

## Doing Your Test Grows, or “How Do I Know What To Grow?”

**You can't make money with aquaponics if you grow the wrong things. Not everything will earn you the same return, and guessing is deadly; especially guessing how much you're going to get per head or per pound for a particular item. Good aquaponics systems grow vegetables like wild, but if you grow the wrong vegetable, you won't make a profit.**

**Example:** in our 6,000 square feet of aquaponics system, we can harvest about 800 pounds per week of high-quality organic head lettuce. But we only get \$2 per pound for it, or \$1,600 gross. If we harvest it a little earlier to get smaller “spring mix” leaves we would only get 600 pounds a week; but we'd get from \$6 to \$9 per pound for it when rinsed, dried, and packed in nice biodegradable individual bags. This is a gross income of \$3,600 to \$5,400 per week. Not bad, right?

We could grow about **2,000 pounds** per week of Napa cabbage in the same area instead. On the face of it, this sounds like it might be a better deal; we'd have **1,400 pounds more** produce to sell. But when you analyze the market for organic Napa cabbage in our location, you find that you only get \$0.79 per pound for it.

This is \$1,600 per week; with slightly lower expenses than we had for the \$3,600 to \$5,400 worth of lettuce spring mix. Selling the 800 lbs of head lettuce for \$1,600 gross would be a **better deal** than the Napa cabbage for \$1,600 gross, because we'd only have to harvest, pack, and move 800 pounds of lettuce instead of 2,000 of cabbage!

It's **obvious** which is the **best** deal for us, though: the spring mix, with a gross of \$3,600 to \$5,400 per week! Where did we get this information? We did preliminary market research, then test grew and test marketed the head lettuce, the lettuce spring mix, and the Napa cabbage to determine how much our yields were, how long our “cycle times” were, how much labor was involved, and how much the market could take.

### What To Grow:

You will know what to grow for profit after you've completed **your preliminary market analysis** and have also done a number of “test grows” in your area. **Why** is it necessary to do a test grow? Can't you just **select things** from the “Planting Trials” section of the manual and be **successful** growing them in your location? **No! Even with all our experience, we couldn't do that!**

**We can't predict which varieties of which species** will grow well in your location. This is because things will grow differently in your location from other locations. All the following things affect plant growth, and they **all** change your results when your location changes even slightly: your average amount of sunlight, your day and nighttime temperatures, your humidity, your knowledge and experience level, and your particular greenhouse or climate-control systems. This holds true even if you're using our exact system designs **with no changes!**

A grower who lives just down the street from you will get **different results**; this is why some farmers who enter the County Fair contests win, and others from the same area don't even come close. So how do you determine what to do? **Do several test grows, then test market with the produce from the test grows.**

If you want to build your commercial aquaponics installation now, and choose what to plant it out in without doing any test grows, OK. **But we warned you:** we know of four large commercial aquaponics failures that invested \$350,000 to \$1,400,000 and lost it all. None of them bothered to do test grows first to determine yields, labor costs, and cycle times (addressed next). These failures are cited in the slideshow titled “Commercial Aquaponic Failures.pptx” that accompanies this manual; we do **not** want an opportunity to add your business to it as a case study in the future.

**One of the things your your preliminary market analysis** will show you is that **lettuce** is a **high-value crop**. This is because growing lettuce in the soil is incredibly labor-intensive and it is also difficult to produce a high-quality product. It's much less work in aquaponics, and the quality is two or three times what soil-grown lettuce has. So we have a suggestion: grow lettuce for money (that is, the varieties your test grow showed you were best) your first year while you continue to do test grows with your Micro System.

**Growing lettuce is relatively easy money;** and by the time a whole bunch of other aquaponics growers come on the market in your area, you will have figured out how to grow a bunch of other crops too, and can move on to the most profitable of them. Your first year is always a cash crunch, and lettuce is a guaranteed income crop for which we've worked out all the bugs. Just follow the "**High Density Planting Techniques For Greens**" section of the manual; it explains how to grow the best lettuce in the world in excruciating detail.

## How To Do A Test Grow:

**Do a "preliminary market survey" first.** This is simple; just cruise the organic produce section of your nearest grocery stores, and write down the produce prices in a list. Average out the prices, then compare this list to the "Planting Trials" section of this manual; this will give you a starting point to order seeds for your test grow from. If there's an item with a high local price that the Planting Trials said grew well, **get some seeds and try it.** If the Planting Trials said it grew poorly, but it's a high-value crop, maybe you should **still** try it, because we know things will grow differently in your area.

## Micro System Ideal For Conducting Test Grows

Our 64 or 128 square foot Micro Systems are **ideal** for doing test grows; you got the plans and manual when you bought this manual. The 64 has **412** plant spaces, and the 128 has **824** spaces; you can try a number of different varieties and species. You'll need all the normal supplies for growing: slit pots, potting mix ingredients of coir and vermiculite, seeds, and nursery trays to hold the pots.

You will also need the following special items so you are able to accurately track all the information you will obtain: a scale that can read to within a hundredth of a pound; plastic plant tags so you can tag each batch of seeds planted with the species, variety, and date planted; and special markers called "**Garden Markers**" for marking the plant tags with. These have ultraviolet filters in the ink so it won't fade, and are environmentally friendly.

## Why Bother With A Test Grow?

The four large recent commercial aquaponics **failures** we just referred to that invested \$350,000 to \$1,400,000 and lost it all is why. **None** of them bothered with **test grows** first to determine yields, market pricing, labor costs, and cycle times (addressed next), nor did they try out their chosen aquaponics **technology** first at a small scale to see if it was **profitable**.

They just "**went for it**", as we say in Hawaii. "**Go for it!**" is a surfing term ("went for it" is past tense), and means "paddle hard and catch the wave!". The problem with going for it comes when you do so without the necessary experience and skill level. You often end up "going over the falls" on your wave. We surfers also call this "being in the washing machine", and yes, it's as bad as it sounds! Use your imagination when extrapolating this technique to a new business that has your money and time involved!

## Specifics Of Doing A Great Test Grow

We'll assume you're conducting this test grow in a reasonably mature Micro System, because if you do this during the "startup" period, everybody knows you may experience slight nitrogen deficiencies which will skew your results. Wait until your startup is over and things are growing well before you do your first serious, well-documented test grow.



**(Left) A Micro System 64 in full bloom; I can pick out 21 different species of plants. Can you find the banana tree and the pineapple plant? Can you identify the three species that are going to seed? (We sometimes collect our own seeds, too).**

We'll further assume you purchased seeds for the produce items with the highest local prices, that you know will grow in aquaponics systems (check in **Planting Trials**, with 150+ varieties of plants we've grown in aquaponics to get an idea where to start). You planted these seeds according to directions in the proper potting mix, have watered them properly to germinate them, have germinated them in optimum conditions (see **Germination Section** of this manual). What now?

Wait, feed the fish, and check ammonia and pH once a week. Your test grows will take from 28 to 90 days, depending on many factors: species and variety of plant, amount of sunlight received, air and aquaponic water temperatures, adequate protection from nighttime cold temperatures, protection from too much sun in the summer, and so on.

### **Documenting Your Test Grow:**

When you planted the seeds, you recorded the **species**, seed **variety** and planting **date** on plastic plant tags with a "**Garden Marker**", then stuck the tag (or three tags, so you don't lose them all if one blows away!) into the pots in the nursery tray you put the newly seeded plants into. These tags accompany the plants during the whole test grow, so you don't mistakenly mix up plants. The **only** thing worse than having something grow poorly is to have something grow really **well** and have **no idea what it is!**

If you've **lost** the plant tags and don't know what that **awesomely productive** variety is, the only recourse you have is to order your **entire** last seed order all over again, replant, and wait a month to three months to figure out what's what. Only this time we bet you'll remember to tag your plants! This is why using plant tags and keeping them with the correct set of plants all the way to harvest **is critical!**

**(Below) Dang! Those plant tags must be in there somewhere!**



### **For Your Second And Subsequent Test Grows:**

- ❖ **After your first test grow**, you will have an idea what grows well out of the crops you selected. However, you couldn't try everything in the seed catalog in the limited area of your Micro System, so you only planted certain things: what you considered your "best bet". It is a **really good idea** to go back during your second and subsequent test grows, and plant **at least** three or four varieties of each vegetable type you're considering, especially if it didn't do well in the first test grow.
- ❖ Here's why: we've found that one or two varieties of a vegetable will do quite well in our specific location, one or two will do poorly, and the others in between somewhere. If we accidentally select the one that grows poorly when we're ordering seeds, and don't ever try the others, we're running the chance that we will conclude that "so-and-so doesn't grow well", and miss a bet, when what really happened is that we just picked the wrong one.

### **Raft Spacing is AS important as which vegetables grow well:**

- ❖ **What do we mean?** Imagine your test grow went well, and you found three or four vegetable "candidates" for your commercial production. Wouldn't you be irritated if, a year or two down the line, you found out that you could grow them at a 20% higher (or lower) density on the rafts and end up with **more total weight**, or **more heads** of produce? I would. So the time to experiment and determine what **planting density** yields the

**most production** (whether it is heads or pounds you are selling) is **before** you build your 10,000 square feet of trough and holesaw all the holes in your **\$25,000 worth of rafts!**

- ❖ **Here's how to determine the optimum raft hole spacing for your selected crops:** Do your first test grows in the standard 32-hole 2-foot by 4-foot rafts; this will give you a "baseline" from which to experiment, and weigh and record the results. Select the three or four crop items that grew best in your test grows on the 32's, and try a test grow of each of them in a 40-hole 2-foot by 4-foot raft, **and** in a 26-hole 2-foot by 4-foot raft. The reason for doing this is that you don't know which will produce more weight: the 40 will certainly produce more heads, but if each head weighs less, you may actually get less weight per raft than growing in a 32. But you **might** get more. Also, even though the 26 makes 6 fewer heads than the 32, these heads may weigh so much that the 26 has a clear "by-the-pound" advantage in production over the 32.
- ❖ If you are selling **by weight**, weigh the results of this test grow with a scale that is accurate to the nearest hundredth of a pound. If the production of your 26-hole or 40-hole raft weighed **more** than that of the 32, then **you have a winner!** The only question then is if going further in the same direction (that is, fewer holes per raft, or more, whichever yielded the higher weight) is going to produce even **more** weight. Further experimentation may be in order.
- ❖ If you are selling **by the head**, take the results of this test grow to your buyers. It's obvious that if you grow more heads that are **exactly the same**, and you can sell **for the same price each** using the 40-hole raft, it's a good deal for you. It's not quite so obvious that the buyer might be willing to pay enough more per head for the larger, more attractive heads that might come from the 26, that you might make more money per raft this way. The only question then is if going further in the same direction (that is, fewer holes per raft, or more, whichever yielded the higher weight) is going to produce even more dollar value of heads per raft.

### **Positive Results Of Our Test Grow:**

- ❖ There's a ton of stuff our aquaponics systems grow really well: basil, thyme, oregano, cilantro, Italian parsley, and other specialty herbs; all kinds of lettuces, chives, green onions, leeks, green beans, purple beans, long beans snap peas, regular peas, Japanese cucumbers, all kinds of tomatoes, many different kinds of oriental stir-fry vegetables including kyona mizuna (which in Hawaii, sells for \$12/lb. around New Year's), cabbages, kohlrabi, silver beet, Swiss chard, and broccoli. We forgot to try cauliflower. We grew some odd stuff like tomatillos, garden berries, thornless blackberries and amaranth (a GRAIN); I am sure there is a lot of other stuff that would grow well, but we were primarily focusing on crops we thought had commercial potential.  
  
Strawberries grew really well until the Chinese beetles decimated them. Please see the "How To Win The War On Bugs" section for how to decimate Chinese beetles, using organically certified pest control methods.
- ❖ We had several varieties of tomatoes that did really well, but attracted insect pests like nobody's business. These would thrive in a greenhouse situation. We considered putting in a system just to grow tomatoes, and probably will when we have the money for the system and an extra \$10-15,000 or so for the greenhouses. Tomatoes need some kind of support, and they put a LOT of weight on that support. Figure for just 32 square feet of rafts of tomatoes, the plants and fruit can weigh two to three hundred pounds. Build your support structures accordingly, and build them so you can get your hands in there and harvest easily.
- ❖ We grew watercress, peppergrass, and other cresses in the margins of our hydroponics troughs. It grew well just floating free, but for commercial growing we made a 4' by 8' frame out of 2" PVC pipe, with a piece of quarter-inch plastic mesh fastened inside it on the bottom side of the pipe; the watercress grows right on top of the mesh in about a half-inch of water that comes up over the mesh. This stuff grows like a WEED in aquaponics systems, is beautiful, crunchy and flavorful, and has incredible shelf life!



**Here is the amazing watercress that took over the entire end of one of the growing troughs. We would cut it back dramatically, and a week later it would look just like this, and a week after that, it was growing over and obstructing the walkways between the troughs.**



- ❖ **Left: Tomatoes growing on the netting. The tomato on the right was bug-bitten when tiny, but grew up to be good to eat anyway!**
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- ❖ **Right: Photo of 32 sq. ft. Nano System (from our "Table Top Systems Manual") showing red support netting strung up to allow the climbing plants (tomatoes, peas, squash, etc.) to grow up it. A shipping box has been added to the system, below left (beige) lined with liner and ready for gravel bed flow-through or rafts. Inflow is from the black mud tub middle left.**

- ❖ Leeks grew in half the time it takes to grow them in the dirt, and got HUGE, while still being quite tender and flavorful. We tried 3 inch slit pots at first, then moved to 2 inch slit pots because the leeks grew just as well in them. Over a period of seven months, we conducted a "cut and regrow" experiment with a raft of leeks, and they successfully regrew four times, with an approximate total of 210 lbs. of leeks over seven months, from one 32 square foot area. Our market price was \$4.00 per pound; if sold through a CSA or Farmer's Market the gross income from that 32 square feet would equal \$840.

### **Negative Results Of Our Test Grow:**

- ❖ We had some odd results: our first set of lima beans and fava beans grew huge bushes but made no beans, but the second time we planted them they made lots of beans. The first time we planted bell peppers, medium-hot peppers and hot peppers, they all grew very well, but then wilted and shortly thereafter fell over with stems rotted in the center. The second (and subsequent) time we planted them they did fine. Our first

eggplant finally matured a 3-oz fruit after 3 months right next to a tomato plant that had given 200 lbs. of tomatoes during the same period; then we got some other eggplants to bear decently. We know of a grower who's grown corn with the appropriate supports. Those short little round carrots grow fine.

- ❖ Obviously, many things will not grow in Aquaponics systems. Trees probably won't work. We've had no luck with lemongrass (grows great for a month, then rots off and falls over); rosemary (just doesn't grow worth a darn!), spinach (sprouts then stays little forever), and long carrots.
- ❖ The problem with research is that whatever portion of your system is planted in research crops is not earning money for you right now. It might if the experiment pays off. The point is, we can't afford to do only research until we figure out what is the best to grow, or the best way to grow it. We need to learn those things while we keep the cash flowing. So please, experiment with whatever you can afford to according to your intuition and analysis, and we promise to share our results with you if you share with us.