

OF HYDROPONICS

INNOVATION

AT ITS BEST



This is the first part of a two-part article.

I have described a little of the area in which I live in previous stories. For those new to the Growing Edge, briefly my home city of Tauranga is the major center of kiwi fruit country, a strip of relatively flat, sub-tropical land on the east coast of the North Island of New Zealand, where the climate is buffered by exposure to the Pacific Coast on the east side and protected by the Kaimai Mountain range on the west.

Today's story takes me over that range to one of the highest producing dairy areas of the world, the Waikato Valley. The rich soil and ideal climate grows terrific pasture grass, and while dairy cows get the lion's share of the grass, the area also supports

Bruce (left) and Brian Dewhurst demonstrate the speed at which transplanting takes place. The plants from the nursery gully directly in front of them are being transferred into the final growing gullies. Note the hole spacings.

When New Zealand growers Bruce and Brian Dewhurst first started growing hydroponically, they decided to grow winter lettuce, a product that was not being imported and that would fetch premium returns. Their success is now a matter of record.



Right: From the summit of the Kaimai Mountain range we look down to a very small portion of the Waikato Valley, a high-intensity grassland dairy farming area.



Above left: Raw water is pumped from an underground bore and enters the iron/manganese treatment cylinder shown at right. The hardness is adjusted by pump injecting a softener (center) and then enters the reverse osmosis unit (left). *Above right:* Most of the 25 growing structures on the site follow this simple design. High-tensile rectangular hollow section framework is roofed with horticultural plastic film. The sides are covered with standard shade/wind break cloth. This particular house is exposed to the open ground.

the blood stock industry along with exotics such as emu from Australia, alpacas from South America, etc.

New Zealand has much in common with our friends in the United States. As I have previously noted, both country's were built with a great deal of pioneering spirit. Waikato Valley farms were broken in by those early pioneers, and soon groups of farmers, in many cases as small a number as six, would get together and build a co-operative cheese, butter or casein factory. When I first went to the Waikato Valley in 1952, there were literally dozens of small villages, each with their own dairy factory. Factory workers supported local stores and garages and sent their children to local schools—in other words, complete communities.

In the late 1950s, the “bean counters” started agitating to get rid of some of the smaller factories because they said that small units were not cost-effective. For the next few years, amalgamations took place until today we have only a handful of huge factories that use large road tankers to cart milk products for many miles from all those small farmers. “So what?” you may ask. Without work in these small villages it wasn't long before the communities started to flounder, so that today many of them are simply a name on a road sign and no longer can you hear the cheerful laughter of children at a local school or see weary

workers enjoying an after-work drink at a local pub. For all intents and purposes the era of New Zealand having its strength in country communities is gone forever. Of course, with modern transport and better roads the country people of today can pop into their local town or city center with relative ease, and the new younger generation will know little of the pioneering sweat that first broke in the land and developed the country's No. 1 industry all those years ago.

As one now drives from town to town, old derelict buildings are often seen. Upon

close inspection faded sign writing can sometimes reveal that this was once the proud Manganatoki co-operative cheese factory, or there is now a new business such as an agricultural contractor working in a very random designed building, which it turns out used to be a dairy factory but has been modified to suit its new use!

I would not blame you if you were to ask, Why are you regurgitating all this history? Well, apart from the fact that my information is that a very similar process has taken place in the United States, it is also the reason why my story today came

Tourists cannot believe how green New Zealand is! This Waikato Valley area is typical of Thoroughbred horse country. This photo, taken in July in the middle of our winter, shows there is a reasonable cover of grass for animal grazing.



into being! Many of those old dairy factories produced whey as a by-product, and this had to be disposed of. One popular use was to use it as feed for pigs and, therefore, many small industries were also established as a result of those dairy factories. Brian Dewhurst was one of those people who were made redundant by the closure of the local dairy factory. He had been a successful pig farmer, and one assumes that had the factory kept going that is what he would still be doing today!

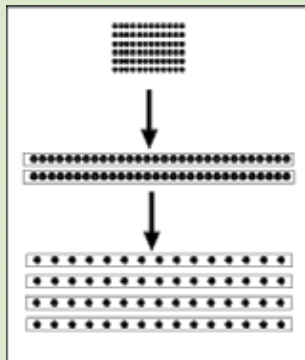
His family owned a few acres close by, and so with the pig farm closed down in 1982, Brian decided to see if he could grow tomatoes in this newfangled hydroponics on the family property. For the next few years he persevered with the tomatoes and experimented with other crops such as peppers. His brother Bruce was at this time a communications company department manager. In the early '90s, fruit and veg agents started importing cheap outdoor tomatoes from Australia, seriously affecting the New Zealand greenhouse grower. So in 1994 the two brothers got together and decided that the real success potential was to grow a product that would not be imported and to grow when the returns would be at a premium—winter lettuce, both as a fresh head product and also as a processed product. Their success is now a matter of record, with now having to turn down prospective clients for their high-quality products, because they just cannot meet the demand.

The question now was, OK, we get a good price for lettuce in the winter, and as a regular supplier we need to be consistent and supply product in the summer, but almost anyone can grow lettuce in the summertime, so what else could we grow to return a premium over the summer months? The very successful answer they came up with was calla lily bulbs for export plus an additional cash flow developed from the sale of the flowers, which were a by-product of growing the bulbs to export size! (I will write an in-depth story about the calla operation in another issue.)

Brian had learnt much about the pitfalls of growing, and Bruce had a very strong head for business, especially marketing.



Top: Bruce selects a sample tray of plants in the nursery house. Note the overhead sprinklers and HPS grow lights. *Above:* Bruce shows the solid root ball that has developed. *Below left:* This drawing shows the three stages in the plant-management system. *Below right:* The roots are naturally air-pruned so that no damage is suffered when the plant is removed from the tray.





Left: A proportion of the whole site grows two crops of lettuce through the winter. In late spring, the lettuce gullies and support frames are removed to allow the growing of tissue-cultured calla lilies to be grown on, in the same greenhouses. *Above:* Tauranga looks out to the east coast of New Zealand.

Today, it's a real family operation for the brothers, with two sons, a daughter plus four permanent employees and a host of temporary workers for the calla season flower harvest.

They started prioritizing those things in the operation which to them would be important. Number one was quality. As long as you are dedicated to not just quality but “the best available quality,” then you will always be first in line with potential clients. Second was, What are the important aspects of growing hydroponic lettuce? Bruce explained that there is not much point in having a gold-plated greenhouse if you have not got a really good quality water supply! Whereas they could get away with up to 180 ppm of sodium when growing tomatoes, they needed to be under 20 ppm sodium to grow good lettuce. So it was that a full treatment system was installed, consisting of iron and manganese deionization followed by physical filtration, pH correction, and then reverse osmosis purification. Bruce reckons the extra production and quality paid for the whole water treatment system in under six months.

They discussed the physical needs of growing a good lettuce and came to the conclusion that there were three main considerations. First, it is important to keep heavy rain off the product, and probably best still, for no rain to get on the product, so a roof is required over the crop. Second, it is important to keep wind off the crop. A gentle breeze is fine, but wind stresses the plant and definitely reduces the quality of leaf, so wind break on three sides of each structure was essential. The fourth

side had to be left open to satisfy the third requirement—in order to grow the desired volume of product, judicious use of every square foot of structure had to be made, and this was the birth of an extremely innovative crop-management system that at first seemed impossible to me, yet was shown to be so easy and effective that these guys should be organizing the space program. Their motto: simple but effective.

Marketing Plan

The basis of the marketing plan was to develop a list of consistently reliable clients for their processed lettuce. This they have achieved to the extent that they have had to close that list because demand still outstrips supply. During the slowest winter production, their fresh-head lettuce supply may well dwindle to zero for a few weeks in order to provide for the demand of the processed product.

The site has 25 greenhouses, and they utilize an innovative management principle. The growth of a lettuce is extremely exponential, so the philosophy for a start is to grow the seedlings for as long as possible in 60-hole seedling trays, then as growth demands plants are then placed into gullies with hole spacings of 120 mm (± 5 inches). These plants grow on until the roots are nearly touching the neighbor's roots, at which time they are transferred into gullies with 250 mm spacings (± 10 inches). As mature gullies of product are removed from the structures the newly planted (250-mm spaced) gullies fill the emptied spaces.

Let's follow through the process. The plants are seeded into 60-hole seeding/

propagation trays. These are placed on benches in a purpose-built nursery greenhouse, complete with overhead misting and lighting systems. When the plants are large enough they are transplanted into nursery gullies and are allowed to grow at high-density population until size dictates they need to move on, at which time the whole length of gully complete with plants is lifted and transported, either by hand if close to final position or by trailer unit if some distance has to be covered from nursery point to final growing location, where they are again transferred into the final growing gullies.

This may at first seem an onerous job, but in fact as long as the roots have not been allowed to intermingle and as long as the transfer is done while the gully is still holding plenty of nutrient which allows the roots to fall and hold together (imagine how long wet hair holds together), then the speed at which the task is completed seems to defy logic!

The actual growing system is based upon the concept of rolling benches. These were designed some years ago and allow for the NFT gullies to be placed hard against each other while the plants are small, and then gradually spaced apart as the lettuces increase in size. Bruce and Brian came up with a revolutionary departure using this tried-and-tested concept.

In the next issue of *Growing Edge* I will investigate the Dewhursts' modifications to their system, management techniques and postharvest treatments. 🍃

Rob Smith is a regular contributor to Growing Edge.