Fishy vegetable production methods explained through aquaponics

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Dr. Joe Masabni, Texas A&M AgriLife Extension Service vegetable specialist in College Station, demonstrates a small-scale aquaponics setup. Credit: Kathleen Phillips

If growing vegetables in a box with no soil and out of direct sunlight sounds a little fishy, well, it is.

"Aquaponics" is a relatively new way of intensified farming that combines aquaculture and hydroponics, according to Dr. Joe Masabni of College Station, Texas A&M AgriLife Extension Service vegetable specialist.

"We are combining fish, which is the aquaculture, and hydroponics, which is vegetable productionin soilless media," Masabni said. "Whether it's running water through pipes or a flood-and-drain system, the idea is to combine the two where the fish waste becomes food for the plants, and the plant roots clean the water by absorbing all the nutrients. The water then is recycled back to the fish."

Aquaponics methods originated at the University of the Virgin Islands in the early 1980s by Dr. James Rakocy, who retired from the university in 2010. He is still active in the industry with the book, "Aquaponics: a Comprehensive Guide to Proven Principles and Practices," which he co-authored with his successor Dr. Wilson Lennard.

The method has been tried and even successfully used by producers in Texas since the late 1990s. But in the past five or so years, Masabni said, interest has steadily increased in Texas among vegetable producers to the point that a majority of the requests for assistance he receives pertain to hydroponics and aquaponics.

"It has become very popular, because in general with hydroponics you can produce the same crop with a lot less water because the water is recirculating. And with the addition of the fish population there is less fluctuation in the nutrients," he said. "You don't have to replenish the minerals, and you don't have to worry about pH results going really high or really low.

"In theory, you can grow any vegetable because what you have is water, oxygen and nutrients," he said. "The roots of the plants are sitting in a nutrient-rich situation with lots of water and lots of oxygen, so they will never rot. Anything can grow."

He said the most cost-effective plants to grow might be herbs, lettuce, kale, watercress, spinach and other small plants that have a relatively fast

yield. Other vegetables, such as tomatoes, also can be grown aquaponically, but may not produce quickly enough to be profitable.

Steve Sumrow, owner of Aquaponics USA in Adkins, said an aquaponic system can be "functional" in a size small enough to fit on an apartment balcony. However, he said, a much larger system would be necessary in order for the it to produce adequate food to sustain a family.

"For a family of four, I'd say a system with about 75 square feet of grow space and about 500 gallons of water would be sufficient to harvest about 10 pounds of fish a month and keep enough breeders to replace the fish used," Sumrow said. "It would also supply the family with an adequate supply of vegetables. Basically, it could produce enough vegetables for a family of four to eat each day, but probably not enough fish for each day."

He added that aquaponic systems can also be built to use solar or wind power, though the system he described which could produce sufficient food for a small family likely use only about $15 in electricity per month to operate.

"If it's for fun it can be done, but if it's for business, you may want to do the math to see what's profitable," Masabni said. "A lot of smallacreage farmers have been making just as much money from the classes and the tours of their facilities as from the sale of the fish or the plants."

The cost effectiveness of various methods is yet to be determined for Texas commercial producers, Masabni said.

"I don't think on a small scale it can be profitable in terms of the production part," he said. "If you add the tours and the 'visit the farm,' experience, then it could be profitable. It is just a good part of a bigger picture.

"A producer can sell produce as a Community Supported Agriculture system, and sell to restaurants and farmers markets, but can also do farm tours and lectures because people want to see the fish and visit the greenhouse where the vegetables are produced."

Done right and depending on the size of the operation, Masabni said, a producer would harvest, transplant and seed daily.

"You keep replacing what you harvest. That's the ultimate goal, though in reality it's often the cycle for every third day, because the operation isn't big enough to sell and replenish daily," Masabni explained.

Aquaponics also lends itself to extending the product'sshelf life, which could be a marketing advantage for producers.

"Harvest is different from field harvest, because we don't cut the roots off and package it. You just remove the excess roots from the growing cup, and then you package it," he said. "It will last a lot longer with no wilting. When the roots remain on the plant, it is still alive, so it can last a couple of weeks in the refrigerator and still taste, smell and look like it was harvested yesterday."

Though he is concentrating on commercial aspects, Masabni said the idea is also inspiring people to try aquaponics on a smaller scale for personal consumption.

"A person might have a fish tank and have a pump that circulates the water to a small bed where vegetables are growing and then circulate the water back," he said.

He plans to offer workshops for interested growers around the state and to do more research into production methods and economics.

"We need to answer questions such as how much nitrate is needed in the water to have a decent crop, which would determine how many fish are needed and how much to feed them," he said. "For a commercial operation, it needs to be profitable, so you would not want to be feeding 1,000 fish if 500 is enough to give you the same vegetable crop, for example.

"A lot of research isneeded as we plan for science-based programming and getting people excited about aquaponics," he said.

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