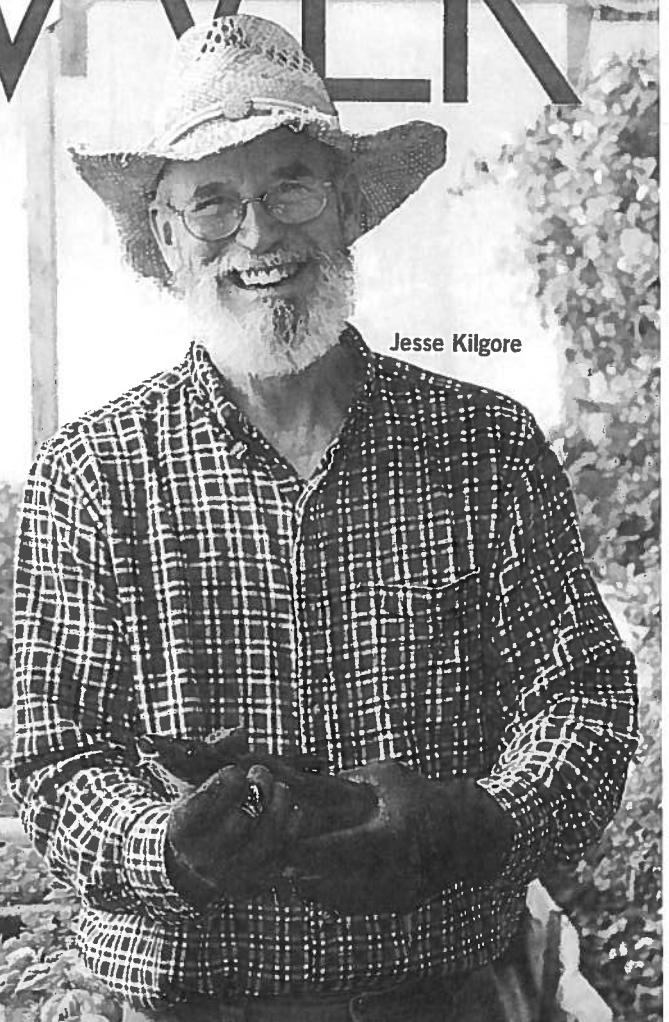
April 2015

greenhouse GROWER

Aquaponics Is Set To Make A Splash

Brogue Hydroponics' expansion into aquaponics uncovers new marketing opportunities for the adventurous grower.



Jesse Kilgore

Biocontrols Special Section
page 40

Aquaponics Is Set To Make A Splash

The owners of Brogue Hydroponics explain why they expanded into aquaponics, and how the shift has helped them uncover a new market opportunity.

by **BRIAN SPARKS**
Contributing Editor
bdsparks@meistermedia.com

THERE is something fishy taking place at Brogue Hydroponics in Brogue, Pa., and according to Bob and Jesse Kilgore, it's all by design.

A few years ago, Brogue started expanding into aquaponics, a combination of aquaculture and hydroponics that relies on the use of live fish to generate nutrients for plant production.

Bob Kilgore, co-owner of Brogue Hydroponics with his wife, Nancy, immediately became intrigued with the concept of aquaponics when he first learned about it at a CropKing conference about 10 years ago. Since then, along with their son Jesse, the Kilgore family has turned it into a new production and marketing opportunity that is on the path to being both sustainable and profitable.

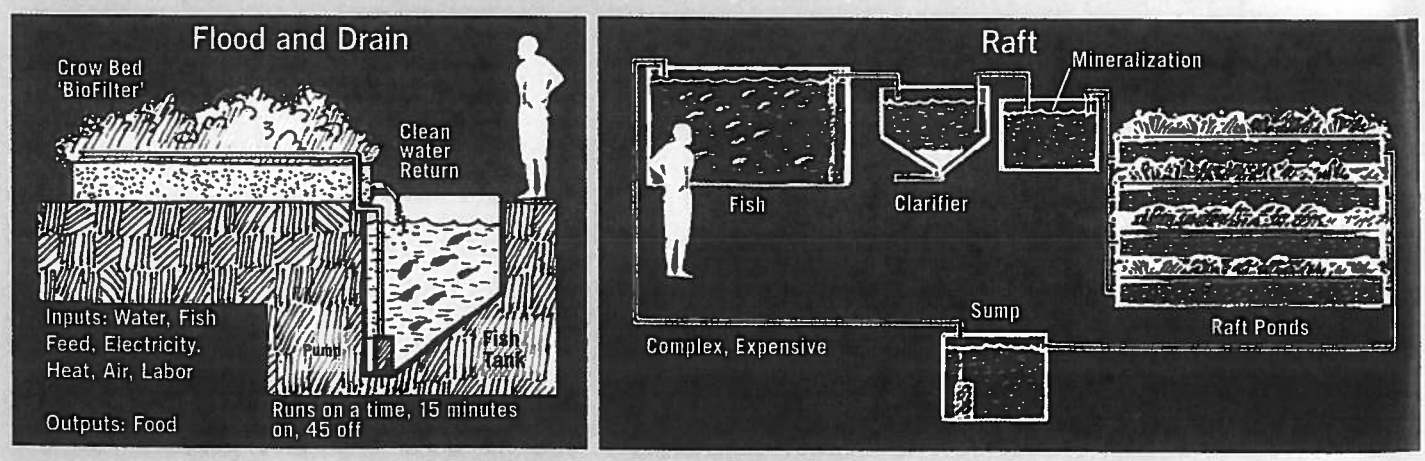
Shift To Aquaponics Was A Natural Fit

In the 30-plus years Brogue Hydroponics has been in production, its target customer base has shifted from wholesalers to restaurants to farmers' markets. Today, while restaurants remain a key audience, the bulk of Brogue's sales come from farmers' markets. "We do two year round indoor farmers' markets, as well as seasonal outdoor markets in the summer," Bob says.

This growth in farmers' market sales means more direct

Two Types Of Aquaponics Systems

The flood and drain system is a simple, low-cost method applicable to both large and small operations. The grow bed acts as a biofilter. The raft system places the plants in styrofoam rafts.



Courtesy of Bevan Suits AquaPlanet

communication with consumers asking for sustainable, locally produced items, which made aquaponics a natural fit for Brogue Hydroponics.

"Even from a non-economic standpoint, it was exciting to grow fish," Bob says. "The sustainability of it is attractive, and the prospect of having locally grown fish and offering them as a product has helped turn it into a niche market for us."

Jesse echoes these thoughts, noting that "lots of people are interested in it. It captures attention and gets them interested in what you're doing. It's good publicity and PR."

The shift to aquaponics, says Bob, was also a natural fit because there were not a lot of structural changes required. "Because we were already in hydroponics, we weren't starting from scratch. We had the systems in place and wanted to add to what we had."

In aquaponics systems, the fish tanks are under the grow beds, so you're able to feed your fish and grow your plants together.

"With our system, we are simply using the same amount of space we would be using for hydroponic production, so we're adding another level of productivity out of the greenhouse without adding any more space or overhead costs," Jesse says.

Choosing The Best System

When it came time to expand into aquaponics, Bob chose to hire a consultant: Bevan Suits at AquaPlanet. Suits worked with Brogue Hydroponics on choosing the production system that best fit what they wanted to accomplish, as well as choosing which fish to grow.

Suits says there are basically two schools of aquaponics (see the graphic on page 14). The "raft" system is the dominant commercial model, based on the work of James Rakocy at the University of the Virgin Islands. The "flood/drain" method (this is the system in place at Brogue Hydroponics) was established at North Carolina State University by Mark McMurtry and, according to Suits, "is widely perceived to be suitable for small-scale hobby systems." However, Suits notes that the flood/drain system was initially developed as a large-scale, greenhouse-integrated design, with reduced costs and complexity. "It's a great design."

Bob says the flood/drain system was simple to build and has been easy to

10 Things You Need To Know About Aquaponics

Are you curious about expanding into aquaponics? Bob and Jesse Kilgore offer 10 factors you need to consider.

1. **Pay attention to nutrient levels.** "In aquaponics, the EC level of nutrients in the solution is much lower," Jesse says. "We've had very healthy plants in an aquaponics system, and we can hardly detect nutrients in the water. It's as if the plants are removing the nutrients as soon as the fish put them in the water. But you have to watch your balance. The plants create clean water for the fish. If you don't have enough plants, you could potentially create harmful water for your fish."

2. **Have a consultant on hand.** "Talk to experts and have them on board," Bob says. "Once you get into the system, you will likely run into problems and need to find solutions."

3. **Pest control can be a challenge.** "You have to be certain that what you spray will not harm the fish," Jesse says. This can be difficult, especially when it comes to insect control. Brogue has always used a combination of conventional materials, organically approved materials and beneficials. But even organic materials can be harmful to the fish and unusable for pest control, so your pool of products is limited. As a result, Brogue uses a lot of biological controls and beneficial insects, as well as insecticidal soaps, in its aquaponics system. "This is another area where having a consultant can help and should be part of your plan," Bob says. "You have to be very knowledgeable about every product and how you are using it."

4. **Air pumps are critical.** "You need air pumps for sure," says Jesse. "One thing we learned is it's better to oversize your air pumps so you have plenty of oxygen."

5. **Along with these air pumps, make sure you also have an alarm system in place.** "Maybe the biggest thing we've learned is how critical it is to have fail safes in place," Jesse says. "This is a difference between hydroponics and aquaponics. If you have a pump go out in a hydroponic system and you notice it four hours later, you might have some plant wilting, but you can turn the water back on and there's no loss. In aquaponics, if a pump goes out, it could be a matter of hours before you lose your fish." Because of this, you need alarms to alert you when your systems aren't working, as well as shut-off switches. "You have to anticipate what could go wrong and figure out a solution," Jesse says.

6. **You need to get an aquaculture license if you want to sell your fish.** "Once you start selling fish, it needs to come from a licensed facility," Bob says.

7. **Find a reliable fish hatchery.** "Make sure you have a good hatchery where you trust the quality of the fish, as well as the fish food," Bob says. "We get all our fingerlings from Zetts Fish Hatchery in Drifting, Penn. I would suggest that folks contact their local agriculture agents for recommendations."

8. **Fish food is not complicated.** "Fish waste in the water is filtered through gravel grow beds, so the plants are acting as biofilters," says Bevan Suits of AquaPlanet. "Sometimes adding nutrients is necessary, but for the most part the only input to the system is fish food, which is available commercially. Over time growers can experiment with their own food production, and there are aquaculture experts more than willing to help with the process."

9. **You need a fish that is going to grow quickly.** "We estimate it takes 9 to 12 months to get trout to market, and 15 to 18 months for bass," Jesse says. "Faster growing fish are more efficient, they eat more and have higher metabolism."

10. **Decide early if you're going to process the fish yourself.** "When we first started selling live fish to restaurants, they would process it," Bob says. "But if you're going to sell fish at a farmers' market, you need to coordinate the processing. We came up with a system where we take it to a monger and we pay him to clean it for us."

maintain. The grow bed is filled with stones that act as a filter, similar to an ebb-and-flow system but with stones instead of perlite.

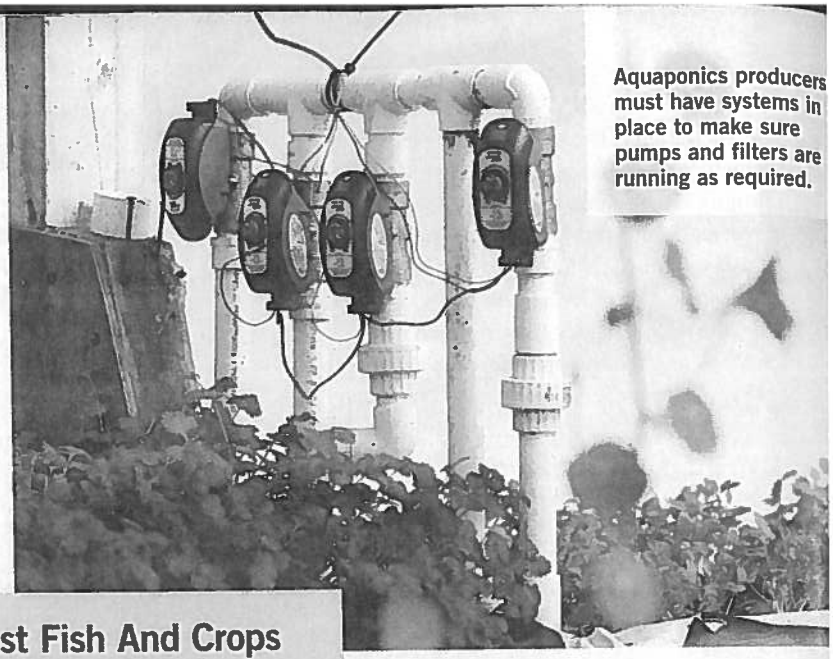
"We have to wash the stones about twice a year, but overall the system has been operating well for several years, and with very little tweaking," Bob says. "All we do is feed the fish and add a small amount of iron in the system."

Match Your Fish To Your Crop

Both the Kilgores and Suits say there is no exact science for matching the types of fish and crops you want to grow. For example, growing basil and tilapia together seems to work well, says Jesse, because they are both warm water-loving crops. On the other hand, "some crops may not do as well if you need to heat your water," says Bob. "We grow trout with cilantro, because we are cooling the water in the height of summer, and this keeps the trout happy and also makes for a great environment for the cilantro."

This would be true for any fish that prefers cool waters and plants that thrive in cooler environments, such as most lettuces and greens. "That's not to say that you couldn't grow lettuce with tilapia," Bob says, "but you may have to meet in the middle in a zone that is a little cool for the fish and a little warm for the plants."

Some systems would be incompatible, for example, trout and tomatoes or cucumbers. In the end, it might come down to simple trial and error. "Our striped bass do well with basil and parsley beds," Bob says. "We heat that water to 70 degrees, and it will sometimes get even warmer in the middle of summer. I don't think lettuce would be happy with that, but the basil loves it."

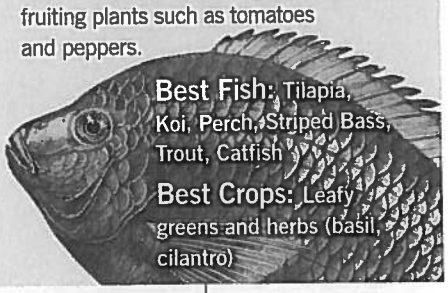


Aquaponics producers must have systems in place to make sure pumps and filters are running as required.

Best Fish And Crops For Aquaponics

The fish and plants you select for your aquaponic system should have similar needs as far as temperature and pH, according to Nelson & Pade. There will always be some compromise to the needs of the fish and plants, but the closer they match, the more success you will have.

As a general rule, warm fresh-water fish and leafy crops such as lettuce and herbs will do the best. In a system heavily stocked with fish, you may have luck with fruiting plants such as tomatoes and peppers.



Best Fish: Tilapia, Koi, Perch, Striped Bass, Trout, Catfish

Best Crops: Leafy greens and herbs (basil, cilantro)

The Future Of Aquaponics Is Exciting

Aquaponics may look like a fad, says Suits, but it has been extensively researched, and can produce fast and high volume of a variety of crops. "It has been shown in studies (bit.ly/1zY8hUy) to exceed hydroponics in yields and can be certified organic. The fish add a wonderful living component to an engineered system."

Making the leap of adding fish to a greenhouse is not difficult, says Suits. "Scaling up into food production does require some careful planning for business development, engineering and training. Daily operations consist of monitoring system levels, planning and processing the flow of seed starts and harvested crops."

However, the long-term value of year-round vegetable and fish production in every city is very big. "One grocery chain, with 15 stores, might need at least 4,000 pounds of tomatoes per week, year round," Suits says. "Existing local growers can only cover a fraction of that per year.

"For aquaponics to succeed requires real farming experience and know-how," says Suits. "For the next generation of farm kids, aquaponics could be just the thing."

For the individual grower, Jesse Kilgore says it simply makes for an exciting future. "If you can make money off fish, it can help increase the profitability of your operation. Sustainability is also a factor, as space for agriculture production becomes tighter," Jesse says. "If you can grow protein and vegetables in an efficient space and system, this can help feed people. That's the type of thing that excites us and our customers, as well." GG

Ways To Learn More

Because the commercial application of aquaponics is still relatively new to the greenhouse industry, there is a lot to learn. Fortunately, there are plenty of resources available to you.

- Consultants are a great resource. Bevan Suits is with AquaPlanet LLC (**AquaPlanetOnline.com**), and on an international level, Suits says Murray Hallam (**Aquaponics.net.au**) is considered the "Steve Irwin of aquaponics."
- Training curricula is being formalized on a government level in Australia, based on the work of Murray Hallam. It is being adapted for the U.S. by the Ingenuity Innovation Center in Oregon. Training will cover the science, operations and food safety practices.
- Industry suppliers such as CropKing, Pentair Aquatic Eco-Systems, Farmtek and Nelson & Pade offer equipment, supplies, technical support and training classes both in person and online.
- Suits is also working with Chemeketa Community College in Salem, Ore., to design and install aquaponics equipment at the college to demonstrate the value of this type of system. Students will be able to learn more about the demands and benefits of producing fish and vegetables in unison.