

## 91000 Classroom Aquaponics System

### What is aquaponics?

Aquaponics is a combination of two words: *aquaculture* and *hydroponics*. Aquaculture is the act of growing aquatic livestock, such as fish or shrimp. Hydroponics is growing plants in water instead of soil. Aquaponics involves raising aquatic animals and also growing plants in a symbiotic relationship.

The idea of aquaponics dates back to ancient days. The Aztec civilization in present day Mexico was probably the first to use the technique. They would create floating islands in lakes to hold the crops. Then, waste material from canals would be diverted into the lakes, fertilizing the plants.

China and other areas of east Asia also did a form of aquaponics. The staple crop of these areas is rice, which is grown in shallow ponds called *paddies*. People realized that if they released fish into the paddies, the waste from the fish would fertilize the plants. In addition, the fish could eat agricultural pests. Common fishes used were the loach and various species of carp. Upon maturity, these fish would be eaten as a source of extra protein.



Today, aquaponics is being explored as a means to increase crop production while at the same time reducing the amount of chemical required. Why would you want to reduce the number of fertilizers required for crops? There are a number of reasons:

- Fertilizers are made from petroleum, a finite resource
- Fertilizers can escape the confines of the farm and find their way into waterways, where they can do damage. For example in the gulf of Mexico is a 'dead zone' caused by fertilizer runoff promoting too much algae growth.
- Good farmland is becoming scarcer, meaning crops will have to be grown either on less good land or in greenhouses.
- Some people think that chemical fertilizers do not add sufficient nutrition to the food grown.

### What are some advantages of using aquaponics to grow food?

- The amount of chemical fertilizers can be reduced.
- Crops can be grown in greenhouses or in lakes, meaning they can be grown anywhere, not just high quality farmland. This means food production can be more local, instead of requiring shipping over large distances.
- The fish can be sold as a secondary product, improving the profitability of the farm.
- A well designed aquaponics set up can use as little as 10% of the water required to grow the same crop in dirt.
- With a suitable media bed, any crop can be grown.

### Components of an aquaponics system:

There are five major parts to any aquaponics system:

**Rearing tank.** This is where the fish, shrimp or other creatures are raised. They may be born and live their whole lives in this tank, or they may be introduced as juveniles. Food is added to this tank to feed the animals. When mature, the animals are harvested. The most commonly used animal is the fish *tilapia*, but other species of fish as well as shrimp or crayfish can be raised.

**Settling basin.** This is where waste from this fish, as well as uneaten food, is caught. This material will be pumped out to fertilize the plants. In many setups, the settling basin occupies the lower portion of the rearing tank to make sure all waste is captured.

**Bio reactor.** On larger systems, this is a tank that holds special bacteria. Smaller units may omit this part. These bacteria convert ammonia from the fish into nitrates, which are usable by the plants. Plants can utilize ammonia directly, but the efficiency of the reaction is low. Allowing the bacteria to make the conversion increases the amount of nitrogen that can be absorbed by the plants. Nitrogen is an essential element for plant growth, and few plants can remove it directly from the air.

**Hydroponics bed.** This is where the plants are raised. The now nutrient rich water will flow past the roots of the plants, and the plants will draw nourishment from it. It is important to keep the bed separate from the rearing tank, or the fish will eat the roots of the plants.

**Sump.** After feeding the plants, water is collected here and pumped back to the rearing tank.

**Operation:**

Operating your classroom aquaponics setup is simple. It contains everything you need to successfully grow a crop, except fish and water. Before you can grow anything, you will need to assemble the unit. Here's how:

- Place the tank on a lab bench or other table. When full the tank will be quite heavy, so place it where it will rest permanently.
- Connect the hoses from the upper end of the hydroponics beds to outlet of the pump.
- Attach small hose to return nozzle of pump.
- Connect other 2 ends to barbed fittings of hydroponics trays.
- Connect 2 larger pieces of tubing to bottom of hydroponics tray and barb fittings on end of aquarium (see picture for proper hose placement).
- If you want, you can add a layer of aquarium gravel to the bottom of the tank.
- You are now ready to use the system!

After you have assembled the system, it is time to add the living components. You will need the seeds, water, and fish. Common goldfish will do well in a small tank. They are hardy, low maintenance fish that look attractive. Other species can be used, but keep in mind the space requirements of the fish before adding them!

- Fill the tank with water. You can use ordinary tap water, but distilled is better.
- Add seedlings or sprout seeds in the hydroponics beds. The plants must be established before the fish are introduced.
- Add the fish to the tank. When doing so, add water from the tank gradually to the bags the fish came in. This will help prevent shocking the fish with a sudden water change, which can distress them.
- Turn on the pump. This will circulate water through the hydroponics beds, which will add oxygen to the water and allow the plants to remove toxins.
- After the system is up and running, you will need to do periodic maintenance. This includes feeding the fish, harvesting the mature plants, and adding water to the system to replace water which is lost to evaporation.
- The blue foam filter should be removed and cleaned every other week.

**Warranty and Parts:**

We replace all defective or missing parts free of charge. Additional replacement parts may be ordered. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Intended for children 13 years of age and up. This item is not a toy. It may contain small parts that can be choking hazards. Adult supervision is required.