

Avocado Culture in the Canary Islands

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Brief History

The first known mention of the existence of avocados in the Canary Islands - specifically West Indian race - was made in 1867 (13). From that time until 1953, the avocado was grown as an ornamental tree or, at the most, in gardens. In the 50's, Garcia Cabezón (7) promoted the crop, importing the best available cultivars from California and Florida although only the Californian cultivar achieved future importance, particularly "Fuerte", "Hass", "Rincon", and "Bacon". Garcia Cabezon also made several selections, "Orotava", "Robusto", and "Gema", among others (6); with the exception of "Orotava" which is still used today as a rootstock in some areas, these selections are no longer of commercial interest.

The avocado is now the second most important subtropical fruit crop in the Canary Islands, thanks to the interest shown in the crop by the research and extension centers of the Ministry of Agriculture and by private growers. The authors wish to acknowledge at this time the research and extension work done by the late F. J. Alvarez De La Peña, of the local Extension Service, whose book on the avocado is considered an obligatory reference work for all avocado growers of the Islands (1).

Commercial Plantings, Cultivars, and Yields

Although accurate statistics are not available, the actual surface under avocado cultivation is close to 1,000 hectares, approximately 50% of which is still not bearing. The Guimar Valley area on the island of Tenerife is the main producing area, with over 200 bearing hectares (4). The island of La Palma has the highest rate of new plantings, registering over 200 hectares during the last campaign alone (1983-84).

The main cultivars are "Fuerte" and "Hass", but new plantings are done mostly with "Hass", "Reed", and "Pinkerton". West Indian seedlings are used as rootstocks in the warmer areas, and Guatemalans (cv. Orotava) in the cooler zones. Gonal "Duke 7" is used only in research plots. "Gwen", "Whitsell", "Esther", "PT-37", and "H-287", as well as "G-755C" (*Persea schiedeana* Nees), have been recently introduced by the Regional Center of Agricultural Research (I.C.I.A.) for testing.

Due to the climatic diversity of the Archipelago, production is possible all year long, beginning in September with "Fuerte" in coastal areas and ending with "Reed" on the northern slopes at higher altitudes.

A large part of the crop - around 6,000 Tm - is consumed locally but large exports are made to the UK markets and, more recently, to the Spanish Mainland market. Several private companies, many under a co-op regime, undertake exportation but there is no official organism to regulate export of the avocado crop.

Grower prices have risen since the 70's, probably due to the tremendous boom of the European market. The largest export company, FRETECO, paid 32-72 pesetas/Kg, in the 1970-71 campaign, and 63-192 pesetas/Kg, in the 1983-84 campaign {US\$ 1= 75 pesetas in 1971; in April 1985, US\$ 1= between 170 and 180 pesetas). Broadly speaking, the lowest prices are usually found in October and November, probably due to competition from Israeli avocados.

Research done in the Islands shows that optimum yields can be obtained from plantings located at sea level and up to 450 meters above sea level on the northern slopes, and up to 600 meters above sea level on the southern slopes, as long as the water supply and quality are adequate, drainage is good at least in the first meter of soil depth, and strong winds do not occur.

Cultural Techniques

Local nurseries supply most of the grafted plants needed, although some growers prepare their own. After disinfecting in hot water, seeds are germinated in glasshouses, using a substrate of "picon" - a black, porous gravel of volcanic origin. Once germinated, the plants are relocated in individual bags, and grafted a few months later; wedge-graft is usually practiced. After the scion has developed, the grafted plants are transferred to partial shade for hardening and finally moved out into the open. In all, the whole process, from germination to field transplanting, takes 10 to 12 months.

In the Canary Islands, where the avocado is a clear alternative to the banana in marginal areas, it is a frequent practice to plant avocados alongside established banana plantations, gradually substituting avocados for bananas as the trees approach bearing age, obtaining thus an avocado plantation without losing income during the first nonproductive years.

The usual planting density is around 36 m²/tree. Originally, this density was lower - about 64 m²/tree, especially when "Fuerte" was used - but recent research shows that a higher planting density, even as close as 25 m²/tree, is more than adequate.

Planting can be done at any time of the year although the summer months are usually avoided due to the water stress risks involved. Plantings are usually made on terraces filled with soil trucked-in from other areas and thus very heterogeneous. Not all types are apt for avocados: those with a pH higher than 8, high salt concentrations (>3 mmhos/cm at 25°C), or soils that are heavy and poorly drained, are not used. Some plantings have been established in adverse conditions but their production is, logically, poor.

On the northern slopes of the Islands, at 300 meters above sea level and with 400 mm. of annual rainfall, irrigation water consumption is between 4,000 and 6,000 cubic meters per hectare and year (9), distributed in 15 to 20 irrigations during the dry season. Modern localized irrigation systems have reduced consumption between 25 and 30

percent.

The fact that the avocado needs good quality water has been one of the limiting factors in the Islands, as water resources are underground. Growers using well-water need to control its quality and only those waters with CE 1,200 micromhos/cm at 25°C, Cl^{-3} meq/liter, and SAR 5, are recommended. When possible, it is preferable to use water obtained through horizontal shafts rather than water pumped up from wells (particularly those drilled at lower altitudes as they are more prone to giving a high salt concentration due to sea water infiltration).

Fertilization

Standard fertilization recommended per plant and year is: 675 grs. of N, 725 grs. of P_2O_5 , and 900 grs. of K_2O for bearing trees. When a Zn and/or Mg deficiency is found, 200 grs. of SO_4Zn and SO_4Mg are applied (8). Iron deficiency is corrected by applying iron chelates.

Weed Control

In mature plantings which cover most of the ground surface no cultural tilling is used, as fallen leaves and diminished sunlight keep weeds at a minimum. In young plants, associated crops such as potatoes are planted during the first 2-3 years although there is some risk of damaging the root system of the young avocados due to the cultural practices needed for these crops. When weed control is necessary, paraquat is used for annual weeds and glyphosate for *Cyperus* sp. control.

Pests and Diseases

To date, pests do not constitute a serious threat to the avocado in the Islands. The following are however found more or less frequently but are easily controlled: *Heliethrips haemorrhoidalis* Bouché, *Protopulvinaria piriformis* CKV., *Pseudococcus longiopus* Targioni-Tossetti, *Lecanium persicae* Sign., and *Tetranychus urticae* Koch. *Aphis gossypii* Flover, *A. citricola* Del Guemio, and *A. fabae* Scop, are found but less frequently than the former group.

In propagation glasshouses the microscopic mite *Polyfagotarsonemus latus* Bank is usually controlled applying soluble sulphur.

As is true of other avocado producing countries world-wide, the main disease in the Canary islands is root rot caused by *Phytophthora cin-namomi* Rand. Other pathogens have been found - such as *Rhizoctonia solani* Kuhn, *Verticillium dahliae* Kleb, and *Diplodia theobromae* (Pat) Now. - but are less important (5).

Advantages of this Crop for the Islands

— Relatively low irrigation consumption (around 8,000 cubic meters per hectare, as long as the water used is of good quality);

- Little threat of pests and diseases, lowering general cultivation costs;
- Little labour involved — the avocado does not even need to have its soil tilled (in fact, this can be prejudicial to the crop);
- Possibility of stepped harvesting, not only among cultivars but also among the different climatic zones found in the Islands, according to the flowering period for each tree, and, finally, the fact that the fruit can be picked in different stages of its development while maintaining an acceptable market quality. Consequently, harvesting can almost be programmed to coincide with market demands;
- Pruning is not necessary, although the tree tolerates it well, making it possible to conduct the tree while it is young, making for easier harvesting and renewal of trees within the plantation;
- The maturation process of the fruit is sufficiently slow to permit a relatively lengthy transport to market (boat, train, or truck);
- The Spanish market is still developing and the European market is still expanding; the EEC increase between 1972 and 1979 was about 60% per year, far above the most optimistic predictions of that time. The trend for the 80's is not yet clear, especially considering the unfavorable climatic conditions for the Israeli crop in 1982 (10) but the prospects are that sales are going up in that market too (G. ADAR, 1982. Personal communication);
- The characteristics of the avocado are such that it does not enter into competition in the market with other fruits and vegetables.

Main Disadvantages for the Crop in the Canary Islands

- The avocado, like most trees, is relatively slow in bearing but this disadvantage has been more or less overcome since the obtention of precocious cultivars like "Pinkerton" and the tendency to use a higher planting density. Associated crops which produce early can also be planted together with the avocado, attenuating yet again this disadvantage. In the case of the avocado as a progressive substitute for the banana, this problem does not even exist as long as the banana plants that do not hinder the avocado tree growth can remain planted for the first three years;
- Regarding *Phytophthora* root rot damage, little can be done when dealing with poorly drained soils, or seedlings from infected nursery stock, but both problems are to some extent correctable through the use of fungicides or resistant rootstocks;
- Salt and compatibility: salt-resistant rootstocks, usually West Indian, are frequently incompatible with recommended cultivars, especially in the northern areas of the Islands where the West Indian types develop slower than the cultivars used (generally Mexican x Guatemalan hybrids);
- Heterogeneity of rootstocks: due to the great heterozygosity of the species, vegetative propagation techniques resulting in homogeneous plants still need to be developed. This is practically solved for Mexican types, resistant to *Phytophthora* root rot, but still

needs to be developed for West Indian avocados. An ideal rootstock for the Canary Islands should have the following characteristics: resistance to *P. cinnamomi*, salt-tolerance, and compatibility with the locally recommended cultivar;

— Product classification: although quality standards exist for both local and export markets, the Canary crops are marketed under several different trade-names. Some islands such as Tenerife are unifying exports under the name "Avocan" but there is still a long way to go before the Canary Islands can market all their avocados under one name, as Israel does with "Carmel" and California with "Calavo";

— Strong market competition: the Islands have to compete with Israel, South Africa, Mainland Spain, French West Indies, several African countries, and the USA, and production and transport costs are generally higher here than in most of these countries. It is feasible to assume that if the avocado continues and increases in popularity and if a serious effort is made and sustained by growers and government, three European countries could eventually supply most, if not all, of the EEC demand within the next ten years: Spain (Canary Islands and the southeastern region of Mainland Spain), France (West Indies and Corsica), and Portugal (Madeira and the southern area of Mainland Portugal). Eventually, Greece and Italy might also join in supplying this demand. Thus entrance in the EEC would be very important in minimizing this problem.

Future Prospects

After reviewing the main advantages and disadvantages, an outline of the avocado's probable future in the Canary Islands is wanting. However, in this context it is important to keep in mind that besides cultural costs, the two main factors of a successful plantation are yields and prices. An increase in yields can be achieved either by improving cultural practices -reasonably well attended to in the Islands - or by introducing new cultivars. In this last there is much room for improvement since most of the trees used are still "Fuerte", much less productive than, say, "Hass", "Reed", and "Pinkerton"; fortunately, local nurseries have done much to bridge this gap, producing plants of these cultivars. Also, top-grafting to new cultivars is easy and the technique is well known (1,12). Although the statistics available are not entirely reliable, some local plantings are already obtaining yields higher than 20 Tm/ha. / year.

Prices, of course, depend on market demands, but there is still enough space - in the local as well as in the European markets - for good quality avocados produced between March and the first half of October (2). However it should be kept in mind that the increase of plantings in Israel, South Africa, or even in the southeastern seaboard of Mainland Spain, will lower - or at best, maintain equal - prices in the future. Despite this, the Canary Islands have some interesting climatic advantages over other prospective areas: the Islands' warm areas, located at low altitudes on the southern slopes, allow earlier harvesting for some cultivars such as "Fuerte", which can be harvested as early as the 15th of September; the moderate climatic conditions found on the northern slopes allow "Hass" and "Reed" to be picked as late as between May and September (unique, since competitors such as Israel or Mainland Spain can very seldom harvest between April and October due to poorer weather conditions).

South African competition is still a problem as most of its production is marketed between May and September, but transport to attractive markets is more expensive. Consequently, the tendency is to recommend that new plantings, on the northern slopes, be done using late cultivars, reserving "Fuerte" for the warmer locations on southern slopes. (In any case, to avoid pollination problems it is advisable to include cultivars of both flower groups - A and B - in new plantings, orientations notwithstanding.)

An effort should also be made to develop the Spanish mainland market, actually around 20 grs/person-and-year, clearly inferior to other European countries which are already around the 100 grs/person-and-year consumption. Although it will take quite a while to reach the 540 grs. mark of France, or the 1,300 grs. of the Canary Islands (17), it is probable that with suitable promotion, the Spanish mainland market could be easily enlarged.

In conclusion, the prospects for the future are, at the least, moderately optimistic for the avocado in the Canary Islands, with its acreage increasing moderately but steadily.

References

- Alvarez De La Pena, F. J. 1975. El Aguacate. Publicaciones de Extension Agraria. Ministry of Agriculture- Madrid.
- Anon. 1982. Fruits tropicaux. Troubles de croissance d' un marche nouveau. Afrique Agriculture, 85: 23-30.
- Calatrava Requena, J. 1982. Los regadios del litoral mediterráneo andaluz, realidad problemática de una agricultura de vanguardia. ICE, Febrero 82: 67-87.
- Galan Sauco, V., & D. Fernandez Calvan. 1982-83. Historia, situación actual y perspectivas del aguacate en Cananas. Conferencia II Semana del Aguacate. EXMO. Cabildo Insular de Tenerife (Diciembre 1982); IX Semana Verde de la Costa del Sol. II Seminario del Aguacate. Almunecar (Marzo 1983).
- Gallo Llobet, L., J. Hernandez Hernandez, & M. C. Jaizme Vega. 1983. Enfermedades del aguacate presentes en Canarias, con especial referencia a *Phytophthora cinnamomi* Rand (podredumbre de raiz). II Congreso de la Sociedad Española de Fitopatología. Vitoria.
- Garcia Cabezon, A. 1963. Variedades nuevas de aguacate obtenidas en Tenerife. Bol. INIA, XXIII (49): 203-206.
- Garcia Cabezon, A. 1975. Historia, área de origen e importancia del aguacate en el mundo. Historia de la introducción del aguacate en Canarias. Conferencia I Curso sobre Fruticultura Tropical y Subtropical. EITA, Universidad de la Laguna.
- Hernandez Abreu, J. M., et al. 1980. Seminario sobre la interpretación de análisis quimicos de suelos, aguas y plantas. Centro Regional de Extensión Agraria. Tacoronte, Tenerife.
- Hernandez Abreu, J. M., & A. Perez Regalado. 1974. Consideraciones sobre las necesidades del riego del aguacate en las Islas Canarias. Agricultura XLIII (512): 837-839.
- Naville, R. 1983. Les importations francaises de fruits tropicaux et subtropicaux en 1982. Fruits, 38 (5): 431-43.

Perez Padron, F. J., & A. Carnero Hernández. 1982. Plagas del aguacate. Conferencia II Semana del Aguacate. EXMO, Cabildo Insular de Tenerife.

Quintana Cabrera, N. 1979. Top-working o cambio de variedad en plantaciones adultas. Xoba, 3 (1): 10-15.

Rodriguez Garcia, V. 1979, La historia del Jardin Botánico de Tenerife en el siglo XVIII. Las fuentes documentales del Archivo General de Indias en Sevilla. EXMO. Cabildo Insular de Gran Canaria. Separata aparte del Libro II Coloquio de Historia Canaria Americana, 1977, Tomo II.