



“The 6 Types of Hydroponic Systems”

Bill Osuch

FULL TRANSCRIPT

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Marjory: Hello and welcome to the Home Grown Food Summit. This is Marjory Wildcraft and this summit is brought to you by the Grow Network, which is the premier community of people who make their own medicine and grow their own food. We frequently get questions about hydroponics and aquaponics, and our next presentation is a very basic presentation on the six different types of hydroponic systems. Before you get all freaked out about that, this actually ranges everything from a little thing that you might have on your countertop all the way to the big mega complex systems that you're thinking of with all the white pipes everywhere.

Our presenter, Bill Osuch does a very very good job of just very simply explaining these six different types of systems, and if you're interested in getting into hydroponics, this will be a really great introduction for you. Bill has been prepping in urban homesteading for over 15 years. He's the father of three active, inquisitive boys. Oh good Lord, I bet their dinner table ... I bet their food [inaudible 00:00:58], I think their food bill every week is expensive. Anyway, when he's not working on a project, Bill is with his boys and he enjoys, reading, traveling, and target sports. Here's Bill Osuch talking about the six basic types of hydroponic systems.

Bill: Hi. I'm Bill with Self Reliant School and today I wanted to talk a little bit about hydroponics. Now, when most people hear the word hydroponics, they think of one of two things. Some gleaming light, space-age, laboratory with rows and rows of plants stretched out or a couple of shady looking characters in a warehouse somewhere growing some marijuana, but you can do hydroponics at home. You can actually grow a lot of fruits, vegetables, herbs, and you can do it without turning your house into something that looks like a space-age NASA laboratory.

What exactly is hydroponics? Well, the word hydroponic comes from Latin, which means working water and just to put it really simply, it's

the art of growing plants in a soilless medium. Something without using regular dirt. When most people think of hydroponics, they think of some sort of system where the plant has its roots directly into some sort of a bucket of water, whether it's still or moving. That is one type of hydroponic system, but there are a lot of others that look a lot like just your standard household container garden.

For example, this is a substance called coconut coir. As you can see, it looks a lot like just standard potting soil, but what it really is, is shredded coconut shells. Now, that's an inert material, it does not provide any nutrients to the plant's roots the way dirt would, so it will hold your plants in place just the same as potting soil would, but you have to provide the nutrients yourself in the form of a nutrient-enriched water. The plants are going to draw all that up rather than pulling any nutrients from the soil, or in this case, from the coconut coir.

Now, there are other systems where your plants are held in things like these little clay pellets. Some systems will use larger rocks in that, lava rocks, river rocks. Some systems can use sand. Some systems can even use things like, they're called polymer pellets and what they really are is water-absorbing crystals, basically just the same thing you find in a baby's diaper. You add water to them, they puff up really good and they hold the water for a long time. They keep the roots moist and they keep delivering that nutrient to the plants.

Now, pretty much anyone can set up a system to grow hydroponically regardless of the type of plant you want to grow or the amount of space you have. If you can take care of a goldfish, you can take care of a hydroponic system. Now, why would you want to grow hydroponically in the first place? With hydroponics, you're creating a perfect environment for the plant. If you give the plant exactly what it needs, when it needs, it's going to be the healthiest it possibly can. With hydroponics, you're controlling everything from the temperature, the lighting, the nutrients that you're giving to the plant, the weather, predators, insects, everything like that.

Now, with hydroponics, you're delivering a Ph balanced liquid directly to the roots of the plants. Because it's liquid, it's highly soluble. That means that the roots can absorb it really easily, much easier than they could absorb nutrients out of soil. This is going to let the plant pull its food in a lot easier than it can in soil where the roots have to go searching out for what it needs. If the plant has to spend less energy on pulling in its food, developing the roots, it can put more of its energy into fruiting and flowering and growing what you're trying to grow to eat. Again, like I said, because you're growing indoors in most cases, you can do hydroponics outdoors, but for the most part, people grow indoors. Because you're growing indoors, you control everything. You control the light, the temperature, the wind blowing across your plants. There's no worry about frost, there's no worry about bunny rabbits, grasshoppers, anything like that.

Now, in hydroponics, you're going to be adding nutrients to the water of the plant and you're going to actually be changing out that water pretty regularly. Maybe every week or every two weeks. Because you're doing this, you're always delivering fresh nutrients to the plant and you don't have to worry about taxing the soil. You don't have to do any kind of a crop rotation where if you're growing the same type of plant year after year in the same space, it's going to be pulling in all the same nutrients, so you don't have to put in a different type of plant to replenish some of those nutrients because you're changing out the water, you're delivering the perfect concentration of nutrients to your plant each time.

In most cases, if you took two genetically identical plants, two plants from the same cutting, seeds from the same batch, things like that, and you grew them side-by side, grow one hydroponically, grow one in soil under ideal conditions on each, you'll more than likely notice that the hydroponic plant is going to grow taller, greener, a little more lush, and have better fruit production for the same amount of effort that you would put into the conventionally grown plant. Also, hydroponic plants are great if you want a little side business, if you want to sell something at your local farmer's market.

For example, here in Texas, let's take strawberries. Strawberries are pretty much in season, local strawberries, from about February through April. The rest of the time, you're going to find that they're imported from somewhere else in the country or somewhere else around the world. Imagine if you could take to your local farmer's market freshly harvested, locally grown strawberries in September, October, November, December, all year round. That would be a pretty good seller. Then, herbs are another good crop to take to your farmer's market. For example, basil. Basil just grows like a weed. In a couple weeks you'll have a huge amount of it and some studies have shown that hydroponically grown basil and other types of herbs, produce more essential oils in their leaves. Anywhere from 20% to 40% more than when you're growing conventionally, so you're going to get a much better flavor to them and you can grow a huge variety, which gives you good market to sell.

Now, what would you not grow hydroponically? Mainly root crops, carrots, potatoes, turnips, radishes. It's hard to find a good medium for them to grow in because the root wants to grow down and even if you did find a good medium and a good setup that grew them, you're probably not going to be as successful as you would growing them conventionally. Potatoes grown hydroponically, you're not going to produce near as many as if you just did a simple potato bucket out on your back patio. Then, you have to think about whether you want to grow something like tomatoes or cucumbers. They both do really well when grown hydroponically, but they require a little more planning because they are a vegetable that needs some sort of a trellising system. You can't just put them in a pot and move them around as you would, say an herb or some sort of lettuce or something like that. You have to plan your system out and decide if you really want to invest the time and the space into building a trellis for a hydroponic tomato garden.

Now, let me talk a little bit about hydroponic systems. Every type of hydroponic system can really be broken down into one of six basic systems. A lot of them are going to have some bells and whistles, some fancy things, look a little bit different from other systems, but really you can categorize them into one of these six systems. I'm

going to go over them from the most simplest with the fewest moving parts, all the way up to the most complex.

The first system would be what's called a wick system. Now, for this you need a pretty tight growth medium and, by that, I mean something pretty fine, like this coconut coir. It's not going to have a lot of gaps in between it like these pellets would. The way this works is simply you either start a seed or a seedling in a pot just like this and it has some sort of a wick material dropping down out of the bottom of the pot. Could be something as simple as just a rag, a candlewick, anything that can pull liquid up into the pot. Then, you simply set this on top of a bucket of your nutrient solution. It's just going to sit there and wick the liquid up into the growth medium. This is going to stay pretty moist and then the plant is going to draw up what it needs. The benefit to this guy is that there's almost no moving parts. You don't have to worry about power failures. As long as you keep your bucket full of liquid, it's going to do good. You just have to worry about keeping the liquid supply steady and a good lighting source.

Now, one thing that you do need for a system like that, and for a lot of different types of systems where you have some sort of, say, a large bucket with water in it, you want to aerate your water. You can do that just with a simple little aquarium pump with an air stone. You know, the little bubbler that you put in your goldfish bowl. What that's doing is it's putting oxygen into the water and then, as the water is absorbed up into the pot, into the plant's roots, the plant's roots are going to take in that oxygen as well. If you just have still water with no oxygen being pumped into it, the plant's not going to do as well.

Next type of system would be something that's called a drip system. It's going to look very similar to a wick system in that you have a pot probably sitting on top of another pot. The only difference is what's happening here is you're taking a water pump, now water pump, not an air pump, and you're pumping water up from the bottom pot to the top pot and it's trickling. Basically, you're constantly watering the pot. Now, this might run 24/7 or you might have it on a timer to

where it runs for an hour, shuts off for six hours. It just depends on what kind of growth medium you've got how well it's going to hold the water. This coconut coir is going to get nice and wet, it's going to stay moist longer than these clay pellets would, so you just have to figure out what you need to keep your roots moist, keep your plant healthy. Now, with this system, you don't need an air pump because as you're pumping the water up from the bottom, trickling it down through the top, that's aerating it right there.

The next type of system that you'll encounter is called a water culture. Now, if you ever have seen one of these AeroGardens in the store, this is a water culture system, sometimes called a raft system. All this is, is you have a plate with small, little pots hanging down from the plate, into the water. The plant sits in this pot and the roots grow down into the water. Now, you've got an air pump in here that's going to pump air into the water, again, to aerate it, give air to the roots of the plant. That's it. There's nothing that's going to pump the water up. The roots just dangle down into the water. This one's good if you have a power failure for a little while. All that's going to happen is your roots aren't going to get aerated, but they'll still be down in the water.

Now, the drawback to some of these types of systems, the AeroGarden specifically, is that this plate on the top is fixed in position. What that means is, the plate is sitting right here and you have a water reservoir below it. If you forget about it, the water level's going to evaporate. It's going to go down and down and down, and as it goes down, you're going to expose the roots on the plant, possibly drying it out. That's something that you have to watch on these. You have to make sure that you're topping off your water pretty regularly.

An alternative type that most people make for themselves is the raft system. It's identical to this, the plants sit on a tray on top of the water, but the tray isn't fixed in position like this. It's actually just floating on the top of the water. As the water level goes down, the tray goes down with it, so that your roots are always immersed in the water. Now, this is one of the easiest ones to make, also. As you can

see here, I just created one out of a simple little plastic storage bin and some of these little pots. You simply drop the seed into some sort of little growth medium to hold it because obviously if you drop the seed in here, it's just going to fall right down into the water. You simply drop the seed in there and press that in and it start to grow. Now, this one, again, because the lid is snapped on, you've got that problem where you need to watch it and make sure your water level doesn't drop down. You could alternatively simply cut the lid out and then have everything floating on the surface, so it can go up and down as your water level rose and fell.

Now, the next type of hydroponic system is called a Nutrient Film Technique or NFT. Now, this is what most people think of when they think of hydroponics. It's a long tube and again, the plant sits in some sort of pot like this and its roots dangle down into the tube. The difference between the NFT and the water culture is in the NFT, the water is continuously moving through there. You don't have a reservoir with a big bucket of water that the roots are going down into. Think of, for example, one of the things a lot of people use is a rain gutter. Now, just the same type of gutter that you have on the side of your house. You angle the gutter a little bit, so that gravity can take the water from one end to the other. Then, you have plants all along there and as the water is going down, it's going right across the roots of the plants. The roots are pulling up that water. Goes down into a reservoir at the end, gets sucked back up, and starts the whole process all over again.

Now, the next type of system is called an ebb and flow system. In this type of system, you have all of your plants sitting in pots in some sort of large, waterproof container. A lot of people might use a kids swimming pool for this. What happens is, on a regular schedule water is pumped up from the reservoir into the pool and it literally floods it to a depth of maybe two, three, four, all the way up to six, 10 inches, whatever size pots you have. You've got your flooded pool and then it holds it there for a few minutes, letting the pots and the material in the pot soak up the water. Then, after a few minutes, it's drained, the water's all drained back down into the reservoir. At this point, your growth medium here has gotten nice and soaked, so

everything's going to be damp for a little while. It waits a while and then it repeats the process, so it fills it, drains it, fills it, drains it, and does that all day long.

Now, the drawback to that, you need a little more complex hardware, you have to know exactly how much water to pump up, so you're not overflowing, you have to have a timer that does multiple times. You have to be able to turn the system on and then off for a few minutes. Then, wait for probably a few hours, then on and off again. You are going to need quite a bit more hardware for that and then, a possible drawback to that, if you have any kind of a power failure and your pump isn't working, then your plants aren't going to be getting the moisture they need. It's not something that you can really use and walk away from for several days without checking in on it occasionally.

Another type of system is called an aeroponics system. Aeroponics is going to be really similar to one of these water culture systems. You're going to have the plants sitting inside of a pot, hanging down, but instead of hanging into the water, they're actually just hanging there in air. Then, inside here, you have a bunch of little mister nozzles. What happens on a regular schedule, the pump is going to turn on and it's going to mist the base of your plant here, it's going to mist the roots just the same as if you were taking a spray bottle and spraying them. Now, the big drawback to that is, because they are hanging in air, they can dry out really quick, so a power failure on one of these systems is critical. Your plants can die really fast.

Now some systems, like this water culture, if you're using one of these little plugs, you can just drop a seed straight in there and put it straight into the hydroponic system. Other systems, like if you're using some of these clay pellets, you're not just going to be able to drop a seed right in there. It's not going to do very well, so you have to start your seed. How do you do that? Well, basically the same as if you were starting your seed indoors to transplant outdoors. You're going to start it in a little plug, in a grow tray, under a grow light. Then, when it sprouts into a seedling, you'll transplant this into here. What these are, it's a substance called rockwool and all it is, is rock

that's been melted at about 1600 degrees and then stretched out, almost like spinning cotton candy. Feels a lot like fiberglass insulation. It's really fluffy, but it's inert, so a plant can't pick up anything from it. It's dense enough to where it will hold the seed in place, but loose enough to where even the smallest of roots can just grow right through it and then out into your grow medium.

Now, finally, the last type of hydroponics that you might have seen somewhere is a system called aquaponics. That's a system where you would have essentially a fish tank down on the bottom with plants up on the top. What happens is you've got your fish living down below and they're producing waste. Your filtration system, the same thing that would remove the waste from a fish tank is going to take the waste water and pump it back up to the plants. That's the fertilizer for the plants. Then, the excess water is going to drip down into the fish tank. In many cases, the plants roots will go down into the tank and the fish can nibble on the roots and that's their food. If you got it right, it's a closed system. You do still need to check your levels in the water, all your Ph levels and nutrients, things like that, just as though you would in either a hydroponic system or in a fish tank, but if you've got it going right, then the fish are going to feed the plants and the plants are going to feed the fish.

Now, it is a more complex system to start off with, so what you really should do is you need experience taking care of a fish tank on its own and taking care of a hydroponics system on its own before you decide to combine the two into an aquaponics system. There's all sorts of different sizes you can get. You can get something just as simple as a small, little five-gallon tank with a few pots of herbs on the top of it. In that case, the fish would probably be just some small goldfish or things like that, and that's more decorative. There are systems that go all the way up in huge size, up to the size of a swimming pool where they're growing a ton of vegetables on the top and the fish are growing large enough down below that they're actually harvested for food.

Now, hopefully, this has given you just a basic introduction to hydroponics. What it is, the types of systems there are, why it's

beneficial. It's a great hobby. It's something that the kids love doing. You can get started for really about the same price as you would for growing plants outside. For just your simple systems like either a water culture or a wick system, all you need is a couple of pots, whatever you're going to grow your plant in, whether it be the coconut coir, the rocks, or just these little plugs, and then an air pump. You should be able to get started for under, say \$20-\$25. You want to know even more, head on over to Self Reliant School and check us out. We have an entire hydroponics course where I go into detail, step-by-step instructions on constructing each of these types of hydroponic systems. Take care and have a great day.

Marjory: Well I really do enjoy Bill's straightforward and down to earth method and form of presentation there. If you want to get in touch with Bill, he has that Self Reliance School. They teach you how to grow, how to cook, and how to preserve food. Click on that button to the right there. That will get you in touch with Bill and the self reliance school, which is an awesome resource and of course you'll get to see more on Bill on hydroponic systems, especially as related to prepping. Down below that, of course is the button to pick up the whole summit package, and I would want to encourage you to do that. That's how we sponsor these types of programs and make this information available to everybody is by packaging these up and selling them and your support really really does help this whole process. Click on that button down below and pick up a copy of the entire summit package with our 30 something presentations in here. Okay, and then come join me on another one. This is Marjorie Wildcraft.