



The Westfalia property extends to the ridgeline along the horizon. Avocado (foreground) and timber (midground) blocks are visible. To the left is African blue basil which is used to attract pollinators.

## Westfalia Fruit and Westfalia Technological Services

**D**uring the Avocado Brainstorming meeting in late May, the attendees were treated to a full-day tour of Westfalia Fruit and Westfalia Technological Services. The day started at the packinghouse where we were treated to traditional dancing and singing by the packinghouse crew. We were told they start every day like this. The day finished late in the evening with a traditional South African braai (barbecue).

Westfalia's story dates to 1895 when the 15,000-acre property was purchased by a couple from Germany's Westfalen province and the estate was named "Westfalia." The farm originally grew eucalyptus, corn, tobacco, cotton, citrus and a few avocados. In 1914, the

estate was sold and subsequently fell into disrepair until it was purchased by Dr. Hans Merensky in 1929.

Merensky's philosophy was that the land should be used in harmony with nature. He implemented agricultural and forestry programs to help preserve water resources and prevent soil erosion. In 1939, Merensky moved to the property permanently and redoubled his efforts to preserve its resources. The farm became a model farm and Merensky invested generously in the local community, supporting schools and universities, and establishing scholarships.

Merensky left specific instructions in his will for how farming efforts should continue at Hans Merensky

Holdings (HMH) after his passing. He specifically directed the HMH Board to solve root rot problems "by research and demonstration and through the correlation and application of scientific knowledge."

### Phytophthora Root Rot Research

What is today known as Westfalia Technological Services, got its start in the early 1970s when Westfalia assembled its first avocado technical team. Those early efforts focused on fungicide trials, developing clonal rootstock techniques and screening for seedling rootstock selection.

In the early 1980s, Westfalia pio-



*We were greeted with singing and dancing by the Westfalia packinghouse crew. They begin each morning with this celebration to give thanks to the Earth and the abundance it produces.*

neered the use of trunk injections of fosetyl-Al (Aliette®) for the control of phytophthora root rot. The subsequent work resulted in the discovery that it was the phosphorous component that was key, and the same results could be achieved using phosphorous acid. Westfalia currently uses a product called AvoGuard, which is a buffered phosphorous acid product.

Today, Westfalia is still injecting those original trees that have now been injected for almost 40 years. Injectors have had to slowly move up the trunk of the tree and, in some cases, are now injecting major scaffold limbs.

Westfalia's system has evolved from the early days when a generator and long extension cords would be carried into the field. Today, a 10-person team — two drillers and eight injectors — can cover about 15 acres per day. They make their injections during October/November and February/March to coincide with root flushes. To keep things simple for the field crews, they use a long pole with hash marks every one meter. This pole is used to measure

the canopy diameter and determine the number of injections based on a table that has been developed during the company's many years of experience.

Westfalia currently has about 600 acres of trees still on seedling rootstocks. Each of these trees receives one maintenance injection per year, except

in weak areas where two injections are done per year.

## Rootstock Selection Program

Westfalia is arguably most famous for its rootstock selection program, which developed the Dusa rootstock (also known as 'Merensky 2'). The rootstock selection program at Westfalia has been around since the earliest incarnation of the technical program, having been called for by Merensky himself. Today, I would characterize the Westfalia rootstock selection program as a finely tuned, precision machine.

Westfalia's rootstock selection program begins on Fire Tower Hill, an isolated grove of avocado varieties specifically selected for their phytophthora tolerance. By isolating these varieties, Westfalia can have a high level of certainty that the progeny (seeds) from this block are the result of cross pollination among the selected varieties. Researchers are striving for hybrid vigor, whereby a seedling inherits traits from both parents and has a level of tolerance that is more than just an additive effect



*Stefan Köhne (right) discusses the development of phosphorous acid injection technology for phytophthora root rot management in the original grove used for trials in the early 1980s. (Inset, lower left) A closeup of the trunk of an original tree from the phosphorous acid injection trials still being injected today.*



*The killing fields where new rootstocks are tested. Note the poor condition of the larger trees just beyond the young trees.*

of the parents.

The second stage of the program is where many programs fail — planting large numbers of seeds. Westfalia plants about 10,000 seeds a year. Unlike breeding in apples, for example, where controlled crosses can be made by moving pollen from one flower to another, avocados rely on natural cross pollination (hand pollination is laborious and results in very low fruit set). Thus, finding that elusive superior tree is a numbers game — the more seeds planted, the greater the chances of success.

After the seeds are collected, they are germinated and the seedlings are grown in a greenhouse for six weeks exposed to phytophthora. Any seedlings surviving after six weeks are propagated to produce 10 clones and those 10 clones are re-screened for another six weeks. Anything still surviving and performing as well or better than Dusa is re-propagated and moved to the “killing fields.”

The killing fields is a site with high phytophthora infection. To ensure that

the phytophthora stays active, Edranol seedlings — highly susceptible to phytophthora — are planted with every batch of test trees. In the killing fields, potential rootstocks are first planted without a scion variety grafted on top.



*Dr. Ben Faber, University of California Cooperative Extension Farm Adviser, next to Gem trees planted in November 2015 under shade netting (left) and outside adjacent to the shade net (right).*

If they continue to perform well (2-3 years), another group will be planted with Hass grafted on top (2-3 more years). Finally, those still performing well will be propagated with several different scions for final evaluation in the killing fields (another 2-3 years).

After this final stage of screening in the killing fields, the best performing trees will move to semi-commercial trial sites. These trials consist of planting 2.5-acre blocks with half of the trees on the new rootstock and half on Dusa (or another commercial standard for the growing region). These trials are all conducted off Westfalia property, in various growing regions in cooperation with commercial growers, to ensure an independent evaluation.

The process from the time a seed is planted to commercial release takes about 20 years. Westfalia is confident it has several new rootstocks better than Dusa that will be released in the coming years. A similarly structured program is in place for selecting new fruit varieties as well.



*Hiking trails abound on the Westfalia estate. This plaque along one trail documents the historic nature of the adjacent block and the pioneering work done there to develop the phosphorous acid injection technology.*

## Shade Netting

Westfalia also is working on improving production practices to help growers produce the highest quality fruit. In Soekmekaar, about an hour north of Tzaneen in Limpopo province, avocados grow very well. The area is at an elevation of about 4,000 feet, receives good rainfall (about 40 inches annually) and fruit mature for the late market. But the area is prone to high winds and hail storms, resulting in 20 percent more grade #2 fruit than in other growing areas.

In November 2015, Westfalia established a 3.5-acre shade net trial with Gem trees. The trees are planted with 6.5 feet between trees and 20 feet between rows. An equivalent planting was established outside the net at the same time. The net produces 20 percent shade and the roof incorporates three different hail release systems.

Westfalia reports the netting has resulted in a 6.2 percent increase in grade #1 fruit compared with the non-netted control, with a 17 percent reduction in wind scar. In addition, the netting resulted in a shift in fruit size to one size larger on average and reduces tree water use by 3.2 percent.

Ben Faber and I studied the net-

ted trees carefully and noticed the netting also affected the growth of the trees. Outside, Gem looked as expected — upright and compact. However, under the netting, the trees appeared stretched, with longer branches, and were significantly taller.

Westfalia is a progressive com-

pany with a proven track record in research and development. Hans Merensky left a tall order for the company, but the team that has been assembled has risen to the challenge. It will be interesting to watch and see what new discoveries come from Westfalia Technological Services over the next few years. 🥑