HASS AVOCADO BOARD

2022

Country Profile: Spain

Producer country profile produced by *CIRAD, The Centre De Cooperation International En Recherche Agronomique Pour Le Développement.*

Acknowledgements

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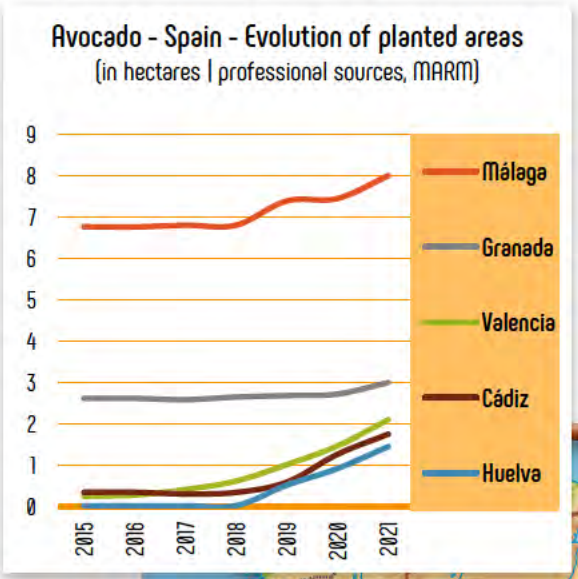
Photo credits: Noémie Cantrelle, Eric Imbert

The avocado in Mainland Spain

The Spanish avocado industry, which took off in the late 1970s, occupies a major place on the world market (world number 10 exporter, trading volumes of around 50 000 t to 60 000 t per year from October to April). To this day Spain remains the only country in Europe to have developed large-scale production, in the particular climate conditions of the Mediterranean, and meeting the high social and environmental standards in force in the European Community. While the historic Malaga/ Granada zone is modernising, its dynamic is being weighed down by severe land and above all water constraints. However, the very recent emergence of new production zones, situated outside of this climate comfort zone, is giving the Spanish avocado industry renewed impetus, which could see its production double by 2028, according to our projections.



History

A new page being written!

The avocado was probably introduced to Spain by the Conquistadors in the 16th Century. The first mention of the presence of this tree in the country can be found in the work "Rariorum aliquot stirpium per Hispanias observatarum historia", by the Flemish botanist Charles de l'Escluse. He describes an avocado tree in the physic garden of the University of Valencia as one of the species he observed during his journey through Spain in 1564 and 1565.

Two agricultural engineers, Luis Sarasola and Roger Magdahl, assisted by a fruit and vegetables merchant from Madrid, Julián Díaz Robledo, made a big contribution to the very first steps of the Spanish avocado industry in the mid-1950s. The first two were seeking to develop commercial production in the Peninsula, and the latter an alternative to fruits from the Canary Islands to stock in his store (tropical fruit imports being prohibited during the Franco dictatorship for sanitary reasons). The first step was to set up a 3.8 ha farm, Rancho California in Almuñécar, situated near the coast in Granada province, in a zone already producing exotics such as the cherimoya. This region, dubbed the Costa Tropical, and the Axarquía region adjoining it further west in Malaga province, would both become the historic core of the Spanish avocado industry, thanks to their particular Mediterranean microclimate with warm winters. Varietal trials were set up, with the support of one of the pioneers of the Californian industry Wilson Popenoe, as well as a nursery in 1958, and then modest commercial production from 1960.

The small nascent industry upscaled and found a new purpose in the late 1970s/early 1980s. The zone's historic crops were at the time going through a crisis due to increasing international competition, and internally, the low technical level and very small size of the farms (minifundios). The profitability of the traditional crops in non-irrigated hill zones (almonds, vines, olives) collapsed, as did (to an even worse extent) the host of small irrigated sugar cane plantations in the plain zones, a historic economic driving force for the region (more than 100 000 t of sugar were produced in the late 1960s in Malaga province). A large-scale conversion movement of these smallholdings began, in favour of horticultural crops providing better economic yields (avocado, able to harness the original climate assets of the region for growing tropical species, but also the potato, vegetables and lemon). According to FAO statistics, the cultivation area went from less than 100 ha in the late 1970s to more than 6 000 ha by the late 1980s.

Spain in a few figures:

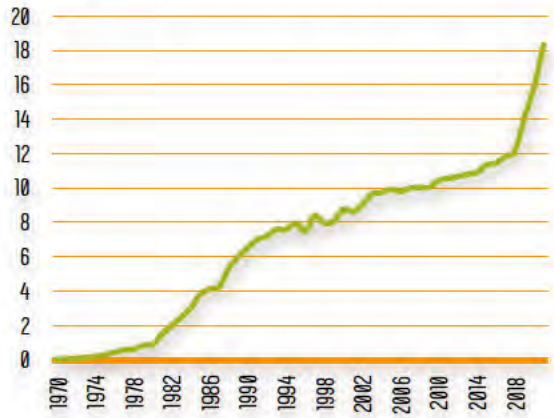
- **Population:** 47.4 million in 2021 (source Eurostat)
- **GNI/capita:** $27,056/year (source World Bank - 2020)
- **Agriculture:** 3.1 % of GDP (Industry 236 %) (source World Bank)
- **Value of agricultural exports:** €60,118 billion (source MAPA - 2021)

Main agricultural export products: (source ITC - 2021)

- **Pepper:** €1,273 million
- **Orange :** €1,227 million
- **Tomato:** €978 million
- **Peach:** €942 million
- **Lettuce:** €890 million

Spain started to position itself in exports, contributing to the take-off of the EC market opened up by Israel. This development was accompanied from the early 1970s by the highly active technical support of the "Mayora Agro-Economic Trial Centre" in Algarrobo, which set up a research and development programme on exotic fruits, run by José María Farré. Despite the water crisis which hit the country between 1991 and 1995, the surface areas dedicated to the avocado continued to expand during the following decade, thanks to the implementation of a vast modernisation/extension programme of the irrigation infrastructures in Axarquía. The Guaro plan, based on harnessing water from the storage lake for the Viñuela dam, with a capacity of 165 hm^3, raised to the useful irrigated area in this region 9 000 ha, across all crops, with the eligible surface areas situated between sea level and an altitude of 140 m, and spread over eight sectors. The Spanish cultivation area had reached approximately 8 000 ha by the late 1990s.

Avocado - Spain - Evolution of planted areas
(in hectares | professional sources, MARM, FAO)



Thereafter, growth was distinctly slower. Tension over the water resources started to weigh heavy, with the surface areas actually in place in the Axarquía area exceeding those specified by the Guaro plan (exploitation of land above 140 m, especially due to lack of responsiveness by the State in granting irrigation permits which encouraged farmers into operating without authorisation). This tension has further increased in recent years, with the appearance of a tough new drought cycle. Despite the very high appeal of the avocado market, the zone's growers are preferring to develop the mango, which has a lower water consumption while also highly being profitable.

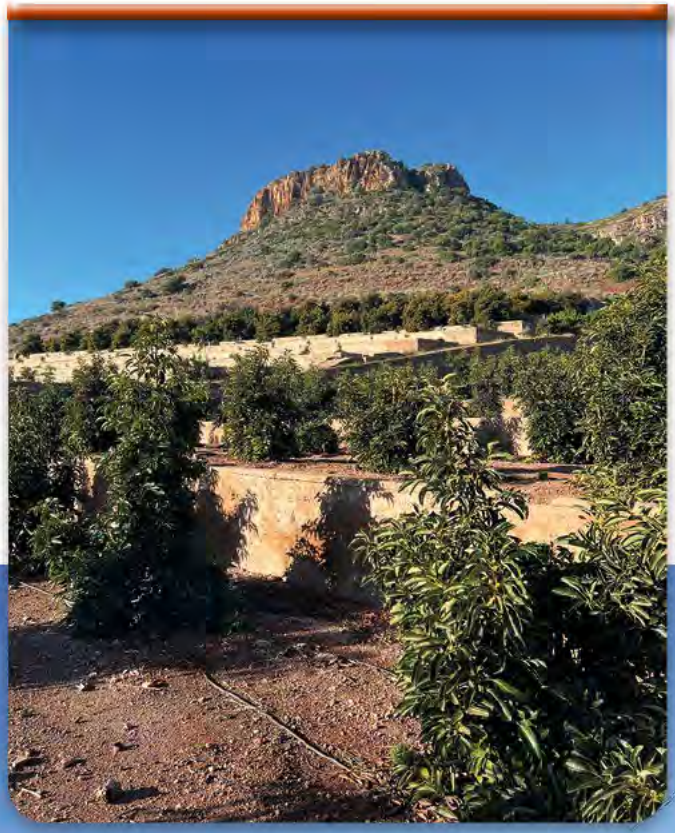
Since 2018-2019, a big national growth trend has returned, with the emergence of avocado plantations outside of the "climate comfort zone" of Malaga/Granada. Highly significant areas have been set up in the Valencian Community, the Cadiz and Huelva regions, with some marginal orchards even being planted in the far north of the country (Asturias, Galicia). These investments in zones with a higher frost risk are motivated by the very good profitability of the crop in recent years, and better land availability, and above all lower constraints on water resources availability. They have changed both the scale of the Spanish industry, which should at least double in volume in the next five years, and also the production structure, with the establishment of very different plantations, in at least two zones, from the minifundio model originating in Arxarquía.

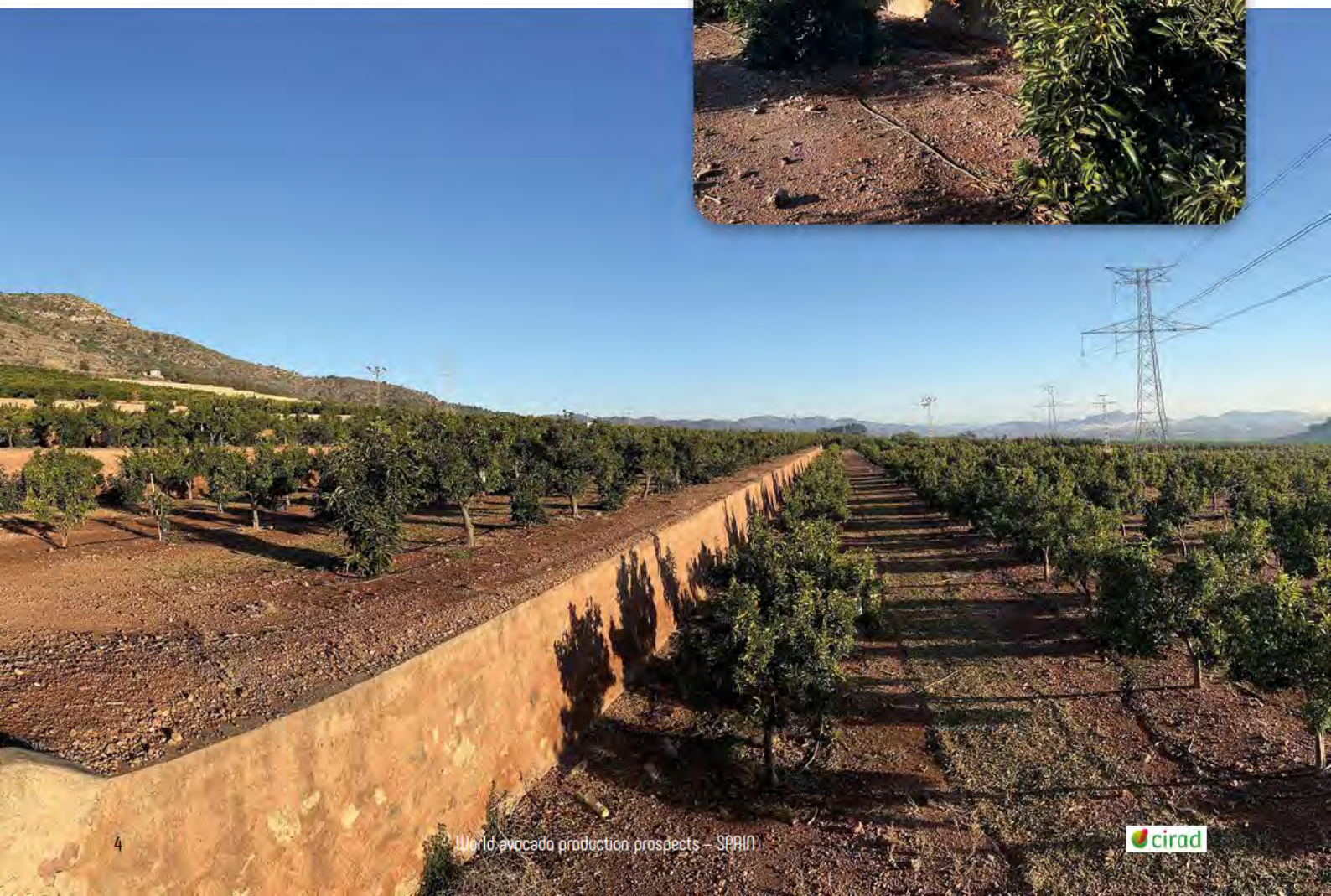
The Valencian Community

A very recent centre extending over more than 2 000 ha, and rapidly expanding, atypical in terms of its geographic position, its production structure and its harvest calendar

The avocado, an alternative to the crisis hitting traditional production

Avocado growing remained a marginal activity until 2017, when planting really took flight (approximately + 200 ha/year according to official statistics, with growth accelerating thereafter to reach approximately 400-500 ha/year since 2019). The Valencian Community has a planted area of around 2 100 ha according to official statistics (2021), with production still restricted because of the young age of the trees. Many growers have opted to replace the region's traditional crops yielding little or no profit, such as some citrus varieties, some kaki or medlar plantations, with the avocado, which fits in well with the generally family-based production system in the zone, requiring crops with a low labour intensity.





Strengths:

- Low water constraint.
- Resilient family system.
- Very mild sanitary stresses.

Challenges:

- Climate risk (frost).
- Production cost.
- Narrow calendar – Lamb.
- Grower training required.

Targeting the warm zones to take advantage of a favourable water situation

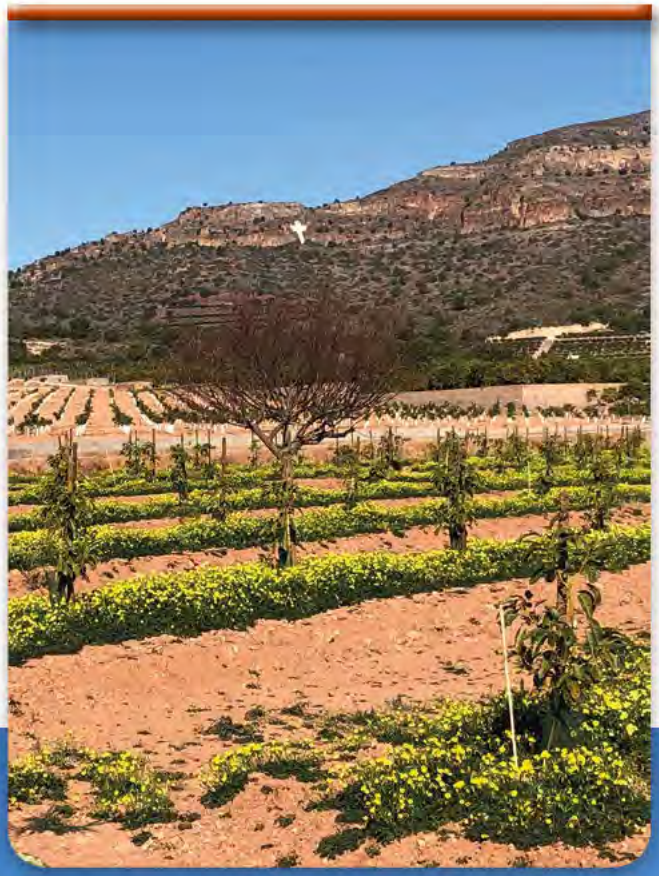
There is a major climate stress in this very northern region for the crop, potentially exposed to frosts. Hence to minimise risks, the plantations have been established in zones enjoying a warm microclimate, generally situated both near the coast to harness the "radiator" effect of the sea and on the foothills to avoid the lowlands which are prone to inversion frost (Iberian system piedmont plain). Such spots can be found between northern Castellón and northern Alicante. For Castellón province, the main ones are the "plana alta" (la Magdalena, Orpesa) and the "plana baja", situated north and south of the city of Castellón. Moving southward into Valencia province, the main zones are the "Camp de Morvedre" and "Horta Nord", then south of the city, "Horta Sud", "Ribera alta" and "Ribera baja" and "Safor". Finally, in Alicante province, the orchards are concentrated mainly in "Marina Baixa" (Callosa). While the winter temperatures are limiting, water resources are conversely much less restricted than in the Malaga zone. The rainfall is generally relatively low, with 2022 being an exception (in recent years, approximately 300-350 mm on average in Castellón and Alicante, 400-550 mm in Valencia). However, the catchment area of the River Júcar, which feeds the zone, is generally well supplied, and well equipped with storage structures (total dam capacity more than 2 800 hm³). Hence availability remains in line with demand, and the water quotas of around 6 000 m³/ha are actually available. There are some salinity problems in some zones.

A typical production system in the Valencian Community

The production system bears the mark of the typical minifundio of the Valencian Community, and is heavily involved in seeking cold resistance. Most of the orchards are small (mainly between 1 and 5 ha), and often planted on terraces overlooking the sea, generally without anti-frost systems. The farmers are mostly double-jobbers, not specialised in agriculture and operating with a family workforce. The big growers working around one hundred hectares across several plantations are the exception, and can be counted on the fingers of one hand. The plantations have a good technical level. The most common density is around 450 trees/ha. The plant stock is high quality (very widespread use of clonal plants). Fertirrigation is widespread, with water generally drawn from the water table. The sanitary pressure is particularly low in this new zone (mainly *Botryosphaeriaceae* airborne fungi on young orchards, and the red spider *Tetranychus urticae*). There are some weak points to note. The irrigation/fertirrigation system is shared between all the growers in the same irrigation union. Hence the water and fertiliser doses are the same for all the plots, whatever the crop type and the grower (except for once a week). Furthermore, while the region's growers have genuine arboriculture experience, the avocado is a new crop, in which they require training. Finally, the production costs are relatively high, especially because of plot fragmentation and the energy requirements to pump water on the hills. The Valencia Avocado Growers' Association (ASOPROA), which brings together approximately 40 % of professionals, works on structuring the sector and provides support in key aspects (training in cropping techniques, promotion, etc.).

A late production zone, based on Lamb Hass

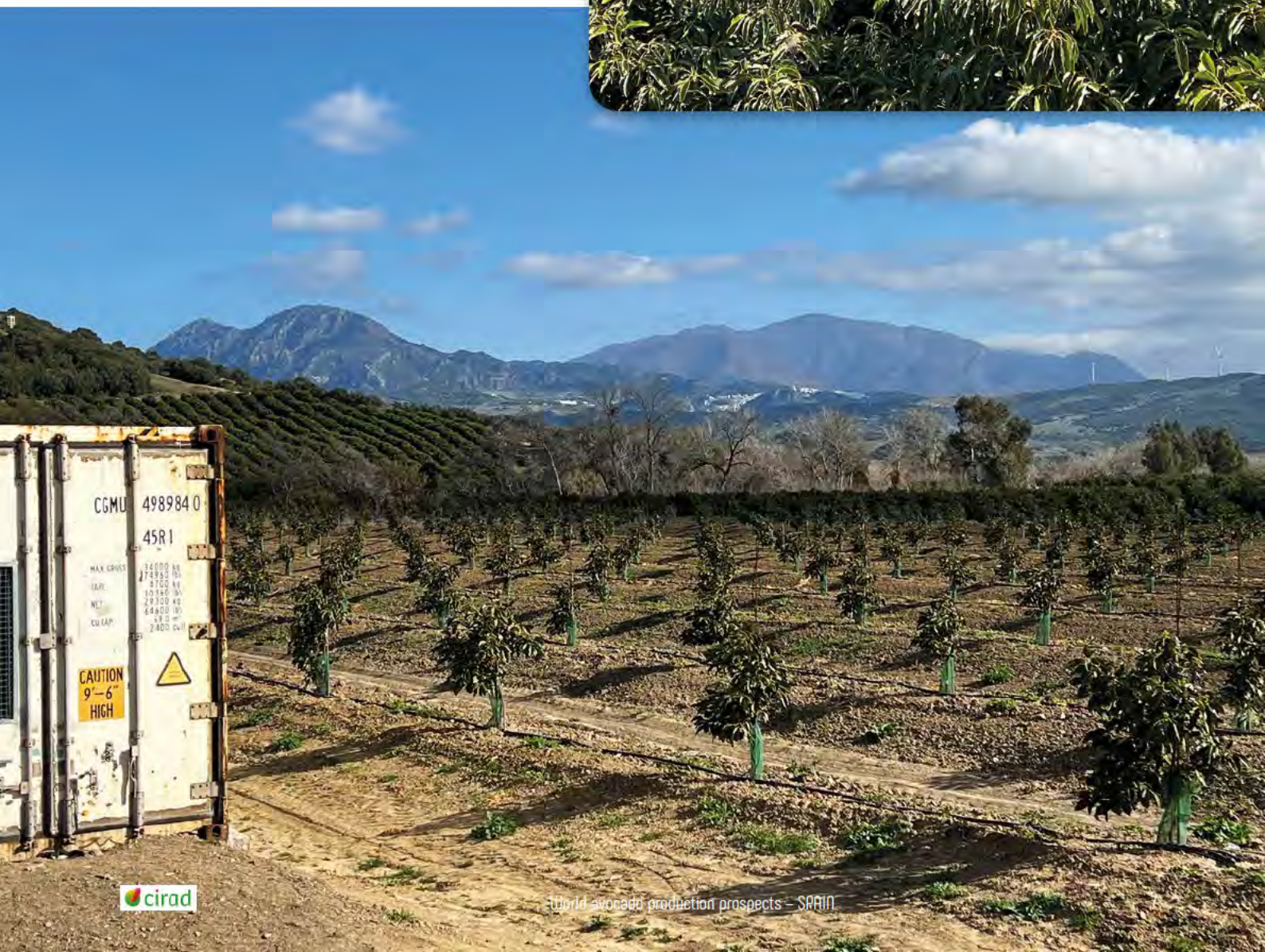
The varietal choices are also atypical: Lamb Hass, derived from a cross between Gem and Hass, represents approximately 70 % of surface areas (larger fruit, reaching prime production quicker than Hass, though the post-harvest phase is regarded as more difficult by some commercial operators). Hence the bulk of the zone's production is available from April to May.



Cadiz zone

Water assets and very recently developed, though very much driven by medium-sized facilities... and one outsized facility

This zone, traditionally focused on citrus growing and extensive livestock farming, is becoming a major production centre for organic and conventional Hass avocado. It covered 1 500 to 2 000 ha in 2021, with very strong growth since 2019, driven by the medium-sized plantations of Campo de Gibraltar and by one facility unique in Europe, by virtue of its extension and production system (Las Lomas). While the temperatures, and the wind in some zones, are limiting factors, water resources and the production potential make it an attractive centre in the context of a deep crisis in citrus growing. Conversely, the production calendar is relatively narrow in the colder zones.



Strengths:

- Low water constraint.
- Good yield.
- Low production cost.
- Technical level often high.
- Very low sanitary stresses.

Challenges:

- Frost and wind risk in some zones.

Temperatures and wind more limiting, but with good water availability

There are two distinct major production zones, both situated in the southern part of the province and separated by "Los Alcornocales" natural park. "Campo de Gibraltar", situated in the east of the province and north of the city of the same name, packs in approximately 1 000 ha across two centres. The Castellar/San Roque centre, with somewhat sandy land, accounts for approximately 40 % of surface areas, topped up by the centre comprising the River Guadiaro valley and its tributary the River Hozgarganta (towns of Guadiaro, Jimena, San Martín del Tesorillo), where the soils are more clayey. The other main production zone, based further west in the La Janda region, covered approximately 500 ha in 2021 (Benalup/Las Lomas). While the climate of the Cadiz province is Mediterranean, it does nonetheless have some noteworthy specificities. Despite the proximity of the sea, situated at most fifteen or so kilometres away, there is a high thermal amplitude and there is a frost risk in some zones during the winter period, as well as the peak temperature risk in summer. Furthermore, there are significant winds (mainly easterly winds in summer, with spells lasting several days known as "levanta", and westerly winds in winter). While there is a climate risk, the region nonetheless has a major asset. High-quality agricultural water availability is good, although the pressure on the resource is increasing and there was considerable tension in 2021-22, with exceptionally low rainfall. The zone has a particular water regime, thanks to its exposure to wet Atlantic currents from the West, which come into contact with the mountain barrier of the Serranía de Ronda. This provides a very good rainfall level (the Sierra de Grazamela, the high point of the zone, is Spain's wettest location), generating high reserves. The Campo de Gibraltar zone is supplied in the West (Castellar/San Roque) by two dams (Charco Redondo and Guadarranque, both with a capacity of between 80 and 90 hm^3). In the East (Guadiaro), the supply is based on pumping from the water table or the River Guadiaro. Finally, the La Janda zone is also supplied by dams (Celemín, with a capacity of 45 hm^3, Almodovar with 6 hm^3 and Barbate with 228 hm^3).

Medium to outsized plantations, with a high technical level and enjoying a very good production potential

In the Campo de Gibraltar zone, the plantations are generally medium-sized (15-30 ha), with some large-scale facilities (from around fifty hectares to a hundred or so hectares). They are situated in a flat or shallow-sloped zone (Guadiaro valley), and generally equipped with protection systems against extreme temperatures. The plant stock is often clonal, with a typical planting density of 7x5 m or 6x4 m. Fertirrigation is systematically applied, and automated. The sanitary pressure is very low (*Tetranychus urticae* red spider), though there are considerable problems with *Phytophthora* in the north of the Guadiaro centre, with heavier land. A highly significant proportion of the plantations are organically farmed (nearly 70 % of surface areas). The bulk of the La Janda zone's cultivation area is based on a single facility, Las Lomas. This orchard has no equivalent in Europe, nor does the farm to which it belongs. This is firstly by virtue of its surface area, with a total of 500 ha of avocados planted in 2022 (with a target of 1 000 ha for 2024), out of a total planted area of 6 500 ha. Secondly, we can point to its technical management too, which is one of the country's benchmarks, with 6x4 or 5x3 planting on ridges with weed control film, in extensive blocks situated on flat surfaces, use of clonal plants, optimal fertirrigation management, protection against gusts and extreme temperatures by micro-spraying, and the very advanced certification level which also covers the aspect of environmental preservation. In both zones, the young orchards rapidly enter production (maturing at 5 years), and the production potential level is very good (probably 10-14 t/ha). The zone is competitive in terms of production cost, especially because of the moderate price of water and economies of scale.

A rather late production calendar, and concentrated in some frost-exposed zones

Hass is ultra-dominant. It matures fairly late, around mid-December (23% dry matter). Some growers situated in zones with a higher frost risk concentrate their harvest between mid-December for the earliest zones and February, to avoid any production losses. The main green variety, used for pollination, is Bacon, alongside Fuerte and Reed. Some plantations also have other varieties, enabling them to expand the season (Gem, Lamb, Maluma, etc.).

Motril/Jete zone

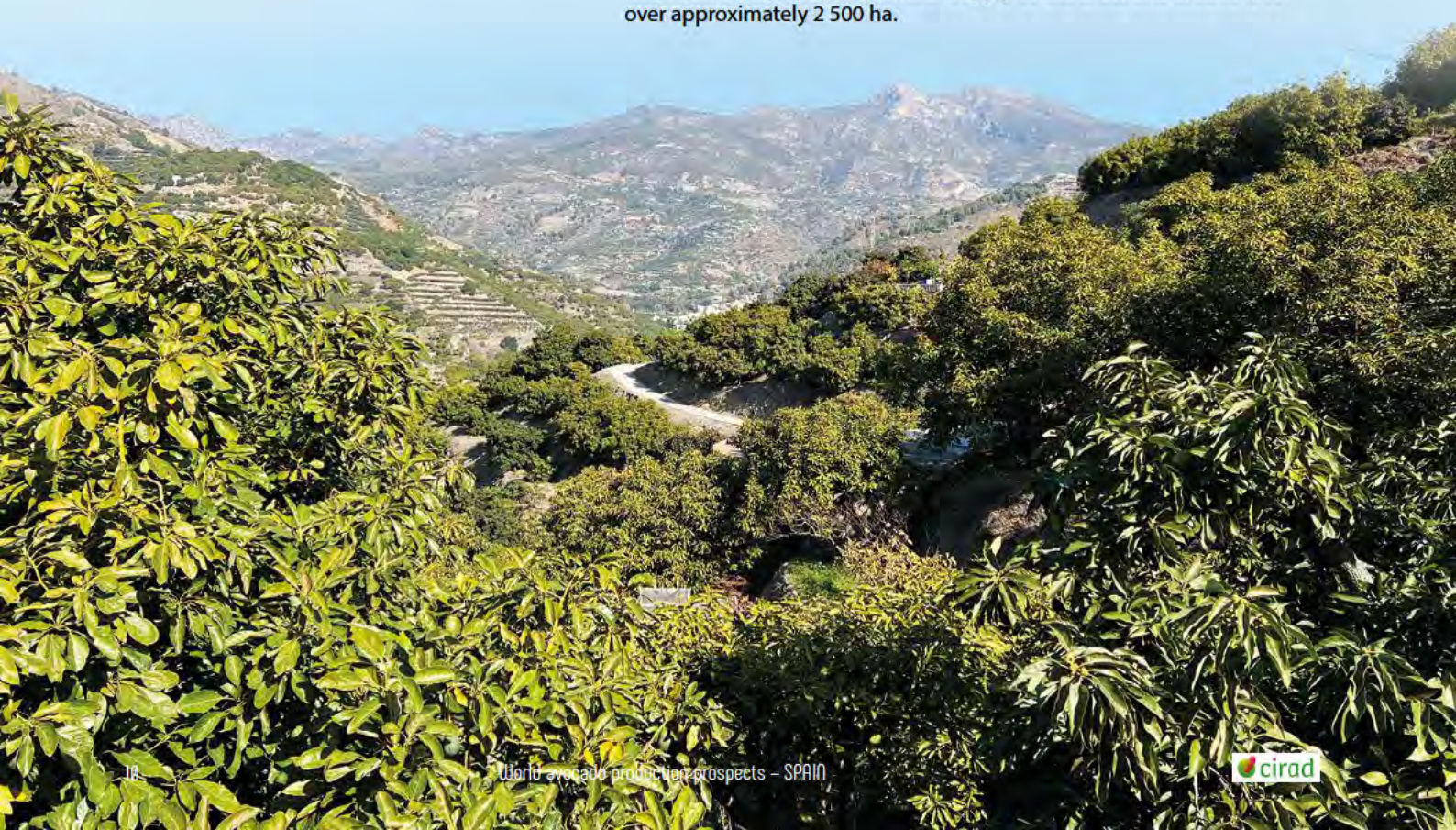
A historic centre of approximately 3 000 ha, highly traditional, but with development potential

Still a highly traditional historic centre

This pioneering zone, where the country's first commercial plantations were set up in the 1960s in Almuñécar, on *Rancho California*, has also remained the most traditional. After big expansion in the 1980s, surface areas have remained practically fixed to the present day, at approximately 2 700 ha, as has the production system.

A steep and fairly windy zone, but with lower pressure on the water resource

The region's cultivation area is divided between two main production centres: the Río Verde valley, which extends from the north of Almuñécar to the surroundings of the village of Otívar, situated around ten kilometres inland past Jete, contains half to two-thirds of surface areas. The rest of the cultivation area is concentrated a few kilometres further east, generally on the hills, especially around the towns of Motril, Salobreña and Torrenueva-Carchuna. Despite the great proximity, the pedoclimatic conditions are a little different from Axarquía. The gradients are much steeper, sometimes very much so. Furthermore, the wind exposure is considerably higher. Conversely, the water issue is less weighty. Rainfall is even lower than in Axarquía (approximately 200-250 mm/year in Motril in recent years, mainly in October and November). However, the volumes available for irrigation are less restricted. In the Río Verde zone, the supply is based mainly on pumping from the water table, and a reservoir receiving both water from the Río Verde and recycling water from the Almuñécar purification station. The salinity is sometimes high. The Motril/Salobreña zone mainly draws on the surface water from natural run-off from the River Guadalfeo, stored in the Rules and Béznar dams, by means of booster pumps. The storage lakes for these two dams, with a combined capacity of more than 160 hm^3, are under-used. A development project under study for more than fifteen years now should kick off within the next one or two years. This should help secure the water supply to the area, and extend it to over approximately 2 500 ha.



Strengths:

- Very suitable climate.
- Resilient family system.
- Very mild sanitary stresses.

Challenges:

- Low yields.
- Low technical level.
- High production cost.
- Windy zone.
- Difficult zone for growing (slopes).

A highly traditional cropping system, due to the steep terrain

The cropping system is very much determined by the very rough topography of the zone. Plantations are generally family-run and very small-scale (just over one hectare on average). The production system is highly traditional. Planting is carried out on benches a few metres wide. The planting density is low (7x7 or 8x8, i.e. between 160 and 240 plants/ha). While micro-irrigation is practically universal, the systems are not always automated. The trees are often more than thirty years old, with a Mexican race rootstock generally used (Mexicola, Topa Topa). Average yields are low (5-6 t/ha). Production costs are generally high (economies of scale limited by the small plantation size, cost of energy required for lifting water up the sloped areas). These are reportedly around €8 000/ha. Sanitary problems are limited (glass mite, generally managed via integrated pest management, combination of *Botryosphaeriaceae* airborne fungi and iron chlorosis problems due to the rootstocks used).

A traditional varietal mix too

While Hass is dominant, the green varieties still represent a significant proportion of surface areas, estimated at approximately 30 %. This choice is due to the risks of gusts, sometimes frequent in November, leading growers to keep a significant proportion of early green varieties in their production.

Axarquía and Málaga province

The core production zone with 50 % of the cultivation area, facing a severe water crisis

A tropical fruits production centre of a size unique in Europe

This historic centre remains to this day the core of the Spanish avocado industry, with estimated surface areas of approximately 8 000 ha, representing more than half of the country's cultivation area. It is situated in an irrigation zone practically entirely dedicated to exotic fruits (avocado, mango, cherimoya, litchi, etc.), of a size unique in Europe, estimated at 14 000 ha. This unusual specialisation is due to the presence of a Mediterranean microclimate, with particularly mild winters. Cultivation of the avocado and exotic fruits in general is, along with tourism and construction, one of the economic lungs of the Malaga region, which would generate nearly 10 000 direct jobs. Nonetheless, the water crisis long established in the region and tending to become more acute, has greatly limited expansion of avocado planted area in recent years, and is even threatening the long-term future of some orchards.

Highly favourable temperatures, but a big deterioration in the water level situation

Surface areas in Malaga province are concentrated primarily in three zones that make up Axarquía: the Vélez Málaga coastal plain ("Hoya de Vélez"), the River Vélez valley and the River Benamargosa valley, which extend to the north forming a V shape. We should also mention the smaller-scale production area of Coín (approximately 1 500 ha) and the emerging Estepona/Casares centre, both situated in the west of Malaga province, outside of Axarquía. The Mediterranean climate prevailing in this part of Andalusia is unique in Spain because of the mildness of its winters. The zone enjoys both the marine influence of the Southern Mediterranean and the natural protection against cold currents of the Cordillera Betica to the north (especially the Sierra de Tejeda). So the temperatures are well-suited to growing the avocado (very low frost risk, with averages of 7-8°C in the depths of winter), even though heatwaves (over 37°C, with low relative humidity) are increasingly frequent in summer. Conversely, the water situation represents an increasingly heavy limiting factor. On the one hand, there is high pressure on the resource. The subtropical fruit cultivation zone has expanded to significant proportions, including above an altitude of 140 m, which marks the theoretical threshold of the irrigated area (lack of responsiveness by the authorities in granting irrigation concessions, leading to uncontrolled plantations). Besides agricultural water, domestic water requirements have increased steeply with urban expansion and the tourism boom since the 1960s, which means high water consumption during the summer period, when agriculture requirements are also at their peak.

Strengths:

- Very suitable climate.
- Crop management.
- Resilient family system.
- Conversion to cutting-edge technical systems.
- Very mild sanitary stresses.

Challenges:

- Water resources.
- Very limited development options.
- Yield no more than middling.

On the other hand, the resource is becoming scarcer. With declining rainfall (520-640 mm per year in the early 2000s, and 260-340 mm per year between 2019 and 2021), the filling rate of the Viñuela dam, the main supply source of the irrigated area situated on the Río Guaro, is in freefall (a 10-year average of 90 hm^3 out of a 165 hm^3 capacity for early January, 45-50 hm^3 in 2020 and 2021 and less than 20 hm^3 in 2022). The Vélez aquifer, another supply source for the zone via deep wells, is also under pressure. In this context of crisis, cuts to the water quotas allocated to agriculture are increasingly frequent and severe (1 500 m^3/ha for the water year 2021-22, as opposed to approximately 5 500 m^3/ha under normal circumstances). In the face of this challenge, work has been conducted to mobilise additional emergency water resources to mitigate the effects of the crisis: recycled water (4 treatment units usable from summer 2022, which will mobilise 8-9 hm^3), reducing water losses between the rivers and the Viñuela dam by cleaning out the feed pipes, and digging wells on the Río Chillar (5 hm^3).

Embalse de la Viñuela

A traditional but functional cropping system, and a renewal trend in progress

The zone's production is based mainly on small family orchards (2-3 ha), although there is a significant number of medium-sized plantations. The topography is flat (Vélez plain), or marked by shallow to medium gradients, which has led to the establishment of terraces (valley zones of the two rivers). Old plantations are predominant, with a generally fairly traditional cropping system (low density of around 160 trees/ha, non-clonal plant stock). However, there is widespread fertirrigation, and yields remain acceptable (8 t/ha). A renewal trend is being applied to the old orchards (30-35 years), which represent approximately one third of surface areas. So the zone is evolving toward a higher-tech system, with a higher production potential (10-12 t/ha), generally based on clonal plants (Duke 7, Dusa, Toro Canyon), higher densities (420 or 550 trees/ha) and better land management (ridges, etc.). The sanitary stresses are limited. There are two main pests (*Oligonychus perseae*, locally known as the glass mite, and a red spider *Tetranychus urticae*). In terms of diseases, the main problem is *Phytophthora* (prevention or uprooting, since no treatment approved in the EU27), and for the past 3 or 4 years a combination of *Botryosphaeriaceae* airborne fungi on young orchards. The direct production costs are within a wide range from approximately €5 500 to €8 000/ha, according to the topography and technical system. Organic planting remains a marginal activity (7%-8% of total surface areas), despite the potential of the zone, with the economic yield generally no better than for conventional agriculture.

Hass ultra-dominant

Hass represents approximately 85 % to 90 % of production. It matures around 20-25 November (23 % dry matter). The main green variety, used for pollination, is Bacon, alongside Fuerte and Reed.

Huelva zone

Strong expansion trend, generating large-scale production facilities, harnessing the zone's water assets

This high agricultural potential zone, nicknamed the "gold mine" for its mild climate, its water resources and the quality of its soils, specialised in strawberry growing from the 1980s, and then other berries in recent years. After trials which yielded mixed results in the late 1990s-2000, the avocado has made a considerable comeback since 2019. Investments have primarily been made by agricultural groups which have established high-tech large-scale orchards. While the climate risk is potentially more considerable than in the eastern part of Andalusia, the water stress is lower in this zone, which like Cadiz enjoys an Atlantic influence. The rapidly expanding surface areas were around 1 400-1 500 ha in early 2022.

Temperatures and wind more of a limiting factor, but good water availability

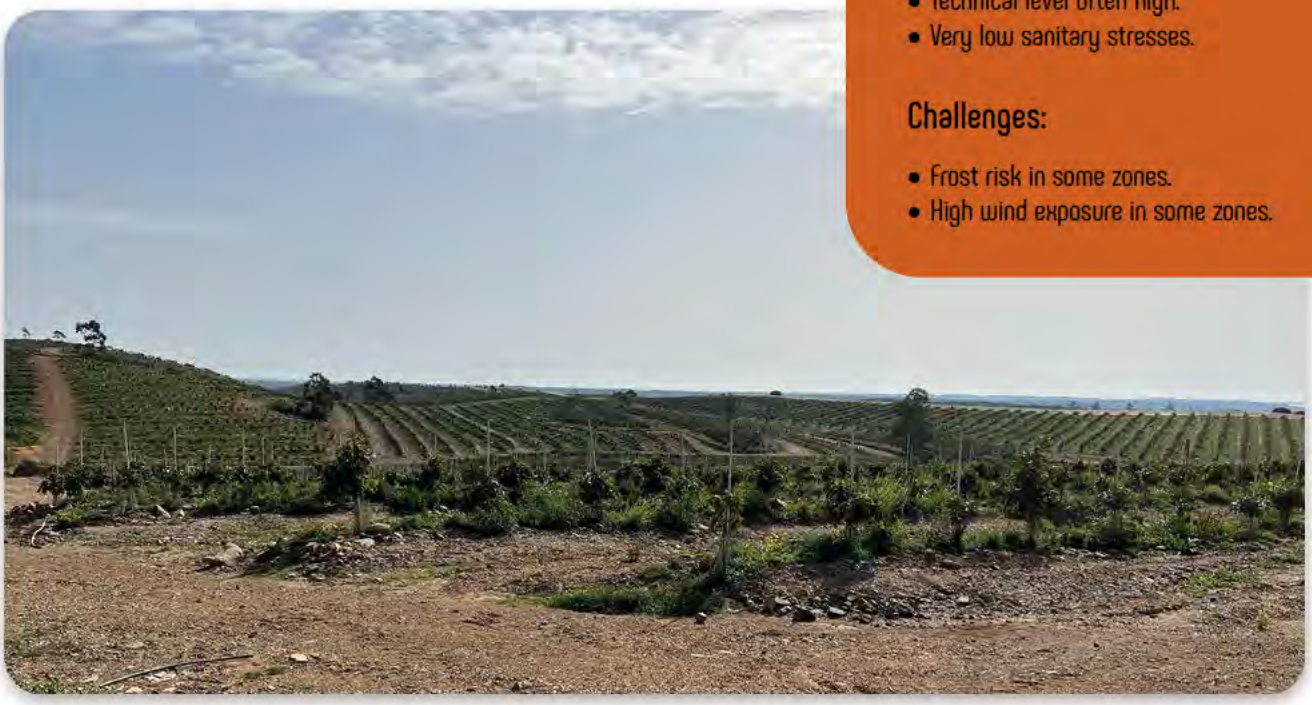
The bulk of the 1 400-1 500 ha of plantations surveyed is situated in the south-western part of the province, between Huelva and the Portuguese border at most 15-20 km from the coast. There are two main centres. The one situated north-west of Lepe (Villablanca, San Bartolomé, Villanueva) packs in the majority of the surface areas (approximately 850 ha). The one around the city of Huelva (Gibraleón, Aljaraque, Punta Umbría) is in second position, with approximately 400-450 ha. This zone enjoys a particular oceanic Mediterranean microclimate, by the Atlantic seaboard. The rainfall level is considerably higher than in the eastern part of Andalusia, although it remains relatively moderate (generally 500-600 mm). Furthermore, the catchment area to which the zone belongs, Tinto-Odiel-Piedras, is richly supplied with water. It has wet Atlantic currents flowing up the Guadalquivir Valley, and pouring into Sierra Morena. It is also equipped with large storage structures, enabling it to cope with the summer low water levels (4 major dams in place – Andévalo, Chanza, Piedras and Machos – representing a combined storage capacity of 1 000 hm^3, designed for irrigation, plus human and industrial consumption). Hence although the water resource is heavily exploited, the supply is less constrained than in Eastern Andalusia. The zone also enjoys an excellent sunshine level. Conversely, it has one of the country's highest wind exposures. It is also subject to climate risks (heatwaves in summer and frost risk in winter). The soils are sandy and generally good quality on the coastal part, while the clay and rock content is higher in the north.

Strengths:

- Low water constraint.
- Good yield.
- Competitive production cost.
- Technical level often high.
- Very low sanitary stresses.

Challenges:

- Frost risk in some zones.
- High wind exposure in some zones.



Large high-tech plantations, with one exception

The bulk of the zone's cultivation area comprises ten or so plantations, varying from 100 to 300 hectares in size. There are some small production facilities (5 to 30 ha), primarily concentrated in a strawberry cooperative which has purchased land and rented it to its members (good complementarity between the strawberry & avocado in terms of labour requirement). However, the combined surface areas of this type of facility represent just 10 % to 15 % of the region's total cultivation area. The large plantations are generally situated on relatively flat land. They are all industrial and with a high technical level. The plant stock, sometimes produced on the plantation, is high-quality, favouring rootstocks that can best withstand cold spells. The planting density is generally higher than in the rest of the country (6x3 m, i.e. 556 plants/hectare). Automated fertirrigation is systematic, often with advanced water management systems. There are frequently systems for mitigating cold snaps or heatwaves (low-pressure sprayers), as well as windbreaks in the most exposed zones. There are very few sanitary problems in this very recent planting zone (*Botryosphaeriaceae* airborne fungi on young orchards).

Calendar

From East to West Andalusia

The Hass harvest starts around mid-November in the earliest zones (Motril/Jete). It comes ten or so days later in Axarquía. Further West (Cadiz, Huelva), the season starts around mid-December. Growers situated in the colder western zones favour a harvest between December and January, in order to limit the risk of frost losses.

So the production calendar is fairly concentrated over the period December/January. In the Valencian Community, the Hass harvest starts in early March, and the Lamb harvest in early April.

Avocado – Spain – Production calendar

Varieties	O		N		D		J		F		M		A		M	
Bacon																
Fuerte																
Reed																
Hass																
Lamb																

Outlets

Exports the main outlet, but domestic market on the up

Exports remain the main outlet for Spanish production. Nonetheless volumes aimed at the local market are on the rise. Consumption of this fruit is constantly increasing in the country, while a significant proportion of the supermarket chains are expressing the desire to promote local and regional produce more (Mercadona, Carrefour, Lidl, etc.). Nonetheless the chains do not purchase the Spanish avocado systematically at a better price level than for imports. Put roughly, the Spanish distribution sector offers two main lines: a loose reference comprising triggered fruit, sold per kilo so as to incorporate variable sizes, and a "ready-to-eat" packed reference (2 to 4 fruits, size varying between the chains: 22/24 for Mercadona, 16/18 for Carrefour). Some chains also have a third "entry level" reference comprising non-triggered fruit, sold in net bags. A significant proportion of production is aimed at the industrial sector, especially for making guacamole. There are at least five companies in the country employing HPP (high-pressure stabilisation process): [redacted] The oil-making sector is also developing.

Players

More than twenty players, but only ten or so major operators

More than twenty companies, different in terms of both size and structure, but all based in the Malaga/Granada region, operate in exports in the field of tropical fruits. Nonetheless, the top six on their own represent nearly two thirds of this industry's total turnover. The number one is the [redacted], which handles approximately 40 % to 45 % of the avocado volumes produced in the country, thanks to a large production base (3 000 growers, primarily small and medium) and tending to extend beyond the historic borders of the Malaga/Granada region. Besides marketing, the cooperative also provides its members with solid technical support (9 field technicians, organising training days, etc.), services in particular in terms of purchasing inputs, plus a research & development activity. The other players are private companies, operating in multiple activities: marketing the harvest of associated growers, trading during the summer and winter seasons, and sometimes production on their own orchards. [redacted] is the second-ranked player, selling approximately 10 % to 15 % of the production, in addition to a major trading activity. Among the other major players, we can mention [redacted], which is developing its own local production (cultivation area approximately 500 ha in the Iberian Peninsula at present, with the long-term ambition to reach 1 000 ha), [redacted], [redacted] and [redacted]. The commercial structure is not yet fully established in the "emerging zones", with production still generally in its infancy. This fruit is currently mainly placed by the sector's major players, and packed at their packhouses in Axarquía. Nonetheless there are some exceptions in the Guadiaro zone in Cadiz (two cooperatives and a few private packhouses in place), in Huelva (a cooperative) and in Valencia (a recent packhouse and a cooperative specialised in the medlar associated with Trops).

Logistics

Service to Western Europe within 72 hours

The logistics are by road-freight only for the EU27 markets. The more distant markets in the zone, such as Scandinavia, are reached within 72 hours. The transport time is also approximately 72 hours for the United Kingdom. A significant proportion of volumes bound for France passes via the Saint-Charles logistical platform in Perpignan, where the batches are redistributed in order to serve the country's main wholesale markets. Fruit shipped outside of Spain is generally ripened on arrival, with a few exceptions.

Exports

Export flow difficult to measure, and practically exclusively aimed at the West European markets

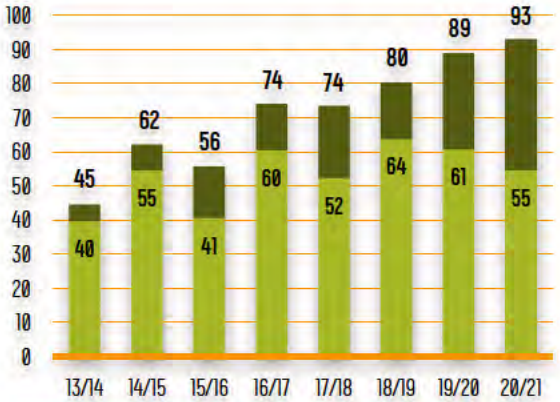
The export level of Spanish-grown avocados is difficult to pinpoint. In recent years the country has become the EC's number two hub, importing and re-exporting increasing volumes of avocados from all over the world (more than 155 000 t during the 2020-21 season, i.e. 20 % of the EU27's total imports). The purpose of this trading activity has changed since 2015-16, going from a top-up supply during the period May to September, when Spain is not producing, to reselling fruit from the Southern Hemisphere year-round (from Peru in particular) and from the Northern Hemisphere (Peru, but also Mexico, Colombia, Morocco and Kenya, to mention just the biggest supplier countries). The share of these volumes out of the country's total exports is impossible to determine, as the Customs data do not specify the primary origin of fruit shipped out of Spain. According to our estimates, exports of Spanish-grown fruit have been around 55 000 t to 65 000 t in recent seasons, making the country the world number nine exporter in 2020-21. This customs grey area does not precisely identify the destination of the Spanish grown fruit either. Nonetheless, it appears that the flow is aimed practically exclusively at the EC market and the other West European markets (UK, Switzerland, Norway), where Spain plays a predominant role during the winter season (8-10 % of the annual supply, and 15-20 % during the winter season). This is a natural positioning due to proximity, which plays in its favour in terms of both product service life and logistical costs. Spain is tending to step up this activity, since the Spanish avocado can bring to bear its assets in terms of sustainability in the broad sense (carbon balance, socially responsible production, etc.) with European consumers and supermarkets, increasingly attentive to these aspects. France is the number one destination for the Spanish avocado, with the wholesale market segment favouring this origin and compensating it accordingly. The Netherlands are in second position, ahead of Germany. Italy is the number four market, and rapidly on the rise. The UK is on the opposite trajectory, but remains the number five destination. The limited volumes exported outside of Europe are mainly aimed at Morocco and South Africa.

Avocado – Spain – Exports during winter season (local production + re-exports)

in 000 tonnes	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
EU27+UK	**41 432**	**58 092**	**52 688**	**68 259**	**69 785**	**73 675**	**85 230**	**88 557**
France	18 001	21 693	20 669	23 615	24 400	25 697	29 994	33 392
Netherlands	4 846	8 557	6 257	9 141	11 588	11 548	15 871	16 146
Germany	5 830	7 795	7 176	10 923	10 151	10 207	9 108	12 038
Italy	525	738	918	1 417	1 773	1 987	4 494	5 179
UK	4 565	7 075	6 734	8 576	9 333	7 964	8 676	4 895
Other EU27	7 540	11 811	10 619	13 827	11 861	15 525	15 933	16 145
Excl. EU27+UK	**3 147**	**4 063**	**2 943**	**5 777**	**3 718**	**6 632**	**3 752**	**4 474**
Morocco	412	1 334	795	937	899	3 961	1 151	1 525
South Africa	1 056	1 019	882	2 058	1 758	912	873	1 204
Norway	-	-	-	622	380	595	637	476
Switzerland	144	16	4	666	381	480	402	384

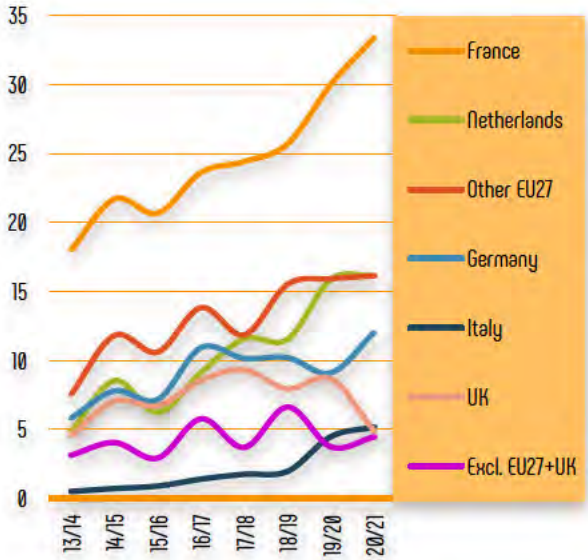
Source: Eurostat

Avocado - Spain - Total exports and estimated exports of locally produced avocados
(in 000 tonnes | source: Eurostat)

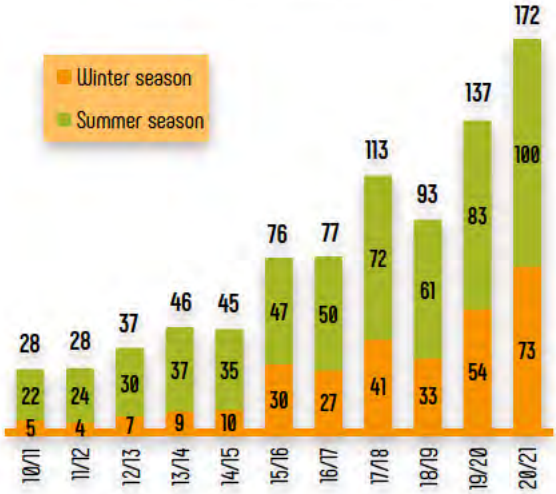


* hypothesis: 50 % re-exports of the volumes imported from third countries during the period considered

Avocado - Spain - Total exports
(in 000 tonnes | source: Eurostat)



Avocado - Spain - Imports
(in 000 tonnes | source: Eurostat)



Avocado – Spain – Imports (in tonnes)

2020-21 winter season	72 853	2021 summer season	99 823
Mexico	39 054	Peru	86 842
Chile	4 950	South Africa	1 755
Morocco	18 573	Kenya	8 987
Colombia	10 276	Brazil	2 239

Source: Eurostat

Production projection

Expected to more than double by 2028

Data and methodology

The data collected from professionals (planted area and yield estimated for each zone, as well as the prospects for change to these two parameters) enabled us to put together a medium-term production projection under certain hypotheses.

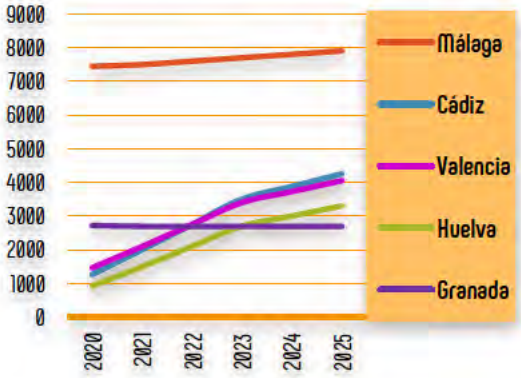
In methodological terms, we worked in three steps to go from raw surface area data to the production projection. The first step consisted in calculating for each zone and for each year in the projection a "theoretical" surface area of orchards in full production. The calculation incorporates surface areas of fully mature orchards, and surface areas of young orchards gradually entering production, taking into account a simplifying overall hypothesis to estimate their progression to prime and maturity (first harvest in 3rd year of the cycle, with a 10 % production potential, one third of the potential in the 4th year, two-thirds in the 5th year and 100 % in the 6th year). These theoretical surface areas were then multiplied by an average yield in full production defined for each region, with a growth hypothesis for this yield for Axarquía, given the improvements in the production systems/renewal of the orchards (one third of orchards renovated over 5 years, with average mature yield going from 8 t/ha to 10 t/ha). Hence we were able to define the projection until 2024. Finally, we incorporated an expansion prospect for the surface areas for the different zones over the period 2022-2025.

Important note: in some pioneering zones, the yield hypotheses are theoretical and based on expert opinion, since of course we do not have sufficient perspective to propose a figure with certainty, especially since the cropping systems are still sometimes at the "running-in" stage.

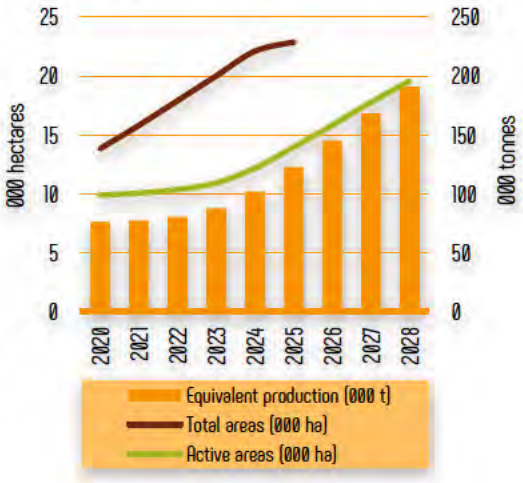
Results

According to our hypotheses, the theoretical surface of orchards in full production would go from approximately 10 000 ha in 2021 (out of a total cultivation area in place of approximately 15 800 ha) to nearly 20 000 ha in 2028. The increase would be mainly due to the massive expansion in the Valencia, Cadiz and Huelva zones (90 % of the rise). Hence, and if we also take into account the increase in yields in the historic Axarquía centre, the export potential would increase by a factor of 2.5 between 2021 and 2028, to reach approximately 190 000 t.

Avocado - Spain
Evolution of planted areas by region
(in hectares | source: Cirad estimate)



Avocado - Spain - Projected planted areas and exportable production
(professional sources, MAPA)



Avocado – Spain – Hypothesis for average mature yields (8 % sorting rejects)

Regions	in tonnes/hectare
Málaga	8.0
Málaga (renovated plantations)	10.0
Granada	6.0
Cádiz	12.5
Huelva	12.0
Valencia	10.0

Limits of the study

This projection cannot incorporate some parameters that could modify the very structure of the industry, in particular:

Consequences of climate change

Climate change could affect three main parameters, with a heavy impact on production. In terms of temperatures, while frosts may have been less frequent in recent years, summer heat waves causing fruit droppage has become increasingly common. Furthermore, this problem brings forward the blooming period at the beginning of spring, when the risk of vagaries that could affect pollination (cold, rain) or cause fruit loss (frost) remains highest. In water terms, the fall in cumulative levels already registered during the October to December period, critical for supplying the water tables and reservoirs, could be further aggravated. Maintaining drastic cuts on irrigation quotas in the major Axarquía zone could compromise the long-term future of significant areas of orchards. Furthermore, extreme climate episodes could also be more frequent (gusts, especially in zones situated on the Atlantic Seaboard, high cumulative rainfall over a short period, etc.).

Water facilities and management

Development projects aimed at better managing water resources have long been under study. Some of them finally seem to be moving forward, with the crisis extending and becoming more severe in some zones. They could radically change the water provision of some production centres, and guarantee the theoretical quotas or even develop the irrigable surface areas. Among the most significant, we can mention:

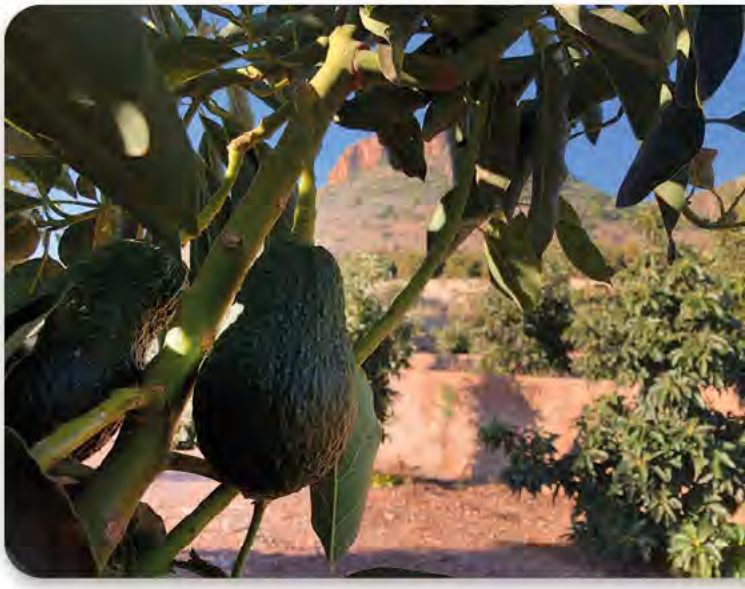
In the Granada zone: improved connection between the Béznar/Rules dams, whose reservoir water is unused, and the irrigation zones situated downstream and largely dedicated to tropical fruits. This project could be completed in the medium term (1-2 years).

In Axarquía: canal bringing water from Campo de Gibraltar to the Costa del Sol, known as the "water motorway". The project has started, but it will be performed in phases, and Axarquía seems a long way off for the moment.

Outside of these development projects, research is currently underway to improve irrigation management. This means in particular making real-time adjustments to the trees' actual inputs, within a homogenous zone in pedo-climatic terms, relying on the data from pilot orchards equipped with tensiometers and transmitted to all the farms. The preliminary results are very promising, and seem to indicate that substantial savings can be achieved.

Market evolution and planting rate

The downward trend in prices, seemingly becoming structural even during the winter, could affect the planting rate in the coming years. We have incorporated a fall into our projection, but this is difficult to assess. We estimated that it would be very slight overall. The price of land with a water supply is prohibitive in some zones, but conversion of less profitable crops (in particular the orange) are not only possible, but indeed necessary in some zones (Valencia, Cadiz, Huelva). Furthermore, in the very short term, extensions are already programmed (plants reserved, land purchased or even prepared). In addition, some of the country's zones have assets in terms of orchard competitiveness (relatively low production cost, good productivity, very good sanitary quality), while the origin has to some extent a comparative advantage in terms of logistical cost, by virtue of its natural EC market. Finally, Spain is able to rely on some very good overall sustainability indicators: a decent carbon balance, again due to the proximity of the market, very good social indicators (wages and social protection to European standards, high proportion of family-run smallholdings), low use of pesticides, which are furthermore highly controlled by European regulations (dry zone, very little affected by any sanitary problems). The importance of these points, already considerable both for the supermarkets and consumers, is set to increase even further in future, via certification, or even legislation. A comprehensive "Spanish avocado" approach built around these assets would contribute to building the resilience of the origin in a context of increasing competition over the coming years.




cirad