

■ 'Maluma': establishing a new generation avocado cultivar commercially

A.A. Ernst, Z.R. Ernst, E.D. Ernst

Allesbeste, Tzaneen, Limpopo Province, Republic of South Africa

ABSTRACT

An industry dominated by a single cultivar, or that produces too few new cultivars, is vulnerable. Ironically no less than 13 fruiting cultivars presently receives intellectual property protection in various countries, of which less than half has established themselves commercially. Presently 'Hass' is the world's premium avocado cultivar, which originated as a chance seedling planted in 1926 by Rudolph Hass in La Habra Heights, California. A plant patent was granted in 1935 in California, which expired in 1952. 'Hass' only established itself during the 1970's, as the initial acceptance of 'Hass' by packers, distributors, retailers and end users, as a superior commercial cultivar was slow. 'Hass' received resistance because of its fruit being black-skinned, rough and small. 'Maluma', a new generation cultivar, was discovered, during the early 1990's, by Andries Joubert on his farm Maluma in Levubu, South Africa. Plant Breeder's Rights were granted to Allesbeste Nursery on 7 November 2004 and commercially released, after 8 years of intensive semi-commercial research, during November 2007 at the VI World Avocado Congress, Chile. Successful commercial establishment in the European Union (EU) and United Kingdom (UK) occurred within another 8 years. This achievement was made possible through the active integration of the following:

- Horticultural attributes
- Marketing attributes
- Competent, loyal participants
- Vibrant trade relationships
- Additional economic value for all participants
- Technical support, able to deal with the critics
- Branding and promotion
- Significant marketable volumes
- Strategic establishment to ensure future 12 months' market presence
-

This active integration was achieved through Allesbeste's vertical integration in all structures from propagation to exporting / marketing, providing a platform for efficiently applying its inherent skills in all fields.

Key words: 'Hass', Superior commercial cultivar, 'Maluma', New generation cultivar, Commercial establishment, Integration.

INTRODUCTION

'Hass' is presently the world's most dominant avocado cultivar (Bruwer & Van Rooyen, 2007), marketed at a premium for its growers. 'Hass', a predominantly Guatemalan with some Mexican genes, originated as a chance seedling planted in 1926 by Rudolph Hass in La Habra Heights, California. Hass bought Guatemalan seedlings, thought to be of the 'Lyon' variety, from Rideout nursery in Whittier. After 3 failed attempts to graft it to 'Fuerte', Hass left the tree to grow out in the field ungrafted. Due to its nutty flavour, creamy flesh, lack of fibre, 18% oil and long harvest season, Hass decided to apply for a US Plant Patent. A US Plant Patent No. 139, the first for a tree, was granted on 27 August 1935. Hass gave H.H. Brokaw, a nurseryman in Whittier, the exclusive rights to propagate and promote the 'Hass' avocado. By the time the patent expired in 1952, Rudolph Hass had made only US\$5000 on the new variety (Shepherd & Bender, 2001; Stradley, 2004).

The market acceptance of 'Hass', a dark-skinned cultivar, was slow as the consumers had learned to recognize "green" as the proper colour for an avocado. Steady promotion by packers and growers gradually resulted in increased market acceptance so that by 1957 'Hass' comprised 15% of the crop in California. By 1972, forty years after its introduction, 'Hass' surpassed 'Fuerte' in total volume marketed from California. By 1990, 'Hass' accounted for 83% of California's avocado production (vs. only 2% for 'Fuerte') (Shepherd & Bender, 2001). In 2010 'Hass' accounted for 96% of production in New Zealand, 85% in California, 90% in Mexico, 57% in Peru, 75% in Chile, 75% in Spain, 80% in Australia, 58% in South Africa, 26% in Columbia and 35% in Israel (Crane *et al.*, 2013). The initial acceptance of 'Hass', by packers, distributors, retailers and end users, as a superior commercial cultivar was slow. 'Hass' received resistance because of its fruit being black-skinned, rough and small (Brokaw, 1989).

'Hass' is an alternate bearer, producing a large percentage of undersized (<170 g) fruit. These tendencies are exacerbated by the occurrence of environmental stresses and *Phytophthora cinnamomi*. The undersized and unmarketable fruit, results in high financial losses for farmers. Therefore the focus is on finding a high yielding, better sized, good quality Hass-like cultivar (Bruwer & Van Rooyen, 2007).

In an article titled "Introducing new cultivars: needs vs. risks", Brokaw (1989) clearly emphasise that an industry dominated by a single cultivar, or that produces too few new cultivars, is vulnerable. Ironically, as reported by Roe & Brokaw (2007), no less than 13 fruiting cultivars presently receives intellectual property protection in various countries, of which to date less than half has established themselves commercially. Of these, the 'Hass'-like cultivars, being released commercially over time are: 'Lamb Hass', 'Gem', 'Harvest', 'Carmen' and 'Maluma' (Crane *et al.*, 2013).

'Maluma', a new generation 'Hass'-like cultivar, was discovered, during the early 1990's, by Andries Joubert on his farm Maluma in Levubu, Limpopo, South Africa, as a chance seedling of unknown parentage. Joubert approached Allesbeste Nursery towards the end of the 1990's

to evaluate the variety. Plant Breeder's Rights (ZA 20043215) was granted to Allesbeste Nursery on 7 November 2004 and was released commercially, after 8 years of intensive semi-commercial research, at the VI World Avocado Congress held in Viña del Mar, Chile, during November 2007. 'Maluma' has been approved in South Africa as an export cultivar since the end of 2006. (Ernst, 2007). Currently 'Maluma' also enjoys full plant protection in the United States of America (US PP21, 099 P3, granted 29/06/2010), Morocco (239/09, granted 5/11/2009), Egypt (127, granted 12/12/2013) and Australia (4840, granted 07/07/2014). Plant Breeder's Rights has been filed and are pending in the other avocado producing countries such as New Zealand, Israel, European Union, Peru, Chile, Brazil, Argentina, Mexico and Columbia.

Table 1. Timescale for the evaluation of new cultivars at WTS (Van Rooyen, 2011)

Procedure	Years
Importation of bud wood (10 – 50 bud sticks)	0
Quarantine (≥ 1 year, 0 – 100% survival rate)	1
Experimental orchard (10 – 20 trees)	5
Large scale testing (50 – 1000 trees)	10
Pre-commercial testing	15
Commercial	20

According to (Van Rooyen, 2011) Westfalia Technological Services (WTS) is constantly on the lookout for cultivars which are similar or better than Hass and the commercial green skin cultivars. Seasonality, productivity, alternate / biennial bearing, fruit size and postharvest quality are specific traits under evaluation. Testing avocado genetic material is a long term process, starting with the importation of vegetative material, grafting it at the quarantine station, bulking up the material after quarantine and then establishing small scale experimental trials followed by larger scale trials, pre-commercial trials and finally commercialisation. In total this process can take anything up to 20 years and at least 15 years from the commencement of the large scale trial (semi-commercial testing of up to 2,5 ha) (Table 1).

The timescale for 'Hass' to find market acceptance took 22 years, if calculated from 1935 (date US Plant Patent was granted) until 1957 (when comprising 15% of the Californian crop). From the date of bulking up the material during 1999, after receiving the first material from Mr Joubert, and establishing the 'Maluma' semi-commercial trial block of 1,5 ha (408 plants / ha) during March 2001 until the commercial release during November 2007, respectively took 8 and 6,5 years. At the time of commercial release 'Maluma' has already proved to achieve market acceptance, among others by the ripe-and-ready programmes of the leading British supermarket, Tesco (Ernst, 2007).

Since the commercial release of 'Maluma' (November 2007) the cultivar, over the next 8 years (2007 – 2015), made significant progress in successfully establishing itself commercially abroad in the European Union and United Kingdom as well as on the local market in South Africa. This paper describes the active vertical integration and management of certain traits, key principles, activities, structures and role players in achieving the common goal of successfully establishing 'Maluma' commercially, with full acceptance at all levels, in a 'Hass' dominated marketplace.

COMMERCIAL ESTABLISHMENT

Profitability for the grower forms the basis and main driving force behind the successful commercialising of 'Maluma'. The platform for successful commercial establishment in the European Union and United Kingdom was laid during the 8 years after Allesbeste received the material from the breeder, Mr Andries Joubert. Full commercialising of 'Maluma' was made possible through the active vertical integration, facilitated by Allesbeste during the next 8 years, of the following:

Horticultural attributes

'Maluma's' horticultural attributes formed the perfect basis for its successful commercialising.



Figure 1. Precocious and productive 'Maluma' trees during second year of planting; a & b 12 – 16 months and c. 18 months after planting. Planting density, 1600 / ha

Figure 1 illustrates 'Maluma's' precociousness, with a high and fairly constant bearing pattern. Plant densities of up to 800 plants per ha (5 m x 2,5 m) are presently the standard recommendation, while an ultrahigh density planting of 1600 trees / ha is under trialling and looks promising. In contrast, Ernst (2007) found 'Hass' in a comparative trial to be a more vigorous grower than 'Maluma', with several upright growing leader branches and with dense lateral branching restricting good light penetration. 'Hass' is less precocious and moderate in production with a tendency towards alternative bearing (Bijzet, 2001; Newett *et al*, 2002).

In early areas with higher daily mean temperatures, 'Maluma' could be harvested for export up to 4 weeks before 'Hass'. The majority of the 'Maluma' fruit reaches commercial maturity at the same time. On high densities (400 trees / ha), to maintain a constant production of reasonable quantity, heavy pruning together with growth retardant sprays are necessary for 'Hass'. No growth retardant treatment is necessary to ensure a high production with 'Maluma'. Growth control with 'Maluma' is done annually after harvest, before flowering, through a light pruning. Hand pruning to maintain sufficient light penetration, supporting good inner fruit production, is recommended.

Both 'Maluma' and 'Hass' belongs to the A flowering group, of which, according to Gazit & Degani (2002), the female part opens in the morning and ends before noon, after which the male part will only open in the afternoon of the next day.



Figure 2. 'Hass' with in transit internal chilling injury (left) and orchard frost damage (right).

'Maluma', other than 'Hass', is not sensitive to internal fruit orchard frost damage and / or in transit internal chilling injury (Figure 2). 'Hass' has a larger count spread with a tendency towards small fruit (< 170g). 'Maluma' has pyriform shaped fruit, which are shiny in appearance, and turns purple-black when ripe, whereas 'Hass' has an obovate shaped fruit, dull in appearance and turn reddish purple when ripe. 'Maluma' illustrates a more evenly ripening pattern than 'Hass' (Figure 3). The seed of both cultivars are obovate with 'Maluma's' seed having a flat basis. The seed of the cultivars accounts respectively for 10-15% and 20-25% of the total fruit volume for 'Maluma' and 'Hass'. 'Maluma' with its better flesh ratio, therefore provides more value for money. Both cultivars have a semi-rough, pebbly (less for 'Hass') and leathery skin, 1-2mm in thickness. 'Hass' fruit are more susceptible to lenticel damage, which could account for export rejections. The fruit maturity dry matter level is 22% for 'Maluma' and 23% for 'Hass'. The flesh colour of 'Maluma' and 'Hass' is creamy-yellow with a light green rind while the texture is smooth with fibres almost non-existent. Both cultivars have an excellent, rich taste with 'Hass' having a slightly stronger nutty tone. 'Hass' becomes rancid at high dry matter levels (at approximately 35%). The shipping ability of both cultivars is excellent if the correct protocols are followed. 'Maluma' is slightly more superior to 'Hass' when it comes to shelf life and oxidation of the flesh after ripening. The efficiency (lower waste levels and more even) in ripening and sorting of 'Maluma' outperforms that of 'Hass' (Figure 3).

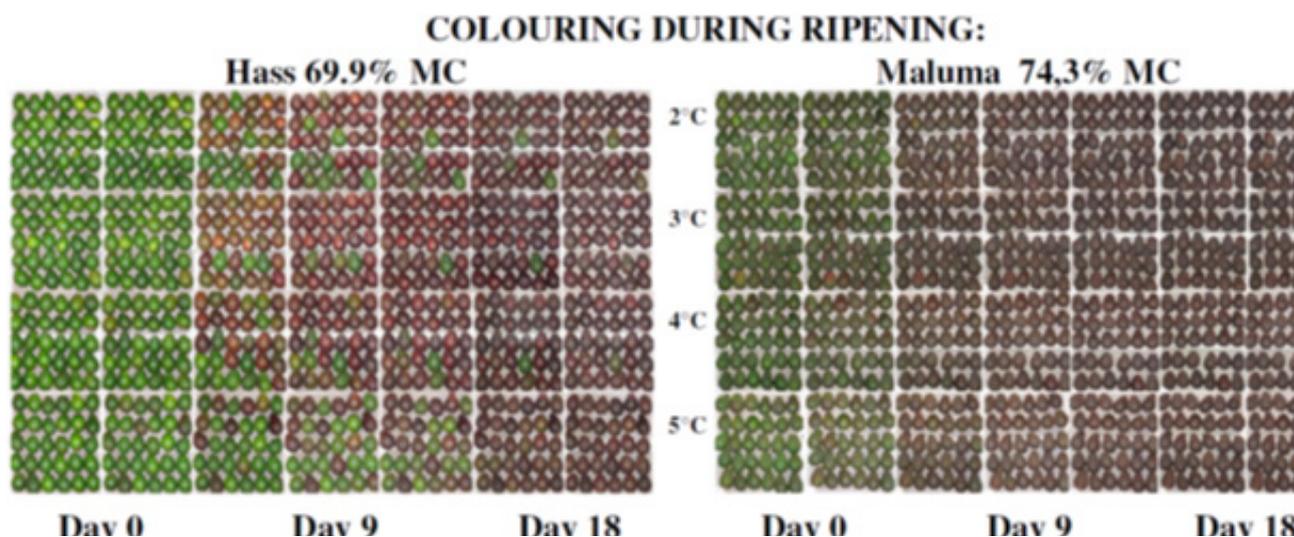


Figure 3. Colouring of 'Hass' and 'Maluma' stored at different temperatures and days.

As far as fruit diseases and disorders are concerned both 'Maluma' and 'Hass' are resistant to *Cercospora* with a fair degree of tolerance to Anthracnose. The presence of ring neck is less significant with 'Maluma'. With both 'Maluma' and 'Hass', fruit during shipping could efficiently be managed to prevent physiological disorders on arrival overseas. Both cultivars are fairly tolerant to insect damage.

A significant volume of fruit could be harvested during the second year with 'Maluma' (2600 kg / ha) compared to only about 500 kg / ha for 'Hass' on a 408 trees to a hectare planting, even though the 'Hass' was treated with uniconazole (1% at full bloom). 'Maluma' received no treatment at all.

Competent, loyal participants and service providers.

Commercialising a new cultivar successfully involves the integration of all structures and activities, vertically from seed to the customer's plate, on an ongoing basis. The identification of loyal and competent participants prepared to work with the cultivar, at all levels, proved to be essential. The successful commercialising of 'Maluma' involved the following structures and activities, as facilitated and managed / guided by Allesbeste:

- Allesbeste Nursery and other licenced nurseries able to propagate superior / quality 'Maluma' trees.
- Allesbeste Boerders (farming), ZZ2 Boerders and other loyal clients of Allesbeste Nursery (as well as other approved nurseries) initially prepared to invest in semi-commercial plantings of 'Maluma' and, after the announcement of commercialising, to have considered 'Maluma' as part of their cultivar composition. As 'Maluma' is a protected cultivar, the grower had to initially sign a Non Propagation and Testing agreement and thereafter the Non Propagation Agreement for growers. Picking and packing the fruit in

accordance with the prescribed 'Maluma' protocols, provided by Allesbeste, is essential.

- Pack houses: Letaba, ZZ2, Amondel and Mopanie, prepared to strictly follow the handling and packing protocols for 'Maluma' as provided and prescribed by Allesbeste.
- Export companies such as Afrupro Exporting, Summerfield / Core and Katopé / Univeg prepared to, where applicable, strictly follow the handling protocols for 'Maluma' as prescribed by Allesbeste.
- Perishable Product Export Control Board (PPECB) for the statutory regulated quality control on all export fruit.
- Haulage companies and shipping lines equipped to manage the cold chain requirements for exporting perishable products, in accordance with the 'Maluma' handling protocols as provided by Allesbeste and requested by the export company.
- Forwarding agents able to do the statutory clearances needed for exporting a perishable product.
- Competent receiving agents, strategically positioned to service the entire market and particularly the demand for ripe-and-ready fruit. 'Maluma' has proven to perfectly suit the ripe-and-ready market, outperforming 'Hass' on ease and evenness of ripening, waste levels and shelf life after ripening (ripe storage). The investment in efficient ripening, sorting and packing facilities is a prerequisite. The confirmation and approval of the agents' ability and established relationships, able to successfully work with 'Maluma', is important.

As indicated, all participants need to commit themselves to strictly follow the 'Maluma' handling and ripening protocols, frequently updated by and with guidance from Allesbeste.

Vibrant trade relationships

For the successful commercialising of 'Maluma' direct relationships were established with the trade, exposing and educating them to the unique marketing attributes of the cultivar and the handling protocols to be followed to successfully work the cultivar.

Additional economic value for all participants.

The additional economic value for all participants working with 'Maluma', is summarised as follows:

- Nurseries: additional tree sale as a result of the growing demand for 'Maluma' trees as well as the increased sales due to larger numbers needed for high density plantings.
- Higher throughput at pack houses and export companies followed by the increasing number of production units planted to 'Maluma' by growers, producing more fruit per unit (hectare planted).
- Significantly reduced waste levels at the ripening agents and higher profit margins with less customer complains.
- Increased returns for the grower as a result of the higher production, better count distribution and lower waste levels during ripening.
- Technical support, able to deal with the critics
- Since 2007, after the commercial release of 'Maluma' two problem areas were identified, namely pink vascular staining and soft arrivals in Europe. Both these disorders relates to the higher respiration rate of 'Maluma' after picking and can efficiently be controlled by storing fruit at < 6°C and in a controlled atmosphere (CA) environment. Picking fruit at a higher dry matter percentage and reducing the exposure to endogenous ethylene will reduce the risk of pink vascular staining (Ernst, 2011; Mhlophe & Kruger, 2012).

BRANDING AND PROMOTIONS

The uniqueness of 'Maluma' justifies the cultivar to be marketed under its own name. The designing of its own unique protected brand followed, supported by an aggressive branding drive, especially targeting the local market. A double branded carton was designed, with two sides of the carton dedicated to 'Maluma', resulting in improved visibility at trade level.

SIGNIFICANT MARKETABLE VOLUMES

In sharing the commercialising experience of 'Pinkerton', Brokaw (1989) highlighted the importance of planting significant hectareage of a new cultivar early, ensuring a critical mass. Hectareage is the cultivar's capital needed to build outlets.

Under the auspices of Allesbeste cooperative growers were identified soon after the inception of 'Maluma', to consider establishing semi-commercial trial sites on their properties. To protect the intellectual property rights of the cultivar, Non Propagation and Testing Agreements were signed with the participants. As a result of 'Maluma's' precociousness and productiveness the fruit numbers needed during the initial evaluation phases, in preparation for commercialising, could easily be met. Because of the confidence gained by growers in 'Maluma' during the semi-commercial phase, a constant demand for trees are experienced since the date of commercialising (November 2007), providing for the fruit needed to fulfil the increasing demand for 'Maluma' fruit.

Strategic establishment of new developments to secure future 12 months' market presence Strategic establishment of 'Maluma' plantings in all avocado producing countries to ensure future 12 months' market presence, initially in the UK and EU, being the countries presently supplied by South Africa. Countries of importance are:

- Spain – first commercial plantings during November 2015. Substantial growth expected. Vivero Blanco licenced to propagate 'Maluma' and appointed as agent to manage it in the EU.
- Peru – Semi-commercial trial plantings established since 2011 in all avocado producing regions. Full commercialisation since February 2015. Dr Odilo Duarte appointed as the agent for 'Maluma' in Latin America.
- Mozambique – Commercial plantings by Avos-in-Moz Limitada since 2013.
- Israel – Semi-commercial trial plantings commenced during 2015. Oren Wallach of Oren Nursery licenced to propagate 'Maluma' and appointed as agent to manage it in the Israeli territory.
- Egypt – Semi-commercial trial planting on the farms of Pico Modern Agriculture.

- Chile – ‘Maluma’ material released from quarantine during July 2015 after 2,5 years.
- USA – Non Propagation and Testing Agreement signed with the Regents of the University of California. Material still to be imported and quarantined.

As mentioned the active integration was achieved through Allesbeste’s vertical integration in all structures, from seed to the consumer’s plate, providing a platform for efficiently applying its inherent skills in all fields. The successes achieved thus far in commercialising ‘Maluma’ internationally were accomplished by a team effort of Allesbeste, applying its inherent skills in the relevant fields needed to commercialise ‘Maluma’. Allesbeste’s competency and relationships stretches over the following applicable fields:

- Horticulture.
- Services providing such as: nursery, farming, packing, exporting and liaising with different service providers.
- Establishing and managing trade relations.
- Agricultural economics.
- Technical and scientific knowledge in agriculture and especially on avocados.
- Branding and promotions.
- Volume management and related logistical aspects.
- Securing intellectual property rights and global commercial management.
- Relationships with competent and loyal consultants particularly in the technical and scientific fields, able to assist in finding solutions where and when needed.

CONCLUSION

From receiving the ‘Maluma’ material from Mr Joubert during 1999 and from establishing the semi-commercial ‘Maluma’ trial block during March 2001, it took 8 and 6,5 years respectively until the commercial release during November 2007. Since the commercial release of ‘Maluma’ (November 2007) the cultivar, over the next 8 years (2007 – 2015), made significant progress in successfully establishing itself commercially abroad in the European Union and United Kingdom as well as on the local market in South Africa. This achievement was made possible through the active vertical integration, facilitated by Allesbeste, of the following aspects: horticultural attributes, marketing attributes, competent and loyal participants, vibrant trade relationships and additional economic value for all participants, technical support, able to deal with the critics, branding and promotion, significant marketable volumes and strategic establishment to ensure future 12 months’ market presence. This active integration was achieved through Allesbeste’s vertical integration in all structures, from seed to the consumer’s plate. The successes achieved thus far in commercialising ‘Maluma’ internationally were accomplished by a team effort of Allesbeste, applying its inherent skills and relationships, in the relevant fields needed to commercialise ‘Maluma’.

REFERENCES

- Bijzet, Z. 2001. Cultivars. In, The cultivation of avocado. Ed. De Villiers, E.A., 2001. Nelspruit. Institute for Tropical and Subtropical Crops. p. 65.
- Brokaw, W.H. 1989. Introducing new cultivars: needs vs. risks. California Avocado Society Yearbook 73:121-126
- Bruwer, T. & Van Rooyen, Z. 2007. Performance and market acceptability of the Hass-like cultivars Gem and Harvest in South Africa. Proceedings VI World Avocado Congress (Actas VI Congreso Mundial del Aguacate) 2007. Viña Del Mar, Chile. 12 – 16
- Crane, J.H., Douhan, G., Faber, B.A., Arpaia, M.L., Bender, G.S., Balerdi, C.F. & Barrientos-Priego, A.F. 2013. Cultivars and rootstocks. In, The avocado botany, production and uses. 2nd Edition, Ed. Schaffer, B., Wolstenholme, B.N. & Whiley, A.W. 2013. Oxon. CAB International. Publishing, p. 205.
- Ernst, A.A. 2007. Maluma Hass® : a New released cultivar in comparison with Hass. Proceedings VI World Avocado Congress (Actas VI Congreso Mundial del Aguacate). Viña Del Mar, Chile
- Ernst, A.A. 2011. Interaction of storage, ethylene and ethylene inhibitors on post harvest quality of ‘Maluma’. Proceedings VII World Avocado Congress 2011 (Actas VII Congreso Mundial del Aguacate 2011). Cairns, Australia.
- Gazit, S. & Degani, C. 2002. Reproductive biology. In, The avocado botany, production and uses. Ed. Whiley, A.W., Schaffer, B. & Wolstenholme, B.N. 2002. Oxon. CAB International. Publishing, p. 101.
- Lemmer, D. & Kruger, F.J. 2015. Development of appropriate storage temperature and ripe-firmness parameters for the Maluma cultivar. Presentation, South African Growers Association Symposium.
- Mhlophe, S.D. & Kruger, F.J. 2012. Effects of harvest maturity, storage temperature, controlled atmosphere and SmartFresh on the post-harvest vascular staining disorder of ‘Maluma’ avocado fruit. South African Avocado Growers’ Association yearbook 35
- Newett, S.D.E., Crane, J.H. & Balerdi, C.F. 2002. Cultivars and rootstocks. In, The avocado botany, production and uses. Ed. Whiley, A.W., Schaffer, B. and Wolstenholme, B.N. 2002. Oxon. CAB International. Publishing, p. 161.

- Roe, D. & Brokaw, R. 2007. Intellectual property rights applicable to fruit trees and the likely effects on regional and global avocado industries. Proceedings VI World Avocado Congress (Actas VI Congreso Mundial del Aguacate) 2007. Viña Del Mar, Chile. 12 – 16
- Shepherd, J. & Bender, G.S. 2001. A history of the avocado industry in California. California Avocado Society Yearbook 85: 29-50
- Stradley, L. 2004. All about avocados: History of the Hass avocado.
<http://whatscookingamerica.net/avacado.htm>.
- Van Rooyen, Z. 2011. New developments in horticultural research at Westfalia, South Africa. Proceedings VII World Avocado Congress 2011 (Actas VII Congreso Mundial del Aguacate 2011). Cairns, Australia. 5 – 9 September 2011



ACTAS • PROCEEDINGS

VIII CONGRESO MUNDIAL DE LA PALTA 2015

del 13 al 18 de Septiembre. Lima, Perú 2015

www.wacperu2015.com

