



2019

## Country Profile: Peru

Producer country profile produced by *CIRAD, The Centre De Cooperation International En Recherche Agronomique Pour Le Développement*, in collaboration with *HAB, The Hass Avocado Board*.



# 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.





# History of the industry and production systems

Introduced to Peru in the 15<sup>th</sup> 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.

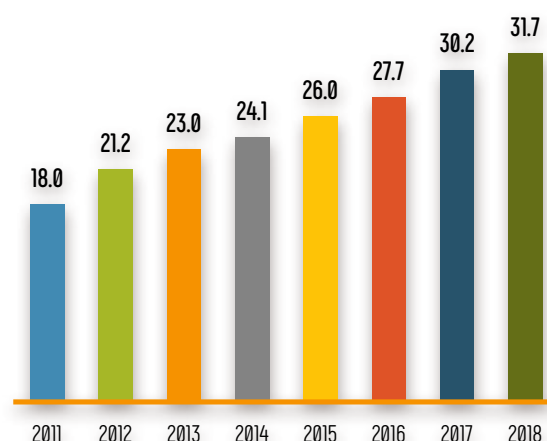
So agri-business took off. Investors initially focused on crops such as asparagus or peppers, which enabled them to acquire a good technical command of large-scale horticultural crops for export, in such a particular pedoclimatic context. On the strength of this experience, large industrial Hass avocado 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, Chinchá 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: Agrodatabank 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

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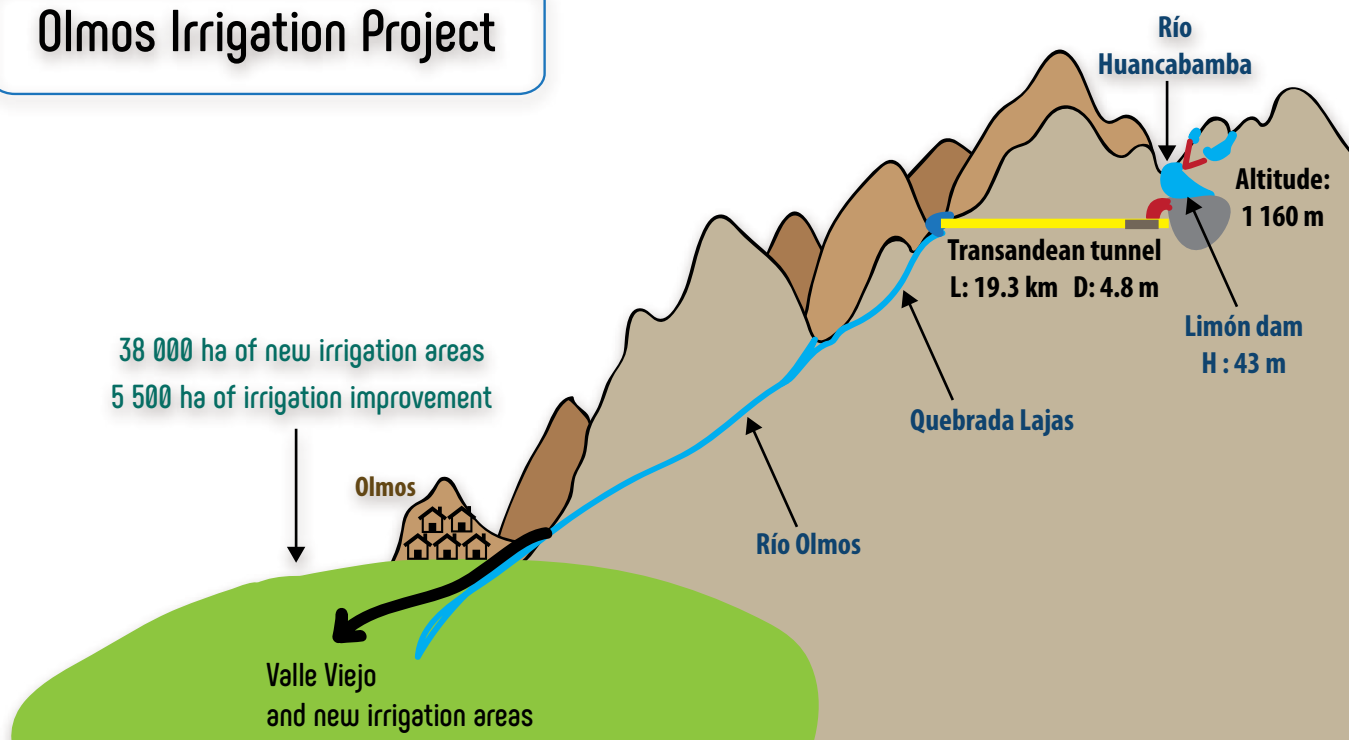
# Olmos zone

**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.



## Olmos Irrigation Project





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<sup>3</sup> 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<sup>3</sup>/ha less than the estimated requirements of 14 000-15 000 m<sup>3</sup>/ha with the micro-irrigation systems used by all the producers (minimum of 12 000 m<sup>3</sup>/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.



## 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 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.





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 m<sup>3</sup>/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

## Strengths:

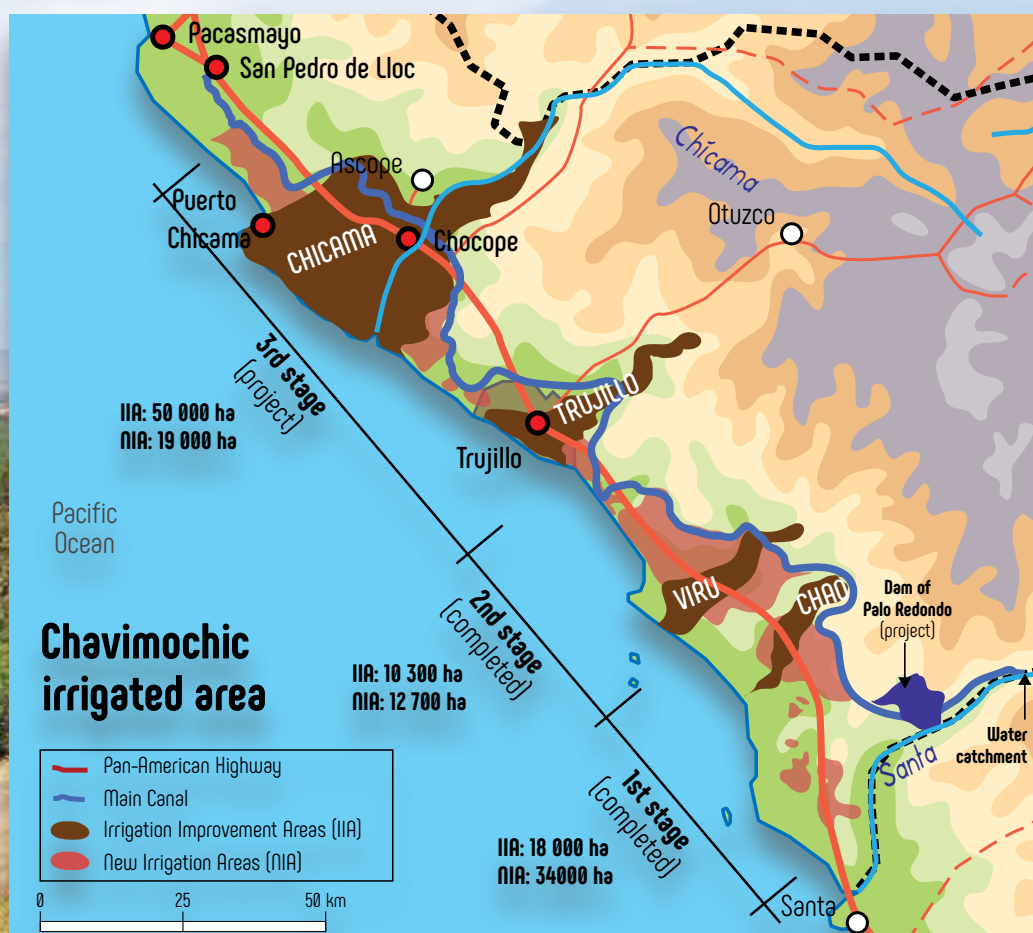
- Pedoclimatic conditions ideal for highly capital-intensive systems, with large water availability.
- Original yet proven cropping system.
- High production potential (climate conditions, high technical level, intensive cropping system, no water limitations).

## Challenges:

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

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.





# 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.





# 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 Paíta 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 Paíta	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

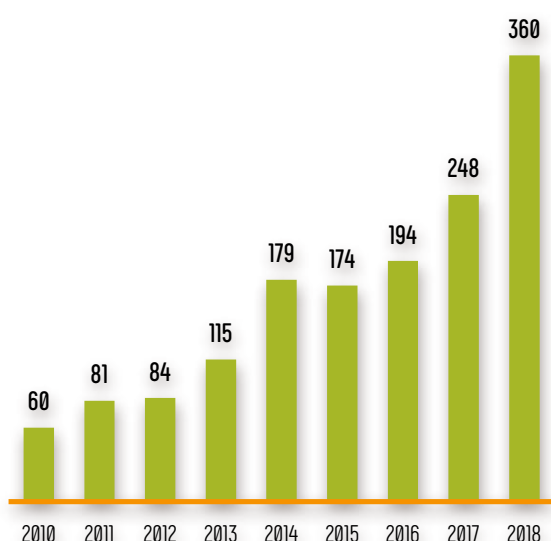


# Exports

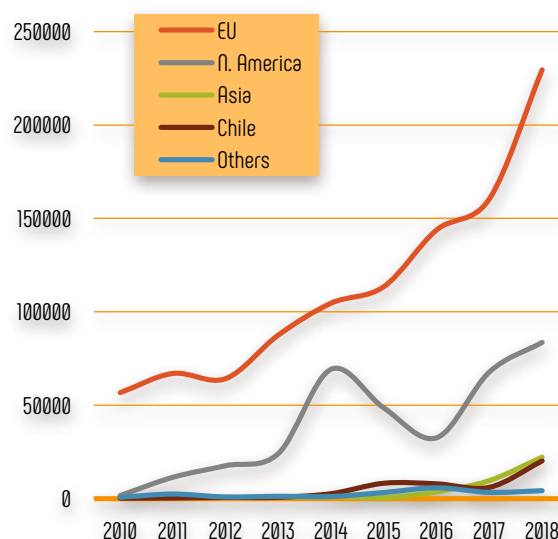
The Peruvian Hass industry has climbed to the rank of world number two exporter after just a decade in existence, with volumes placed on the international market approaching 350 000 t across all varieties in 2018. This surge has been based on increasing demand from Europe –practically the sole outlet 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
<b>Total</b>	<b>59 521</b>	<b>81 431</b>	<b>83 576</b>	<b>114 544</b>	<b>179 044</b>	<b>174 277</b>	<b>194 098</b>	<b>247 524</b>	<b>359 989</b>

Source: SUNAT

### Avocado – Peru – Top 10 of exporters in 2018

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

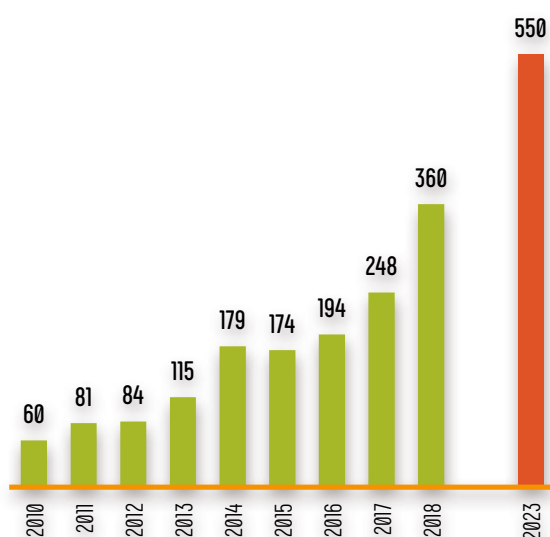




# Prospects

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
<b>Total, Peru</b>	<b>31 650</b>	<b>16.3</b>	<b>516 400</b>



## 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	1 <sup>st</sup> harvest	2 <sup>nd</sup> harvest	3 <sup>rd</sup> harvest	4 <sup>th</sup> 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	
<b>Estimated total production in 2023</b>	<b>632 650</b>	
<b>of which Hass production</b>	<b>601 018</b>	95 % of production (other varieties for pollination = 5 % of stock)
<b>of which exportable production</b>	<b>552 936</b>	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 Siguan 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.





