

# Aquaponics : a perfect eco-system of plants and fish

## By Noucetta Kehdi

In this beginning of year, I wanted to offer you something new. A concept that you can easily adapt to your growing operations, whichever their size, and discover another aspect of the wonders of the world of plants.

Last year we introduced Aquaponics to several fairs in Europe, with huge success. Our booth was photographed and filmed by the media in each country, and our aquaponic system was shown on TV and in the newspapers. Each fair brought visitors interested by the display, and several asked us for more information on how to adapt the technology at home. Of course we helped them all, and promised to soon write an article to explain a little more.

### What' aquaponics?

Aquaponics as a practical application started only a couple of decades ago. It is a hybrid technology that combines "aqua-culture" (fish farming), and "hydro-ponics" (growing plants without soil). This is an environmentally sound technology that wastes hardly any water, uses practically no plant foods, and needs no filtration system for the fish. It works as an eco-system between plants and fish, where fish waste provides a food source for the growing plants, and the plants provide a natural filter for the fish.

Although fish farming and soilles plant culture have been traced to ancient times, the combination of the two is quite new. Research in aquaponics started around the 1970s and continues today. Many universities and laboratories world-wide are interested in this new technology, one that allows you to grow plants and raise fish with a minimum of wastes - and costs - for your fun as well as for commercial applications. In schools, aquaponics is an excellent model of nature's biological cycles that shows students the life of fish as well as plants, in a perfectly synergetic process.

Aquaponics is an amazing loop, and a perfect example of synergy inspired to man by nature. If you look around, plants grow in the oceans, and inside and around ponds and lakes. Why? Creation must have many reasons for this. But one of them is certainly the close relationship that exists between plants, fish and water.

Fish must live in a clean, well-oxygenated environment, and must be fed properly. They



consume their food and reject their waste in the form of solids and liquids. The accumulation of wastes in the tank will poison the fish. This is why aquariums are always sold with a special filter, which eliminates wastes.

Plants consume most their food through their roots. In order to do so, the solids must be reduced to their chemical foundations. This is called “denification process”. (more info in “[www.growfish.com](http://www.growfish.com)). Simply described, the solids must be exposed to water in order to feed certain bacteria (the “nitro-bacteria”), which begin to break them down. All along the chain of bacteria, solids are transformed first into Nitrites, a terrible poison to plants, and then, into Nitrates, which plants eat and thrive on. During this conversion, many mineral salts are processed too, bringing to the plant most of the essential elements it needs.

While the plants absorb their food, they remove all wastes from the fish water, thus providing a clean and healthy environment, which the fish need to live and develop in.

On a commercial scale, aquaponics is still a marginal technique, although more and more companies are starting to use it nowadays, especially in Australia and California.

In the Virgin Islands, a crew of researchers have developed a commercially viable aquaponic system designed for use in the tropics where natural fish populations have been depleted and most agricultural products must be imported.



The University of Davis in California is readapting our concept of the “family farm” (aquaponics/UC Davis) with this technology, introducing it into homes and gardens for pleasure, fun and small to medium scale auto-production.

On a hobby level, aquaponics has the potential to catch on quickly. It is a very easy and rather inexpensive process that will please gardeners and fish lovers alike.

## **What do you need to do Aquaponics?**

- 1 • a fish tank and a plant support
- 2 • bacteria to decompose the fish wastes
- 3 • a filter to host the bacteria and aerate the water
- 4 • fish and fish food
- 5 • plants

6 • pH regulators (Up and Down) and Test Kit, and an exhaustive supplement of micro and sub microelements, to prevent eventual deficiencies in the plant's diet.

### **Fish and plant equipment:**

Any pet shop will help you buy the aquarium, the filter, and the «nitro-bacteria» needed to convert the fish waste into plant food. It is good to know that the bacteria are not essential to buy, as they will naturally develop in the tank in about 3 weeks. But if you don't want to wait and if you want to secure your results, you may as well buy them in proper quantities and mixes with the rest, they are not too costly.

As for the grow system, it has to be hydroponics. You may choose any type you wish. You can use NFT or Aero-hydroponics, according to the way you like to grow: NFT for soft/cool growing, Aero-hydroponics for dynamic/lively results. It is important to secure an excellent oxygenation of the solution, for the fishes as well as for the plants. Of course ensure proper temperature, good ventilation, cleanliness, etc... all the parameters you have to guarantee in a traditional hydroponics grow-room.

Place your grow system on top of the aquarium, add a pump to create the circulation system, and you are set. If you wish to have detailed information, don't hesitate to contact us for technical support: [info@eurohydro.com](mailto:info@eurohydro.com)

### **The fish:**

There are many fish to select from. It is best to choose fresh water species, as your plants won't be happy in brackish, salty water. You can mix several species or you can have only one at a time, this is your choice. Here again your pet shop will advice you on the ones you can raise according to the size of your tank and the temperature of your water. In our greenhouse we raise Japanese Koï's (carps) because they are very hardy and can stand about any temperature and environmental variations. They are beautiful and very coloured. It is said that no 2 Koi fish look alike and in Japan some specimen are sold for several thousand euros a piece! Koi fish may grow a lot, but it seems that as long as they stay in a small tank, they won't grow more than the environment allows.



### **The plants:**

You can grow about any plant in aquaponics. If you start a commercial operation, it is best to choose plants which thrive on high Nitrogen levels like lettuces, aromatic and culinary herbs. Indeed it is the fish food that ultimately determines the fertilisers fed to the plants, and there are no customized fish

feed blends with variable NPK ratios, available yet ...

But as a hobby gardener, or to raise your “family garden”, you can choose all the plants you want: decorative, edible, medicinals, herbs, etc... What you must ensure is a steady balance between the amount of fish (including the relation to fish feed) in the tank, and the amount of plants in order to prevent toxicities and deficiencies. This is why the fish feed is an important parameter. It has to be of good quality, so that your fish eat as much of the food as possible, and leave less waste as a by-product in the reservoir.

The best food for fish is live fish. Almost all fish love fish, and there are live fish to fit any size of fish! Apart from being a very rich food, live fish will move fast and give your fishes some exercise to keep them healthy... (funny but true!) You can prepare your own fish feed too! Your pet shop will tell you which diet adapts best to your fishes, and you can prepare it at home. For those who want to guarantee a 100% organic crop, this may be their best option...

In any event, and whichever your fish diet is, it is not uncommon to experience some deficiencies in your plants, especially iron. This is why, once every 2 to 3 weeks, we add a few drops of Bio Essentials (an exhaustive mix of micro and sub micro elements containing a good blend of iron chelates), as a supplement. That’s all, you need nothing else for a healthy crop.

## How to start your aquaponics operation?

To start your aquarium you must do the following:

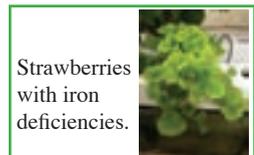
- 1 - To make your fish happy, put some sand in the bottom of the aquarium
- 2 - Fill your aquarium with tap water in the following manner:

Place a plastic sheet on the sand, and place a bowl on the plastic, then fill the tank slowly, so that the water filling the reservoir doesn’t move the sand. Take plastic and bowl out gently once you finished filling.

- 3 - Leave the filter run as is for 24 hours, to let the chlorine in your water evaporate! (if you don’t want to wait, you will find a special product to get rid of chlorine at your aquarium store, but this is not really needed.)

- 4 - It is important, before introducing the fish, to adjust your water’s pH so that it suits the fish as well as the plants. The optimum level to maintain is 7.0, which is a good compromise between the ideal pH for fish (7,5) and a good one for plants (6.5). To do so, use a good blend of pH Down or pH Up, and a pH Test Kit. *GHE’s Dry pH Down (powder form) is an excellent quality, natural pH regulator for this purpose.*

Note: Some may think that a pH level of 7.0 is too high for plants, but in reality most plants will accept high pHs with no problem. It is true that in



hydroponics, most mineral salts are best available when the pH varies between 5.5 and 6.5, and the chelates are best protected inside this range. But at pH 7.0, most salts will remain fairly available. Of course it is not as perfect as in pure hydroponics conditions; this is why it is recommended to add a small amount of micro and sub microelements once in a while.

5 - Add the nitro-bacteria: 2/3 in the filter, 1/3 spread on the sand.

6 - Put the fish in. Choose young fish, they will adapt better.

7 - Add the growing trays or chambers on top of the aquarium, and hook your system up.

8 - Wait for two or three days for the fish wastes to build up, and for the nitro-bacteria to transform them into nitrogen, and then add your plants.

9 - Regularly monitor your water's pH and EC, to make sure your plants and fishes live in the environment best adapted to their needs.

An easy way  
to build an  
aquaponic system.

*1 styrofoam float*  
*1 PVC support for pots.*  
*1 aquarium*  
*1 air pump*  
*1 airline*  
*1 Filtre*  
*Bacterias, fish y plants*



You are all set. Sit back, enjoy your fish, and watch your plants grow happily in the most natural and economical grow system possible. If you want to know more, go on the Internet and look for "aquaponics", or call us, we will be happy to help you.

I wish you all an excellent year 2005, one where your plants - and fish - will bring you happiness and satisfaction, and the best crops possible!

