NFT (Nutrient film Technique)

What is NFT?

NFT is the growing of plants, bare-rooted in long, waterproof channels, down which flows a very shallow stream of re-circulating water, into which are dissolved all the minerals required to grow healthy plants.

Who invented NFT?

The idea of NFT was conceived and born at The Glasshouse Crops Research Institute in the mid 1970's in England, lead by Dr Allen Cooper and his team of horticultural scientists.

Why was it thought to be necessary?

In the United Kingdom at that time most Tomato crops were grown in soil, with expensive heating to grow crops to yield results early in the season. The main competition came from Dutch growers, but with the advent of the EEC, other European producers were able to send cheaper produce to Britain all year round. The British glasshouse industry was under extreme financial pressure, and lobbied the government of the day to start research programs to find better and cheaper ways to produce their food requirements. Hence the work done at The Glasshouse Crops Research Institute was started.

What happened next?

'The Grower' magazine published in the UK, published an article in the mid 1970's on the then experimental NFT findings. The magazine found its way to New Zealand, where the local glasshouse industry had just received the horrendous news that the price of crude oil was about to increase by about 70%. Most NZ growers in the mid 70's used oil for heating, this was going to cause major cost problems for them, so the NFT report, claiming cheaper heat input was seen as a savior, even if it gave no increase in yields.

One of the largest greenhouse Tomato producers in the southern hemisphere at that time was PTO Growers in Auckland. They converted one of their many commercial greenhouses to the NFT system as described in the magazine. The results were to say the least very disappointing, but as there was no direct contact with the NFT inventors, they thought it must be something they were doing wrong, and started a few tests to see if they could get the system to perform as stated in the article. Many months later, and after many people had got together to sort out the many problems, they finally got it to work as it was intended.

The New Zealand horticultural industry took to NFT like the proverbial ducks to water, and within a few years over 50% of all tomatoes produced in glasshouses in NZ were in NFT or other types of Hydroponic systems. Other crops followed, Lettuce, Herbs and Strawberries, until today there are very few crops not grown in NFT, including many flowers.

The problems the initial NZ growers encountered had not been seen in the UK, as all trials were in small experimental units. When growers in the UK also converted commercial greenhouses over, they also had many of the same problems, these have since all been attended to. When converted into commercial scale units, they found a few basic principals had been overlooked as to what plants require to grow. The main one being the Oxygen required in the root zone by all plants.

Today we have a very strong NFT growing community, and additional work is ongoing to improve quality and quantity of produce grown.

What are the basic principals on which NFT works?

The fundamental basis of NFT is that the nutrient solution flows down a covered gully in a thin film (1mm deep) A thin film is essential as it allows much of the Oxygen required by the plant to be taken from the air above the roots. The roots form a dense mat in the channel, and because roots grow into those of the adjacent plants, the whole mat becomes an anchoring point, just as if they were planted in soil, no plant movement. The shallow film of liquid flowing under the roots ensures a permanent supply of water, and minerals. The upper surface of the root mat, although moist, is in the air. This ensures a permanent supply of Oxygen. Thus the reason for many crop failures in water culture (lack of oxygen) is overcome.

The size of the gullies in width, height, length and shape are all very important, as is the slope of the gully from top to bottom.

Short period growing crops, such as Lettuce, can be grown in rigid PVC gullies 100mm wide by 50mm high (4" x 2"), to a maximum length of 18 meters long.

Longer term crops, and those with a larger root mat, Tomato, Cucumber, Strawberry and Beans are grown in gullies 150mm x 75mm (6''x3''), made in either rigid PVC, or in disposable plastic film, such as

Panda film (black inside, white outside)

Many crop failures in the early years were due to gullies of insufficient size, and the root mat blocked the gullies, causing flooding or ponding of roots, leading to Oxygen starvation, root death, and finally plant death. Gullies that were too long were also a problem, again depleting the dissolved Oxygen as the nutrient went further down the gullies.

Round pipe is not flat based, and cannot have a film across the base, this leads to the lowest roots being submerged at all times and again root death. Round pipes will work for hobby growers in some conditions, where gully length is very short, and pumps can be turned off for a period of time allowing the roots to be exposed to air when the gullies drain out.

The slope of NFT gullies is very important in eliminating ponding, and a fall of 1 in 40 is recommended. If using the Panda film type plastic film gully, then the smoothness of the floor or surface it is placed on is critical, as any dips, indentations or hollows can cause ponding.

The length of the gullies is also limited to ensure all roots that are in the film of nutrient can get their Oxygen from the dissolved Oxygen in the nutrient. 18 meters is the maximum to ensure this with most crops, under normal climatic conditions. In hot climates the length is often shortened as less dissolved Oxygen can be put into warmer water.

Nutrient returning to the main tank has to be re-oxygenated, and the best way to achieve this is to use a Spa Pool venturi, drawing in fresh air to oxygenate the nutrient, it's also the cheapest way to ensure maximum dissolved Oxygen.

Where is NFT today?

The industry has progressed to a point where New Zealand, Australian, and American companies now export NFT systems and technology to the rest of the world.

There is sufficient information freely available to all growers, to ensure they put in the correct equipment and design for success.

Yields obtained by NFT growers are significantly higher than thought possible only a few years ago. Glasshouse Lettuce growers in soil can expect 7 crop turns per year if they do everything right, NFT growers have taken this from 7 crops per year to a point where some are now doing in excess of 12 crop turns per year, with less water usage and nutrient intrusion into the ground. Outdoor lettuce growers in soil expect 4 to 5 crops per year, while the Hydroponic equivalent produces 8 to 10, and at some sites where climatic conditions are ideal up to 12. Tomato growers produce at lower heating costs for out of season winter crops, and at higher yields per Sq meter, with the added advantage that they also get a better quality end product, again with no runoff to pollute the environment, and less water use.



Australian outdoor Lettuce NFT bench system under hail cloth for protection.

What's the future for NFT?

Growing spray free (toxic free) is possible. People who want toxic free food can now buy this from their local Hydroponic supplier.

In the future it should be possible for all commercial Hydroponic growers to make a 'living' supplying consumers with what they want, at a price that everybody is happy with, and not pollute the environment. Clean, pure water is becoming a scarce commodity in the world, recycling Hydroponic systems use a fraction of the water that soil growers have to use, and waste products are much less, and easier to dispose of.

Areas where drought is a problem to field growers and food is scarce need never be without food, providing clean water, electricity and sunlight are available, Hydroponic growing makes more economical use of what water is available.



New Zealand indoor sliding NFT gully system for Lettuces.



USA indoor NFT system for Basil.