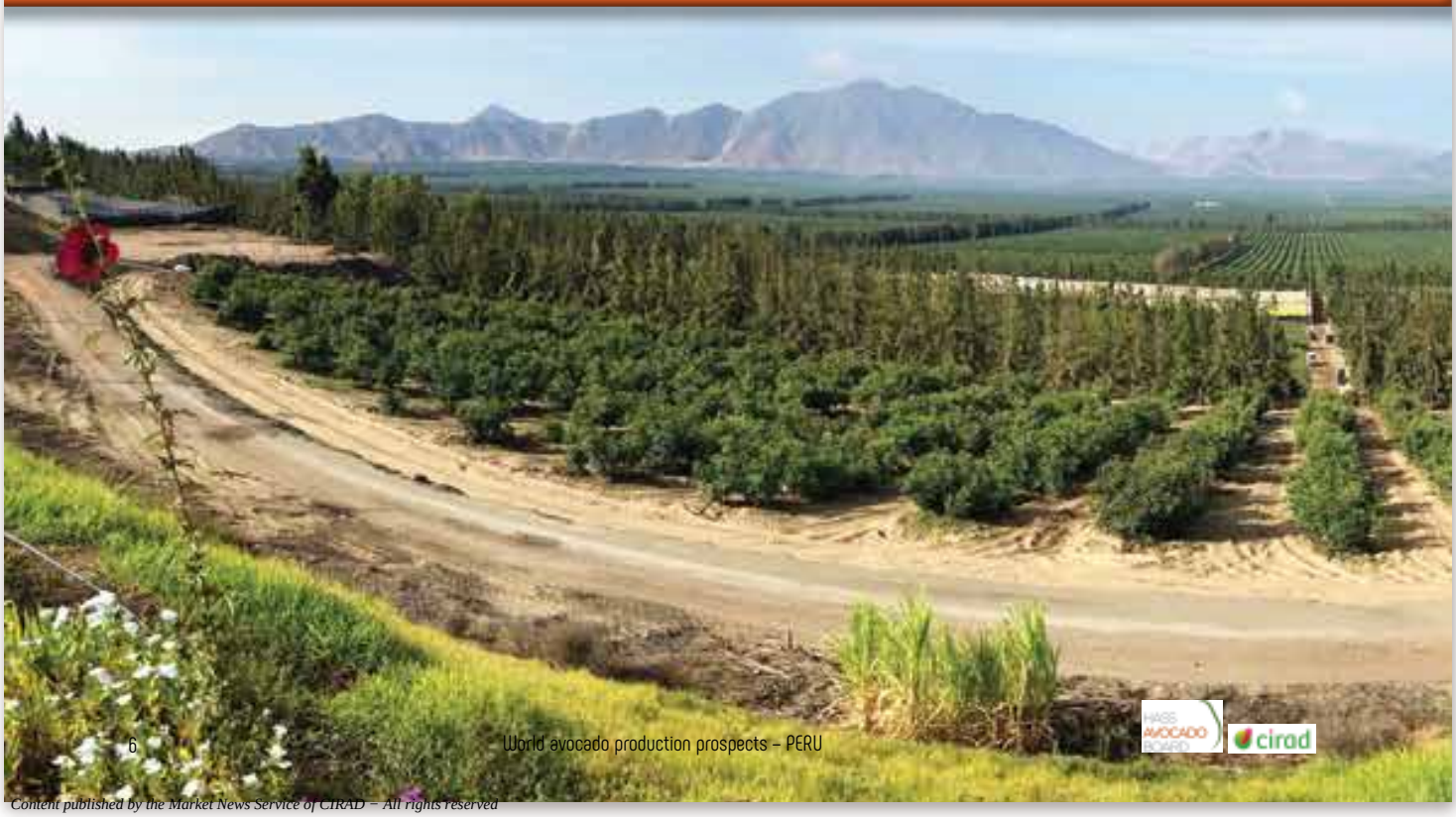
The sanitary pressure is low in this virgin ecosystem, which means that mild management methods can be used. Hass makes up the bulk of the plantations. Early Hass like do not provide any advantage in terms of calendar, but Maluma is being tested by certain operators with a view to providing better sizing.

Three-quarters of the 4 200 ha planted are in the hands of the three big producer-packer-exporter groups, which have set up orchards of 600 to 1 500 ha; the remaining surface areas are mainly controlled by companies owning 300 to 500 ha. The extremely flat terrain is favourable for planting large cultivation areas. There are currently no packing stations in the zone, with a large-scale project due to appear in 2021. The fruit is transported in harvesting bins (after hydrocooling for one operator) in refrigerated lorries to the packing stations, which are situated in Piura (transit time approximately 5 hours) or even Chavimochic (transit time between 8 and 9 hours). The refrigerated containers loaded at the station are then exported via the ports of Paita or Callao. The region's producers have teamed up with the Pro Olmos association, and are actively working on subjects of general interest (plant protection, etc.).

Chavimochic zone

The cradle of the Peruvian Hass industry, the vast Chavimochic irrigated area remains one of the country's main production centres. The pedoclimatic conditions are just as peculiar as they are favourable for growing Hass, under very large-scale production systems, very high-tech and capital-intensive. Despite the ongoing high availability of the main production factors, the zone's development is currently being limited by the saturation of the market window occupied by Chavimochic.

Chavimochic is the biggest and oldest of the country's irrigated areas (the first lot opened up in the mid-1990s). This large-scale project, situated near the coast in the north of the country, is aimed at improving or developing irrigation in four valleys of the Department of La Libertad (Chao, Virú, Moche, Chicama). It draws off some of the waters from River Santa, the most powerful and regular on the country's Pacific Seaboard, thanks to its big catchment area in the heights of the Andes (rainwater and meltwater). Three of the four valleys have now been developed, to cover a total of 75 000 ha. Unlike Olmos, the supply is provided by open canals. The water quality is excellent, though with high turbidity, especially during the rainy season, which means that a sedimentation process needs to be applied.



6 World avocado production prospects – PERU

The pedoclimatic conditions are fairly similar to those at Olmos. The soils are also very sandy, yet temperatures are still more favourable for growing, since the maxima are less extreme, not exceeding 30°C (minima of 14-15°C). The terrain, which is a little rougher than in Olmos, is still favourable for planting large surface areas. The zone has become one of the country's main production centres for sugar cane and various horticultural specialities for export in processed form (canned asparagus, pepper and artichokes) or fresh (blueberry, easy peelers, avocado). Chavimochic is the cradle of the Peruvian Hass export industry. The pioneer of the crop in the country, Camposol, set up its first plantations there in the late 1990s. Surface areas dedicated to Hass covered approximately 7 000 ha as at the end of 2018. They saw great expansion during the latter part of the 2000s, often replacing the asparagus and pepper.

The production system is similar to Olmos, highly original and high-tech (widespread fertigation, etc.). While water availability for irrigation is not limited, water is subject to progressive prices, though it is still cheaper than in Olmos (irrigation level generally 16 000 to 18 000 m3/ha). Hence, due to the less extreme temperatures, sizing fluctuates within a higher range than the Olmos region (sizes 16 to 18 predominating). Early Hass like, or those providing extra sizing (Maluma) are under-developed. Some producers are nonetheless testing Lamb in order to extend the end-of-season market window. For the most part standard density planting is being applied. The range of rootstocks used is wider than in Olmos. The calendar is later, with the harvest starting in late April-early May. The average yield is around 16 to 18 t/ha, though this can undergo major variations (12 to 22 t/ha depending on the year). On the oldest plantations, now aged more than twenty years, no fall in productivity or sizing has been observed to date.

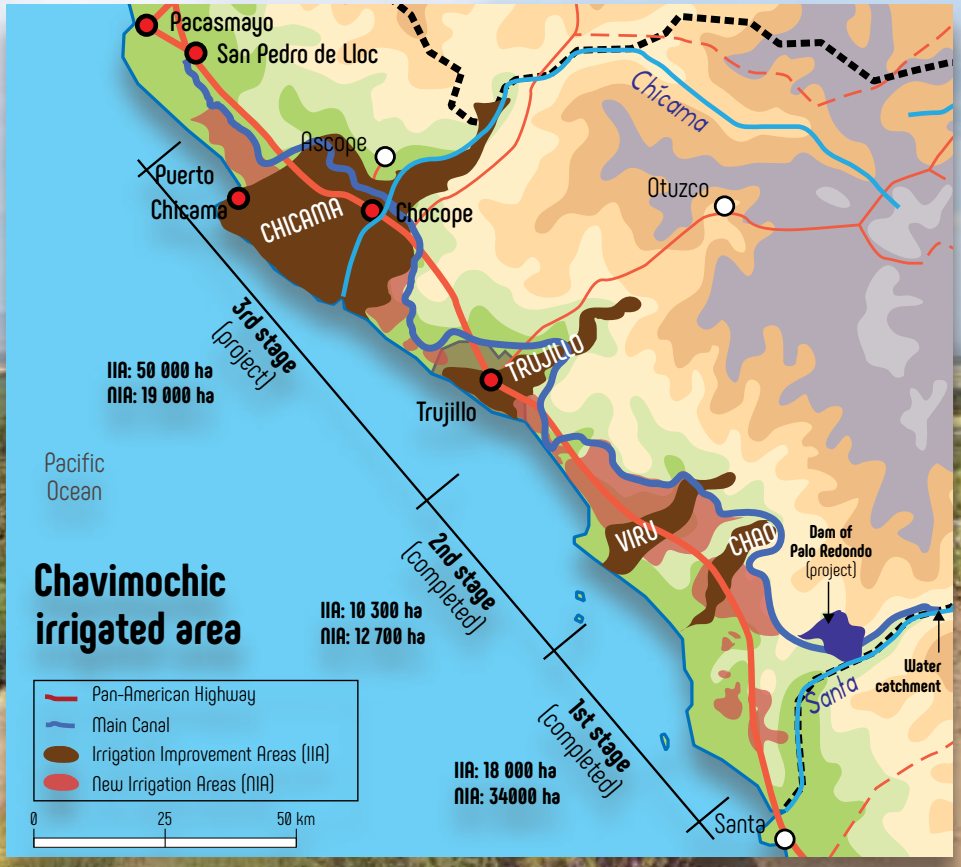
These surface areas are 80 % held by five big producers/packer/exporter groups. They comprise orchards of 600 to 2 600 ha. The remaining surface areas are mainly controlled by companies owning 100 to 250 ha.

Strengths:

- Pedoclimatic conditions ideal for highly capital-intensive systems, with large water availability.
- Original yet proven cropping system.
- High production potential (climate conditions, high technical level, intensive cropping system, no water limitations).

Challenges:

- Production highly concentrated in the same market window: marketing and logistics under pressure.
- Open water infrastructure, more fragile.



Coastal river valleys

Departments of Ancash, Lima and Ica

The coastal river valleys, traditional agricultural zones which have partially switched toward export crops, are Peru's number one avocado production area. The production systems are more diversified and smaller than in the large irrigated areas in the north of the country. Planted areas are now seeing more moderate expansion.

The desert strip bounding the Peruvian coast in the Departments of Ancash, Lima and Ica is punctuated with valleys shaped by rivers running from East to West, from the Andes Range to the Pacific. These water courses are fed by meltwater and the precipitation battering the high-altitude zones in the Cordillera. Waterworks have been set up to be able to harness these high agricultural potential zones. Structures such as canals, wells and retention basins have been built to cope with the irregular river flow, with the majority of potential discharge occurring from December to March. Just as in the rest of the coastal part, rainfall is practically zero, yet the climate is particularly favourable, with temperate temperatures varying between 15 and 32°C throughout the year, slightly lower than in Chavimochic.

Agriculture has a long-standing presence in the lower river valleys, where we can find traditional crops aimed at the local market; plus, more recently, export produce. Avocado planted areas can be estimated at between 10 000 and 12 000 ha. The main production centres of the Department of Ancash are Casma, on the river of the same name and Chimbote, on the River Lacramarca. In the Department of Lima, we can find in particular the Barranca zone on the River

Pativilca, Huaura on the river of the same name, Huaral on the river Chancay and Cañete on the river of the same name. Finally, avocado plantations have also been set up in the Department of Ica (Chincha zone in particular, on the River Matagente). Barring a few differences, the growing conditions are very similar to Olmos and Chavimochic. The highly sandy soils are a bit richer in the alluvial zones. The chemical quality of the water is sometimes not as good in zones supplied by wells (higher salinity). Finally, the holdings are smaller in size (from twenty or so to a few hundred hectares, with few plantations in excess of 1 000 ha), with producers sometimes grouped into associations. The production system varies according to the plantation size, but is frequently lower-tech. Yields too are variable: approximately 14 to 15 t/ha on average. The production calendar is very similar to that of the Chavimochic zone (season starting in late April-early May), and fruit sizing is also medium to large. The planting dynamic is fairly low (land availability, water stress especially for wells, saturated production calendar).

Strengths:

- Excellent pedoclimatic conditions.
- Good productivity level, although variable.
- Proximity of port of Callao.

Challenges:

- Water stress, in terms of both quality and quantity.
- Diversity of production systems (coexistence of lower and higher tech production systems).

Sierra zone

The Sierra, a traditional arboriculture zone, has a significant asset in its early production calendar. Surface areas, hard to estimate because of the small plot size and highly traditional nature of the production system, are tending to expand. However, they are still being limited by the physical constraints on these high-altitude zones.

The Sierra designates a vast high-altitude zone running right the way down the Andes mountain range. Hass plantations are set up in the foothills on the western side, where the altitude is generally between 1 000 and 2 000 m (up to 3 000 m). The zone has a major asset: a deferred production calendar, due to the lower temperatures than in the coastal zone. Hence the Hass season can start from mid-February. The main cultivation zones are situated in the southern part of the zone, most particularly in the Departments of Ica, Arequipa, Ayacucho, Huancavelica and Cusco.

Cultivation of green avocado varieties and more generally arboriculture are traditional activities in the foothills of the mountain range, aimed at supplying the local market. Small producers, often organised in associations, are gradually converting to Hass. On the one hand, this export variety is more lucrative, while these isolated zones are particularly deprived. On the other hand, producers are entitled to incentives and technical support from local governments and some exporters specialising in the "acopio" system (packers/exporters bundling together the harvests of a large number of small producers based in the same geographic zone). The production system is very different from the very high-tech and capital-intensive systems on the coast. The plantations are small-sized (0.5 to 6 ha on average) because of the very rough terrain and highly fragmented land ownership due to the agricultural reforms of the 1970s. This fragmentation makes it hard to estimate total surface areas, reportedly fluctuating between 2 000 and 4 000 ha. Cropping techniques are basic, and the low sanitary pressure makes it possible to limit use of synthetic pesticides. Irrigation is not used systematically, especially in zones situated above 1 200 m where rain is more abundant. Yields are generally fluctuating between 7 and 14 t/ha.

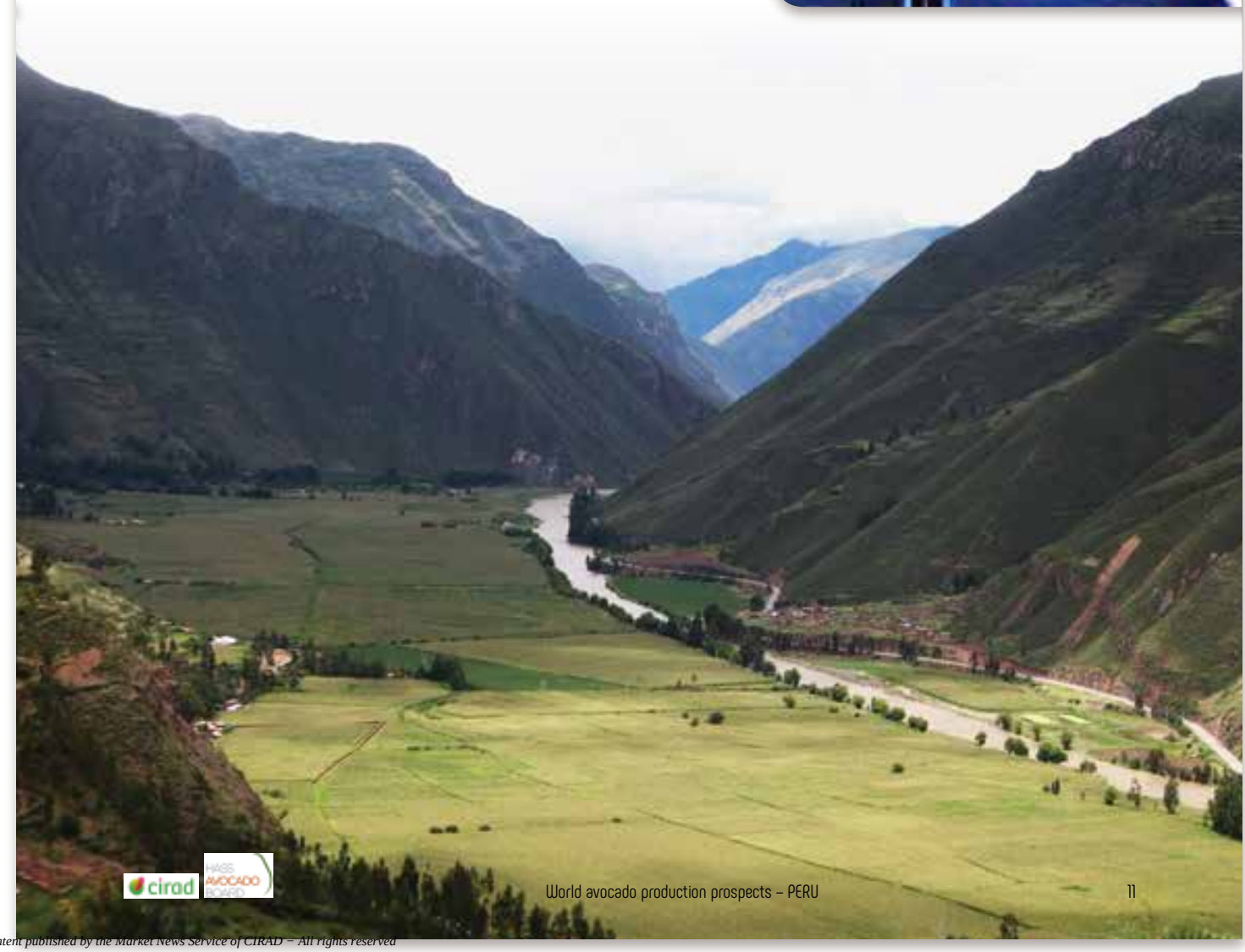
There are no packing stations in the zone, with the service provided by the coastal packing stations after what can sometimes be a long transit. The main shippers have set up tracking plans so as to control stage of harvesting, and ensure the homogeneity and maturity at the beginning of the season. GlobalGap certification is fairly widespread despite the limited size of the plantations. The packers favour a long-term relationship with the producers, signing multi-year contracts. Production is prepaid at the beginning of the season (from February to mid-April).

Strengths:

- Early calendar.
- Limited investment and production costs.

Challenges:

- Tough terrain.
- Highly traditional production system.
- Controlling production heterogeneity.
- Logistics.



World avocado production prospects – PERU 11

Varieties cultivated

Hass has an increasingly monopolistic hold on the export sector, with more than 95 % of volumes aimed at the international market, as opposed to 80 to 85 % ten years ago. The other export varieties are Fuerte, which remains widely planted mainly to supply the local market, Ettinger, Zutano and Bacon. Hass like varieties (early-season such as Carmen and Maluma or late season such as Gem and Lamb) are still rarely planted, though some trials are being conducted (Maluma, which could improve the sizing in the Olmos zone, and Lamb which could extend the end of the season). Traditional cultivars, suited to the particularly extreme conditions of certain parts of the country, are cultivated to feed the local market. Topa Topa, a Mexican race derivative, remains abundant in high-altitude zones for its cold tolerance. The black-skinned fruits are rich in oil but of low export quality. Hybrids of Guatemalan x West Indian races (Choquette, Collinred, etc.) are cultivated in tropical climate zones in the east of the country.

Hass avocado – Peru – Production calendar

Zones	J		F		M		A		M		J		J		A		S	
Sierra																		
Olmos																		
Chavimochic																		
Coastal valleys (Ancash, Lima, Ica)																		
TOTAL																		

Early zone: low night-time temperatures: Sierra + Arequipa / Nazca
Every 500 metres in altitude: + 15 days earlier

Outlets

The outlets vary considerably according to the varieties. Hass has practically no local consumption. Prohass has since 2012 conducted some awareness raising actions ("Huevo de vitamin" campaign in 2012, "Doctor Hass" campaign in 2014), supported by some players involved in exports (including Camet Trading). The main Hass outlet is the export sector, with sorting rejects processed into pulp (approximately 15 000 t to 20 000 t exported in 2016, 2017 and 2018) or cut and frozen (approximately 8 000 t exported in 2015). The national market, drawing on some 31 million inhabitants, reportedly accounts for around 100 000 to 120 000 t (mainly Fuerte and Creole varieties).

Logistics

The merchandise is forwarded to the ports by road via the Pan-American Highway, the country's only major north-south axis. Despite some improvement, sizing remains insufficient (only two lanes in most sections) considering the amount of traffic and bearing in mind that there are no bypasses for most urban centres. Hence transport times are generally long (ten hours or so from the Chavimochic irrigated area to reach Callao). Furthermore, the heavy rains in 2018 highlighted the fragility of the infrastructures in place on this axis (bridges, filling, etc.). Approximately two-thirds of the fruit is exported via the port of Callao (Lima's port), with the remainder going from the port of Paita in the north of the country. Both are overloaded and frequently saturated. The modernisation project at the port of Salaverry, situated near Trujillo, might provide the professionals with a third port out to the international market. The transit time means systematic use of controlled atmosphere technology.

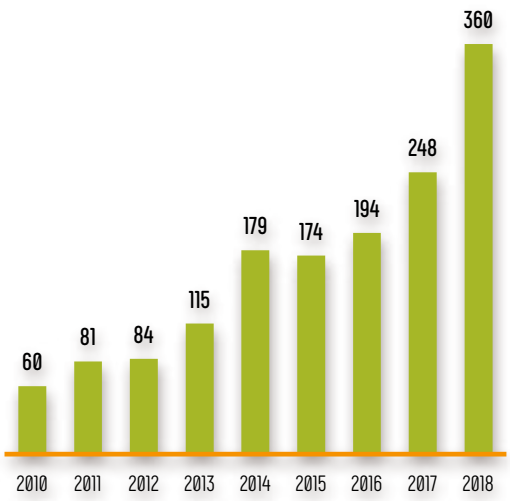
Avocado – Peru – Sea-freight logistics

Port of departure	Port of arrival	Transit time
Callao or Paita	Rotterdam	18-23 days
	Algeciras	17 days
	USA - East Coast	8-13 days
	USA - West Coast	13-18 days
	China	25 days
	Chile (Santiago)	4 days

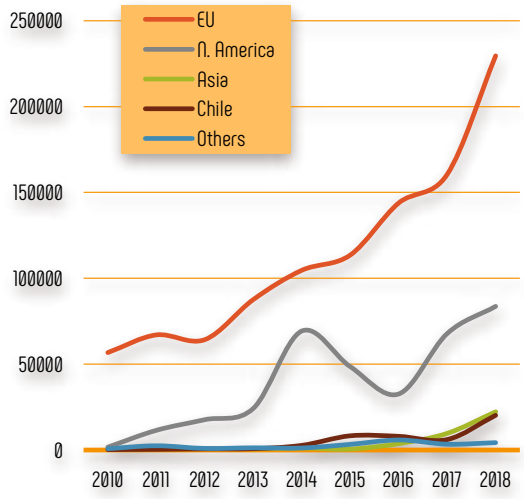
Exports

The Peruvian Hass industry has climbed to the rank of world number two exporter after just a decade in existence, with volumes placed on the international market approaching 350 000 t across all varieties in 2018. This surge has been based on increasing demand from Europe –practically the sole outlet for the Peruvian avocado until 2011. Since then, a new high-potential market has opened up with the USA lifting the sanitary restrictions which had been placed up on its borders. After a few up-and-down campaigns, the Peruvian Hass now seems to be well received in this country, as is attested by the massive volumes to this outlet in 2018 (more than 80 000 t, i.e. nearly a quarter of total exports). Nonetheless, given the very rapid growth in production, Peruvian professionals have worked tirelessly, with the support of Prohass, in search of diversification markets, especially in neighbouring South American countries and in Asia. Chile is now a major outlet, since the easing of the sanitary protocol at the end of 2013 (more than 20 000 t exported in 2018). Asia has also become a major destination since the opening up of the Chinese and Japanese markets during summer 2015 (rapidly growing volumes of 17 000 t and 5 000 t respectively in 2018). Other regional markets (Argentina, Brazil) or more distant markets (India) were also opened up between 2016 and 2018, while negotiations are in progress in particular with South Korea, Thailand, Mexico, New Zealand and Australia. The export sector remains concentrated despite more than one hundred players, with the top five alone accounting for 40 % of the turnover.

Avocado from Peru - Exports all varieties
(in 000 tonnes | source: Peruvian Customs)



Avocado from Peru - Exports by destination
(in 000 tonnes | source: Peruvian Customs)



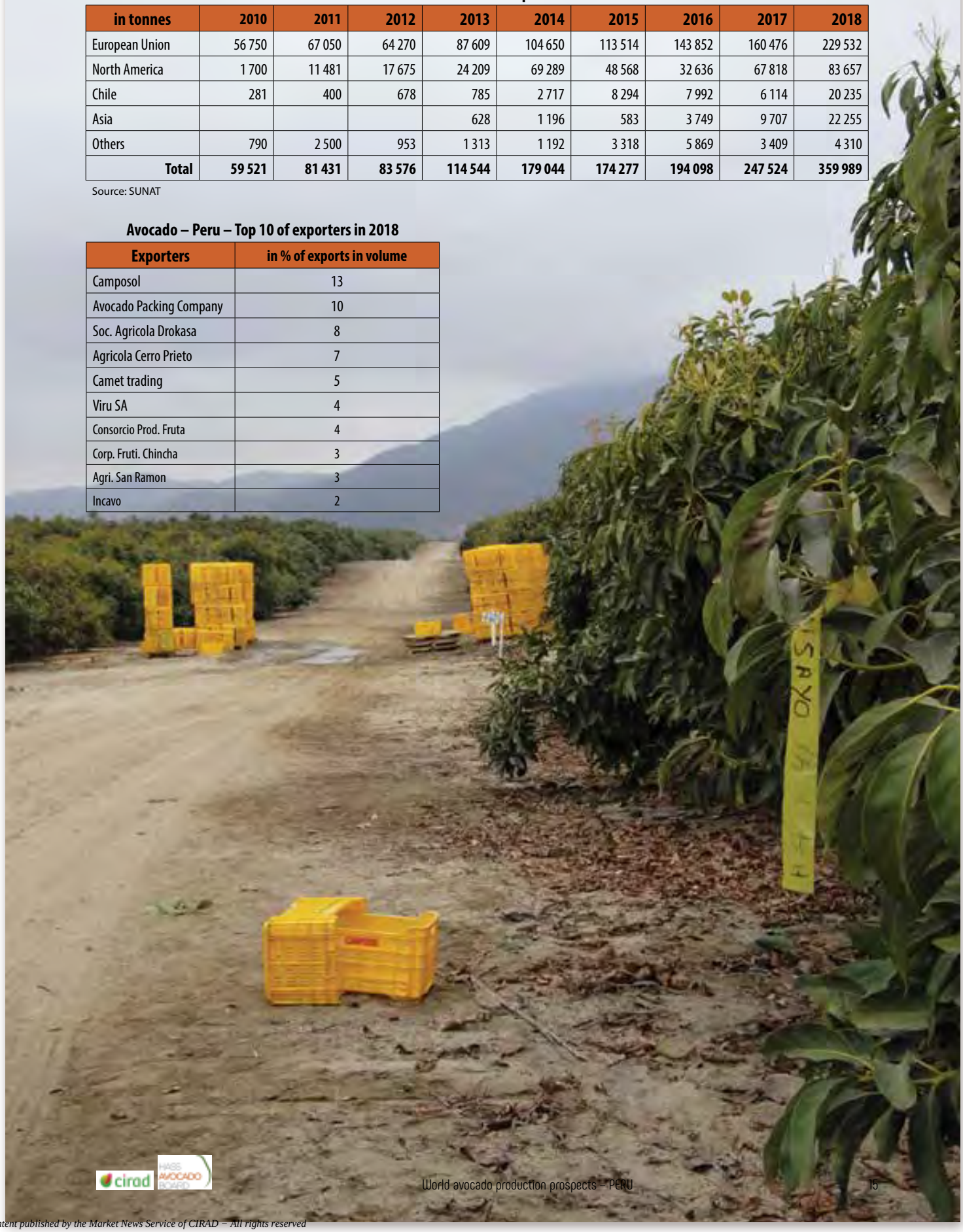
Avocado – Peru – Exports

in tonnes	2010	2011	2012	2013	2014	2015	2016	2017	2018
European Union	56 750	67 050	64 270	87 609	104 650	113 514	143 852	160 476	229 532
North America	1 700	11 481	17 675	24 209	69 289	48 568	32 636	67 818	83 657
Chile	281	400	678	785	2 717	8 294	7 992	6 114	20 235
Asia				628	1 196	583	3 749	9 707	22 255
Others	790	2 500	953	1 313	1 192	3 318	5 869	3 409	4 310
Total	**59 521**	**81 431**	**83 576**	**114 544**	**179 044**	**174 277**	**194 098**	**247 524**	**359 989**

Source: SUNAT

Avocado – Peru – Top 10 of exporters in 2018

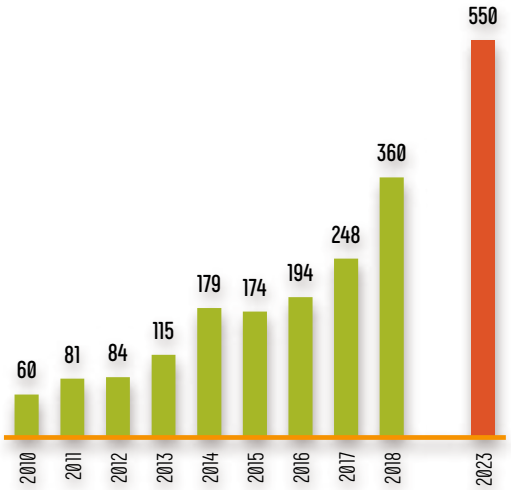
Exporters	in % of exports in volume
Camposol	13
Avocado Packing Company	10
Soc. Agricola Drokasa	8
Agricola Cerro Prieto	7
Camet trading	5
Viru SA	4
Consorcio Prod. Fruta	4
Corp. Fruti. Chincha	3
Agri. San Ramon	3
Incavo	2



Prospects

Our projection comprises two steps: the estimated production from the planted surface areas as at the end of 2018, once they have reached maturity (in five years, i.e. the end of 2023), and the estimated entry into production of the future orchards to be planted between 2019 and 2023.

Avocado from Peru - Export projection
(in 000 tonnes | source: Peruvian Customs)



Estimated production of currently planted orchards, upon reaching maturity

We have identified four distinct production systems, each featuring its own kind of production potential.

Avocado – Peru – Estimated production of currently planted areas in 5 years' time

Zones	Planted areas as at end of 2018/ beginning of 2019 (ha)	Average yield of adult plantations (t/ha)	Production 2023 (5 years' time) (t)
Olmos	4 500	22.5	101 250
Chavimochic	7 000	17	119 000
Others Lambayeque, Libertad	4 450	17	75 650
Sierra	3 000	10	30 000
Ancash, Lima, Ica valleys	12 700	15	190 500
Total, Peru	**31 650**	**16.3**	**516 400**

Estimated prime of the new plantations

Avocado – Peru – Projected annual planting rate (2019 to 2023)

Years	2019	2020	2021	2022	2023
Planted areas (in ha/year)	3 000	1 500	1 500	1 500	1 500
Note: assuming a slowdown from 2020					

Avocado – Peru – Average yield of these plantations according to age

Years	1st harvest	2nd harvest	3rd harvest	4th harvest	Stock maturity
Yield (in t/ha)	5	8.5	12	15	18.5
Note: assuming an average production system for the Ancash, Lima, Ica and Olmos valleys					

Production development scenario

Avocado – Peru – Projected exportable production in 2023

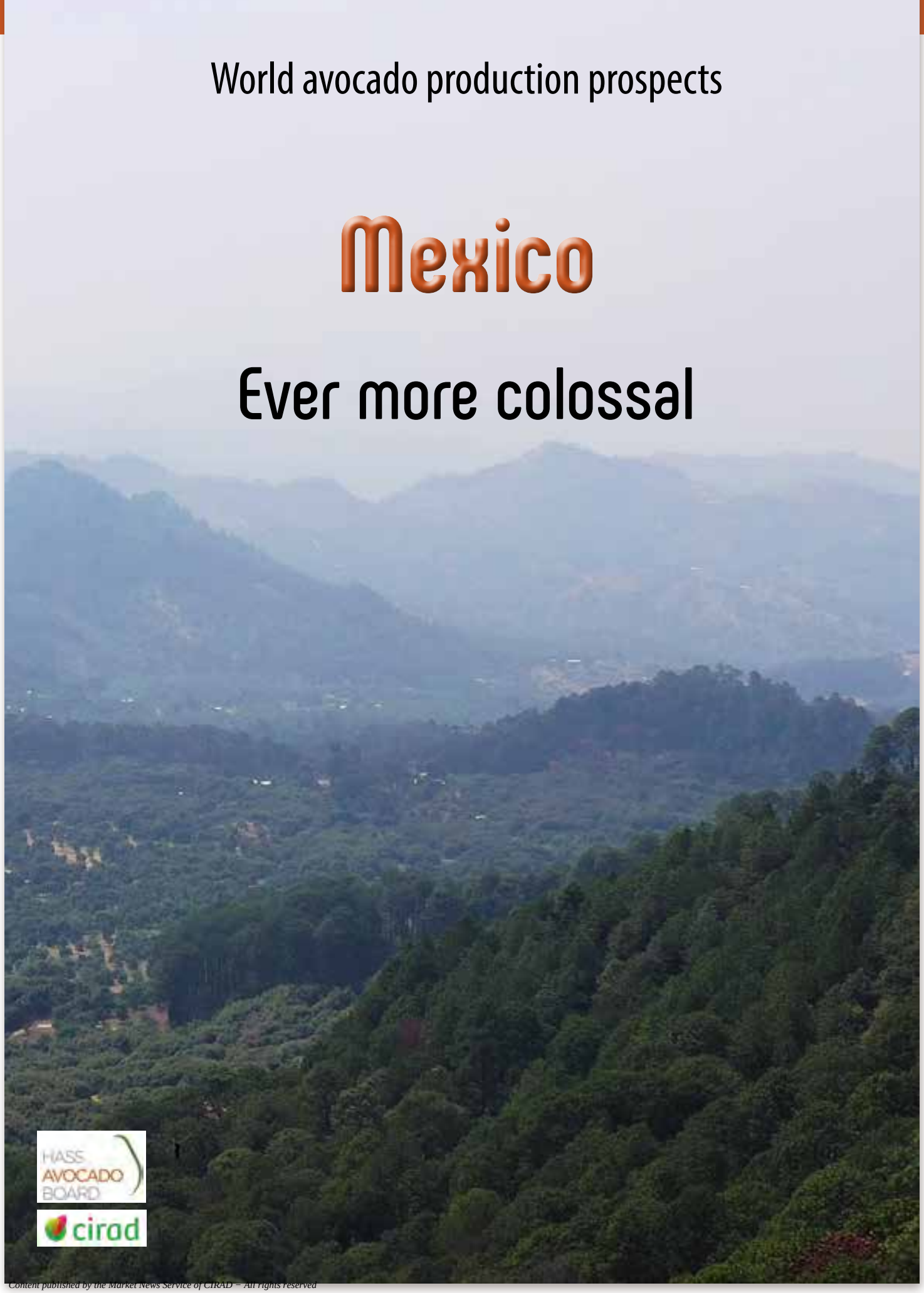
	in tonnes	Notes
Production of orchards planted until 2018	516 400	
Production of orchards planted between 2019 and 2023	116 250	
Estimated total production in 2023	**632 650**	
of which Hass production	**601 018**	95 % of production (other varieties for pollination = 5 % of stock)
of which exportable production	**552 936**	Packing yield = 92 % of production (8 % sorting rejects)

Our hypothesis is based on a medium-term slowdown trend in the rate of planting. The big producer groups, which were hitherto the main driving forces of the industry, are aware that the fall in profitability registered in 2018 has a structural dimension due to the extent of the planted surface areas in competing countries and in Peru (enormous volumes to be sold during the production peak of the Chavimochic area and the Lima, Ancash and Ica valleys). The blueberry is already regarded as a highly profitable alternative, despite very heavy investment costs (return on investment in two years, or even one year despite a starting cost of approximately 50 000 USD/ha). Other crops are also under development (easy peelers) or under trial (exotic berries). Furthermore, the strategy of opening the production calendar in the early-season slot (especially the Olmos zone) also seems to have reached its limits (planted surface areas already large), while water availability is becoming limiting in this area. Most of the big groups wishing to continue to invest in the avocado are now turning to geographic zones with a production calendar complementing the Peruvian one (such as Colombia). Hence only some large-scale projects are still scheduled within Peru in 2019-2020. Two factors which could relaunch a large-scale planting dynamic should nonetheless be considered. On the one hand, big sugar cane groups, faced with a more difficult sugar and ethanol market, are starting to take an interest in the avocado. These businesses have the necessary production factors (land, water, financial capital) for potentially rapid development. However know-how, and above all the particular production techniques for horticultural produce aimed at the demanding export markets, could be limiting factors. On the other hand, large agricultural surface areas should be available in the medium and long term. There are plans to open or extend irrigated areas (Majes Siguas in the Arequipa zone: 60 000 ha; Chavimochic 3: 60 000 ha between Trujillo and Chicama; Olmos 2: 35 000 ha, which could also remove the current constraints in terms of water availability in the Olmos 1 area). Furthermore, the country's already high average yield per hectare could increase. Clonal rootstocks, which can considerably increase productivity, are starting to be more widely used, while the first replanting programmes of old orchards should begin shortly.

World avocado production prospects

Mexico

Ever more colossal



The avocado in Mexico

The historical cradle of the avocado, Mexico is favoured both by pedoclimatic conditions ideal for the crop, and the huge appetite of the neighbouring US market, which the industry has played a big part in developing. Hence Mexico reigns supreme not only in terms of world Hass production, of which it controls two thirds, but also in the international trade, where its market share is in excess of 50 %, despite some weaknesses and an often traditional production system. While it retains excellent profitability, the expansion rate of the cultivation area could be less frantic than before.

World avocado production prospects – MEXICO 1

History of the industry

A native fruit, but fairly recent industrial development due to the export sector

Mexico is a cradle of the avocado, with the word itself being derived from Nahuatl, meaning "testicle". Archaeological digs conducted in a cave in the Coxcatlán region, in the State of Puebla, showed that this fruit was already present in the region 7 000 to 8 000 years ago. The country's central volcanic belt, which crosses Michoacán, is believed to be the natural habitat of one of the three races of *Persea americana* Miller, also known as the Mexican race. Nonetheless, the Mexican cultivation area has only fairly recently swelled to the immense proportions of more than 200 000 ha seen today. According to the country's first agricultural statistics in the 1930s, this area covered only approximately 3 000 ha. The dissemination of better production techniques (grafting) and improved varieties such as Fuerte sparked a growth trend over the following decades, albeit to a relatively limited extent, since the cultivation area had yet to reach 10 000 ha by the end of the 1950s. Thereafter, the industry began to take off. On the one hand, the production crisis which arose in the USA in the 1960s led Californian nursery growers to find diversification markets in Mexico for their Hass plants, a variety discovered in the 1930s. This variety rapidly became the national benchmark thanks to its post-harvest resistance, its yield and its taste characteristics. On the other hand, from the early 1970s the Mexican government implemented a fruit growing development policy, especially in Michoacán, to prevent overproduction of coffee, the predominant crop in this highly fertile region. Indeed, a specific plan aimed at promoting the avocado was developed from 1973, conducted by CONAFRUT (Comisión Nacional de Fruticultura). In particular, this envisaged granting technical assistance, enhanced credits from FIRA (Fideicomisos Instituidos en Relación con la Agricultura) and even giving away plants. The context became favourable for development of the crop, although these funds were primarily absorbed by the downstream segment through the development of packing or transport infrastructures. An increasing number of smallholdings resulting from the agrarian reform of 1915 ventured into this industry. This was when the cultivation area saw rapid expansion, up to approximately 50 000 ha in the mid-1970s, and then to 100 000 ha in the 1980s, with Michoacán becoming the country's number one production area.

Faced with a massive influx of production and a saturated local market, professionals sought to diversify their outlets, by developing the export sector from the early 1980s. Great efforts were undertaken to reopen the US market, closed since 1914 for sanitary reasons (presence of pests assigned quarantine classification by the US authorities). Orchard monitoring and eradication campaigns of the insects concerned were launched, alongside lobbying of the US sanitary authorities, in a promising context of the implementation of a free trade treaty between the USA, Mexico and Canada (NAFTA). Avocados from Michoacán zones declared quarantine pest-free were authorised in the US market in a limited number of non avocado producer States from 1997, after nearly a decade of joint efforts by the Mexican industry. The progressive opening up of this market, complete by the end of January 2007, generated an exponential growth trend in the industry, especially with the intense promotion campaigns for this fruit launched in the USA in the early 2000s, driven by the APEAM (Asociación de productores y empacadores exportadores de aguacate de México), the MHAIA (US based Mexican Hass Avocado Importers Association) and the HAB (Hass Avocado Board).

Mexico in a few figures:

- **Population:** 126 million inhabitants in 2018
- **GNI/capita:** 9 180 USD/year
  (source: World Bank - 2018)
- **Agriculture:** 3.3 % of GDP (Industry 31.2 %)
  (source: World Bank - 2018)
- **Value of agricultural exports:** 34 billion USD
  (source: SIAP - Banco de México - 2018)

Main export agricultural products:
(source: SIAP - Banco de México - 2018)

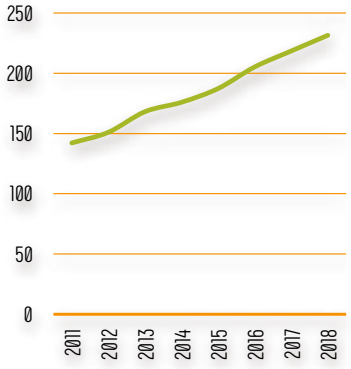
- **Avocado:** 2 392 million USD
- **Tomato:** 2 080 million USD
- **Pepper:** 1 158 million USD
- **Cucumber:** 521 million USD
- **Raspberry:** 491 million USD

Current extension and location of the cultivation area

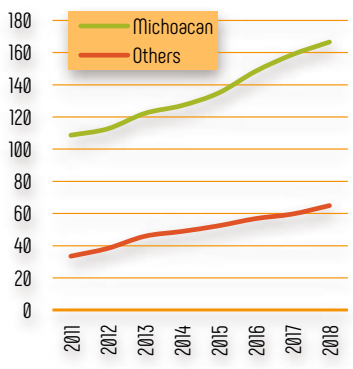
Record surface areas and growth, thanks to Michoacán and Jalisco

Mexico has by far the world's largest cultivation area. With an estimation of more than 223 700 ha planted at the end of 2018 according to official statistics, it reportedly represents between 55 and 60 % of world planted surface areas of the Hass variety. Its growth dynamic is as exceptional as its extension: more than 12 000 ha per year on average for the past five years, up by more than 60 000 ha between 2005 and 2014. It is mainly packed into the volcanic belt running across the centre of the country, from the Gulf of Mexico to the Pacific Ocean. Michoacán, the only State authorised to export to the USA, is by far the country's number one production centre, with three-quarters of total surface areas in Mexico. It is also the region with the strongest recent cultivation area growth (+ 9 000 ha on average for the past five years). Jalisco, the province adjoining Michoacán, but with a very different production system, lies in second position (22 000 ha in 2018 according to official sources, 26 500 ha in 2019 according to professional sources), with just under 15 % of total surface areas. This State has been the other driving force behind the growth in the Mexican avocado industry since the mid-2000s (approximately 2 000 to 3 000 ha/year in recent years). The next states in the ranking are the State of Mexico (approximately 10 500 ha, mainly packed into the South-West: municipalities of Coatepec Harina, Temascaltepec, Donato Guerra, etc.), Nayarit (7 000 ha in the centre of the state: municipalities of Tepic, San Blas, Xalisco, etc.), Morelos (5 400 ha in the north-east tip: municipalities of Ocuituco, Tetela del Volcán, etc.), Guerrero (4 300 ha in the central region: municipality of General Heliodoro Castillo, etc.). There is significant growth in some of these States.

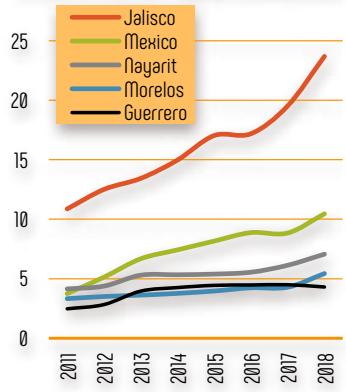
Mexican avocado
Planted area
(in 000 ha | sources: Sagarpa, professionals)



Mexican avocado
Michoacan share of planted area
(in 000 ha | sources: Sagarpa, professionals)



Mexican avocado
Breakdown of other planted areas
(in 000 ha | sources: Sagarpa, professionals)



Michoacán

Michoacán is unique, accommodating approximately half of world Hass production, within restricted surface areas, representing barely 10 % of the State's total surface area. The ideal pedoclimatic conditions prevailing in this cradle of avocado cultivation, and the strength of demand from the USA, provide the host of producers in the region with a very good level of economic returns, despite an often basic production system, and highly fragmented plots. The development of this industry with its high social impact should slow down in coming years, because of the saturation of the optimal production zones.

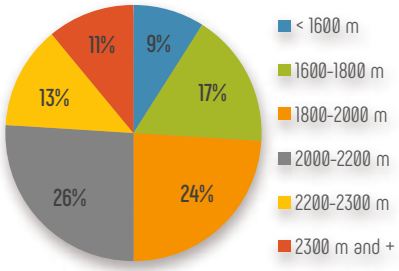
Pedoclimatic characteristics

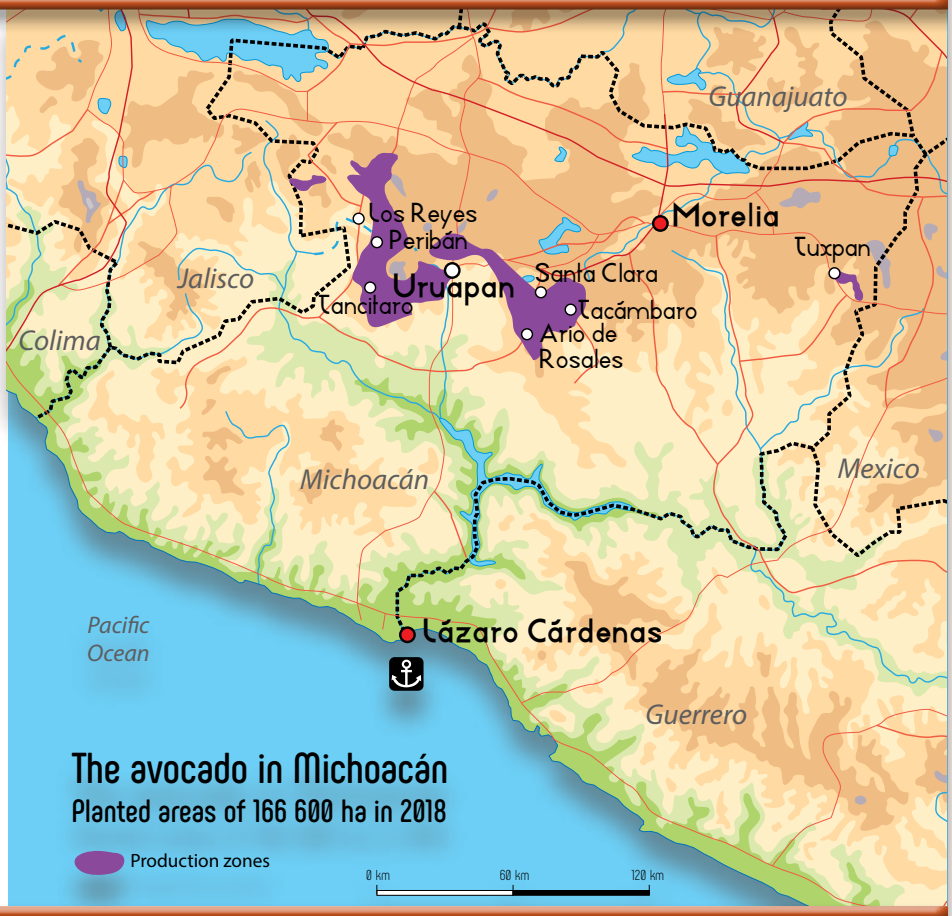
The avocado production zone in the State of Michoacán is located on the country's central volcanic belt (Eje Volcanico), a Quaternary volcano region extending from east to west over approximately 900 km along the 19th North parallel. It stands out on its own for sheer area, extending over approximately 175 000 ha in 2019 (by way of comparison, the Peruvian cultivation area, next in the ranking, has just under 32 000 ha). It extends over a length of approximately 250 km, in a W-shape ranging from

Avocado – Michoacán – Hectares

Breakdown by districts	ha in 2018
East: District of Pátzcuaro, incl.	57 877
Ario	16 031
Salvador Escalante (Santa Clara)	16 293
Tacámbaro	17 000
Centre: District of Uruapan, incl.	60 168
Tancítaro	23 650
Uruapan	16 200
West: District of Zamora, incl.	34 372
Los Reyes	6 009
Peribán	12 560
Others	14 185

Avocado - Michoacan - Distribution of planted areas by altitude
(source: MHAIA)





Strengths:

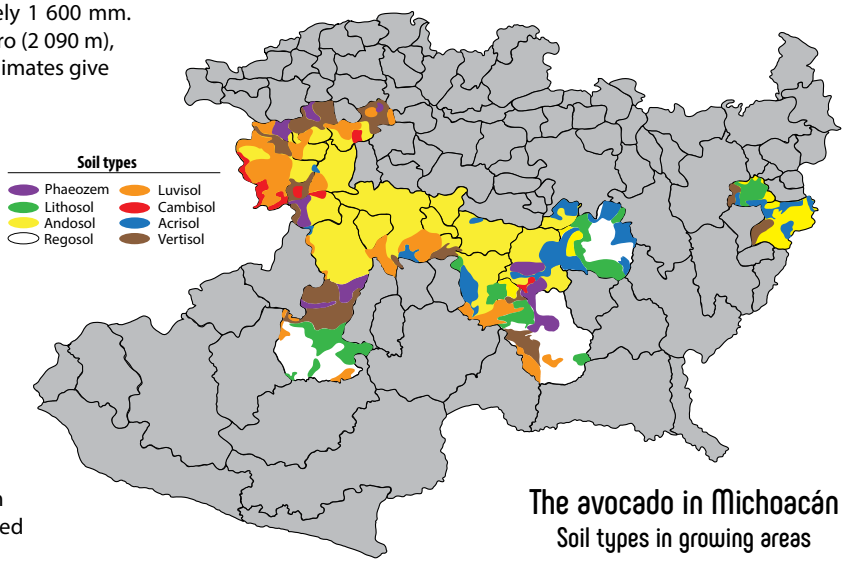
- Ideal pedoclimatic conditions.
- Easy access to the huge and highly lucrative US market.
- Unique production period due to its length (all year round).
- High social externalities (small to medium orchards).

Challenges:

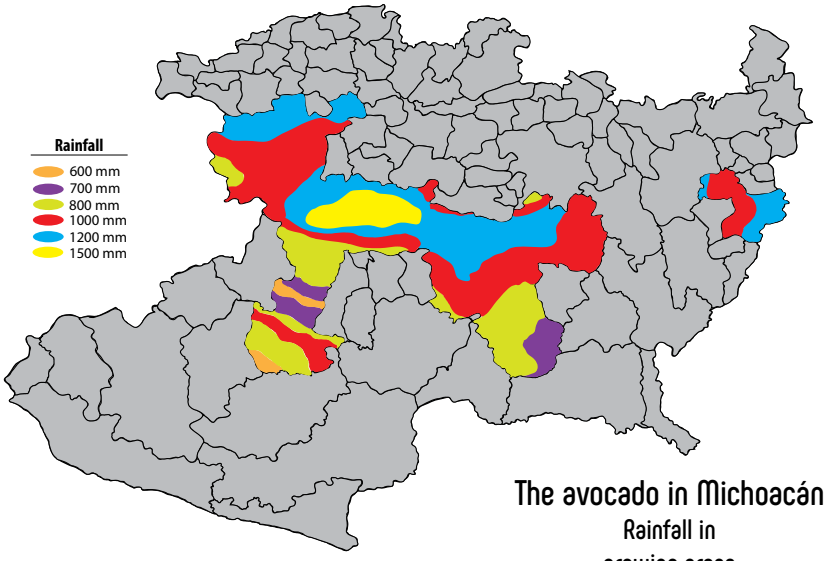
- Disconnection between export and production sectors.
- Heterogeneous maturity due to four flowerings.
- Low technical level of a significant proportion of producers.
- Security context.

roughly Tigüindín in the west to Tacámbaro in the east, and centred on Uruapan. This rugged region, similar to the original habitat of one of the main avocado races, brings together ideal pedoclimatic characteristics for Hass cultivation. Firstly, andosols, highly fertile volcanic soils, deep and well-draining, cover nearly 90 % of the production region (presence of acrisol or luvisol types – leaner or heavier – in the eastern and western edges). Secondly, the zone has a wide variety of climates (six main ones), since it extends over altitudes varying from approximately 900 m to 2 600 m. The climate stages situated at between 1 800 m and 2 300 m are particularly favourable (temperate humid to sub-humid zone, assumed "natural" for the avocado), packing in nearly 80 % of total surface areas. Rainfall is between 1 000 and 1 200 mm inclusive (except around Uruapan, where it is in excess of 1 500 mm), with precipitation primarily concentrated during the summer from June to October. The average temperatures fluctuate between 20 and 22°C in the hottest low-altitude zones, and between 12° and 18°C in the cooler high-altitude zones. By way of example, the mean minimum and maximum temperatures range from 6.5° to 29°C in Uruapan (1 600 m), with a rainfall level of approximately 1 600 mm. They range between 4.5° and 26.5°C in Tancítaro (2 090 m), with a rainfall level of 1 000 mm. These microclimates give Michoacán a unique set of properties: avocado production is present practically year-round, thanks to four annual flowerings. The only two blemishes for these exceptional cultivation conditions are the relative acidity of the soils and the rugged terrain (45 % of orchards on slopes of more than 25 %).

In recent years, the cultivation area has extended to more marginal municipalities for avocado cultivation, with the "natural" zone now saturated. These are lower-lying regions, with warmer temperatures, lower rainfall and often less rich and heavier soils; or conversely, higher-altitude regions, with lower temperatures, more frost and hail-exposed and also with less suitable soils.



The avocado in Michoacán
Soil types in growing areas



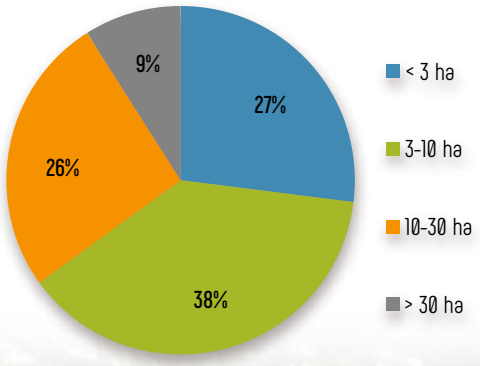
The avocado in Michoacán
Rainfall in growing areas

Maps source: Agroecología de la franja aguacatera en Michoacán, México. Maribel Gutiérrez-Contreras, Ma. Blanca Nieves Lara-Chávez, Ana Tztzqui Chávez-Bárcenas, Héctor Guillén-Andrade. Sep. 2010, VOL. 35 Nº 9 - Interciencia

Production structure

Michoacán's immense cultivation area is highly fragmented, in the hands of approximately 30 000 producers. More than 60 % of total surface areas are concentrated in plantations of less than 10 ha, with 25 % in plantations of less than 3 ha. This number has increased in recent years, with smallholders now able to obtain export certification to the USA. So the crop has massive socio-economic externalities. Medium-sized orchards (10 to 30 ha) represent approximately 26 % of total surface areas, while large orchards (more than 30 ha) approximately 9 %. Nearly 70 % of producers farm their own land or rent it, with the remaining 30 % enjoying access to community land (ejido). A significant proportion of producers, especially the small ones, are not specialised in the crop (urban investors, employees who may or may not be part of the agricultural sector, with a dual profession).

Avocado - Michoacan - Production structure
(source: MHAIA)



8 World avocado production prospects – MEXICO

Production practices

Michoacán's 1.5-million tonne annual harvest is derived mainly from highly traditional, low-tech production systems, which is still giving good results to this day because of the excellent pedoclimatic conditions. The plant stock is old, with an average tree age probably of between 20 and 25 years, and in certain orchards above 40 or 50 years. For the vast majority the stock is derived from nurseries providing no sanitary guarantee (no certification system in place). A single "local" Mexican race rootstock is used ("Criollo Mexicano"). The planting density is low, at generally between 150 and 200 trees per hectare (the oldest orchards have a 10 m x 10 m spacing, in staggered rows).

Production practices are basic, and consist above all in applying fertilisers and lime-based soil improvers (acidic volcanic soils) and combating the diseases and pests which are fairly common in the zone because of the very wet climate. The main pests are certain thrips (especially *Scirtothrips perseae*), certain mites (*Oligonychus perseae* and *punicae*) and certain scale insects (*Abgrallaspis aguacatae*, *Hemiberlesia lataniae*). The establishment of a strict control protocol has made it possible to eradicate quarantine pests: no interception has been recorded since the start of the export program to the USA. The main diseases are anthracnose and scab (*Sphaceloma perseae*). Conventional management is applied (no integrated pest management). Annual pruning is not generally applied, with producers unwilling to be unable to harness certain flowers. The orchards are 60 % rainwater supplied, with the trees potentially exposed to water stress at certain key phenological stages. The water stress period is tending to increase with climate change, since the absence of a short rainy season in February, highly beneficial for flowering, has become recurrent and the start of the main rainy season is tending to come later (June instead of May). The absence of irrigation also limits use of fertilisation. When it is applied, irrigation is mainly via micro-sprayers (70 %). The water is generally of good quality, and mainly supplied by catchment reservoirs ("ollas") or very deep wells (down to 500 m). The average yields are around 8.5 to 9.5 t/ha in traditional rainwater-supplied orchards. This figure reaches 15 to 18 t/ha for higher-tech and irrigated orchards, better reflecting the actual production potential of this region with high pedoclimatic potential.

Orchards planted in recent years are shifting toward higher-tech production practices, in response to tighter pedoclimatic constraints in recently developed zones. Irrigation is more widespread, annual pruning is fairly common, and planting densities are higher. Nonetheless, yields are not always better, with certain zones actually proving unsuitable for the crop.

A large part of the agricultural work is carried out by contractors. Harvesting, which is down to the purchaser of the produce, is always sub-contracted.

The main production certifications are those relating to Contamination Risk Reduction System (SRRC) and Good Practice in Pesticides (BUMP). The certifications required by the major world markets outside of the USA are under-developed and on the wane (e.g. only approximately 3 500 ha covered by Globalgap certification in 2019, as opposed to 9 000 ha a few years previously). Approximately 10 % of production is organic certified, with orchards operated under this system spread throughout the production zone. However, surface areas are stagnant, with producers shifting toward a more productive conventional system.

Production cost and profitability

Production costs are relatively low, due to the favourable pedoclimatic conditions and generally basic production practices. Direct variable costs would appear to be approximately 4 000 to 4 500 USD for the traditional production systems without irrigation (up to 3 000 USD if the technical process is very basic, with limited equipment), and 5 000 to 6 000 USD for higher-tech irrigated orchards (excluding harvesting). The two main cost items are fertilisation and sanitary protection. The cost of agricultural labour remains competitive, although the price per working day is two or three times the official mark (set in early 2019 at approximately 103 Mexican pesos per day, i.e. 5.70 USD). Variable costs associated with irrigation are limited (electricity, used in particular for pumping water, is 80% State-subsidised, while water access is billed).

Varieties and production calendar

Hass is utterly dominant, representing approximately 90 % of planted surface areas. Its physiology is fairly unique in the region, due to the variety of climate stages where it is grown. In the "natural zone", the harvest starts from early to mid-July with the "flor loca" fruit (generally fairly round in shape), which represents approximately 5 to 20 % of the total harvest. It continues with the "aventajada" fruit, harvested from September, and which accounts for 10 to 25 % of overall production. The harvest ends with "normal" fruit (in October, with 60 to 80 % of the harvest). The season ends with the "marceña" fruit (in March, 15 to 30 % of the harvest). These start dates are indicative, falling earlier in the warmer low-lying zones, and later in the cooler high-altitude zones. The flowering harvest periods form an overlapping sequence, leading to heterogeneity in the maturity of the fruit marketed during certain harvest periods.

Hass Mendez represents approximately 10 % of planted surface areas. This Hass mutation has the particularity of having a very early production calendar. Its main harvest is available from July, a particularly useful period since it coincides with the production low point of regular Hass. Mendez produces a second harvest, very limited in volume, later ("loca tardia"). Despite its useful harvest calendar, Mendez has not been much developed, due to a very marked alternate bearing phenomenon.

Avocado – Michoacán – Production calendar

Variety	Harvest	J	A	S	O	N	D	J	F	M	A	M	J	Harvest share
HASS	Loca	■	■	■	■	■	■	■	■	■	■	■	■	5-20 %
	Aventajada	■	■	■	■	■	■	■	■	■	■	■	■	10-25 %
	Normal	■	■	■	■	■	■	■	■	■	■	■	■	60-80 %
	Marceña	■	■	■	■	■	■	■	■	■	■	■	■	15-30 %
HASS MENDEZ	Principal	■	■	■	■	■	■	■	■	■	■	■	■	90 %
	Loca tardía	■	■	■	■	■	■	■	■	■	■	■	■	10 %

Upstream/downstream relations

Commercial relationships are guided by a unique balance of power for the world of agriculture. Producers hold great negotiating power thanks to the incredible vitality of demand from the US market and the ability to store the fruit on trees for several weeks (even several months in the coldest areas). Hence the production and packing/export links are disconnected in the vast majority of cases: export production originates primarily from independent growers. Only a very small number of exporters are also producers, especially due to the agrarian reform which has greatly fragmented and split up the plots, making it hard to create the large areas required for exports. The climate of insecurity has also contributed to discouraging investment.

There is also originality in the informality of the relationships between production and export: while most exporters have contractual commitments with importers/the supermarket sector (often for one-month periods), there is no formal contractual commitment between the production and export links, in terms of either volumes or price. Most exporters purchase all the fruit at prices fluctuating on a daily basis (spot). Advance purchases of the harvest as a whole do happen, but they remain very much in the minority (5 %). The bulk of fruit is purchased from the orchards (fruit paid for on the tree regardless of quality level or size), with picking at the exporter's expense, and often carried out by contractors. Hence producers choose between exporters according to the purchase price offered, payment times, relationships and feedback on quality of picking. Finally, purchases are either made directly between exporters and producers, or via intermediaries. This link, which covers between 10 and 20 % of the supply, has expanded particularly over the past four or five years, with very small producers entering the US export programme. Hence intermediaries perform the function of aggregating production often located in remote zones, and representing very small volumes. However, their image is sometimes tarnished by tax evasion and producer intimidation scandals, with some locally dubbed "coyotes".

This system, that creates high added-value, allows producers to make massive investments in promotion, research and information via APEAM, MHAIA (and since 2013 AFM). Between 2000 and 2018, more than 323 million USD have been invested – a unique amount in the world of fresh fruits and vegetables. This is one of the keys to both the success of the Mexican industry and the development of the US market, which has been profitable for all industry stakeholders.

World avocado production prospects – MEXICO 11

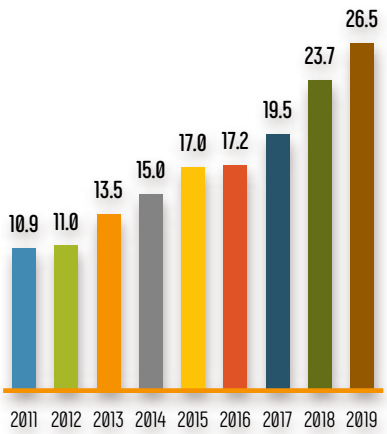
Jalisco

This recently developed production region has one of the world's top three cultivation areas, thanks to its explosive growth dynamic in recent years. Pedoclimatic conditions are generally less favourable than in Michoacán, and it still has no access to the US market. However, the production system is higher-tech, and the early clone Mendez is an asset in terms of competitiveness. Just like in Michoacán, development should slow down because of saturation of the best production zones.

Pedoclimatic characteristics

Commercial scale cultivation of Hass in Jalisco is a recent phenomenon, dating from the early 2000s, when land originally dedicated to livestock farming, the staple crops (maize, sugar cane, etc.) or forests (pine) were converted to higher added-value production such as the avocado, or more recently berries. The avocado zone is packed into the south-east of the State, within a radius of approximately 30 km around the city of Ciudad Guzmán. Its extension was evaluated at 26 500 ha in mid-2019,

Hass avocado - Jalisco - Planted area
(in 000 ha | sources: SAGARPA, APEAJAL)



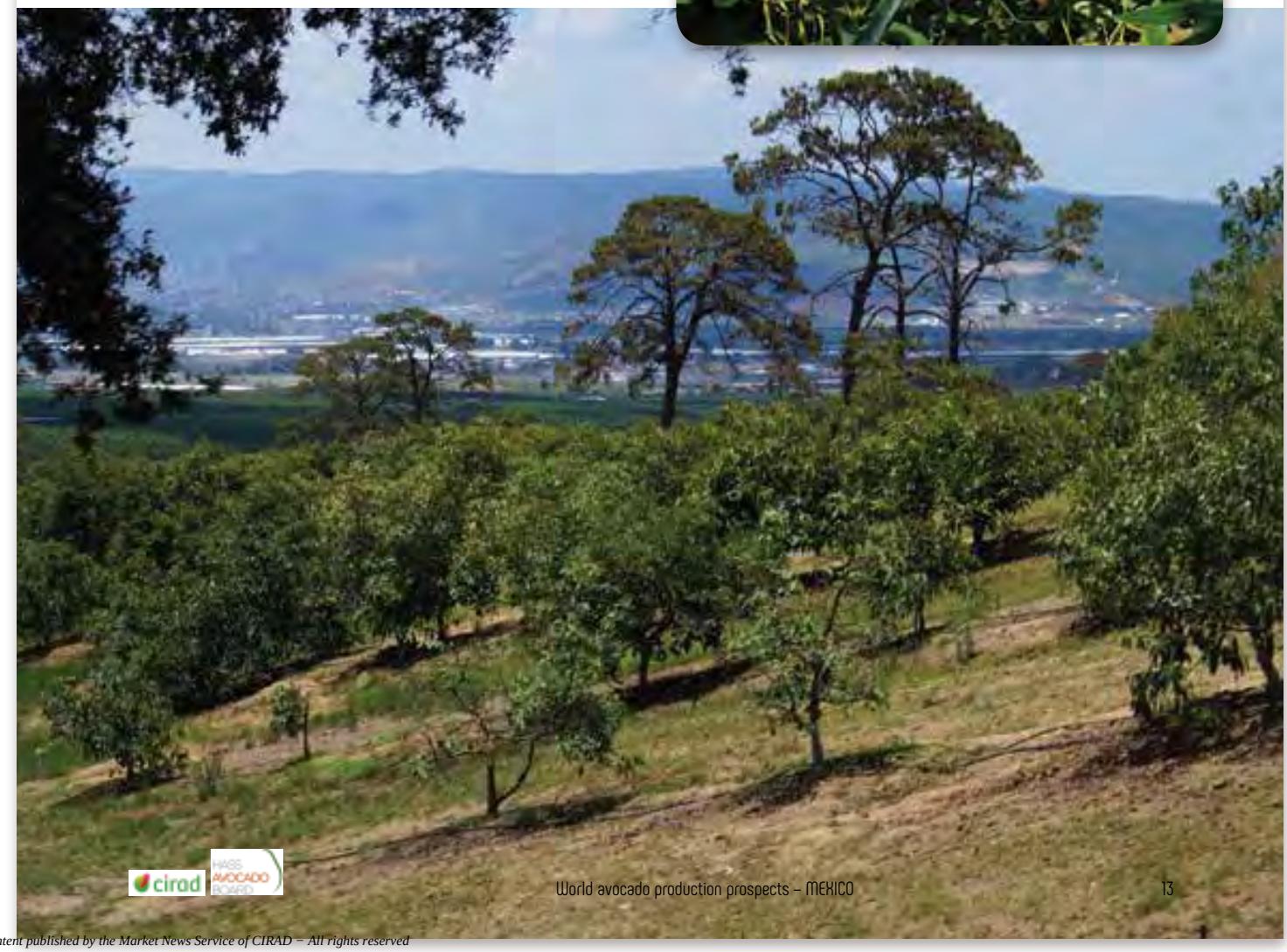
comprising approximately 18 500 ha of productive orchards and nearly 8 000 ha of young plantations not yet officially registered. The two main production centres are Sierra del Tigre to the north-east of Ciudad Guzmán (orchards of the municipalities of Gómez Farías, Concepción de Buenos Aires, Zapotiltic and north-eastern Ciudad Guzmán/ Zapotlán) and the Nevado de Colima mountain range to the west of Ciudad Guzmán (orchards of the municipalities of Tuxpan, San Gabriel and southern Ciudad Guzmán/Zapotlán). The rest of the cultivation area lies mainly in Sierra de Tapalpa to the north-west of Ciudad Guzmán (Tapalpa), and near the Sayula Lagoon. The pedoclimatic conditions vary with altitude, though the constraints are tighter than in Michoacán. The climate is temperate to semi-tropical, sub-humid, with rainy summers. The minimum average temperatures fluctuate between 8 and 16°C, and the maximum average temperatures between 25 and 32°C. The average rainfall is between 650 and 1 000 mm, and very much concentrated between June and October. The soils are highly variable in type and quality. There are rich, deep and well-drained volcanic soils in the high-altitude zones (andosol type, locally known as topuré), and poorly developed, sandy or sandy-clayey soils of variable depth in the plains zones (regosol, cambisol). Plantations were originally set up in the high-altitude parts (1 700 to 2 300 m), where pedoclimatic conditions are most favourable, and later lower-altitude zones were developed (up to 1 100-1 300 m).

Strengths:

- Decent pedoclimatic conditions in most zones.
- Early and attractive production calendar.
- Flatter topography, enabling economies of scale.
- Good technical and certification level.

Challenges:

- Water and land resources now limited.
- Security context.
- More competitive and distant outlets, due to lack of access to US market.



World avocado production prospects – MEXICO 13

Production structure

The State had 1 400 producers in 2016. The production structure is highly diversified. According to a very rough estimate, large plantations covering several hundred hectares represent approximately one quarter to one third of total surface areas. These large facilities coexist with smallholdings. Approximately 60 to 70 % of land is rented, with long-term leases.

Technical processes

The production system is higher-tech than in Michoacán, in particular because of distinctly tighter pedoclimatic and commercial constraints. The plant stock is younger (eight years on average for Mendez) and use of certified plants is commonplace. The Mexican race local rootstock remains omnipresent. The planting density is considerably higher, reaching on average 300 to 400 trees/ha (arranged in a square pattern known as "marco real"). In some very high-tech plantations it can be as much as 550-600 trees. More than 90 % of orchards are irrigated, with fertirrigation also commonly employed. Water requirements are around 2 000 to 3 000 m3/ha. The water supply, increasingly tight, is based primarily on deep wells (80 to 600 m), with the quality remaining good except in zones close to the Sayula Lagoon. Water catchment systems are also frequent ("ollas"). The most common irrigation technique is micro-spraying. The most commonly encountered sanitary problems are, for diseases, anthracnose, scab and stem-end rot, while the pests present are the same as in Michoacán. The main production centres have been certified as quarantine pest-free by SENASICA, the sanitary branch of the Mexican Ministry of Agriculture, but not by any US agency yet. Integrated pest management techniques are used on certain holdings. The plantations enjoy a high certification level (numerous international certifications such as Globalgap, etc.). Average yields are around 15 t/ha.

Production cost

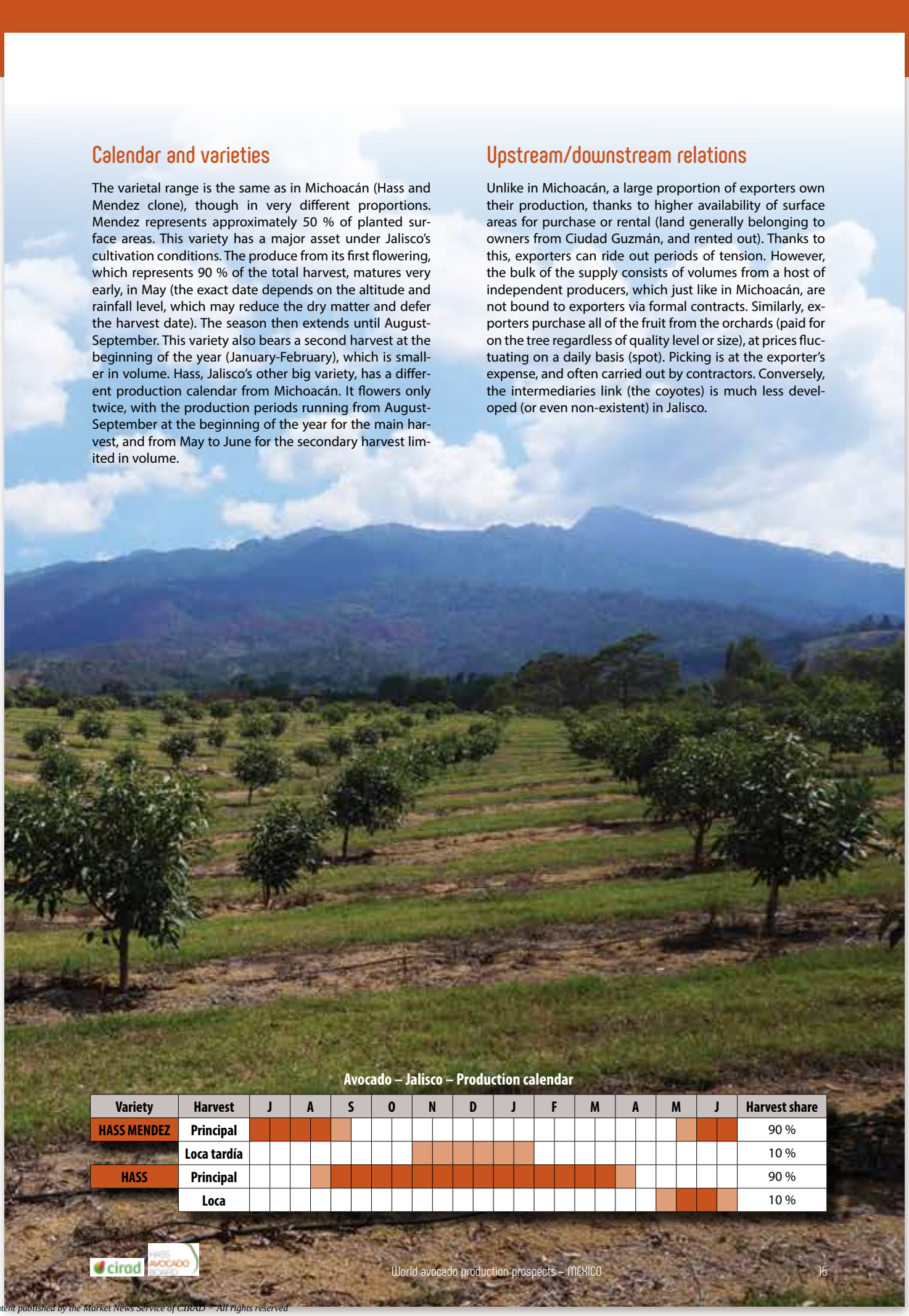
The average production cost in Jalisco is higher than in Michoacán, since irrigation is essential in most zones. Nonetheless, it remains competitive, at somewhere between 5 000 and 6 500 USD per hectare excl. harvest. The width of the cost range is due to the differences in technical level of the production systems, and to the land situation (owned or rented).

Calendar and varieties

The varietal range is the same as in Michoacán (Hass and Mendez clone), though in very different proportions. Mendez represents approximately 50 % of planted surface areas. This variety has a major asset under Jalisco's cultivation conditions. The produce from its first flowering, which represents 90 % of the total harvest, matures very early, in May (the exact date depends on the altitude and rainfall level, which may reduce the dry matter and defer the harvest date). The season then extends until August-September. This variety also bears a second harvest at the beginning of the year (January-February), which is smaller in volume. Hass, Jalisco's other big variety, has a different production calendar from Michoacán. It flowers only twice, with the production periods running from August-September at the beginning of the year for the main harvest, and from May to June for the secondary harvest limited in volume.

Upstream/downstream relations

Unlike in Michoacán, a large proportion of exporters own their production, thanks to higher availability of surface areas for purchase or rental (land generally belonging to owners from Ciudad Guzmán, and rented out). Thanks to this, exporters can ride out periods of tension. However, the bulk of the supply consists of volumes from a host of independent producers, which just like in Michoacán, are not bound to exporters via formal contracts. Similarly, exporters purchase all of the fruit from the orchards (paid for on the tree regardless of quality level or size), at prices fluctuating on a daily basis (spot). Picking is at the exporter's expense, and often carried out by contractors. Conversely, the intermediaries link (the coyotes) is much less developed (or even non-existent) in Jalisco.



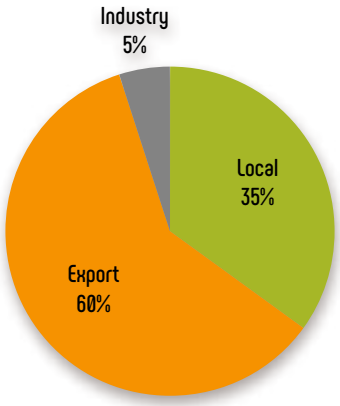
Avocado – Jalisco – Production calendar

Variety	Harvest	J	A	S	O	N	D	J	F	M	A	M	J	Harvest share
HASS MENDEZ	Principal	■	■	■	■	▪								90 %
	Loca tardía							▪	▪	▪	▪	▪	▪	10 %
HASS	Principal			▪	■	■	■	■	■	■	▪			90 %
	Loca											▪	■	10 %

Outlets

The Mexican avocado industry changed tack in the early 2000s. Initially, production was aimed at the local market, where the avocado is a staple often consumed on a daily basis in various forms (including the iconic guacamole). The industry then switched to the export sector, contributing to building demand in the USA. The export sector, which is now the main outlet, has accounted for between 55 and 60 % of production in recent seasons. The local market nonetheless remains a major outlet. Despite steeply increasing prices, it remains less lucrative than the export sector, and its supply levels fluctuate greatly, apparently in long-term decline because of trade policies favouring the export sector. It has been estimated at between 650 000 and 750 000 t in recent years (corresponding to a consumption of 5 to 6 kg/capita/year). The proportion of production dedicated to industry is limited (less than 5 %), yet volumes are substantial given the magnitude of the country's harvest. Several large guacamole and frozen fruit piece production units are in operation (Calavo, Simplot, San Lorenzo, Freshcourt, Cupanda, etc.), some of which own cutting-edge high-pressure pasteurisation equipment. There are also several oil extraction plants, including an ultra-modern one capable of producing extra-virgin oil (Mevi).

Mexican avocado - Outlets
(various sources)



Players

The export sector remains concentrated despite the presence of numerous players. Although there are 58 packing stations operating on the export market, the top five groups control 50 to 60 % of volumes. These are mostly US companies (such as Mission, Calavo, Westpak) or mixed-ownership groups (Aztecavo).

- Mission (USA)
- Calavo (USA)
- Aztecavo (Agricom/Westfalia group)
- Agroexport (Mexican)
- JBR Avocados (Mexican)
- Westpak (USA)

The stations have a wide range of certifications, and are enjoying a boom phase with their facilities expanding and modernising; in contrast with the highly traditional nature of some of the production.

Logistics

Exports are mainly by road-freight (to the USA and Canada): it takes just 18 hours by truck container between Uruapan and the Texan border (McAllen, Pharr and Laredo), which are redistribution hubs for the rest of the USA and Canada. It takes in total three or four days by road between Michoacán and the East Coast of the USA or Canada. The road-freight cost is low, at around 2 000 to 2 500 USD per trip for double-trailer containers. At peak periods, such as the Superbowl, nearly 1 300 containers per week travel between the USA and Mexico, equivalent to one every six minutes. Despite the short distance, ripening is carried out at the consumption centres rather than at the point of shipment.

The US-bound fruit is packed in 11.3-kg lugs (25 pound double layer lugs), under a specific sizing system, different from the EU one. Plastic crates (folding and reusable or single-use) are increasingly used. Segmentation is developing, in particular with net bags containing small and very small-sized (mini) fruit. In Europe, the predominant packing system remains the 4-kg box.

Although at certain peak consumption periods, some batches can sometimes be transported by air-freight, the bulk of trade to the most distant destinations is by sea-freight. Fruit bound for the Japanese market travels by road-freight to the port of Manzanillo (Colima), situated less than 200 km away on the Pacific Coast (2-hour trip), or Lázaro Cárdenas in Michoacán. The total sea-freight transport time to Japan is 21 days, for an average transit time of 17 days, with a 4-day layover at the arrival port for additional sanitary inspections (demanding destination, with specific MRLs). Europe is served from the Gulf of Mexico via the port of Altamira, approximately 900 km away (approximately 11-hour trip), with the crossing taking generally 20 days, although it can be as much as 25 days in case of poor sailing weather, especially during the peak production period (October/November). The sea-freight cost for these two destinations is around 5 500 USD/container. Transport to China takes 25 to 26 days, though it may be as many as 30 days, depending on the layovers. The import specifications are similar to the USA, but more demanding in cosmetic terms.

Avocado – Mexico – Sea-freight logistics

Port of departure		Port of arrival			Main lines
		Altamira (Gulf of Mexico)	Manzanillo (Colima)	Lazaro Cardenas (Michoacán)	
EU	Antwerp	19-22 days	24-25 days	22-24 days	Hamburg Sud Hapag Lloyd CMA-CGM Maersk
	Rotterdam	21-24 days			
	Algeciras	21-25 days			
Japan	Yokohama		16-18 days	18 days	
China	Shanghai		20-28 days	24-32 days	

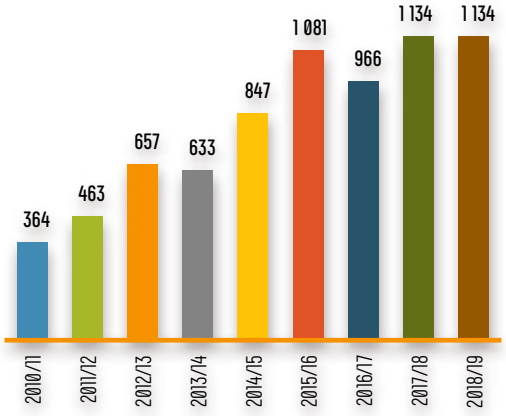
Exports

With more than 1.1 million tonnes of exports in 2017-2018, Mexico, the world number one avocado exporter, accounts for nearly 60 % of world trade (1.9 million tonnes in 2018). While certain pioneering players attempted to venture into exports in the 1980s, things really got going in the 1990s to accompany the growth of the young European market and the Japanese market. However, this development really exploded thanks to the opening up of the US market in 1997. The gradual lifting of the sanitary protection measures restricting access to this market has enabled exporters from Michoacán, the only authorised production region to date, to trade in an increasing number of States (19 States authorised in 1997, up to completely open access since 2007, under the NAFTA agreements). Hence Mexico, which shipped less than 25 % of its supply to the USA in the early 2000s, now exports 75 % (i.e. from less than 50 000 t to 938 900 tonnes in 2018-2019). Conversely, three avocados out of every four consumed in the USA come from Mexico, and exclusively from the State of Michoacán.

On the one hand, the vitality of US demand, stimulated by the various promotions conducted under the auspices of the HAB, has driven by this success. Created in 2013, the Avocados from Mexico (AFM) association is the marketing branch derived from the two organisations representing Mexico in the USA, the Mexican Hass Avocado Importers Association (MHAIA) and the Association of Mexican avocado producers & packers (APEAM). AFM works to promote the origin on the US market, with a very substantial marketing budget of around 60 million USD in 2018 funded at 67 % by MHAIA and at 33 % by a voluntary investment of APEAM. On the other hand, the proximity between the production zones of Michoacán and consumption market gives the origin advantages on this market in terms of freshness, maturity, competitiveness (inexpensive road-freight logistics in less than 24 hours), and affords producers and exporters an opportunity for an excellent economic return. Finally, there is a high degree of vertical integration between packing and export. This sector was mainly developed by historic US market operators setting up in Mexico in order to top up the Californian supply, and develop a year-round avocado presence on the market. The Mexican supply is mainly focused on the central USA and the West Coast.

Of the other export markets, Canada, the number two destination for Mexican avocados, imports more than 80 000 t, and has made big progress in recent years. The European Union and Japan import equivalent volumes, of around 60 000 t. While Japan is very demanding in terms of phytosanitary regulations and volumes are stagnating, Mexico has tended to make a comeback in Europe in recent years. Finally, exports to China and neighbouring Central American countries are making strong progress (excepted Costa Rica because of a trade dispute). The most distant markets are supplied by a mixed supply from Michoacán and Jalisco. However, Michoacán tends to focus on the US market. The expectations of this market, less competitive and closer, are in line with the more limited international certification level and with fruits less well-suited in physiological terms to long-haul transport. Conversely, Jalisco, whose production is making big progress and which does not have access to the US market, is consolidating its presence on these distant destinations, offering more flexible trading conditions and a high certification level.

Mexican avocado - Evolution of exports
(in 000 t | source: Mexican Customs)



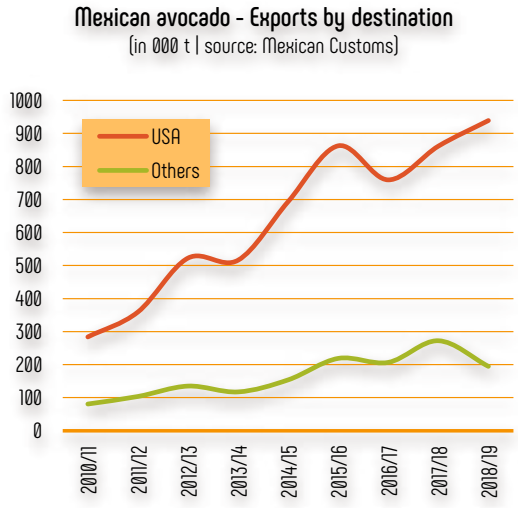
Avocado – Mexico – Production global calendar

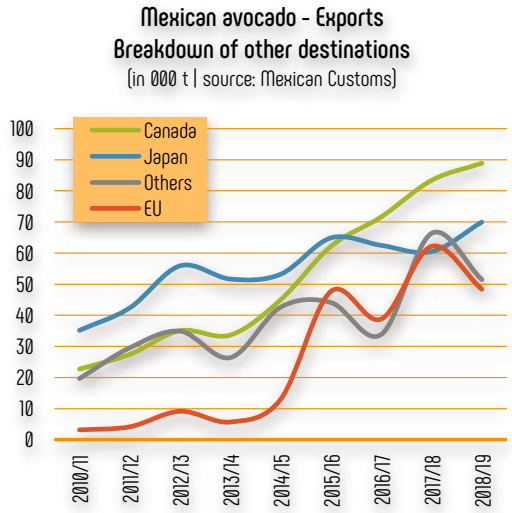
Zone	J	A	S	O	N	D	J	F	M	A	M	J
Jalisco												
Michoacán												

Avocado – Mexico – Exports

in tonnes	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
United States	283 814	359 262	522 488	516 085	693 344	862 457	759 318	861 393	938 953
Japan	35 159	42 354	55 883	51 626	53 175	64 864	62 459	60 455	69 960
Canada	22 687	27 431	35 044	33 632	44 958	62 148	71 607	83 346	88 854
European Union	3 155	4 153	9 137	5 690	12 996	47 689	38 768	62 146	48 348
Others	19 642	29 537	34 893	26 386	42 597	44 092	33 820	66 306	51 465
Total	**364 457**	**462 737**	**657 445**	**633 418**	**847 070**	**1 081 251**	**965 972**	**1 133 646**	**1 197 580**

Source: Mexican Customs





Prospects

Our projection for Michoacán and Jalisco was put together in two steps: estimating the production from surface areas planted in late 2018, and estimating the prime production of future orchards to be planted between 2019 and 2023. A summary projection of the production of the other States is included in a third step.

We factored in structural data relating to cultivation area (surveying the surface areas of the various States), agronomic data (current and future productivity) and availability of certain production factors. We mainly used information gathered from interviews with sector professionals, and from official data banks (SAGARPA, JLSV, etc.) or professional data banks (APEAM, APEAJAL, etc.).

Certain external and contextual factors potentially playing a role by 2023 could not be incorporated. These were:

- **Climate change.** Change to rainfall patterns, in particular resulting in a deferred rainy season, more intense spells of rain and more frequently occurring extreme climate phenomena (hail, violent winds, intense storms), already seems to be a reality. This dimension may occasionally adversely affect production.
- **Poor industry cohesion.** The producer's great power of negotiation has very positive externalities (see page 11). However despite the work of APEAM, production is still very much disconnected from the export sector (practically no vertical integration, no contractualisation, prices negotiated daily). This lack of cohesion is a challenge for some stakeholders, while issues common to the industry as a whole (sanitary, trading, etc.) may emerge on an increasingly competitive world market.
- **Competing origins coming to the fore,** with aggressive trading practices (working on commission, very low production cost, etc.), highly homogeneous quality and a high level of both sanitary and trade certification. They could compete with Mexico's positions on certain markets, especially the distant ones, especially since the origin's reliability has been dented over the past two years by several episodes of social disruption led by a minority of producers, causing occasional but substantial, supply problems, which the downstream segment took a very dim view of. This aspect could have an impact on Mexico's market shares.

Step 1: Estimating the production of currently planted orchards

We considered three different production systems, each with particular potential. For Jalisco, we applied a single high-tech system. For Michoacán, we used a traditional system, representing 60 % of planted surface areas, and a distinct high-tech system, including in particular irrigation. We assumed that the productivity of the traditional system would increase very gradually. Although the crop has an excellent profitability, structural investments in the orchards remain limited, providing no grounds to expect any very marked rise in yields, despite their relatively low level for the zone's potentialities. This is borne out by analysis of their long-term evolution, with a gain of approximately 500 kg/ha between 2009 and 2018 according to SAGARPA data. Conversely, we adopted a hypothesis of still moderate yet more marked expansion (1 t/ha over 10 years), thanks in particular to a generational change in farming. Young growers, better trained in production techniques and the rationale for investment, are gradually taking over from retiring growers.

Avocado – Mexico – Yield hypotheses for mature orchards

Zone		Proportion of surface areas	Yield (t/ha)
Michoacán	Traditional system	60 %	9.25*
	High-tech system	40 %	16.0
	Average yield	100 %	12.0
Jalisco		100 %	15.0

* up from 9.0 to 9.5 t/ha between 2018 and 2023

Average plantation yield by age:

We assumed that trees started to bear significant production from 5 years in Michoacán, and from 4 years in Jalisco, with full production potential reached at 8 years and 7 years respectively. The prime production was defined by experts, and confirmed by the literature.

Avocado – Mexico – Prime production hypothesis

Cultivation area age	4 years	5 years	6 years	7 years	8 years
Michoacán - average yield (t/ha)	(0.3)	1.3	4.2	8.4	12.0
Jalisco - average yield (t/ha)	1.6	5.3	10.5	15.0	15.0

Cultivated surface areas and projected production of established orchards:

The official survey is not conducted when the trees are planted, but rather when the orchards are registered in the export programmes with the local phytosanitary authorities (Junta Local de Sanidad Vegetal), generally when production is becoming significant (i.e. 5 years for Michoacán and 4 years for Jalisco). The surface areas issued every year by the Ministry of Agriculture is therefore a rough figure, as the extension of the young orchards is imprecise.

Avocado – Michoacán – Survey of cultivation area in 2018, and projected production of planted surface areas

Planted area	Age, end of 2018	Age, end of 2023	Surface areas (ha)	Yield in 2023 (t/ha)	Production in 2023 (t)
recorded before 2015	>= 5 years	>= 10 years	131 400	12.0	1 576 800
in 2015	4 years	9 years	13 500	12.0	162 000
in 2016	3 years	8 years	10 400	12.0	124 800
in 2017	2 years	7 years	7 800	8.4	65 520
in 2018	1 year	6 years	8 400	4.2	35 280
Total			**171 500**		**1 964 400**

Avocado – Jalisco – Survey of cultivation area in 2018, and projected production of planted surface areas

Planted area	Age, end of 2018	Age, end of 2023	Surface areas (ha)	Yield in 2023 (t/ha)	Production in 2023 (t)
recorded in or before 2016	>= 4 years	9 years	23 700	15.0	355 500
in 2016	3 years	8 years	2 344	15.0	35 160
in 2017	2 years	7 years	4 163	15.0	62 445
in 2018	1 year	6 years	3 133	10.5	32 897
Total			**33 340**		**486 002**

Step 2: Estimating the prime production of the new plantations

For Michoacán, we selected a hypothesis based on a slowdown in the planting rate, in accordance with the trend registered in recent years in the survey data (going from approximately 10 000-13 000 ha in 2015 and 2016 to 7 500-8 500 ha in 2017 and 2018). The crop's profitability remains excellent. However, good-quality land reserves in the "natural zone" are increasingly limited, especially since regulations for conversion of primary forests into zones for agricultural use are now better respected (stricter application of the law, even leading to some symbolic uprooting of illegal plantations). Planting is now taking place in more marginal zones for the crop, with a less favourable or even borderline climate, less well of in terms of soil quality and water availability. We opted for two hypotheses: expansion slowing down slightly to 7 000 ha/year, and a more pronounced slowdown to 5 000 ha/year.

For Jalisco, the surface areas projection is more complex. As regards production factors, the situation also points to a slowdown in the planting dynamic. Water availability is more limited, while irrigation is a must. Operating permits for new wells are no longer being granted, though rights can be purchased. Secondly, as in Michoacán, good-quality land is increasingly rare and expensive. The land still available is in more borderline zones for the crop. From the economic standpoint, the balance is positive overall, though profitability is generally not as excellent as in Michoacán. Production costs are higher, while due to lack of access to the USA, the harvest has to be sold on a more competitive international market. So we opted to issue two hypotheses: a short-term drop in the planting rate, followed, or not, by an upturn in expansion in surface areas at a slightly higher tempo in the medium term, with the potential opening up of the US market. Jalisco has a major asset with its early production (Mendez), highly complementary with the Michoacán harvest, and marketable in a period when this market is highly open. Some of the State's 20 000 ha of sugar cane, situated in zones with avocado potentialities, could be converted.

In every scenario, production of the surface areas planted from 2019 has little impact on the 5-year production projection, with the trees only reaching their full potential from 7 or 8 years, according to the regions (i.e. from 2026-2027). The first significant production from these young orchards will be harvested in 2022 for Jalisco, and in 2023 for Michoacán.

Avocado – Mexico – Estimated additional production in 2023 according to two surface area expansion hypotheses in Michoacán and Jalisco

Surface area expansion		Annual expansion (ha)		Additional production in 2023 (t)	Comment
		2019-2021	2021-2023		
Hypothesis 1	Michoacán	5 000	5 000	6 500	5 000 ha 5 years old
	Jalisco	3 000	3 000	20 475	3 000 ha 4 years old, and 3 000 ha 5 years old
Hypothesis 2	Michoacán	7 000	7 000	9 100	7 000 ha 5 years old
	Jalisco	3 000	4 250	27 038	4 250 ha 4 years old, and 3 000 ha 5 years old

Step 3: Production of other States

Mexico's other producer States represented approximately 30 000 ha in 2018. They were not subjected to precise analysis in this study. We opted to assume continuing expansion in the States of Mexico and Nayarit, at a similar rate to recent years (extending the surface area curves, with a similar average yield to Michoacán due to the apparent similarities in the production systems). We assumed that the increase in surface areas would remain limited in other States such as Chiapas, Morelos, Guerrero or Sinaloa (pedoclimatic constraints, security problems detrimental to investment, etc.).

Avocado – Mexico – Estimated growth in surface areas and additional production in 2023 for the other producer States

States	Surface areas in 2018 (ha)	2015-2018 expansion rate (ha/year)	Surface areas in 2023 (ha)	Production in 2023 (t)
Mexico	10 500	760	14 298	170 855
Nayarit	7 100	433	9 266	110 732
Others	4 330	0	4 330	51 744
Total	**21 930**	**1193**	**27 894**	**333 330**

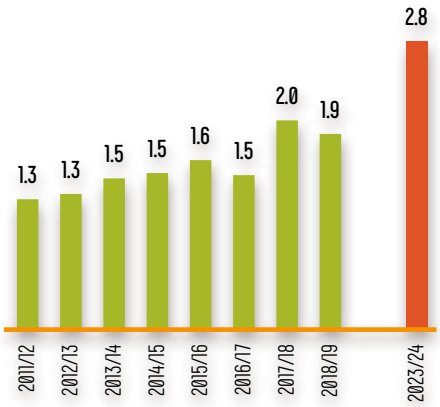
Synthesis

Regardless of the scenario, production should be around 2.8 million tonnes in 2023 according to our hypotheses, i.e. a rise of approximately 800 000 t since 2019. The differences between scenarios will start to significantly affect the production potential after 2023.

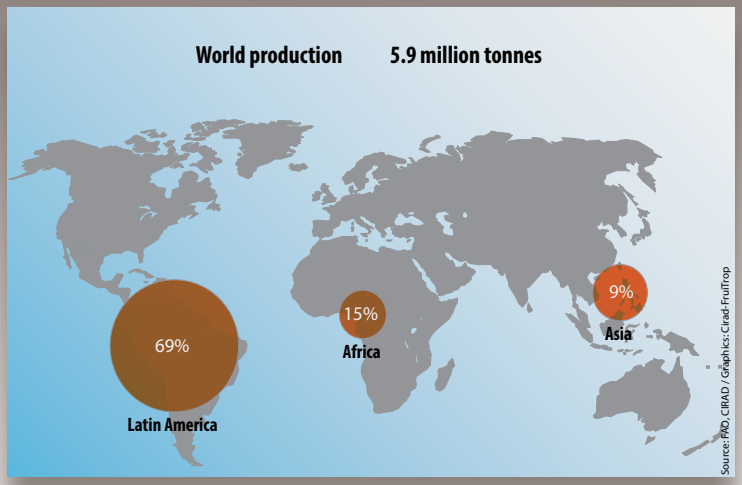
Avocado – Mexico – Synthesis of projected production in 2023

in tonnes	Hypothesis 1		Hypothesis 2	
	Michoacán	Jalisco	Michoacán	Jalisco
Production of planted areas prior to 2018	1 964 400	486 002	1 964 400	486 002
Production of plantations established from 2019	6 500	20 475	9 100	27 038
Total	**1 970 900**	**506 477**	**1 973 500**	**513 039**
Total, Michoacán + Jalisco	**2 477 377**		**2 486 539**	
Other States	**333 330**		**333 330**	
Total, Mexico	**2 810 707**		**2 819 869**	

Mexican avocado - Production projection
(in million tonnes | source: CIRAD)



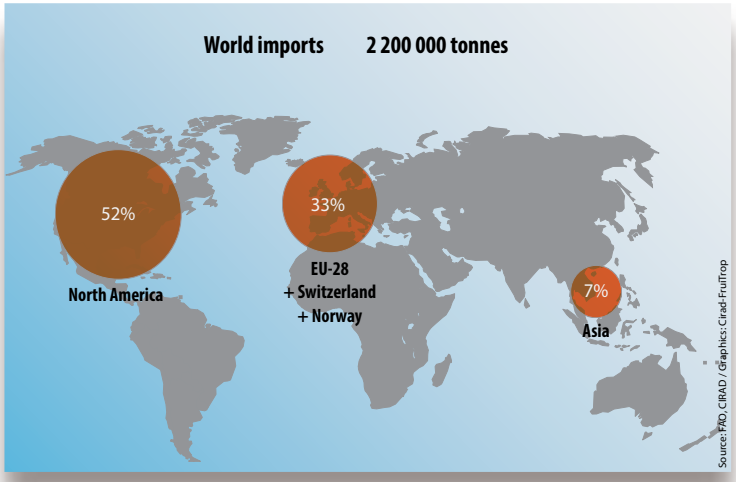
AVOCADO - Production (2018-19)



Avocado — Top 9 producer countries	
tonnes	**2018-19 or FAO 2017**
Mexico	1 950 000
Dominican Rep*	638 000
Peru*	467 000
Indonesia	363 000
Colombia*	314 000
Brazil*	213 000
Chile	210 000
Kenya*	194 000
Rwanda*	162 000

Professional sources (2018-19), * FAO (2017)

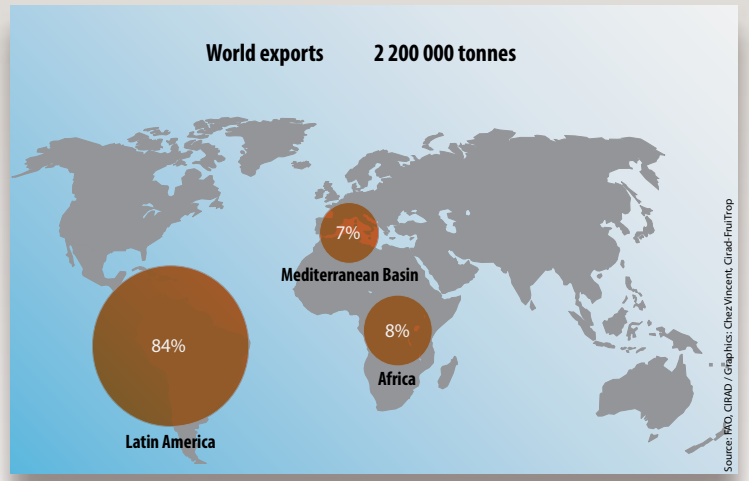
AVOCADO - Imports (2018-19)



Avocado — Top 7 importer countries	
tonnes	**2018-19**
United States	1 058 083
Netherlands	400 999
France	143 093
Spain	129 734
United Kingdom	114 773
Canada	93 551
Japan	76 614

Source: National Customs

AVOCADO - Exports (2018-19)



Avocado — Top 6 exporter countries	
tonnes	**2018-19**
Mexico	1 198 000
Peru	360 000
Chile	147 000
South Africa	90 000
Israel	78 000
Kenya	75 000

Professional sources, National Customs

USA - Imports - Main supplier countries						
tonnes	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Total	**603 160**	**780 412**	**917 667**	**846 414**	**982 316**	**1 058 083**
Mexico	512 276	686 404	853 617	764 680	862 596	917 730
Peru	21 617	64 448	46 284	31 573	64 420	81 893
Dom. Rep.	15 958	15 548	7 393	20 805	25 757	29 560
Chile	53 305	10 600	10 362	29 354	29 454	28 001

Source: USDA

Canada - Imports - Main supplier countries						
tonnes	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Total	**46 139**	**57 089**	**69 953**	**76 118**	**89 052**	**93 551**
Mexico*	33 451	44 958	62 150	71 607	83 346	88 854
Peru	2 905	5 542	2 627	1 130	3 567	1 955
USA*	8 910	5 649	4 494	2 785	1 076	1 532
Dom. Rep.	456	534	483	379	629	581
Chile	261	65	3	3	20	20
Others	156	341	196	214	414	609

Sources: COMTRADE and *National Customs

South America - Main markets							
tonnes	2012	2013	2014	2015	2016	2017	2018
Total	**17 670**	**18 403**	**21 125**	**21 760**	**24 152**	**24 873**	**38 134**
Chile	698	3 882	2 659	9 285	11 151	5 700	23 812
Argentina	9 179	9 621	13 208	10 807	12 784	19 033	14 310
Ecuador	1 770	996	2 130	538	-	7	12
Colombia	6 023	3 904	3 128	1 130	217	133	-

Source: COMTRADE

Central America and Mexico - Main markets							
tonnes	2012	2013	2014	2015	2016	2017	2018
Total	**42 132**	**42 266**	**38 184**	**38 777**	**37 975**	**32 977**	**37 725**
El Salvador	13 754	12 666	12 213	12 269	12 570	12 005	14 931
Honduras	10 412	11 405	10 263	11 379	9 972	11 079	11 215
Costa Rica	13 731	13 061	12 424	11 187	9 334	7 783	7 899
Guatemala	3 312	2 923	3 211	3 942	6 081	2 110	3 680
Mexico	923	2 211	73	-	18	-	-

Source: COMTRADE

European Union - Imports - Main supplier countries						
tonnes	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Total, incl.	**307 358**	**349 426**	**413 717**	**507 582**	**542 656**	**684 232**
Total N. Hemisphere	**157 266**	**167 741**	**220 318**	**278 351**	**305 045**	**313 643**
Chile	62 968	42 797	78 244	90 138	92 467	87 571
Israel	42 844	46 086	34 995	56 600	41 567	60 101
Spain	36 700	50 600	37 700	55 200	48 600	57 000
Mexico	6 293	12 918	45 593	36 884	60 993	47 561
Colombia (Sept/Aug.)	1 142	3 740	11 189	24 024	29 752	38 000
Morocco	4 766	7 798	7 115	9 552	21 746	11 237
Dominican Rep.	1 810	3 034	4 445	5 527	7 345	8 657
Portugal	-	-	-	-	1 440	3 032
Greece	740	765	987	424	560	484
Total S. Hemisphere	**150 092**	**181 686**	**193 399**	**229 231**	**237 611**	**370 589**
Peru	86 260	101 971	114 321	144 367	157 744	228 769
Southern Africa*	45 165	56 713	50 962	54 095	43 984	87 127
Kenya	13 313	15 604	20 728	23 444	25 425	41 525
Brazil	3 928	5 265	3 535	3 908	7 189	6 680
Tanzania	968	1 643	3 278	2 948	2 987	6 244
Argentina	158	43	78	133	3	76
Others	300	447	497	337	280	168

* South Africa, Zimbabwe, Swaziland / Source: Eurostat

Other West European countries - Main markets							
tonnes	2012	2013	2014	2015	2016	2017	2018
Total	**14 779**	**17 148**	**20 600**	**23 746**	**27 120**	**28 215**	**29 360**
Switzerland	7 340	7 915	9 516	11 376	13 823	14 694	15 528
Norway	7 090	8 787	10 496	11 673	12 411	12 422	12 779
Iceland	349	446	588	697	886	1 099	1 053

Source: COMTRADE

Russia - Imports - Main supplier countries						
tonnes	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Total	**13 948**	**14 404**	**9 767**	**15 109**	**18 840**	**31 593**
Total N. Hemis.	**9 431**	**8 209**	**5 914**	**9 782**	**10 941**	**16 808**
Israel	9 004	8 123	5 814	9 614	10 234	15 216
Colombia	-	-	-	44	475	1 016
Chile	147	86	99	123	232	576
Total S. Hemis.	**4 853**	**5 427**	**3 853**	**5 327**	**7 899**	**14 785**
Kenya	405	232	497	1 735	4 260	7 191
South Africa	2 678	3 994	2 197	1 902	957	3 355
Peru	1 462	982	1 069	1 586	2 100	3 089

Source: COMTRADE

Other East European countries - Main markets							
tonnes	2012	2013	2014	2015	2016	2017	2018
Total	**1 948**	**2 636**	**2 749**	**2 850**	**2 324**	**3 321**	**6 627**
Ukraine	1 623	2 068	1 852	1 231	1 685	2 218	4 793
Belarus	255	482	744	1 441	388	770	1 501
Serbia	70	86	153	178	251	333	333

Source: COMTRADE

Japan - Imports - Main supplier countries						
tonnes	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Total	**56 836**	**57 372**	**67 243**	**67 394**	**65 703**	**76 614**
Mexico	50 278	52 758	63 986	63 549	59 192	69 701
Peru	-	-	25	969	3 347	5 166
USA	4 971	2 124	80	1 174	2 585	1 099
Chile	892	786	683	175	118	512
New Zealand	695	1 704	2 467	1 527	461	118

Source: National Customs

China - Imports - Main supplier countries						
tonnes	2013	2014-15	2015-16	2016-17	2017-18	2018-19
Total	**4 223**	**13 629**	**22 165**	**31 068**	**41 971**	**47 127**
Peru	-	1 154	520	2 802	6 437	17 073
Mexico	-	10 794	14 223	10 919	17 690	13 952
Chile	-	1 092	5 783	13 405	15 029	13 616
USA	-	243	1 052	644	1 084	1 011
Others	-	346	587	3 298	1 731	1 475

Source: National Customs

Other Asian countries - Main markets							
tonnes	2012	2013	2014	2015	2016	2017	2018
Total	**3 320**	**4 062**	**5 302**	**6 113**	**10 103**	**15 247**	**20 693**
South Korea	534	722	1 097	1 515	2 915	5 979	11 560
Singapore	1 691	2 015	2 815	2 991	4 210	5 737	5 070
Malaysia	565	773	956	1 075	2 377	2 932	3 300
Thailand	530	552	434	532	601	599	763

Source: COMTRADE

Oceania - Main markets							
tonnes	2012	2013	2014	2015	2016	2017	2018
Total	**9 629**	**10 967**	**19 889**	**15 214**	**19 757**	**16 407**	**13 504**
Australia	9 627	10 941	19 889	15 214	19 757	16 407	13 504
New Zealand	2	26	-	-	-	-	-

Source: COMTRADE

Persian Gulf - Main markets							
tonnes	2012	2013	2014	2015	2016	2017	2018
Total	**16 985**	**22 604**	**26 818**	**36 400**	**39 476**	**43 249**	**41 884**
Saudi Arabia	7 736	10 156	10 312	16 697	17 527	20 451	19 217
U.A.E.	7 352	10 077	13 250	15 841	17 000	16 555	17 777
Kuwait	857	1 247	1 601	1 791	2 084	4 523	2 680
Bahrain	266	382	726	791	955	1 194	1 180
Qatar	486	598	904	1 280	1 910	526	805
Yemen	288	144	25	-	-	-	225

Source: COMTRADE

Africa - Main markets							
tonnes	2012	2013	2014	2015	2016	2017	2018
Total	**11 790**	**15 675**	**11 517**	**11 671**	**8 134**	**8 830**	**15 920**
Morocco	8 817	9 130	7 627	6 749	3 975	4 417	11 130
South Africa	1 660	2 308	1 962	2 246	2 416	2 733	2 655
Burkina Faso	683	589	1 046	1 436	767	779	888
Egypt	112	2 914	80	593	202	329	845
Namibia	518	734	802	647	774	572	402

Source: COMTRADE

Avocado

Varieties

Avocado is a dicotyledon of the genus Persea of the Lauraceae family. More than 200 varieties are divided between three races. The Mexican race is of little commercial interest as most of the fruits are too small. However, its agronomic qualities mean that it is widely used as rootstock or as a parent. Practically all sales of fruits of the West Indian race are on domestic markets. International trade handles mainly varieties belonging to the Guatemalan race or crosses between the Guatemalan and Mexican races.

The Guatemalan race

Persea nubigena* L. Wins var. *guatemalensis

This race probably originated not only in the highlands of Guatemala but also in the Chiapas in Mexico. The leaves are large and uniformly dark green on both faces. Although it is not as tolerant to cold as the Mexican race, it is useful for marginal cultivation zones. The fruits are roundish and have thick, very hard warty skin. The size may vary considerably but they are generally larger than fruits of the Mexican race. The seed is fairly small and almost always clings. Pulp oil content is medium at 10 to 20%. Flowering to harvest time is 8 to 10 months. It can be longer in the cold parts of California (12 to 14 months). The race is a good parent for crosses (contributing genes for small seeds). Nearly 40% of avocados belong to this race, including 'Anaheim', 'Corona', 'Sharwil' and the major commercial varieties such as 'Edranol', 'Gwen', 'Hass', 'Nabal' and 'Reed'.

The West Indian race

Persea americana* Miller var. *americana

In spite of its name, this race probably originated in Colombia. It is well suited to humid tropical regions where it is used to supply local markets. The tree has large green leaves. The fruits are elongated, usually large and weigh 400 to 900 g. The epidermis is fairly thin (0.8 to 1.5 mm) and is smooth and shiny, soft green or greenish yellow or reddish when mature. The pulp is watery with a low oil content (< 10%). The seed—often free—is large and has a more or less corrugated surface. All these characteristics make the fruits delicate. They often display pulp browning (caused by chilling injury) at the temperatures generally used for the storage and refrigerated transport of fruits of the other races (+ 6°C, + 8°C). The race is the most sensitive one to cold and aridity but the most tolerant to salinity. The flowering to harvest time is only 5 to 7 months. The West Indian race groups about 15% of avocado varieties and the best known among them are 'Peterson', 'Pollock' and 'Waldin'.

The Mexican race

***Persea americana* Miller var. *drymifolia* Schlecht and Cham.**

This fairly hardy race is adapted to low temperatures originated in the Mexican highlands. It differs from the two other races in several botanical characteristics:

- the leaves are generally small and release a characteristic aniseed odour when crumpled;
- flowering is earlier than in the other races and the flowering to harvest time is 7 to 9 months;
- the fruits are small and elongated and rarely weigh more than 250 g. The skin is very thin and smooth.

The pulp is often fibrous and has a high oil content (> 15%). The seed is generally large and sometimes free. This race is very sensitive to salinity. In contrast, it tolerates high temperatures and comparatively low relative humidity. Furthermore, it has greater tolerance to *Phytophthora cinnamomi* than the other races. It thus forms good rootstock and its genetic potential is well exploited in hybridisation breeding programmes. Finally, its high lipid content is an interesting feature when the fruits are used for oil production. About 20% of varieties belong to this race. The best known include 'Duke', 'Gottfried', 'Mexicolo', 'Topa Topa' and 'Zutano'.

Hybrids

A large proportion of the varieties of interest for international trade are hybrids. These are generally natural crosses and in rarer cases are the result of breeding exploiting the inter-fertility of the three races. The main selection criteria are agronomic (resistance to pests and diseases, especially *Phytophthora*, tolerance to salinity and cold, productivity, etc.) and those related to fruit quality (size, high pulp percentage, flavour, absence of fibres, oil content, etc.). 'Bacon', 'Ettinger', 'Fuerte' and 'Lula' in particular are natural Mexican x Guatemalan hybrids. Guatemalan x West Indian hybrids, mainly from Florida, include the varieties 'Ajax', 'Booth', 'Choquette', 'Collinson' and 'Simpson'. Mexican x West Indian hybrids such as 'Indian River' are very rare. Other varieties resulting from inter-race crosses are possible.

Hass

Guatemalan race

Flowering type: A
Fruit shape: pyriform
Skin: dark green and brown at maturity, not very thick, warty
Oil content: 18 to 20%
Average weight: 250 to 350 g
Seed:skin:pulp ratio: 16:12:72 (small seed)

'Hass' has replaced 'Fuerte' as the sector standard. It is currently the most commonly planted avocado in the world. It was selected by Rudolph Hass in California in the early 1920s and registered in 1935. The tree is vigorous and highly productive. The fruits vary in shape in some production regions, ranging from pyriform to ovoid. Average fruits size is fairly small in hot regions. Keeps well on the tree. The skin turns from dark green to purplish brown at maturity. It is easy to remove from the pulp. The organoleptic qualities are excellent. Rich flavour (nutty taste) and buttery non-fibrous pulp.

Fuerte

Mexican x Guatemalan hybrid

Flowering type: B
Fruit shape: obovate
Skin: green, matt, smooth, medium thickness. Pliable and tough, it is easy to remove
Oil content: 16 to 18%
Average weight: 250 to 400 g
Seed:skin:pulp ratio: 15:10:75 (large seed)

This variety was long the most commonly planted in the world and originated in Mexico (Atlixco). The tree is vigorous with fairly good frost resistance (to 4°C), but is particularly temperature-sensitive during the flowering period. Productivity is generally good in temperate zones but it displays strong alternate bearing. The fruits are easy to peel and have excellent organoleptic qualities (buttery pulp).

Ettinger

Mexican x Guatemalan hybrid

Flowering type: B
Fruit shape: narrowly obovate
Skin: bright green, fine, fairly smooth
Oil content: 18 to 22%
Average weight: 250 to 350 g
Seed:skin:pulp ratio: fairly large seed

This variety was bred from 'Fuerte' in Kefar Malal in Israel, where it is mainly grown. The tree is very fertile and vigorous with an erect habit. The fruits are similar to those of 'Fuerte'. The skin is susceptible to problems of corky areas and tends to adhere to the pulp. The pulp is buttery and fibreless and has good organoleptic qualities.

Reed

Guatemalan race

Flowering type: A
Fruit shape: spheroid
Skin: medium thickness, slightly rough, pliable
Oil content: 19 to 20%
Average weight: 400 to 500 g
Seed:skin:pulp ratio: 17:11:72

This variety of Californian origin was selected by James Reed. Registered in 1960, the patent expired in 1977. It has succeeded in conserving the qualities of its parents 'Nabal' and 'Anaheim' without their negative features. It is fairly productive and alternate bearing is not marked. Its resistance to cold is comparable to that of 'Hass'. The fruits are large and a singular round shape. They keep well on the tree. The organoleptic qualities are excellent and the buttery pulp has a slight nutty taste and does not blacken after slicing. Peeling is also easy.

Pinkerton

Mexican x Guatemalan hybrid

Flowering type: A
Fruit shape: pyriform
Skin: dark green, rough, tough and pliable, medium thick, easy to peel
Oil content: 18 to 25%
Average weight: 270 to 400 g
Seed:skin:pulp ratio: 10:13:77 (small seed)

A recent variety bred in California by John Pinkerton and registered in 1975. It is probably the result of a Hass x Rincon cross. The tree is very vigorous and tolerates temperatures of -1/-2°C to 30°C. Production is good and alternate bearing is mild. The fruits may suffer from ring-neck if the tree is under conditions of stress. The organoleptic qualities of this variety are excellent (nutty taste). The pulp is smooth, buttery and fibreless.

Photos © Guy Bréhinier

Avocado

Post-harvest

Post-harvest management of fruits is of prime importance. It affects both quality and yield as losses can range from 5 to 50%.

The special features of climacteric fruits

Climacteric fruits have special physiological characteristics. They must be harvested after reaching a sufficiently advanced stage of development and hence of maturity. It is only then that they are capable of synthesising sufficient amounts of ethylene to be able to start ripening (a strong increase in respiration that physiologists refer to as 'climacteric' marks the start of deep-seated physiological changes). Only mature fruits will display satisfactory organoleptic characteristics once they have ripened. Avocado is a singular climacteric fruit. It can only start the ripening process after it has been picked. One of the best ways of storing the fruit is therefore to leave it on the tree. Some varieties can remain on the branch for several months, depending on the season. Suitability for 'tree storage' is generally very small or non-existent for West Indian cultivars but marked for hybrids, especially for Guatemalan x Mexican crosses. Nevertheless, prolonged storage can have a negative effect on production in the following season. These physiological considerations highlight the importance of the harvest date. Several variables that depend on the variety and the producer country concerned are to be taken into consideration to judge the optimum stage of maturity. Visual appraisal, fruit weight and diameter and the number of days after flowering give useful information but this is not accurate enough. Determining the matter content—strongly correlated with the oil content—is the most commonly used method. Appraisal of the stage of maturity is completed by analysis of enzyme activity, electrical conductivity, aromatic compounds or precursors or by tasting tests when the fruits have ripened.

Photos © Eric Imbert

Storage

Cooling

The temperature is lowered to slow the metabolism of the fruit so that it can be stored. This slows ethylene synthesis and its effects. It is therefore sought to bring the fruits to the best temperature for storage as rapidly as possible after harvesting (ideally in less than 6 hours). The duration of cooling depends on the initial and final temperature of the fruit and on the ambient air conditions (temperature, wind velocity and relative humidity). The time necessary varies from 8 to 10 hours. It is important to halt the cooling phase 2°C before the final temperature desired to be sure not to reach temperatures that are too low and that might damage the produce.

Refrigeration

Optimum storage temperatures vary according to the variety, the period of the season (maturity) and the storage period desired. In general, the temperature for mature avocado ranges from 5 to 12°C with atmospheric relative humidity of 85 to 95%. The more delicate end-of-season fruits are stored in the lower part of the temperature range. For 'Hass', physiologists advise maintaining fruits at 5 to 7°C at the beginning of the season and 4.5 to 5.5°C at the end. More than four weeks of storage at these temperatures is not recommended. The optimum temperature range for 'Fuerte' is 6 to 8°C but for no more than three weeks. In practice, professionals keep all the classic commercial varieties at between 5 and 6°C. Temperatures must be strictly controlled to prevent any fluctuation. Movement of air is also regulated. Heat is released during the beginning of the ripening process and this must be taken into account. Maintaining the cold chain is of crucial importance.

Controlled atmosphere

Controlled atmospheres are widely used for long transport and can lengthen the duration of storage. Low O_2 levels combined with high CO_2 reduce respiration and ethylene production. An O_2 content of 2 to 5% and CO_2 of 3 to 10% are generally used. The main classic commercial varieties can thus be stored for 5 to 6 weeks and even longer for 'Hass'. The effects of unsuitable O_2 and CO_2 levels are described in the paragraph entitled 'Main types of post-harvest physiological deterioration' below.

Alternative technologies for long storage

Treatment with 1-MCP. Application of 1-MCP (1-methylcyclopropene) is reported to limit the internal symptoms of chilling injury (dulling of the pulp, vascular browning) in fruits stored for more than four weeks. The technique is said to give good results especially for the green varieties that are less suitable than 'Hass' for long storage (with regard to the standards in force). It has been used on a proportion of the South African harvest for three years.

Step-down temperature. This technique has been used in the South African avocado sector for several years to conserve fruit quality and reduce internal symptoms of chilling injury. The storage temperature is lowered in steps (1 to 2°C each week) during transport, with care taken not to descend below 3.5°C. There are procedures (temperature and duration) for the different cultivars and regions of South Africa.

Photos © Eric Imbert

Packing

Fruits with the desired maturity index are sorted, washed and graded before packing. Each market has its own packing requirements.

Avocado — USA — 11.34-kg box 43 x 32.6 x 17.50 cm	
Weight (g)	Size
422	28
377	32
340	36
298	40
241	48
196	60
156	70
122	84
102	96

Avocado — Europe — 4-kg box 35 x 28.5 x 9 cm	
Weight (g)	Size
461-475	8
366-400	10
306-365	12
266-305	14
236-265	16
211-235	18
190-210	20
176-189	22
156-170	24
146-155	26

Avocado — USA 5.67-kg box	
Weight (g)	Size
422	14
377	16
340	18
298	20
241	24
196	30
156	35

Avocado — Japan — 6-kg box 43.9 x 33.1 x 11 cm	
Weight (g)	Size
340	18
298	20
241	24
196	30
156	35

Photos © Eric Imbert

Ripening

The ideal temperature for ripening is 15 to 20°C. Above 25°C, ripening is irregular, unpleasant flavours appear and the risk of rot increases. This natural process can also be controlled. Treatment with ethylene (100 ppm at 20°C for 12 to 72 hours depending on the maturity of the fruit) speeds up ripening by 3 to 6 days. It is possible to obtain fruits at an even stage of ripeness in chambers in which temperature, relative humidity and ethylene content are the main parameters controlled. Nevertheless, ripening still depends on the initial stage of maturity of the fruit.

The main precautions to be taken in shops

Avocado fruits are very sensitive to impacts and to pressing by consumers. Ripe and nearly ripe fruits must be stored at lower temperatures (1 to 6°C). Misting is not recommended.

Main types of post-harvest physiological deterioration of avocado

Storage-related damage

Chilling injury. This damage is caused by low temperatures—generally lower than 3°C—or by prolonged storage. The symptoms may appear three days after packing during storage and more often when the fruits are removed from the cold room. Two forms of chilling injury are observed. The symptom of internal chilling injury is a browning of the pulp starting at the base of the fruit and sometimes vascular browning in the same area. In 'Fuerte', this disorder takes the form of small dark spots in the pulp. The symptoms of external chilling injury are irregular black spots on the epidermis. They may appear during storage and most frequently when the fruits are removed from cold storage.

O_2 deficit and excessive CO_2. Too great a decrease in the O_2 level (in particular to less than 1%) can cause irregular brown spotting of the epidermis that can spread to the pulp. Too high a CO_2 level (over 10%) can cause discoloration of the epidermis and the development of unpleasant flavours, especially when the O_2 level is low.

Fungal infection in the field revealed during or after storage

The control of fungal diseases requires effective orchard management and appropriate pre-harvest treatments. Any bruising of the fruits must be avoided at the post-harvest stage, they must be refrigerated rapidly and the cold chain maintained.

Anthracnose. This is the most frequent disease during storage and is caused by infection of the fruit by Colletotrichum gloeosporioides in the orchard and appears only during ripening. It causes serious necrosis. Ordinary small, scattered injuries develop into large circular brown spots on the epidermis. The underlying pulp blackens and the rot reaches the seed. The rate of development of this rot depends on the transport and storage temperature and above all the state of maturity of the fruits.

Stem-end rot. This disease is also caused by infection by a fungus, Botryodiplodia theobromae. Small pale brown spots appear initially in the stem zone. The rot spreads rapidly to the rest of the fruit. The pulp is then infected to the seed. Any injury in the epidermis favours infection by the pathogen.

Avocado — Post-harvest diseases caused by pathogenic fungi

Pathogens	Diseases
Alternaria spp	Black rot
Botryodiplodia theobromae	Stem-end rot
Botryosphaeria ribis (*Dithiorella gregaria*)	Stem-end rot
Colletotrichum gloeosporioides	Anthracnose: Black rot
Fusarium spp	Stem-end rot
Penicillium expansum	Blue mould
Pestalotiopsis perseae	Brown spots
Phomopsis perseae	Brown rot
Phytophthora citricola	Small surface injuries
Pseudocercospora purpurea	Soft rot
Rhizopus stolonifer	Corky patches on epidermis
Trichothecium roseum	Pink rot

The harvest stage in the case of climacteric fruits

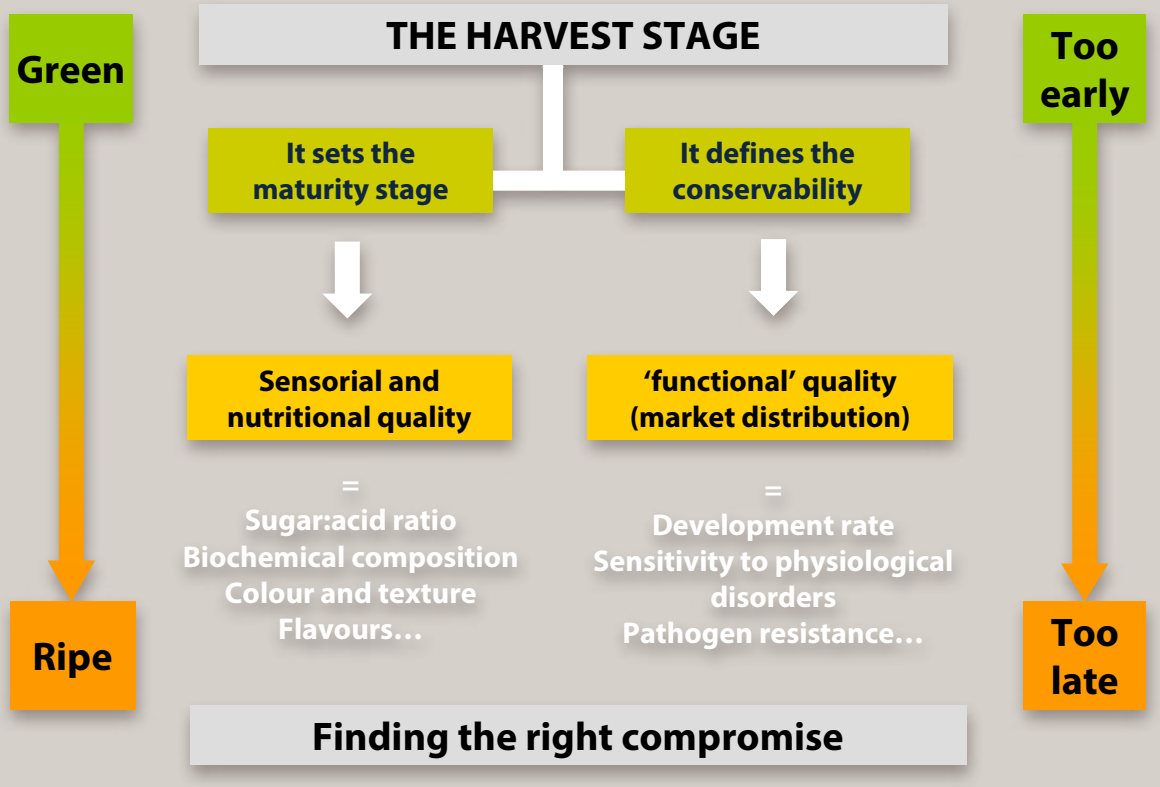
This stage is particularly important since the state of maturity of the fruit is "set" upon harvesting (see FruiTrop No.198, page 29, maturation article). The impact of the harvest stage is split into two aspects (see diagram):

- in qualitative terms, the earlier a fruit is harvested, the less taste properties it will exhibit, with a fairly low sugar content (enrichment in sugars is linked to the length of time on the plant) and a poor ability to develop flavours;
- in commercial terms, a fruit harvested at a stage too close to the fruit's true maturity will have a lower conservability. But if the fruit is harvested too early, its ability to ripen may be insufficient, and it will not be able to go through the correct maturation development.

Importers are dependent on the compromise which may be found to reconcile taste quality and market distribution. Defining an optimum harvest stage is a real challenge, since there are not necessarily any clear visual descriptors indicating with acceptable precision the stage of maturity before maturation of climacteric fruits (known as the preclimacteric stage).

In parallel, with the markets constantly changing, the development of triggering (avocado, mango) becomes singularly complicated: how to be sure that the fruits have reached their ability to ripen? How to adapt the triggering process to the fruit's stage of maturity, in the knowledge that the batches are heterogeneous?

There are possible alternatives for improving batch homogeneity, but this calls for a high degree of interaction between the production and distribution industries. Eventually, we will need to take into account the changes to cropping techniques on fruit physiology (conservation, metabolism of maturation). We will also need to assess the possibility of sorting fruits using non-destructive measures, to obtain homogeneous batches in order to adapt and ensure the performance of the triggering techniques.



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Banana

A report by
Denis Lœillet

Contents

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Banana
European market

Lacking the survival reflex

by **Denis Lœillet**, CIRAD
denis.loeillet@cirad.fr

2019 could provide a moment of respite after the genuine *annus horribilis* which the banana went through in 2018. Import prices into Europe are picking up. The only question being asked now is whether the market is back on the right track for good, or whether it is continuing to carefully work toward its self-destruction. Prophets of doom tend not to be popular, their predictions by their nature doomed to be believed. Especially since the banana sector is no different to the rest of society, in that it prefers reassuring lies to inconvenient truths. So let's be optimistic, and leave the world supply gates wide open.


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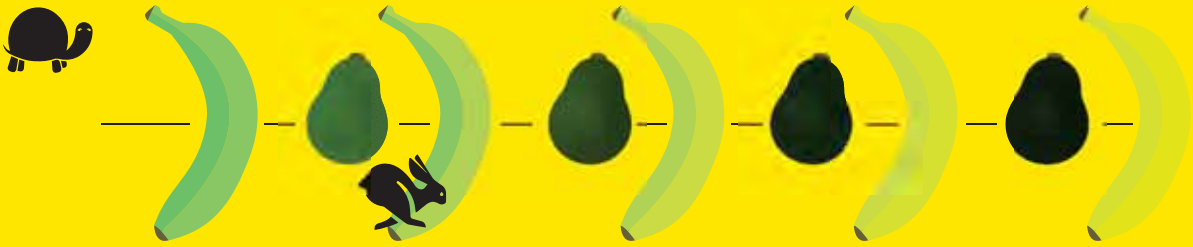
There's no use rushing, ***everything in good time***



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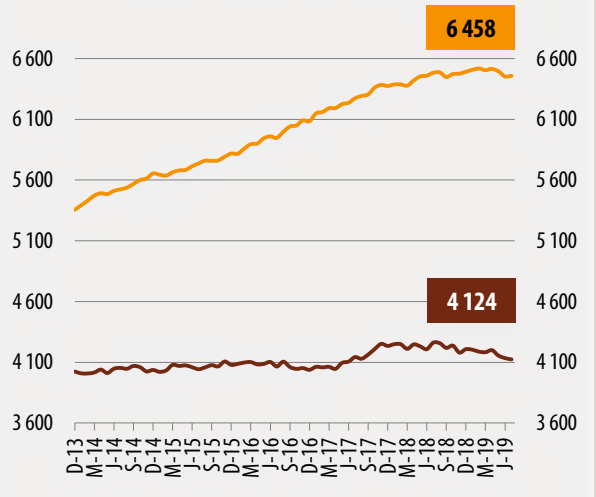
Banana consumption in the European Union is breaking records with every passing year. The mean annual growth rate since 2013 has fluctuated between + 2.6 % and + 6.9 %. Europeans scoffed down some 6.6 million tonnes in 2018, nearly one million tonnes more than in 2014! There is apparently a bottomless well of consumption to draw on. The only shame is that the USA and Canada are not joining in the party.

We could highlight that the unlimited appetite of European consumers is a formidable boost for the world banana cultivation area. Expansion is ongoing, mainly or even exclusively in the dollar zone, to meet this growing demand. This might lead the reader to conclude that the supply is increasing solely for the purpose of meeting world demand; an easy solution to the paradox of the chicken and the egg.

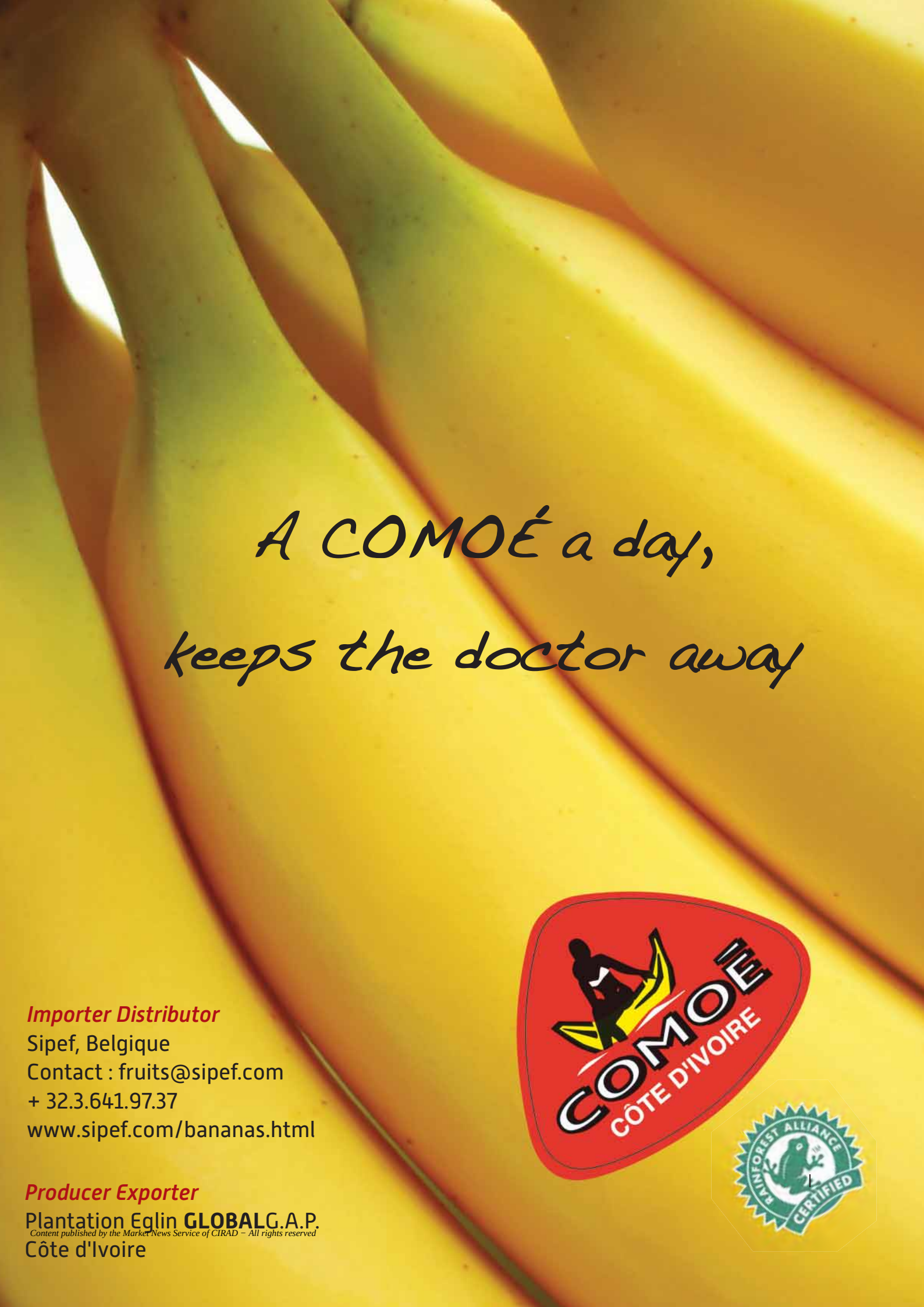
This explanation is indeed a tempting one. It provides a perfect alibi for the many detractors of this market, which if not regulated, is at least organised. Since if growers, out of a pure Pavlovian reflex, are simply responding to a stimulus from the European markets, we must excuse Guatemalan and Ecuadorian producers for wanting an ever bigger market share. The sin of this arms race is absolved, and the banana world can continue in its trajectory… into the wall.

And that is what has been going on for years now. If we invert the burden of proof, producers are being encouraged to increase the supply. Putting things back in the right order, it is the supply which is fanning the fires of demand. It is true that certain markets are far from maturity. Eastern Europe, for example, is still under-consuming in terms of the banana. Its constituent countries now consume more than one million tonnes (see **FruiTrop 263**, page 68). In this case, consumption is driving the supply. Yet although not trivial, this example cannot be generalised. If this were the case, world prices would be holding up, rather than be tumbling as they have done since 2015.

Banana - EU and USA - Supply (12-month sliding scale)
(in 000 tonnes | sources: CIRAD, Eurostat)



Note: excl. European production marketed in the production zone



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Less than 12 euros per box: any more offers?

It has been demonstrated time and again, in particular in our January 2019 edition (see **FruiTrop 262**, page 58). To reiterate the main conclusion: European prices have never been as low as in 2018, dropping for the first time below 12 euros per box (CIRAD barometer for the EU-28 at the import stage). Furthermore, it is hard to find an operator (or shareholder) satisfied with how this year has gone. Of course, the supermarket sector has never had fruit available at so low a price, and banana consumers such cheap bananas. Trading departments, submerged by the surging supply, placed more of the accumulated quayside volumes that had built up than they actually sold. So consumption was at full throttle. There, yet again, is our concept of the supply pushing so hard that prices collapse.

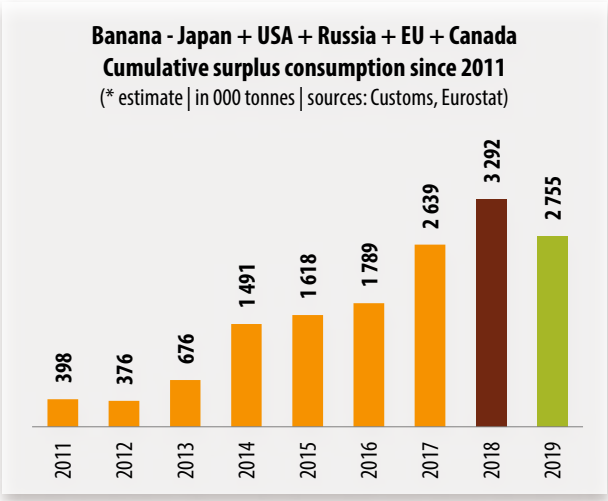
So once again the boot is on the other foot, since ultimately the intermediate links are the ones paying the price. A summary study (see **FruiTrop 261**, page 20) showed that in the course of a decade, Ecuadorian producers had lost nearly 80 USD/box. Yet the fall in duty in the EU (100 euros/tonne, i.e. 1.8 euro/box) should logically have given back the origins, i.e. the producers, some of their purchasing power. Textbook logic, but this is not the logic of the market, and in particular of an international market open to all-comers, which is often detrimental to the most fragile players in the system.

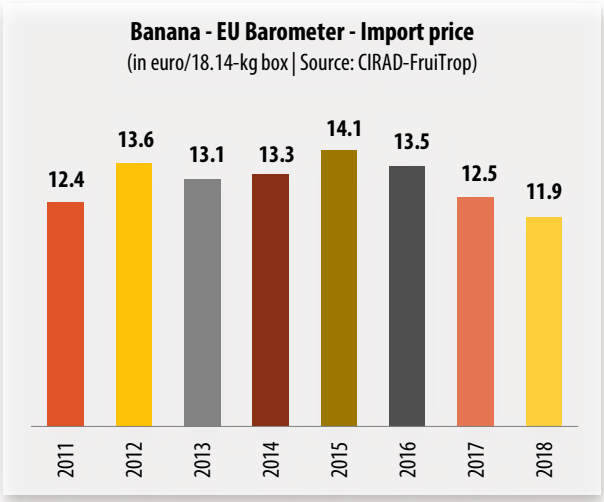
The air is foul and no-one is opening the window. Ecuador is casting admiring glances toward Guatemala, which is extending its production under often deplorable environmental and social conditions. Yet Ecuador is doing more than look. Its operators are increasing their production potential by flouting, sorry bypassing, Ecuadorian banana law (extension prohibited barring an exemption for organic cultivation, for instance), which is now restrictive in name only. The other dollar origins are also pressing their advantage, not necessarily through expanding their surface areas, but though improving their productivity, as in the case of Colombia.

Even Lidl backtracking

The results are in: between 2010 and 2018, and on the world's six major markets (EU, USA, Russia, Japan, China, Canada), there was a total supply surplus of 3.2 million tonnes! And this surplus found its way onto the fruit and vegetable shelves. Price was the only adjustment variable. Even Lidl, after going upmarket with a stated intention to sell only Fairtrade certified bananas, has backtracked, arguing that the position was impossible to sustain in the face of highly aggressive discount policies implemented by its sworn enemy Aldi.

To properly understand the scale of this surplus, if we compare it to the annual export capacity of Côte d'Ivoire, it represents ten times this capacity! Which must give Ivorian producers a bitter laugh, as well as other African producers, and indeed all ACP producers. Fifteen years ago they were predicted to be the future big beasts of the world market. Yet they have not budged from their rut of one million tonnes to the EU, and many have collapsed or are in the process of doing so. Well done those who pushed that forecast! They contributed to placing a thick smokescreen over the dollar zone's potential. As Lao Tzu said: "When the wise man points to the moon, the fool looks at his finger."





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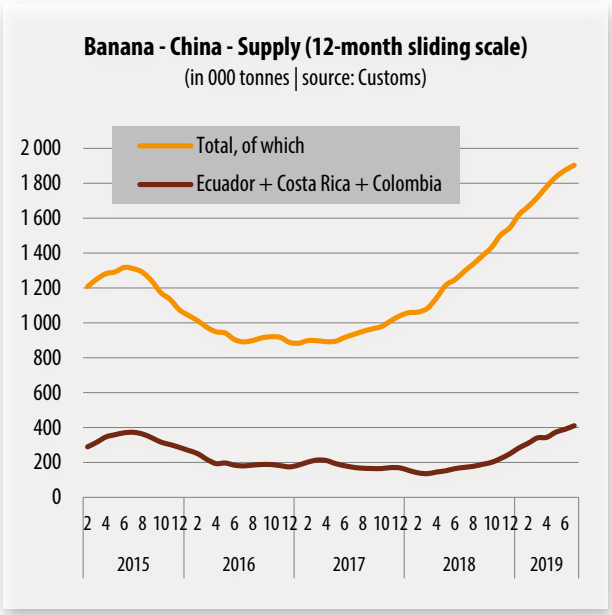
Yet the fools are not quite as foolish as we might believe. Since while they have left the world market like a battlefield, they have never applied to themselves the principles of virtuous globalisation and benevolent deregulation. The offenders will recognise who they are. They are directly or indirectly players in or regulators of a private hunting ground, i.e. the USA and their Canadian neighbour. A happy few are keeping this market on a tight leash, and therefore extracting and isolating this immense world importer (4.8 million tonnes) from the international market for their own benefit. This is the only major geographic zone which saw its consumption fall in 2018 (- 1 %). And in 2019 (first 7 months) it has confirmed an even greater apathy (- 3.4 %).

But let's return to our free and competitive markets, to show once and for all that it is supply that creates demand, and not the other way round. 2019 is a perfect year for this. European consumption over the first seven months of the year was 3 867 000 tonnes, down by 1 %. A small figure, but for the first time in year, volumes have stopped increasing and are even falling. The effects have not been slow in coming. The import price has rallied slightly, albeit without yet taking off. After a downward trend since 2015, the fall has been stopped, with the hope of seeing a positive end to the year.



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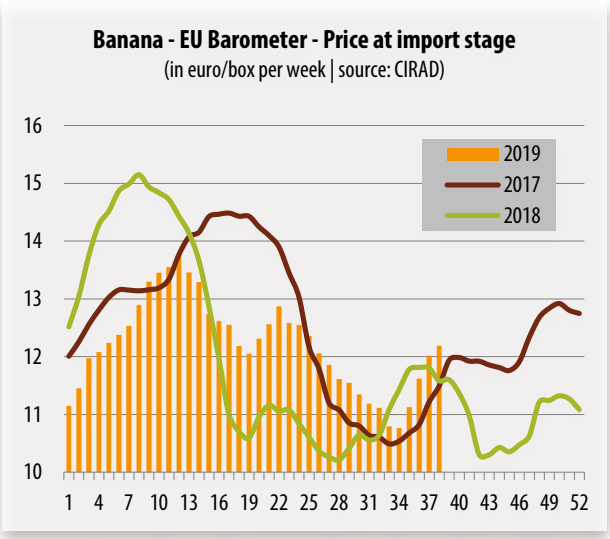

Still no banana riots?

Unless I have missed something, the rolling TV news channels have not been wall-to-wall with hordes of irate consumers at the doors of European supermarkets (in the West or East) demanding bananas – as they have done for the latest versions of the Koreo-Sino-American mobile phones. Phew! The banana famine has not yet reached European shores. Furthermore, they have not demonstrated against the exaggeratedly high price per kilo of banana.

So where does this slight reduction in pressure on the European market come from? The explanation could not be more conventional. Yet again, we can hail the climate as exerting a powerful braking effect on world potential. El Niño (now officially over) has since autumn 2018 kept world growth potential under control. For which we can give thanks. It is also said that Asia, and more particularly China, is the new frontier for the banana. China has continued its forward march, because it has banana-hungry consumers and it cannot meet this increasing demand. One of the reasons is due to the destructive effects of fusarium wilt (tropical race 4) on the banana planted area in the south of the country. This disease has been spread by our Chinese comrades inadvertently yet methodically beyond their southern border. However, once again we should not be conned. Just because China opens an eye, does not mean that the world banana market needs to grow by another 10 % every year. The figures produced by Ecuador should give us food for thought on the Chinese mirage. Over the first 35 weeks of the year, Ecuador shipped 19 million boxes to Asia (across all destinations) out of nearly 230 million boxes exported! So this is still a long way from a big replacement.

So yes, the market is poisoning itself, and it is proving that many of those losing out are on the same side of the Atlantic as those demanding ever greater deregulation. A clear-minded thinker, from outside of the sector, might simply ask: but to what end? One of the answers might well be: to break down added value. Since the world banana market lacks this reflex granted to all living species, that of survival. Instead, it is on a cycle akin to that of the phoenix. True, it is reborn from the ashes, but every time on the wreckage of past deregulation ■

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Banana
Tropical race 4 (TR4) fusarium wilt

What we really know about this disease and its impacts

by **CIRAD**
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The long-feared arrival in the Americas of Tropical Race 4 (TR4) fusarium wilt (also known as Panama disease) triggered an explosion in the worldwide dessert banana sector (Colombia, officially in August 2019). Wild rumours have been flying around, now that Pandora's Box has been opened, endangering the entire export banana sector. Yet every disease has its retinue of charlatans and imposters, sometimes in a scientific disguise.

So FruiTrop, the magazine published by CIRAD, world-renowned for the quality of its research on Musa, sets out to restore a bit of calm and objectivity to the debate. In the form of "an FAQ section", and a short list of bibliographic references, this document aims to demonstrate the great gravity of the situation, provide some indications as to the measures to take where the disease is present and where it has not yet appeared, but also to nip the craziest rumours in the bud.

1. The basics on TR4

What is TR4 and what damage does it cause?

Fusarium wilt (also known as Panama disease) was first identified in 1874 in Australia on the banana (race 1). It is now found in nearly all tropical and subtropical banana production zones. The pathogenic agent responsible for the disease is a soil fungus: *Fusarium oxysporum* f. sp. *cubense* or FOC. Various races of this fungus (races 1, 2, 3, subtropical race 4 or SR4 and tropical race 4 or TR4) have been identified. Apart from race 3, which attacks only Heliconiaceae (a family closely related to Musaceae), they all cause major vascular damage under certain conditions (soil, climate, cropping intensification, drainage, etc.) in various varietal groups, making them unproductive. Race 1, for example, decimated the Gros Michel variety in the 1960s. What has just been identified in North-East Colombia is TR4. Having appeared in the 1990s, it is currently booming in South-East Asia. It attacks Cavendish and other varietal groups (including cooking bananas) under all tropical conditions. Studies are in progress to measure the sensitivity of the various varietal groups to the disease.

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External symptoms
Yellowing of the leaves and "flaring" of the pseudo-trunk

© Luc de Lapeyre

What are the symptoms of fusarium wilt?

- **One of the most characteristic external symptoms** is gradual yellowing of the stock plant leaves (absence of initial symptoms on the shoot leaves), from bottom to top; so it is the oldest leaves which are affected first. These yellowed leaves end up completely drying out, and bend, leading to "flaring" of the pseudo-trunk.

- **The most characteristic internal symptom** is the dark red to brown coloration adopted by the inside of the leaf sheaths forming the pseudo-trunk (observable by means of a cross-section cut of the pseudo-trunk). This vascular tissue reaction proceeds from bottom to top, and from the exterior to the centre of the pseudo-trunk. The further the infection progresses, the more the tissue is affected.

Photos © Philippe Tixier

Internal symptom
Coloration of vascular tissue

How does this disease work?

This soil fungus infects the roots, and then the tissues of the bulb and pseudo-trunk. The banana reacts to this invasion by producing gums which obstruct the progression of the fungus into the plant. Hence this obstruction disrupts water and mineral transport in the banana plant. Finally, the plant dies from a kind of asphyxia.

What are the detection methods for the disease?

The presence of the disease can be visually guessed at through observation of uncertain symptoms on banana plants, but it needs to be confirmed by laboratory analyses, which take around three weeks. In fact, these analyses often require the fungus from the infected plant to be isolated, and then cultured in the laboratory. Faster molecular detection methods (based on infected banana fragments) have been developed in France. Others are under development by CIRAD, to offer a quick and less expensive tool (LAMP, loop type tool, etc.), which firstly will be able to analyse hundreds of samples quickly (banana, soil, water), and secondly detect the disease at a very early stage (before the appearance of external symptoms on the banana plants).

We can only lament that big banana exporter countries such as Colombia, Ecuador, Costa Rica and even Guatemala have not developed detection and sample analysis capabilities, though the threat of introduction of TR4 has been looming for years. The private sector, the very essence of its activity now being called into question with the arrival of TR4, must finally invest in a minimum of R&D, based specifically on State services. At present, two laboratories (European and Australian) are technically able to confirm the presence of the disease, and provide its genetic filiation (type and origin of strains).


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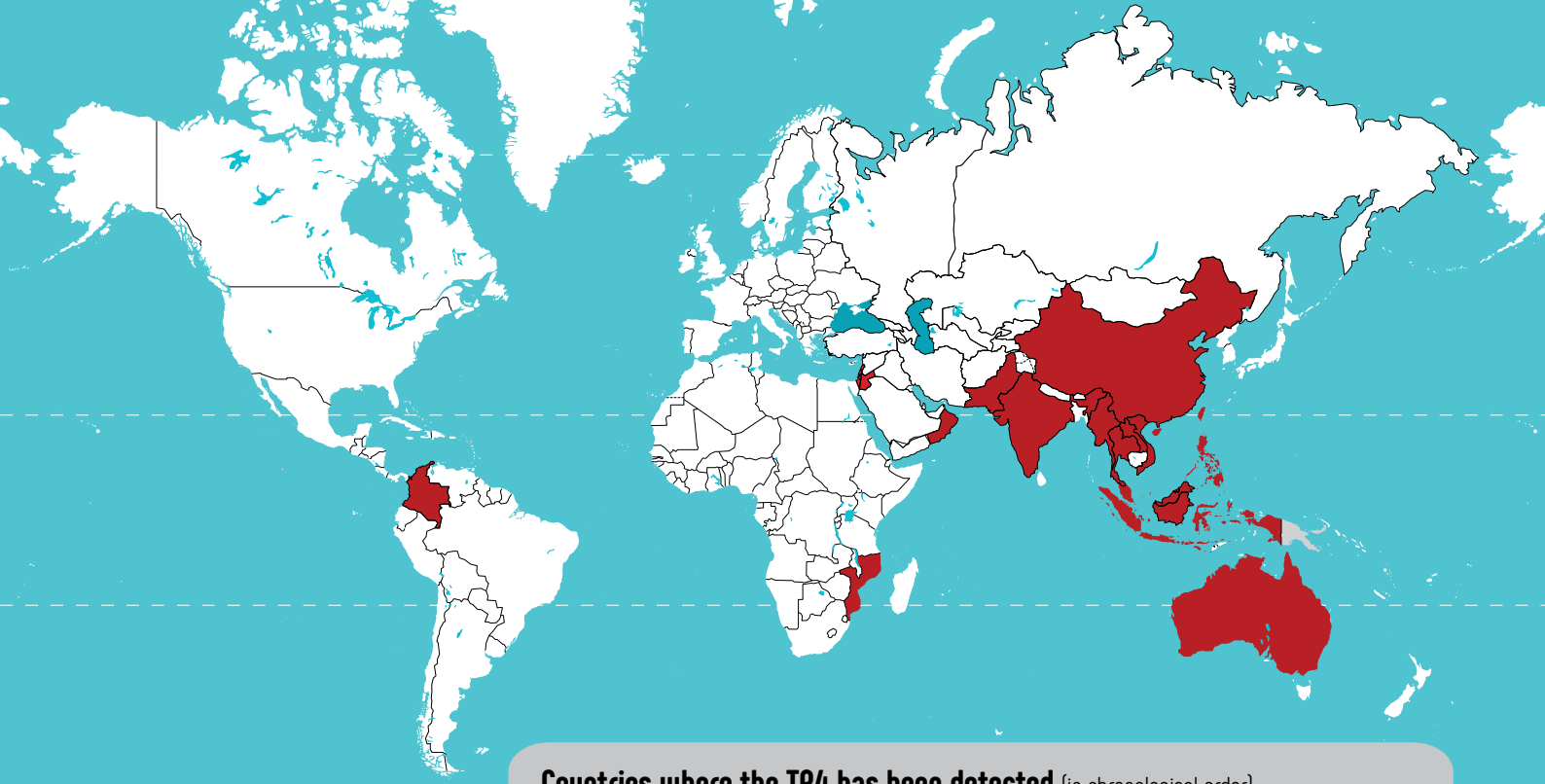

Countries where the TR4 has been detected (in chronological order)

Taiwan (1970s)
Indonesia (1990s)
Malaysia (1990s)
Australia (1997)
Papua New Guinea (2000)
China (2001)
Philippines (2005)
Jordan (2013)
Mozambique (2013)
Pakistan (2015)
India (2015)
Oman (2015)
Lebanon (2015)
Australia (2015)
Israel (2016 - officialy eradicated)
Laos (2017)
Vietnam (2017)
Myanmar (2018)
Thailand (2019)
Colombia (2019)

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2. Extension and propagation of the disease

Where is the disease present today?

After being detected in the 1990s in Asia (Taiwan, Indonesia, Malaysia, South China, Philippines), Australia and more recently (2014) in Pakistan, it has come to the fore since its discovery from 2012 in the Middle East (Oman, Jordan, Lebanon) and above all for the first time on the African continent in Mozambique (2013), on a new Cavendish banana industrial plantation dedicated to the export sector, and shut down since. It has now crossed the ocean, having been identified for the first time in August 2019 in Colombia (north-eastern region of La Guajira).

Is it present in Africa?

Only in Mozambique. Fusarium wilt has never been reported and described in Central and Western Africa. The banana production project in Mozambique is highly restrained, and has been completely closed down and placed under surveillance, (no banana or plantain planting), especially by its immediate and not-so-immediate neighbours, such as South Africa.

Example of poor practice

Infested plot left in an abandoned state, after being cut by machete and before herbicide application

© Luc de Lapeyre

How does this disease spread?

The main cause of large-scale dissemination of the disease is due to **human action** (visitors, labourers, local residents), whether by movements of **plant material** from sensitive and infected plantations (shoots and clumps, other host plants and substrates), by **direct contact** with infected ground on shoes/boots or tools (leaf cutters, machetes, shovels/spades, etc.). **Animals** circulating from plantation to plantation may also be involved. The micro fauna (e.g. weevils) are apparently involved in disseminating the disease. **Water** is also a vector for the fungus (rainwater run-off, drainage channels), but contamination by this route is very slow. Conversely, wind has little impact.

Can the disease be transmitted by other plants from infested production zones?

YES. The fungus can also be introduced by importing other host plants able to accommodate it. Great uncertainty remains over the range of hosts, but some asymptomatic hosts, such as ornamental plants and fruit trees, have been described. Plant substrate is also a source of transmission.

Can the disease be transmitted by fruit (bananas) from infested production zones?

NO, seemingly, but further studies are required. Although the fungus is not present in the fruit, or on banana skins, the crowns could host it asymptomatically. So the fruit is not completely without risk for the production zones.


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3. Prevention, eradication and contingency measures

Can the disease be eradicated?

NO. There is no treatment to eradicate this fungus once it has become established in the soil. Treatment products, the effectiveness of which is yet to be confirmed, are used to disinfect tools, vehicles, labourers' shoes, etc. If we want to be exhaustive, there is only a single case of eradication in the world to mention – albeit hotly disputed by some of the scientific community – in 2018 of an outbreak in Israel in 2016.

Can diseased banana plants be uprooted and replaced with healthy ones to get rid of the disease?

NO, for Cavendish. Once present, the fungus eliminates any possibility of replanting Cavendish in an already infected zone for decades. It persists in the soil thanks to preservation and survival structures known as chlamydospores, and in particular has the ability to persist asymptomatically on plants other than the banana, including weeds. In so doing, it maintains its pathogenic capacity for decades, after being cut from its host plant – the banana – and despite adverse conditions (water stress, etc.). The Cavendish banana can no longer be grown for many years in zones already infested.

How to prevent propagation of the disease to other zones?

This involves stepping up **prevention** and information campaigns in countries not yet affected. This includes disseminating information, training the professionals (in agriculture, tourism) and the general public in the phytosanitary rules inherent in transporting plant material, and disinfecting equipment, shoes and substrates from infected countries.

Are prevention methods effective?

YES, if they are actually applied. As is often the case for any prevention policy against diseases or invasive pests, the implementation of the preventive actions and compliance with the phytosanitary rules are key factors for success. Furthermore, it needs to be applied for the long haul, yet very often over time alertness wanes and bad habits quickly take over, especially since this disease can quickly establish itself and spread via a host of propagation channels: plant material and contaminated soil particles, shoes and tools belonging to people working in banana plantations, wheels of agricultural machinery, wild and/or domestic animals, other host plants, surface water (and irrigation channels). Hence the risk needs to be managed at various levels: international, regional, national and local. The tension in Latin America is such that it is easy to find codes of good practice published by the industries themselves, or by the national authorities of each country.

Are contingency measures effective?

Not as yet. Current management methods (destruction of diseases plants and adjacent plants, setting up outbreak and plantation containment measures, disinfection of vehicles and personnel shoes, foot baths, etc.) are not able to eradicate the disease, but can slow it down and contain its expansion. Contingency measures become less effective as natural dissemination channels come into play, especially via the water cycle: high run-off, floods, irrigation channels, animal transit, etc.

To prevent its propagation to other zones, should the entry of all plant material from infested zones be prohibited?

YES. The entry of all plant material in any form from infested zones must be prohibited, by all means.

In disease exclusion zones, the only phytosanitary guarantee is to use vitroplants produced and acceptance-tested in a sterile medium (also providing a guarantee against any other sanitary risk), whose stock plants are certified as originating from countries officially free from the disease. For even greater security, it is preferable to obtain a sanitary certificate stating that the plants are pathogen-free (analysis based on indexing on symptom-free plants = sanitary guarantee by accumulation of proof).

Any other plant material must be excluded, particularly vitroplants in detached form (not in a sterile medium), whether with bare or clumped roots (any earth or any other substrate must be excluded).

Furthermore, since other species (cultivated or wild) have been identified as asymptomatic hosts of the disease, they must not be sampled and transported outside of the infested zone. Similarly, soil contamination of tools, containers (pots, vessels, etc.) or agricultural machinery must be prevented.

However it is vital to show discernment within a country, to refrain from generalising and take into consideration only the affected zones. For example, in Colombia, the zone concerned is La Guajira, and no suspicions have been proven true anywhere else in the country.

4. Impact of the disease

What is the impact of this disease?

There are major economic and social impacts in the affected production zones. Management of the disease is costly. Losses due to death and destruction of banana plants cause producers significant economic losses. There are still not much data regarding the economic impact of TR4. We can for example read that on a given plot, after five years, 50 % of plants are infected. On top of these yield losses, there are additional losses due to the destruction of infected plants and adjacent plants (planned destruction in management protocols for infestation outbreaks). Hence the production base may be profoundly altered in the zones concerned, in particular because of the disappearance of many small growers incapable of managing the disease and coping with revenue loss. Conversely, the big and high-tech plantations have demonstrated that they are more resilient.


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5. Some "fake news"

Can the disease be transmitted to humans?

NO. TR4 (like race 1) attacks only plants. It cannot be transmitted to humans. The fungus is not present on or inside the fruit. We reiterate that it is a fungus that lives and develops in the soil. The allegations of possible transmission and effects on humans that are emerging, including in the form of scientific publications, do not relate to this fusarium wilt.

Is this the end of the export banana?

NO. There are several countries living with the disease. This has been the case with the Philippines since 2008, yet the country has remained in the leading pack of world banana exporters. However, to achieve this, both producers and the various links in the industry have had to adapt, innovate and invest in less sensitive Cavendish varieties or in new production zones. This probably means an increase in production costs.

Hence crazy as it may seem to need to spell it out, this does not mean the end of the export banana sector in Colombia, especially since the disease has been identified in a marginal and isolated production zone (relatively far removed from Magdalena, and even further from the big Uraba production area – see Colombia country file), and the authorities have taken drastic measures to contain its possible extension to other zones. This should calm fears in the supermarket sector, which was already contemplating adjusting their supply in favour of competing origins.

6. Avenues for research

What are the avenues for research?

Efforts have largely turned toward the creation and selection of resistant or tolerant varieties (conventional hybridisation or genetic modification). Yet as ever, candidate varieties must also meet the requirements of the producers (productivity, formation of clusters, etc.) and of the markets (shape, taste, green life, etc.). A Taiwanese laboratory (Taiwan Banana Research Institute – TBRI) created several Cavendish mutants tolerant to TR4, yet most seem incompatible with the requirements of the current international market (productivity, compliance, etc.). The clone GCTCV-218, also known as "Formosana", is currently being cultivated in some countries affected by the disease (NB there are several accessions which vary in their response to the disease). Similarly, the French vitro-culture laboratory VITROPIC has a Cavendish variety which has demonstrated fairly good tolerance in laboratory conditions. Its response is under assessment in natural infestation conditions. In addition, this variety presents particularly beneficial agricultural and commercial characteristics. Furthermore, CIRAD has developed dessert banana hybrids (different from the Cavendish), exhibiting very good resistance to TR4.


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7. Links to find out more

More information on the disease

ProMusa: http://www.promusa.org/Tropical+race+4+-+TR4

World Banana Forum Task Force on TR4: http://www.fao.org/world-banana-forum/disease/fusarium-tr4/en/

ICA – Colombia (in Spanish): https://www.ica.gov.co/areas/agricola/servicios/epidemiologia-agricola/fusarium-raza-4-tropical

ANSES report (in French): https://www.fruitrop.com/Articles-par-theme/Agronomie/2018/Analyse-de-risque-phytosanitaire-pour-les-departements-d-outre-mer-TR4

Video published by the Costa Rican Ministry for Agriculture & Corbana (in Spanish): https://www.youtube.com/watch?v=JGXQx512QIE

Good practice

Recommendations to prevent the entrance of diseases for the banana (in French and English): https://www.fruitrop.com/en/Articles-by-subject/Direct-from-the-markets/2019/Recommendations-to-prevent-the-entrance-of-diseases-for-banana

Good practice kit against TR4 for growers. Queensland Government, Australia: https://www.publications.qld.gov.au/dataset/panama-disease-tropical-race-4-grower-kit

Contingency Plan published by OIRSA – Organismo Internacional Regional de Sanidad Agropecuaria (in Spanish): https://www.oirsa.org/contenido/2018/Sanidad_Vegetal/Manuales%20OIRSA%202015-2018/Plan_conting_FOC_R4T_2017-V2-Final-FEB18-2017.pdf

Professional releases / Press bulletins / Regional alerts

OIRSA alert: https://www.oirsa.org/contenido/2019/ALERTA%20Foc%20Raza%204%20T%20publicacio%CC%81n%2010.07.2019.pdf

Regional Statement by the Ecuadorian Ministry of Agriculture: https://www.agricultura.gob.ec/wp-content/uploads/2019/08/Declaracio%CC%81n_Encuentro_Regional.pdf

Instituto Colombiano Agropecuario – ICA: https://www.ica.gov.co/noticias/presidente-ivan-duque-dirige-pmu-santamarta

Augura press bulletin: http://www.augura.com.co/wp-content/uploads/2019/07/ICA.-Boletin-Prensa-13.07.pdf

TR4 in Israel: https://www.fruitrop.com/en/Articles-by-subject/Direct-from-the-markets/2018/Panama-disease-TR4-in-Israel-presence-confirmed-since-2016

Producer country file

The banana in Colombia

by Carolina Dawson and Denis Loeillet

Colombia is one of the major players in the international banana market, as the world no. 5 exporter and the no. 2 supplier to the European market. Despite pedoclimatic assets and great experience with the crop, the country began losing momentum from the mid-2000s, in particular because of a chronic lack of investment. However, the long-awaited return of a stabilised political climate and of a more favourable peso/dollar exchange rate has revitalised investment, from both the public authorities and private operators. Official confirmation, in August 2019, of the presence of Panama disease in its TR4 form has focused international attention on Colombia, the first country in the Americas to be affected by this disease.

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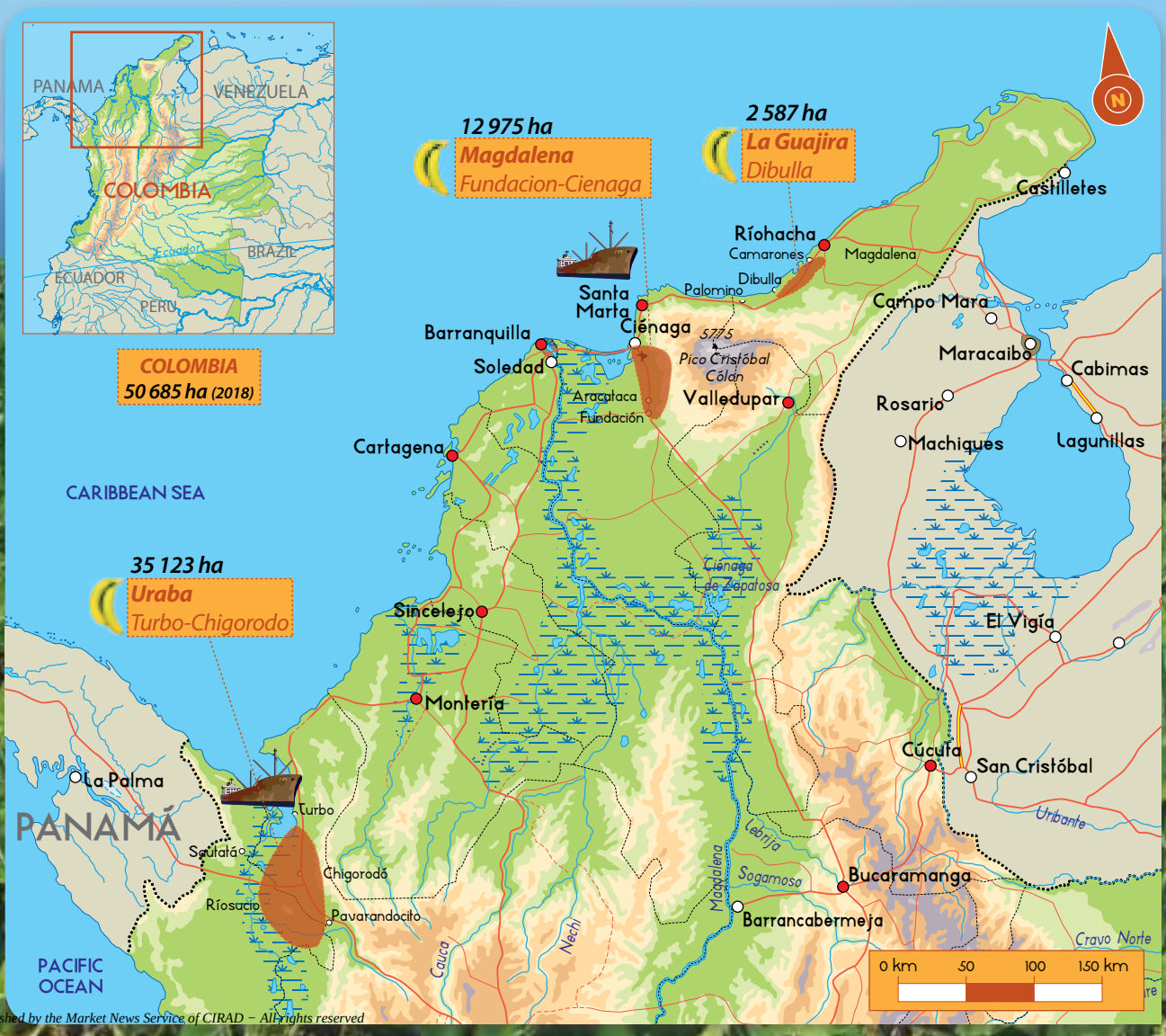
Banana
Colombia

Location

The banana cultivation area, extending over 50 000 ha, is concentrated in two zones on the Caribbean coastline. The Urabá region, situated in the westernmost part of this coast, on the border with Panama, is the country's main production area (north-west tip of Antioquia Department). It can count on nearly 35 000 ha of plantations, concentrated in four districts: from Turbo in the north to Chigorodó in the south, by way of Apartadó and Carepa. The mean rainfall is 2 650 mm, increasing from north to south (from 2 000 mm on the coast to 4 000 mm from the south of Apartadó). It is unevenly distributed over time, with a distinct shortage from January to March and a very wet period from September to November (peak in October). The mean temperature is 24°C. The production facilities are medium to large in size, with 90 % of plantations extending over more than 50 ha. The other main centre is also situated on the coast, but further east. This zone's 15 000 ha are distributed either side of the Sierra Nevada de Santa Marta, primarily in its western part (Magdalena Department, from Fundación to Ciénaga), and also in the East (La Guajira Department, developed more recently, dating from 2005). The climate differs from that of the Urabá region in terms of higher temperatures (mean level 28 to 30°C, with minima dropping to 21°C), and a distinctly less plentiful rainfall (1 400 mm, received mainly from August to early December, and to a lesser degree from mid-April to late June). Furthermore, the production facilities are more heterogeneous in size, ranging from very small (approximately 500 plantations of less than 5 ha) to large (plantations of more than 50 ha, representing 60 % of surface areas). Approximately 75 % of producers have surface areas of less than 20 ha, and are organised in cooperatives and associations. Both these zones have a flat topography which facilitates cultivating and harvesting the clusters. They also enjoy good-quality soils, although generally a bit clayey, with loams a bit more common in the Magdalena region. The effects of erosion are limited, but problems of compaction are not uncommon in the Urabá zone, a region characterised by intensive and very high-tech production systems.



Banana
Colombia

History

Banana production for the export sector goes back more than a century, with a major centre in Magdalena Department dating back to 1885. Its development was greatly boosted under the United Fruit Company (UFC, later Chiquita), until a serious social crisis in the early 1930, which was followed by a period of dormancy. The Colombian banana industry was given a new lease of life in the early 1960s with UFC moving its operations to the Urabá zone, sought-after for the availability of unfarmed, fertile land, and a geographic location protecting it from hurricanes and quickly able to reach the US market. The industrial sector, which converted to Cavendish in the early 1970s because of the fusarium wilt, made great strides forward until the early 2000s, despite an extremely unstable political climate in the country from the mid-1980s. This dynamic was driven firstly by Frutera de Sevilla (a local subsidiary of UFC), and then by local groups (Uniban in the early 1970s, and then Banacol and Proban in the early 1980s), which became autonomous in terms of both production and export from 1983. After a planting dynamic of practically zero since the mid-2000s, a slight recovery has been observed since 2016, in particular in the Magdalena zone. The sector is one of the country's biggest currency earners (861 million USD in 2018), though it remains far behind flowers (1.6 billion USD) and even further behind coffee (2.6 billion USD). Representing 40 to 50 % of the agricultural GDP of the Departments of Antioquia and Magdalena, it now generates approximately 41 000 direct jobs and 124 000 indirect jobs.

Production

The stagnation of surface areas and the downward trend in productivity, going from more than 2 200 boxes/ha in the late 2000s to 1 850 boxes/ha in 2015, express the difficulties that the sector had to face. Firstly, the industry suffered from a lack of investment and technical support over the long term, due to an extremely unstable political climate until 2006, followed by a decade of low profitability (difficult world market and peso/dollar exchange rate highly unfavourable until 2014). In addition, production costs were on the increase, especially because of the resurgence of black sigatoka, especially in the Urabá zone. Finally, climate conditions are increasingly unstable and restrictive, with increasingly intense periods of drought, excessive rain or string winds. In 2019, the extreme drought due to the El Niño phenomenon hit the Urabá zone in particular, leading to big production losses. These climate events highlight the country's shortfalls, especially in terms of irrigation and drainage in the Urabá region (just 25 to 30 % of plantations irrigated). The sector seems to be starting to bounce back, as is demonstrated by the improvement in mean national productivity since early 2016: it climbed to 2 000 boxes/ha in 2018, especially thanks to yields stabilising at around 1 900 boxes/ha in the Urabá region and an improvement in the Magdalena zone (2 200 boxes/ha), less affected by black sigatoka (drier zone), and where plantations with higher-tech production systems have been established. The economic context is now brighter, with a favourable exchange rate since 2015 (or even very favourable since 2018), and inflation more limited, not to mention the political and social stabilisation, which now seems set to last. Investment programmes are underway, mainly driven by the profession and with more of a focus on organic and Fairtrade. The country plays an important role on the organic banana market, with approximately 3 100 ha dedicated to this segment, i.e. all of the surface areas in La Guajira, in the zones of Riohacha and Dibulla, and some in Magdalena.

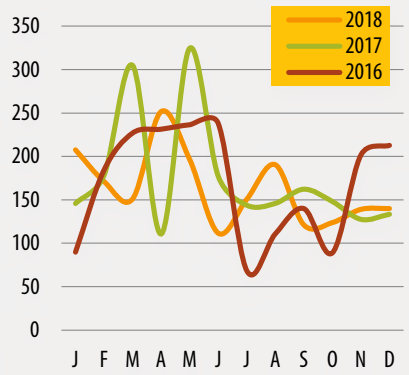
Colombia is also the world's biggest plantain producer (production estimated in 2016 at 1.7 million tonnes), and the world number 3 exporter, after Ecuador and Guatemala, with shipments in 2016 estimated at 120 000 t, primarily to the USA and the European Union, to which it is the main supplier. The plantain is produced across much of the territory, with some concentration in the central coffee growing zone (altitude 1 100 to 1 600 m). However, the main zone for exports (mainly small producers) can be found near the Cavendish banana plantations in the Urabá zone.

The Colombian production sector is currently in the spotlight following the official confirmation, on 8 August 2019, of the presence of fusarium wilt in its TR4 form, on two plantations in the La Guajira zone, in the municipios of Dibulla and Riohacha. Hence 185 ha were quarantined, and then destroyed. If the containment protocols implemented and the sanitary measures recommended by the authorities are correctly observed, the propagation of the disease to other production zones should be contained. Hence in the short term, production levels should not be significantly affected by this disease.

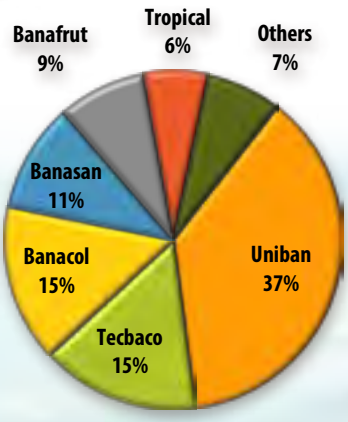
Organisation

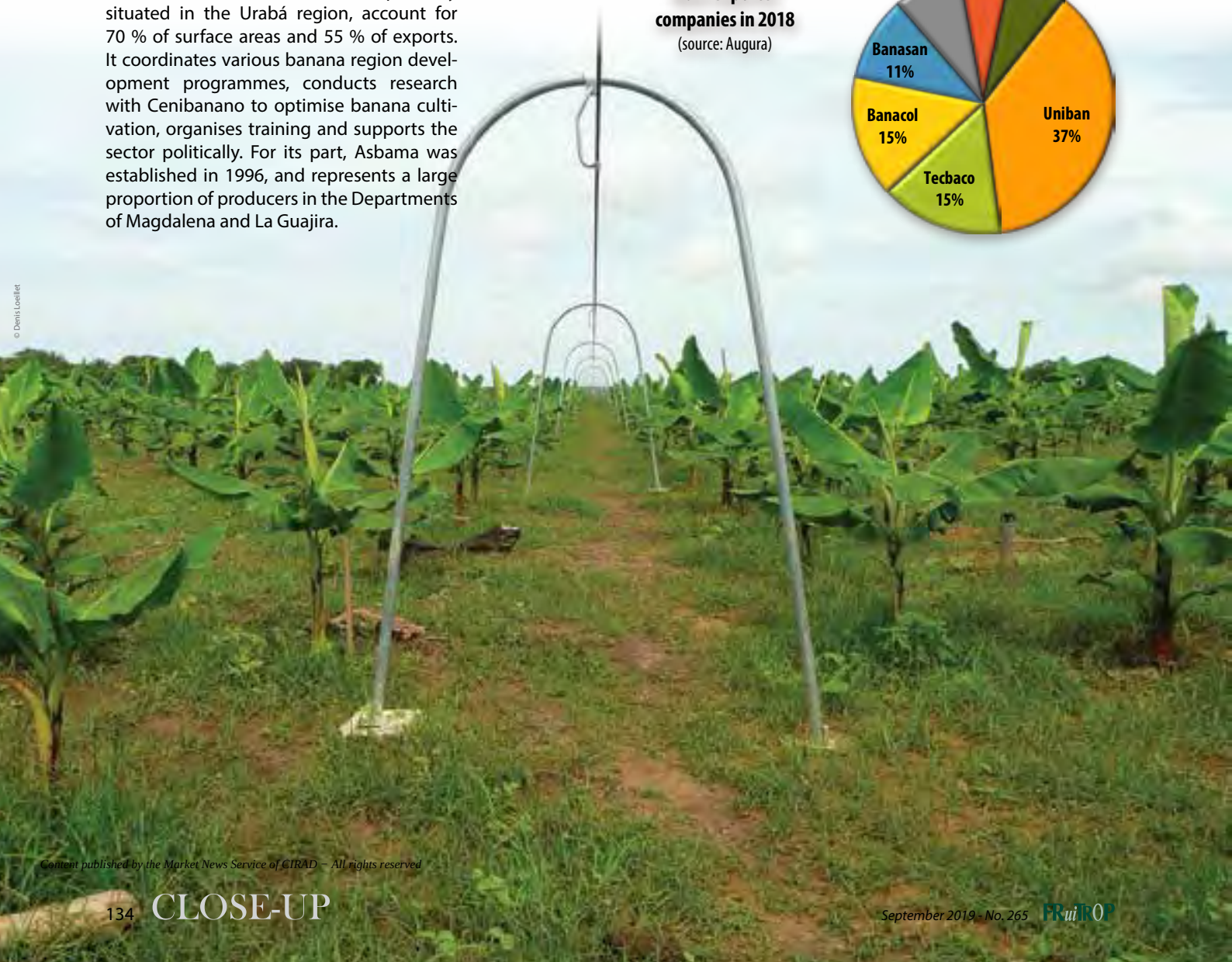
The production system is based on approximately 1 100 farms, varying greatly in size according to the region: most of them extend over more than 50 ha in the Urabá zone, yet range from 1 to 5 ha in the Magdalena and La Guajira zones. The export sector is highly concentrated, and mainly comprises local players, with more than 90 % of volumes in the hands of the six leading marketing companies. Uniban is by far the number one operator (37 % of volumes). It is followed by five facilities with a market share ranging from 6 to 15 % (Banacol, Tecbaco, Banasan, Banafruit, Tropical). These exports are generally speaking governed by contracts, sometimes over many years, with the downstream segment and in particular the big multinational groups. The sector is represented by two associations: Augura and Asbama. Augura was established in 1963, and is the main one. Its affiliates, primarily situated in the Urabá region, account for 70 % of surface areas and 55 % of exports. It coordinates various banana region development programmes, conducts research with Cenibanano to optimise banana cultivation, organises training and supports the sector politically. For its part, Asbama was established in 1996, and represents a large proportion of producers in the Departments of Magdalena and La Guajira.

Banana - Colombia - Monthly exports
(in million tonnes | sources: Customs, Comtrade)



Banana - Colombia
Main exporter companies in 2018
(source: Augura)





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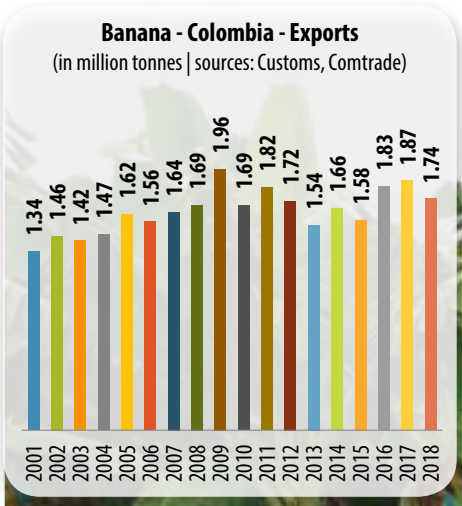
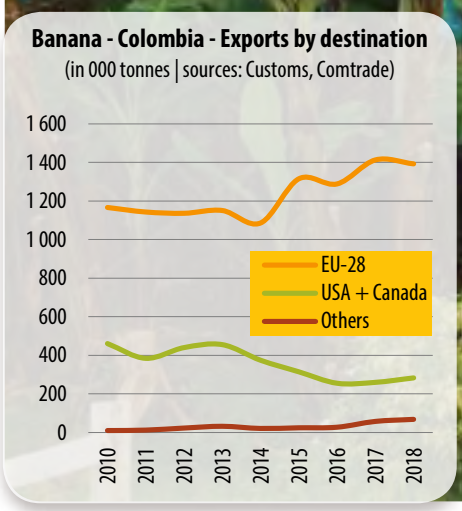
Banana
Colombia

Exports

Cavendish exports have alternated between 1.5 and 1.7 million tonnes for nearly fifteen years. An increasing proportion of volumes is bound for the EU-28, which has long been the number one market for the Colombian banana (market share of around 80 % in 2018, as opposed to approximately 60 % in the early 2000s). The main entry points are the northern ports (Belgium, Germany and the Netherlands), Italy and the United Kingdom. Conversely, while the USA remains the number two outlet, the proportion of volumes it is receiving is on a downward trend (from 40 % in the early 2000s to nearly 15 % in 2018), because of increased competition from Guatemala. Shipments to the rest of the globe are marginal, accounting for barely 1 to 4 % of total exports. Approximately 70 % of outgoing volumes come from the Urabá zone, and the remainder (30 %) from Magdalena-La Guajira. Colombia, along with other Latin American countries, is a signatory to an Association Agreement with the European Union, stipulating accelerated lowering of import customs duty. The customs duty reduction process, which started in 2010, has seen duty fall from 176 euros/tonne before the implementation of the system to 82 euros/tonne in 2019. The final step, to 75 euros/tonne, should be attained in 2020, with a rendez-vous clause which allows for reopening discussions with the EU on the subject of the future of this system.





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Logistics

Volumes from the Magdalena and La Guajira zones are shipped by road-freight to the port of Santa Marta, situated less than 100 km from the plantations. Approximately 30 to 40 % of exports leave via this port, served both by dedicated ships and regular lines belonging to big shipping companies. The logistics are more complex for the Urabá region, from which the majority of export volumes originate. The fruit, palletised or containerised, is shipped by road-freight to the Turbo sea terminal, situated in the Gulf of Urabá, and fairly close to the plantations. They are then loaded onto barges, which must follow a long canal to the sea (15 km), and are then transferred to conventional ships moored near the coast where the wind conditions are often changeable. A new port for docking commercial ships is at the planning stage (Puerto Antioquia, in the South-East near the city of Nueva Colonia), under the national infrastructures improvement programme. The work should be completed within four years' time (2023). Meanwhile the port, which will be able to route 6.6 million tonnes of merchandise per year, will be connected to a modern motorway circuit "Autopista Mar 1" and "Autopista Mar 2". The Colombian banana industry has a major asset in terms of logistics, since it can serve the US East Coast and Europe without having to cross the Panama Canal.

Banana – Colombia – Sea freight

Ports of arrival		Transit time
USA	Baltimore	10 days
	Charleston	8-16 days
	Houston	10 days
	Miami	6 days (direct)
	New York	10-14 days
	Port Everglades	5 days (direct)
	Savannah	10 days
EU	Antwerp	13-21 days
	Hamburg	15-22 days

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