HISTORY
Avocados were likely introduced into South Africa by settlers coming from the West Indies and other Dutch colonies between 1652 and 1700. Supporting this theory are references to early specimens suggesting that they were all seedlings of the West Indian race. Interestingly, in some parts of the country large, low-oil fruit from West Indian seedling trees are still preferred over higher quality avocado varieties introduced from California.

Between 1932 and 1938 the first experimental avocado cultivar evaluation block was planted for the Department of Agriculture near Nelspruit (see Figure 1). Large-scale plantings of avocado commenced in the same region in 1938, once it was shown that the imported California varieties performed well in the region. These plantings were mainly made in the mountainous areas of the Lowveld — (Figures 2 and 3) a region characterized by grasslands, thorn tree scrub and abundant wildlife.

THE INDUSTRY
Climactically, the industry is mostly located in warm to cool subtropical areas with a predominantly summer rainfall of approximately 30 – 45 inches. Most soils are of granitic or doleritic origin, are highly leached, acid to very acid, and are infertile. They are mostly oxisols (red clay loams to loamy clays), and are basically well drained in spite of clay contents from 20 to over 50%.

The avocado industry currently consists of around 3 million trees planted on approximately 36,000 acres. Total production varies between 125 to 250 million pounds. The most important production areas are Tzaneen with 38% of the trees, followed by the Nelspruit area at 33%, Levubu at 21% and the Natal Midlands at 8% (Figure 1).

In 2001, South Africa was the largest exporter of avocados worldwide. About 60% of the total avocado crop is exported annually with 97% of this destined for the EU. The export volumes are around 50/50 Hass/Fuerte with a small amount of Pinkerton. The largest EU markets for South African avocados are Germany, France and the U.K. South Africa’s main competitors on EU markets are Kenya, Spain, Mexico, Chile, Israel, Peru and the U.S.

Figure 1. Most avocados are produced in the eastern part of South Africa, a subtropical region with summer rainfall.
The South African avocado industry is under the leadership of the South African Avocado Growers Association (SAAGA) which is funded by voluntary levies from all members. Its mission is to improve the economic viability of the production, packaging and marketing of avocados.

SAAGA encourages coordinated fruit exports, funds limited field and postharvest research, and organizes grower meetings. Two field representatives and one technical officer serve as the “extension team” working with the approximately 500 individual growers. Under SAAGA’s leadership, the industry is very tight-knit, with most growers participating in monthly “study group” meetings held in each region. These meetings generally include a field tour and barbecue, and serve as both educational and social functions. Growers are quick to embrace new technologies and are progressive by world standards. SAAGA produces an annual yearbook containing the results of their research, a monthly newsletter called AvoInfo, and they also run a website at: http://www.avocado.co.za/

Avocado consumption in South Africa has been increasing due to efforts by SAAGA to develop the domestic market. Their marketing tools emulate those used by CAC and include radio campaigns, celebrity chef recipe features, recipe competitions and print advertisements. Current domestic consumption is between 2.5 and 3.0 lbs. per capita, with a long-range target of 5 lbs.

PLANTING AND ORCHARD SYSTEMS

There are six registered avocado nurseries in South Africa producing certified disease free trees. Most new trees are on clonal rootstocks with Duke 7 the predominant choice. The Merensky series of clonal rootstocks developed by Merensky Technological Services, Tzaneen, is showing promise in local trials and the first trees will be available to South African growers in 2003.

Most orchards are now trained to hedgerows with trees spaced approximately 12–15 feet in the row. Rows are spaced 18–20 feet apart. A combination of mechanical hedgerow cutting and plant growth regulators (triazoles) are used to control vegetative growth (Figure 4).

While in many growing areas summer rainfall is abundant, winters are very dry and irrigation is required to maintain production and optimal tree condition. Systems generally are similar to those in California with Israeli designed mini-sprinkler systems dominating the industry. Leaf and soil analysis are performed routinely and tree nutrition is
Anthracnose can also be a serious problem in wet areas on all varieties. Recently, Colletotrichum spot has been a problem on Pinkerton fruit. Phytophthora root rot decimated the industry in the 1960’s and 70’s. Much of the early work on phosphorus acid for Phytophthora control was conducted in South Africa and today treatments with commercial phosphite products are routine. While many growers still use injection techniques to apply the product, there is a move toward foliar sprays to mitigate tree damage. For a detailed description of the techniques currently used for Phytophthora control in South Africa, see the inset on root rot in the previous issue of AvoResearch (Vol. 2, Issue 1). Phosphorus acid for Phytophthora control was conducted in South Africa and today treatments with commercial phosphite products are routine. While many growers still use injection techniques to apply the product, there is a move toward foliar sprays to mitigate tree damage. For a detailed description of the techniques currently used for Phytophthora control in South Africa, see the inset on root rot in the previous issue of AvoResearch (Vol. 2, Issue 1).

International Food Safety Requirements

With an emphasis on export markets, the South African industry is moving rapidly to adopt several food safety requirements of the international community. The European Union, and particularly the United Kingdom have become particularly sensitive to food safety issues. SAAGA is currently working with a consultant to deliver a EUREP-GAP (Euro Retailer Produce Working Group — Good Agricultural Practices) document for growers to achieve compliance within the EU.

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This will be followed by similar documents for the packing industry which will include a GMP (Good Manufacturing Practices) manual and a HACCP (Hazard Analysis Critical Control Point) manual. Both of these manuals will allow for rapid identification and rectification of food safety and quality problems in the handling chain. (Note: CAC recently received a $150,000 grant from the CDFA Buy California Initiative to produce similar documentation.)

If this is not enough, some of the EU’s retail giants are doing third-party audits of local groves, picking operations, and packing facilities and have raised the bar of food safety standards above international norms.

**Research**

Research projects on avocados are mainly conducted by three entities. Two of these are public institutions, the University of Natal, Pietermaritzburg, and the Agricultural Research Council’s Institute for Tropical and Subtropical Crops, Nelspruit. The private Merensky Technological Services near Tzaneen receives very limited public funding, but is a very prolific avocado research institution (Figure 5). The new Merensky series of rootstocks originate from the latter organization.

Research projects currently underway in South Africa include cultivar breeding and evaluation, tree nutrition and physiology, manipulation of growth and fruiting, pest and disease management, and postharvest physiology. Research results are presented annually in summer (February) at the SAAGA Research Symposium. For a copy of their latest research abstracts, visit the SAAGA web site at: http://www.avocado.co.za/

**The Future: Strategic Positioning for the U.S. Market**

In spite of enormous transit distances, South Africa regards the U.S. domestic market as an important future destination for their fruit. This is because they believe they could deliver Hass fruit to the U.S. domestic market from June through September, the period we currently have to ourselves. Also, their production costs are low (skilled farm labor is paid around $0.50 to $1.10 per hour resulting in harvest costs of 0.5 to 1 cent per pound of fruit), and foreign exchange rates from an undervalued currency drive exports.
PLANTING TREES ON CLONAL ROOTSTOCKS

Guy Witney
California Avocado Commission, Production Research Program Manager

With good returns for Hass on domestic markets, the California avocado industry is in a tree planting boom, and many growers are experiencing long waiting periods for tree delivery. As a result, some are accepting delivery of whatever Hass trees they are able to procure regardless of rootstock choice, perhaps without fully realizing the impact this may have on production in the future. This article is an attempt to answer the many questions received by the CAC Production Research Program not only on rootstocks in general, but also specifically as rootstocks are known to influence Hass production.

To simplify this article, it is useful to consider what constitutes a viable nursery tree. Fundamentally the tree needs to have functional shoots and roots. In horticultural terms, the shoot system is the scion variety and the root system the rootstock variety. In avocados there are three simple options for a viable tree: The scion could be growing on its own roots as a rooted shoot cutting; the scion could be grafted onto a germinated seed (called a seedling rootstock); or the tree could be grafted onto a clonal rootstock (a genetic selection duplicated over and over in the nursery).

Why do we use rootstocks at all?

Why not grow avocados on their own roots? For example, why do we not have Hass trees rooted on Hass roots? Perhaps one of the most basic reasons that we use rootstocks in avocado cultivation is that it is notoriously difficult to get roots to develop on avocado shoot cuttings. Many well known researchers have tried in the past, including Schroeder, Gustafson, Frolich, Platt, Kadmian, Ben-Y’acov, and Salazar-Garcia. Cuttings, air layering and tissue culture have all been attempted to propagate avocado varieties on their own roots, but few successes have been reported. While a contributing factor, the difficulty encountered in propagating trees on their own roots is not the only reason rootstocks are used in avocado cultivation.

Imagine a tree growing in a grove in California. The root system and the shoot system exist in very different environments, each with its own set of environmental constraints. For example, the shoots, flowers and fruits may be exposed to extremes in temperature, desiccating Santa Ana winds, and a burgeoning range of pests. While simultaneously the roots may be challenged by shallow soils, Phytophthora root rot, wet and cold conditions or other constraints. We have selected scion varieties (shoots) and rootstock varieties (roots) to meet some of these challenges. Each part (rootstock and scion) contributes different attributes to the tree as a whole, and the combination determines the overall productivity of the tree. Using conventional breeding techniques, it would take a very long time to develop an avocado tree with the genetic makeup that results in both an ideal root and shoot system on the same un-grafted tree. While genetic engineering may offer this promise in the future, this science has a long way to go before delivering the ideal avocado tree in a single package. By grafting, we can select the best combination of root system and shoot system for specific orchard environments, resulting in productive trees with good quality fruit.

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