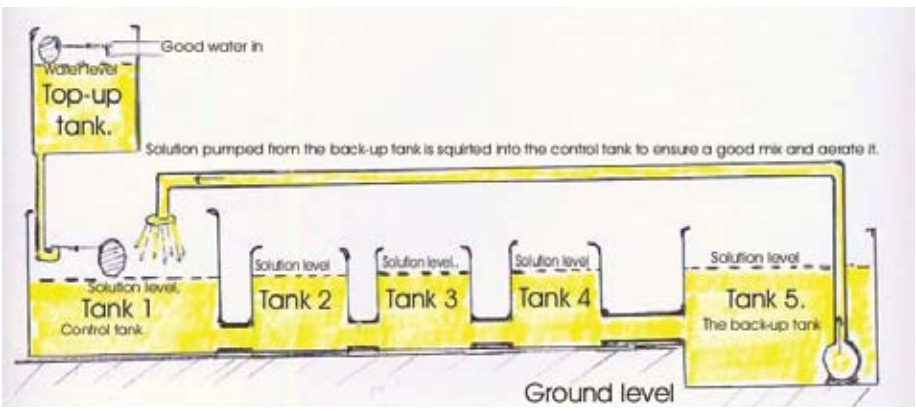
# A DOME FULL OF CROPS

## Strawberries, tomatoes, peppers, black French beans, scarlet runner beans, small new potatoes, herbs, even cauliflower and sprouts—all are grown hydroponically to provide a healthy addition to my family's diet

Above: I've set up several hydroponic grow units in my backyard Solardome greenhouse. On the left one channel feeds into and from the back-up tank (green cover). To the left of the door is an experimental strawberry unit, and center is a FruitWise unit (small tank). *Below:* Tanks 1 and 5 used by my channel units. Tanks 2, 3, and 4 could be used for other systems, but the nutrient solution strength would have to be acceptable to all plants being grown. Gravity is utilized to adjust all parameters. Note unit is on an incline that allows gravity to work.




By Les Bridgewood

A Solardome greenhouse is very good, except for two points: one, if it rains when the door is open, the rain comes in since the door follows the contours of the dome. And two, the dome's round, and that makes it very difficult to plan a layout using square and oblong tanks.

For the first arrangement in 1990 I chose three large fiberglass GroTanks. I arranged them around the Solardome, an arrangement I stayed with for a good number of years. I was using the two-part packs (A and B) of nutrients at that time. This requires equal parts of both packs (with a good mix in-between) to be added to the solution every time the EC fell. With three tanks that was very time consuming.

When I rearranged the layout years later I tried out a system with one large tank. This had three channels feeding into and out of it and involved three pumps in the solution. Maintenance proved to be difficult, but it was a big success with fantastic crops and a big savings in time.

The channel using the back-up tank as its main tank (green cover). Black concrete with 2-inch insulation under it forms a night store heater. A filter insulated with commercial rockwool against heat loss is being tried out.

Tomatoe plants grow in one channel using the back-up tank and strawberries in the center tank, all using the same solution.

## Current Setup

In 2005, the layout was changed again and now operates as I describe here. It's easily maintained, time-saving and easy to automate. In the center of the Solardome I have a FruitWise unit which stands in its own small tank. Two of my channel systems have a largish tank each, and these are placed around the sides. Both channels operate in the same way. The pumps pump the solution out of the tank into the open end of a channel where it inflates a 6-feet length of flat plastic irrigation tube with solution. Cable ties are good for making the joint between the 15 mm pipe and the irrigation tube. The far end is sealed, of course. The irrigation tube is laid internally along the full length of the channel and the solution is ejected out of holes at regular intervals along its length. When the pump is switched on (24/7), the plastic tube is inflated with the solution, the ejected solution runs along the channel base under the plants' roots, and in doing so supplies the important oxygen and nutrients and returns to the tank at the point it entered.

Since the solution does not come into contact with the outside air all the heat in the solution is available to roots. If some of the holes in the plastic irrigation become stopped-up, then it can be cleared by squeezing the tube hard a few times. The roots form around the warm irrigation hose. The pump does not have to be large; a 4-watt pump does the job nicely.

## Feeding My Channel System

The two largish tanks I refer to as the control tank and the back-up tank have two functions. Both act as the main tank (one each) for my two channel systems. One of the tanks is referred to as the control tank, and for good reason: items in this tank control the solution level, the EC, the solution temperature and the pH of the solution in all the tanks. A homemade probe and module controls the solution strength (the EC) using a single solution valve to inject concentrated ionic nutrients. If packs of A and B of nutrients are used, then double valves can be controlled by the one module to inject equal quantities of both packs if the EC falls. A low-pressure water float valve controls the solution level by switching the flow on and off from the top-up tank, replacing the lost water, while a heater with a built-in thermostat regulates the solution temperature to around 20 C. The pH in the control tank is monitored regularly but maintained manually at pH 6. All the tanks except the top-up tank are linked together by a good size hose. If the diameter of the hose is large enough, all the parameters will be the same in all the tanks. Of course, all these parameters can be adjusted manually in the control tank if preferred. The result will be the same—a very effective, low-maintenance system.

## Using Gravity

In a separate function the control tank supplies solution to one of my channel systems. The backup tank supplies solution to my second channel system. To ensure the solution is aerated and all the parameters in all the tanks remain constant, I devised a method that involves use of gravity. The capacity of both these tanks will be relatively high.

The top-up tank needs to be around 2 feet above the control tank and supplies low-pressure water. The top-up tank itself can be connected to a mains supply via a non-return valve (required by law in the UK). A high-pressure float valve in this tank controls the mains water input and, as a result, the water level in the top-up tank.

The FruitWise tank (this could be omitted or given another use) and the control tank should be level with each other. The back-up tank should be lower than the others, especially if the diameter of the hose connecting all the tanks together is small.

Water from the top-up tank flows into the control tank via the low-pressure float valve adjusting the solution level. The solution with the set parameters then flows into the back-up tank and all the other tanks in line. The time taken for the other tanks to reach maximum level (with the same parameters) will depend on the diameter of the linking hose, the bigger the diameter the better. The final level in all the tanks will be averaged out by gravity with the total overall level controlled by the low-pressure float valve in the control tank.

## Mixing the Solution

A small wattage pump fitted in the back-up tank is used to ensure the solution is fully mixed and aerated by returning the solution back to the control tank. Using

a squirting action through a rose helps to aerate the solution at the same time. If the connecting hose between the tanks is adequate in diameter and the movement of the solution by the pump is matched, gravity will ensure the mixing of the solution in all the tanks and the parameters will all be the same. Controlling the pump using a power timer and setting the timer to suit the diameter of the hose (if a large diameter hose cannot be accommodated), will allow the flow between the tanks to be matched.

The same pump can be used when it is time to change the solution to pump out the old solution. Discarded solution can be used on the garden where the plants outside benefit. Solution will continue to flow by gravity through all the tanks when the pump has been activated. Gravity will be active before, during and after the operation of the pump.

However, if the connecting hose has a small diameter (15 mm), as in my system, then the low-pressure float will set the level in the control tank, and the levels in all the other tanks will be set by gravity over a period of time, but not instantly. In this situation, when the pump is transferring solution from the back-up tank to the control tank, the level of solution in the control tank could be raised, applying extra pressure to the rubber washer in the low-pressure float valve. If this is so, the travel of the float lever on the low-pressure float valve is restricted by a stop (a wine cork!) inserted between the float lever and the valve guard. With a 15-mm hose connecting all the tanks, the level in the back-up tank will fall until gravity has returned the levels to normal again.

To prevent equipment failure in this tank due to the low solution levels, the tank itself is set lower than the others to be sure it will always have solution over any heaters and pumps. Take care also that the control tank does not overflow; set the timer on the pump to avoid problems. Both these points are important.

The setting for all the solution temperatures in the system is set and maintained at a constant 20 C by heaters in the solution. A minimum air temperature of 10 C was aimed for, but due to low outside air temperatures this fell on occasions to 6 C. All plants managed with these low air temperatures for the short time they were exposed to them, thanks to the heated solution. My heating bill was lower as well.

As the seasons moved on temperature was not a problem. When flowers formed on the plants, ionic bloom was used at an EC of 2.6 (CF 26) to maintain the fruit crop throughout this period. Liquid silicon from Growth Technology sprayed over the strawberry foliage prevented problems with fungal diseases like bud rot and powdery mildew that strawberries are prone to.

The tomatoes and peppers plants were first brought on from seed in the house then planted in the greenhouse in late November. As for the strawberry plants, they were the result of doing a good deed for my neighbor who had a very badly overgrown strawberry bed. I am sorry to say later in the year we decided we were not keen on the taste of these, so an expensive hunt was started to find a sweeter-tasting fruit. We had a good crop of strawberries that started in February and went on through the year. The tomatoes were ripe by early March, and we had a good crop of peppers a month or so later. All carried on producing well into the autumn.

*Les Bridgewood is a hydroponic grower and author in the UK.*

**Resources**

Solardome Geodesic Domes
Solardome Industries Ltd.
www.solardome.co.uk

*Right, top to bottom:* Electronic controls are housed in a clear plastic box. All power is correctly fused, earthed and fitted with safety residual current cut-out devices. Green top-up tank is at top left, with power control boxes are below. Control tank is on the right. Green hoses can be seen leaving the control tank going to the small tank in the center then out to a back-up tank. The corner of the green top-up tank can be seen at bottom left corner, with copper pipes feeding mains water. Green hoses connect all three tanks. The floor is concrete insulated from the ground by a 2-inch thick block. Strawberries grow in the center tank and tomatoes grow in the channel using the back-up tank. All tanks are connected by 15-mm hose.