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How to have a garden in the drought: Hydroponics

This summary is based on notes taken at the meeting. Slides from this meeting are also available at the ATA Melbourne site¹.

David brought a collection of system components and products to illustrate the talk. This was his first PPT presentation! While he mainly talks to professionals, anyone can have a go at hydroponics - particularly if you have an inquisitive mind. Basically we're talking about how to deal with drought, for example...

1. You could collect water from the tap as it's heating and put this straight into a simple hydroponic box, e.g. a polystyrene box from the fruit shop with added drain hole. Mix in a soluble fertilizer of nitrogen, minerals and trace elements. The container can be placed anywhere, on a patio or unused pathway, preferably against a north-facing wall. With this you can grow your own fresh and healthy food, e.g. potatoes, tomatoes, whatever you like - even if you don't have the soil.
2. You could alternatively buy a commercial tray with valve feeding - water feeds by gravity to a certain level, feeding pots containing your herbs, strawberries, lettuces, etc. so you can go away on holidays. This would suit apartments where you don't have your own soil.
3. Plastic channels can be used to hold herbs or lettuces in place, with water flowing past the roots 24 hours a day. A pump can be controlled by a simple timer - the technology can be simple.

Tomatoes grown in the field use 500% more water than hydroponic ones grown in greenhouses - 65Kg of fruit per sq metre compared with 7Kg. Unfortunately in Melbourne, we've built houses on much of the best soil. For example, Cranbourne used to be all market gardens but is now housing. Many of those farmers went up to the Murray where there's plenty of good soil, but unfortunately it's now running out of water and many want to return. We need food to feed a greater population and hydroponics can help - it doesn't rely on good land.

Hydroponic systems

There are various types:

- *NFT* (Nutrient Film Technique);
- *Dripper systems*: the older style 'run to waste' systems. Used water can be directed to cows or wetlands, or the systems can be *re-circulating*;
- *Flood and Drain*;
- *Capillary matting*: water from the bottom and provide an even distribution of water;
- *Aeroponics*: used in extreme situations.

Choosing your particular system will depend on what you plan to grow, what's practical for your home and budget, and whether you want to grow all through year. Some considerations:

- *Greenhouse*: plastic or more high tech glass;
- *Irrigation*: simple dripper tube or a high tech system controlled by pumps, timers, computers;
- *Heating and cooling, ventilation*: could be controlled by computer,
- *Production considerations (labor)*: mainly a commercial rather than home issue;
- *Water*: the real issue is quality, e.g bore water may have minerals to sort out. Low use can be achieved if it is recycled. Water captured in tanks from roof of greenhouse is generally

¹ ATA Melbourne <http://www.ata.org.au/branches/melbourne>

sufficient for 80-100% of needs, but in times of drought you may need to buy in water or use mains supply. Water stored in dams may have evaporation and mineral issues.

- *Reliability*: production must be consistent and of high quality. You need backup strategies.

Media

Unless just growing lettuces or herbs in a channel system, you need some form of medium to to:

- Support the plants;
- Hold moisture – reduces stress over dry periods;
- Retain oxygen – must be an open medium.

It must be clean to prevent diseases and have good drainage. Some alternatives are:

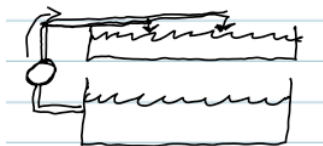
- *Coco peat* - cheap and reusable. Comes from coconut industry in India and Sri Lanka.
- *Rock wool* - similar to that used in ceiling insulation without some of additives. This spun basalt rock is good, lasts for two years, but is costly. It also needs to be recycled – still an issue in Australia;
- *Sawdust* - common, e.g. pine plantation. Good, cheap but breaks down quickly so not used so much any more;
- *Sand and gravel* - alternatives for flood and drain systems;
- *Perlite, vermiculate* - common in hobby situation;
- *Scoria* (as used in driveways) – heavy; how hydroponics started 30 years ago.

NFT channel systems (Nutrient Film Technique)

Water is recycled through a channel. Nutrient and water taken up by plant is replaced. Diseases might be the main disadvantage, but filters can keep them under control. You can use high technology computers and sensors to read nutrient levels, pH, temperature and to adjust nutrients.



This is mainly used short-term crops – if water fails, the crops are quick to replace, c/f tomatoes. You need a really good water supply and to allow for water in channels to flow back to the tank in the event of the pump failing.

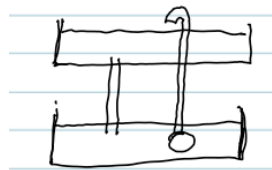


Top feed Drippers

Generally these recycle about 20% of the water through media – you don't know how much nutrient remains, so it's better to rely on the known 80%. Mainly used for tomatoes and capsicums. Greenhouse temperature and humidity can be controlled with vents and screens.

Flood and drain.

Plants are basically in a pot that is flooded periodically. Typically used for roses, seedlings, grafted tomatoes in not to over water to allow oxygen to roots. It



periodically. Typically nurseries. It is important can be tricky.



Aeroponics

This is the Rolls Royce method, generally not practical commercially. Plants are suspended in air with a fine mist spraying nutrients over the roots. It is used in Antarctica to grow vegetables; there's an example in Disneyland of a large tomato plant growing for several years.

Examples of consumables

Eco oil is a good organic product used in hothouses for aphid, white fly, etc. Just a vegetable product.

Aminogro is made out of multiple components of fish products rather than just a single one that may not work in every case.

Seaweed is recommended for transplanting – it helps roots re-establish in pot plants. You can get this as a powder concentrate - a small packet will do several hundred litres.

Organic fungicide – a mineral salt that changes the pH surface tension of spores and causes them to collapse – safe to use.

Plant starter is alternative to seaweed, e.g. for indoor plants, orchids.

David recommended you buy an EC (Electrical Conductivity) meter. While pH is important in soils, in hydroponics pH mainly refers to just the water – it's easy to adjust for different values, for example, caused by different locations, water sources, or dam conditions.

Questions:

Chlorine in Melbourne water is largely gassed off, but water may vary over the year with dam conditions. There may be issues with zinc in water from tanks.

The (poor) taste of tomatoes is partly due to the plant type and partly how they are grown. Supermarkets require their fruit to be picked early so they lose flavour and may be gassed to make them red. Never store a tomato in the fridge until it is cut – always leave in a bowl to ripen with other fruit – will improve their flavour.

Water requirements vary with what you grow, e.g. big tomato plants transpire lots of water, but lettuces in a re-circulating system require only a few litres. In a garden, lots of mulch and good soil is required. Hydroponics really only uses the water required by the plants – so there is no loss of water into the water table, or evaporating from open fields.

Holland use a lot of hydroponics. It's a lot colder than here, but you'd be surprised at the amount of hydroponics in Australia - probably 80-90% of roses, 100% of gerberas, most herbs, truss tomatoes. We're running out of land and water and need to feed increasing numbers of people.

Root vegetables like carrots or potatoes need a big box. You also need to build up around the potatoes as they're growing. It's important to feed the plants the amount of food they need, e.g. the fertilizer strength for lettuce is 1/3 that for tomatoes. Use different boxes with plants with similar needs, e.g.

- tomatoes, capsicums & cucumbers;
- cabbages & cauliflowers;
- lettuces, herbs & strawberries.

Refer to Web sites or books for these details, e.g. Straun Sutherland "Simply Hydroponics". Wet Earth² have plenty of resources on setting up drip and other irrigation systems.

Growers are starting to use solar power to run equipment.

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² Wet Earth <http://www.wetearth.com.au/content/dripirrigation.asp>