



# **NFT** in **BRAZIL**

**MAURICIO MATHIAS** chronicles the development of hydroponics and NFT technology in Brazil, and profiles three successful salad producers with different market approaches.

## The History



The basic NFT system introduced into Brazil by Shigeru Ueda from Japan in the 1970's.



Pioneer researcher Dr Pedro Furlani (centre).



Early hydroponics was used as a research tool to grow crops such as coffee and citrus.



If a foreign visitor had come to Brazil in the 1980's or 90's, only to return now, he or she would notice a great difference in the cultivation and marketing of hydroponic produce. Even though there is still room for improvement in different parts of the supply chain, much has evolved in the last years.

In the 70's hydroponics was already being used in academic circles, but there were no commercial applications at that time. Even as a research tool it was used for crops such as citrus and coffee, perhaps more so than for the leafy vegetables that made it popular. Now retired researcher Dr Pedro Furlani, a plant nutrition expert, is a veteran of those days and has continued in the sector as a private consultant. His first practical contact with it was in 1973 in an Al-tolerance trial, and the experience he gathered along the years would prove valuable in time.

Towards the end of the 80's, Mr Shigeru Ueda, a grower from Japan, brought with him the basic principles of what was already in common use there – NFT (Nutrient Film Technique). He had to make some adaptations since most of the materials needed simply weren't available in Brazil at the time. His basic unit consisted of corrugated fibro-cement (or asbestos-cement) roof tile covered with a plastic liner. These tiles are relatively

inexpensive and easily found throughout the country. The tile 'valleys' formed by the corrugation were half-filled with gravel, which anchored the lettuce roots. These tiles (measuring about 1 by 1.5m each) were connected lengthwise, thus forming long gullies on raised bench tables. Each table included a cover to protect the crop from rain. The structures were placed side by side with a path in between, not unlike raised growing beds in a field.

In spite of these humble beginnings, market success soon followed. At the time, the increasing number of working moms was ready for a cleaner product with fewer pesticides and without bugs, and individually wrapped. Growers benefited from lower pesticide use (at least in the initial phase) and higher yields since there were fewer pests and diseases to contend with. To top it off, lettuce plants had practically no yellow leaves at the bottom to discard, unlike soil-grown plants. Retailers and consumers alike benefited from the longer shelf-life, and that was all before there were specific breeding programs for hydroponic plant material.

The market demand spurred new growers, who in turn looked for advice; only there was none available. Ueda himself stopped growing altogether to become a lecturer and later a fertiliser supplier to a growing market. Improvements on the initial setup



replaced the stones, which built up algae, with a top liner that helped to keep the plants upright and prevented the sun's rays from reaching the solution. Without a rooting medium, these systems became true NFT using a free-flowing solution.

The very first cell-trays to start plants used cotton as a rooting medium, then vermiculite was tried, but both left the root exposed and sensitive at the transplant stage. Finally, most growers settled for phenolic foam (oasis plugs), which is still predominant. As different people went about their own adaptations and inventions in various parts of the country, the top liner was replaced by a styrofoam sheet and the corrugated tile eventually gave way to PVC pipes. Initially, holes for the plants were drilled at regular intervals; later, the pipes were cut in half lengthwise and then closed with a pre-drilled styrofoam lid for insulation.

Slowly, manufacturers of plastic goods noticed the growing market and started to offer specific materials to hydroponic growers: pipes with square sections for more root-solution contact area; with removable lids for easier cleaning. More recently, pipe covers with a reflective surface became available. Fertiliser manufacturers also followed suit and marketed high-quality soluble macro and chelated micro nutrients – initially, growers had to make do with field fertilisers.

This historical perspective occurred at a time when the Internet was just starting to become popular. There were few books available in Portuguese, and even fewer extension professionals with hands-on experience in hydroponics. Plus, throughout the 80's and 90's the Brazilian currency was weaker than the US dollar, making imported products uneconomical to the average

grower. During this period there was little awareness of what was already in practice overseas and a home industry gradually developed by trial and error, a sure-fire, but very costly pathway.

The industry's slow development in those days can be attributed to the sliding national economy. Hyperinflation was only controlled in 1994. While hydroponic salads were well-received by part of the public, they still had a long way to go to become mainstream. For most consumers, 'hydroponics' was a novelty and perceived as somewhat chemical or artificial. Slowly but surely a more balanced view prevailed and hydroponic produce managed to carve out a niche for itself, very much like organic produce did more or less during the same period. But unlike the organic movement, hydroponists never organised a representative association. To this day, as one travels around Brazil, the same growing problems can be seen in different regions. Without sharing their experiences, countless growing solutions have been devised by individuals who often re-invent the wheel.

### Courses and the 90's Boom

The Brazilian economy stabilised in the second half of the 90's. By then researchers had adapted existing knowledge to national conditions as well as contributing their own ideas. Starting in São Paulo (SP) state, the most populated and industrialised part of Brazil, workshops and seminars on hydroponics began to be offered.

Among those who were at the very start of hydroponics in Brazil was Dr Pedro Furlani, now retired after 35 years at the IAC research institute and now heading his own plant nutrition

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company, Conplant. At a recent congress in Mexico he was elected vice-president of the International Association of Hydroponic Consultants. Besides his consultancy work, he teaches at weekend seminars in partnership with a local hydroponics equipment supplier, and at week-long plant nutrition refresher courses. Since the very first hydroponics meeting in 1994 in the city of Campinas, SP, he points out that a lot has changed.

"We have a new generation now growing in NFT systems. When it first started it attracted a lot of the urban public from all walks of life, who had little or no experience with plants. Few of those still remain in the biz. Today, the average NFT grower is someone who has been a soil vegetable grower and is progressively shifting to hydroponics. Naturally, there are still improvements to be made, but it's increased the professionalism of the industry. Now people realise that hydroponics is not a magic system that allows you to grow anything in any season. It's a very good way to work if you apply a consistent methodology," said Dr Furlani.

Another enthusiast from the pioneering years is Dr Jorge Barcelos, a professor at Santa Catarina State University in southern Brazil. When he decided to create Lab Hidro in 1996, a hydroponics-specific lab within his department, there was little funding available. Besides research with new crops and systems, Lab Hidro is also a major centre for spreading knowledge. Regular weekend courses not only attract students from all over Brazil, but also a steady number of foreign visitors. Students learn the basics of hydroponics, obtain some practical experience sowing and transplanting, and become acquainted with some of the available equipment and supplies. Among the ideas being evaluated by Barcelos is a one-tank-per-bench system.

"Under the tropical conditions of Brazil, *Pythium* has been one of the worst problems for NFT growers every summer. There is research going on to control it, varying from

biological control to ozone treatment, and others. However, there may be a quick and inexpensive way to avoid *Pythium* from spreading to the whole operation; the best part is that it can be retrofitted in most existing systems. Instead of having the nutrient solution circulate back to the main tank that feeds the whole greenhouse, only recirculate within each bench or limited set of benches. This way there is no return to the main tank. Once an individual bench tank is low it can be refilled from the main tank. So far it has been very successful, even through summer when the solution temperature goes up. And we believe that the extra cost of more tanks and valves is easily recouped by preventing an eventual *Pythium* infestation from spreading over to more benches, especially when you have plants of different ages," comments Barcelos.

### Growers

BioPlanta is located in Rio Grande do Sul, Brazil's southernmost state. BioPlanta is a 10-year-old hydroponic operation that grows eight different types of leafy vegetables, delivering 2,500 vegetable packs a day, grown in 3,300m<sup>2</sup> of plastic houses. BioPlanta's specialties include the packed mini-salads. Arugula (*Eruca sativa*), best known in Australia as 'Rocket' or 'Roquette', is top among them. When harvested early it is very tender, leaves have a less pungent taste with a velvety feel to it, and it is also rich in carotenoids and the anti-oxidant lutein. BioPlanta advertises these benefits on the packaging for healthy-minded consumers. A major benefit for growers is the short growing cycle when pests and diseases are generally not a problem, thus less spraying. Salad packs are sold in plastic trays or in recyclable polyethylene bags. BioPlanta's 'Mix Baby Leaf' bag contains six types of leaves: purple and crisphead lettuce, endive, beets, romaine, and arugula.

In order to arrive at this winning combination chefs and consumers were interviewed - it took BioPlanta two years of experimentation to arrive at the right varieties. The main challenge was growing the different varieties in the same cell, so plants had to have similar growth rates and size to perform well. Part of the cultivation is in what is locally known as a 'pyramid' setup to increase yield per m<sup>2</sup>. According to BioPlanta's owner, Ricardo Rotta: "Not everybody agrees with it though, since it cost 30% more than benches, and if it is not properly designed the lower levels produce less, especially here at more southern locations. I understand that growers located closer to the equator do better with it."

Watercress (*Nasturtium officinale*) is another early-harvest salad. In spite of it being known for its distinct tang, BioPlanta grows a variety bred to be milder in order to appeal to children's taste.

"Increasing children's vegetable intake seems to be a struggle the world over," says Ricardo Rotta. "It was a



Dr Jorge Barcelos conducts regular courses for new practitioners.



*The main challenge was growing different salad varieties in the same cell.*



*The pyramid setup increases yield per m<sup>2</sup>.*



*BioPlanta's 'Mixed Baby Leaf' consists of six types of leaves.*

surprise for us to find consumers who were fond of watercress but were hesitant to buy the regular type since they weren't sure of the conditions they had been grown under, water cleanliness being such an issue now. Our hydroponic produce solved the problem since it's completely safe. Plus, it does great grown in the same solution formula used for arugula."

### Same plants, different marketing

Back to São Paulo state, two growers about 200 km apart are examples of different, but both successful marketing strategies for the same products. Fabrício da Silva is a 30-year-old co-founder of his family business, Companhia das Hortaliças. In spite of his young age he has been into hydroponics longer than most people. He attended one of first courses offered in Campinas when he was 16 years, and two days after finishing it he had the figures in hand to convince his father it was a good opportunity.

Together with his brothers and father he built the first 1,000m<sup>2</sup> greenhouse with a wooden structure. The 2m wide benches had 100mm PVC pipes for lettuce, and 50mm pipes for watercress.

"The rest, as they say, is history - and a lot of work," says Fabrício. "With the revenue from that we built the second house with metal arches, but still all home-made. We could

afford to buy the whole structure before the next expansion!"

With time his dad left his job to help run the operation, Fabrício went to college to study agriculture, and two of his brothers joined the firm. Today, he concentrates on the administration side of the operation, "which is as big a challenge as growing the plants", he adds.

The family oversees 25 employees who tend to 2ha of field vegetables and 1ha hydroponic operation, which is divided into plastic houses of different styles, heights and sizes. The facility includes a 200m<sup>2</sup> pack house.

The main crops are arugula (representing 40% of sales), three types of lettuce (40%) and watercress (20%); common chicory is still in a trial phase. All propagation is in coir and then transplanted to the channels or pipes.

"Since the several expansions happened in different years, each incorporated the technology of its time, or didn't, depending on the cash available," Fabrício explains. "When I'm asked what the main difficulty has been I always say it's the bank. After all these years, there is still no specific credit line for hydroponics. Growers have to apply under 'horticulture' or 'greenhouse cultivation', and it's never sufficient."

## Companhia das Hortaliças



Modernisation includes a new arch greenhouse design.



Fabrício was introduced to hydroponics technology as a 16-year-old.



Watercress is another early-harvest salad.



Today, Fabrício concentrates on the business side of the operation.



Arugula is sensitive to excess light and heat, requiring shading screens.

"Growing-wise, *Pythium* was a big battle at the start too, but we won. Whenever it got hot, it would show up and then spread. We were using the standard 3% incline on the benches, but after we lost a house to the *Pythium*, we increased it to an 8% slope. As the water runs faster it doesn't warm up as much in the greenhouse. Plus, I use a much larger tank in the lower greenhouse and have more of a buffer this way. Shading screens help control temperature, too, and are a must for arugula, a sensitive plant," he adds.

Thanks to the diversity of varieties on offer, the company now supplies some of the major supermarket chains in the Campinas area, a city of 1 million people. The company delivers daily with all products packed in sleeves and boxes stamped 'Companhia das Hortaliças', or Vegetable Company.

Another pioneering operation is PoliPlant, owned by three brothers: Milton, Flávio and Fernando Pereira de Paula - two engineers and one architect. They are located in the town of Mogi das Cruzes, right in the heart of the main vegetable-producing area that supplies São Paulo. Their first venture into agriculture started in the early 90s, but as seedlings producers. With quality plants the business was able to supply

## PoliPlant



Four people take care of 7,000m<sup>2</sup> of plastic houses.



In Brazil, greenhouses are predominantly open on the sides.



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*PoliPlant co-owner, Milton Pereira.*

80 million plants/year at their peak, but as costs went up competition increased. When more and more growers started to grow their own seedlings, they decided to diversify.

In 2005 they started NFT salad production, a natural step since they already had greenhouse experience with short cycle plants. A major advantage is only four people take care of 7,000m<sup>2</sup> of plastic houses.

"We decided to focus on what we do best: to grow," Milton explains. "The entire production is sold to wholesalers who send it mostly out of state, and to some trendy stores in São Paulo, but that is their business. They tell me how much they want for each type, we grow, and they pay us. I don't have a truck and don't want to be troubled about delivery store hours or being stuck in traffic jams. I am a grower and I worry about my product."

It must be working well as the company is phasing out the seedling operation to concentrate on their hydroponic operation.

"Naturally, this mindset has to reflect in quality. For example, I don't even have a brand name," continues Milton. "Buyers bring in their own plastic sleeves and boxes, but supermarkets know my produce and ask for it. The choice of variety is a key, too. For example, I do little lettuce because it's an easier crop and many people have it. Arugula is trickier and someone with a steady supply attracts buyers, mainly in summer when there is practically no field production.

### Market

Alexandre Mori, product coordinator at Sakata Seeds, one of the main vegetable seed companies present in Brazil, shares his viewpoint about the national market.

"When it comes to hydroponic product we can say that Brazil is a growing market, but at a slower pace than some years ago. The market is growing basically because it is a cleaner, handier product. Undoubtedly, demand for watercress and arugula has increased significantly more than lettuce. The baby leaf market in Brazil, however, is only starting but some hydroponic growers are slowly introducing this concept into the market, trying out different combinations of leaf mixes for the local taste, with some growers experimenting with oriental leaves," he concluded.

### About the author

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