

The Genius of Simplicity

by John Wesley Smith

Genuine progress is sometimes misunderstood or simply overlooked. It may come from unexpected sources or manifest itself in unusual ways. The pioneer and his innovation may even meet active resistance, especially in an era when multinational corporations dominate both our technology and its applications.

Tom Speraneo may be a pioneer/innovator in our day, all because of a nearly fatal and disabling car crash. A strong will to survive gave him the impetus to focus intellect and effort on the development of a low-cost, no-nonsense bioculture system. This creative method of food production is no mere novelty. It could very well provide the means of survival for more than just the Speraneo family in the not too distant future.

Tom, Paula and their two children operate S & S Aqua Farm in West Plains, Missouri, located in the beautiful, but economically depressed Missouri Ozarks. They integrate hydroponics and aquaculture in a closed system to produce premium Rocky Mountain white tilapia and fresh, superior quality herbs and vegetables, including basil and tomatoes.

For several years after the accident Tom clung to employment in his chosen field of computer systems design and analysis, but a series of setbacks and Tom's 80-hour work weeks proved to be too much. His wife Paula was concerned for the family's future and Tom's health. She didn't want to raise their children as a widow. That forced Tom to change his attitude and the direction of his life. Today, Tom works at home and is committed to a venture that relies on family participation and support as key components of success.

When the family's income was reduced they were forced to get along without many things. Living under tight budget constraints presents problems for any family, but the Speraneos have turned them into opportunities. They are no strangers to hardship, hard work and sacrifice.

The simplicity of the Speraneo system was born of necessity. It uses no visible fil-

tration components, no prepared plant nutrients, no expensive lighting systems and no heaters. He humbly calls it "Ozark engineering," but the truth is Tom Speraneo is nothing short of a resourceful genius who knows necessity is the mother of invention. He demonstrates the principle that necessity makes one do what reason will not.

Simple Beginnings

It was during a visit to friends in California that Tom discovered the excellent flavor of tilapia, a fish that produces delicious white flesh with few bones. He set out to learn more about this exceptional fish and decided to start raising his own, though he did not plan to integrate hydroponics into the system at first.

Tilapia are hardy, disease resistant, herbivorous fish primarily found in tropical and semitropical areas of the world. They're native to Africa and the Middle East and have been raised for food since the days of the ancient Egyptians around 2,000 B. C. It is believed Christ fed tilapia to the multitudes. Tilapia is the most popular fish for culture in the world, next to carp. Though they're still shaking off a reputation as a "trash fish," production and market demand are on the rise in the United States.

Tom was well acquainted with fish keeping, since he had been keeping tropical fish in aquariums from age seven. He was well aware that raising tilapia required water filtration, but could not afford a filtration system costing up to \$6,700.

After researching the literature, careful planning and scrounging for materials from salvage yards and auctions, the Speraneos began raising tilapia in a 500-gallon, tank, cycling the effluent through three growing beds that produced an abundance of large cucumbers and tomatoes — all in a 12- by 24-foot attached greenhouse. The cost of the entire project was about \$3,000.

That's a remarkable achievement under any circumstances and probably could not have been accomplished by just anyone.

Yet Tom says he could improve on it today, looking back with hindsight. "It's better to achieve anything with no money than to have a lot of money and achieve at a mediocre level," Tom explained. "I would have blown it if I would have had \$100,000 to start with."

A larger project was built in 1992 and is the center of activity now. It consists of a 50- by 80-foot solar greenhouse containing six 1,200-gallon tanks, each connected to four, five or six grow beds. Tom refers to each tank with its beds as a "node" on the order of a local area network (in computer systems design language) with a separate experiment conducted in each node. Therefore, not all nodes have the same number of grow beds.

Tom is a meticulous record keeper, vigilantly keeping daily logs on each node. Being a perfectionist, he plans to complete a year or two of experimenting and data gathering while he continues to seek just the right balance, fine tuning details and optimizing production.

Planning, research and production began in the small greenhouse during the long process of applying for loans. Adequate financing was hard to come by. They were turned down by almost every financial institution. Bankers were willing to take risks on familiar commodities like cattle and hogs, but were concerned about what to do with a large number of tilapia in case the business failed.

Eventually, the Speraneos were awarded a Small Business Administration (SBA) loan to build their large greenhouse after submitting a business plan and thoroughly answering all the SBA's questions. Though establishing the business has been a struggle, they remain undaunted and continue to produce much needed income from the sale of produce and fish, as they have done from the beginning in the smaller greenhouse.

Simplicity of Bioculture

From the outside, the Speraneo system doesn't look complicated, yet nothing about it would work if not for those com-

plex synergistic relationships that take place in a natural setting. The effluent from the fish tanks is not filtered or purified at all before reaching the plants. According to Tom, "Most systems have hydroponics uppermost in mind and purify the water to go through feeder lines. This system does it backwards. We throw everything in there."

Each grow bed contains a foot of pea gravel. Plant roots occupy about the first 3 inches of gravel, allowing effluent to trickle through the remaining 9 inches and down the length of the bed before being pumped back into the tanks. The plants get all the nutrients they need, while bacteria in the gravel remove harmful ammonia produced by the fish. "The water comes back to the fish nearly 96 to 98 percent pure. It's so pure you could drink it, except for some bacteria from the gravel," Tom said. "It might give you the Aztec two-step."

Adding nutrients for growing the plants is unnecessary. However, it is important to have plants at different stages of growth in each node to fully utilize the effluent. Since several grow beds are connected to a tank, one bed may contain seedlings, another may contain half-grown plants, while another may contain produce ready for harvest.

This perpetuates the water purification process. Tom warned that fish must never be left without plants in the grow beds or water purification stops. Likewise, the grow beds should never be permitted to dry out or bacteria in the gravel, essential for the purification process, would die. The more plant roots, the better. One cubic foot of grow bed space is necessary for every cubic foot (7.36 gallons) of water in the tanks. Of course, plantings at various stages of growth can also insure a continuous, regular harvest.

It is also essential to keep the fish from becoming overcrowded. One way Tom does this is to prevent breeding. Growth rate is also slowed down for female tilapia in the reproductive stage. Tom doesn't allow fish density to exceed 3/4 of a pound of fish per gallon of water. Overcrowding can lead to the spread of disease and stunted growth.

The Speraneo system offers the flexibility to produce a diverse array of plants. All

seeds and cuttings are started directly in the gravel. For example, basil seeds become covered with a nutrient slime coat after the first 24 hours and germinate rapidly. The seeds are planted thickly, then placed in the appropriate spot in the rotation when ready. Flowers and bedding plants for the farmers' market are started in the grow beds. Tomatoes can be started from cuttings. The Speraneos are attempting to grow tree saplings and even some rare plants.

Simple to Operate

Tom had experimented with hydroponics before, without success. In his bioculture system plants get what they need without the fuss of mixing chemicals. The pH is adjusted by simply regulating the amount of protein in the fish feed. Protein content affects ammonia output from the tilapia. No further treatment of the water is necessary. The unfiltered effluent/nutrient is pumped straight to the grow beds through 1-inch PVC pipe.

Regular monthly maintenance keeps the pipes from clogging. Surprisingly, there is no build-up on the gravel. After three years, Tom has not needed to clean the gravel or the fish tanks. Despite a possible problem with calcium carbonate from well water, there have been no problems with nutrient deficiencies. Calcium carbonate could tie up iron, but spraying tomatoes with iron chelate foliar spray made no difference. Slow growth is remedied by more sunshine. Tom made this discovery during last winter's unusually cloudy weather.

Half-horsepower pumps are used for recirculating the water "I know 17 other ways to do this that don't work," Tom said. Experiments with interval rates between pumping cycles are designed to determine which rate gives greater production. Cycle intervals vary from two to 15 minutes.

After the initial input charge of 140 to 170 gallons pumped from each tank, the return through the beds takes about ten minutes. A bucket containing a pump at the end of each bed holds 10 to 15 gallons. When this fills up, the water is pumped back into the tank and forced through an inexpensive plastic cap drilled with numerous 1/4-inch holes, creating a shower-head effect. This oxygenates the water to optimum levels for the tilapia, providing

for improved health and feeding rates. Additional aeration is unnecessary. The plants in the gravel get plenty of oxygen as well. When Tom switched to gravel from sand, oxygen to the fish increased by 25 percent.

There is no effluent discharge from the Speraneo system, making it environmentally friendly. Due to the recirculation and efficient reuse of water, only 7 to 7.5 percent of the water must be replaced per month as a result of evaporation and plant uptake.

Tom believes in growing organically, but his system also demands it. Any pesticides sprayed on the plants would find their way back to the fish. Any chemicals poured into the fish tanks to treat diseases would find their way to the plants. Predator wasps, ladybugs and lacewings are used to control whiteflies, aphids and any other pests that affect the plants.

As for the tilapia, they are exceptionally hardy fish and not prone to the diseases common to other species. "I've killed more tropical fish than I can remember by pouring in chemicals to treat something," Tom said. The tilapia are fed a standard catfish feed, specially purchased without drugs or antibiotics.

There is little or no waste with this method of bioculture. Leftover foliage and roots are thrown into the fish tanks and eaten by the tilapia. Anything they do not eat goes to the compost pile. Dead fish — there have been precious few — are also thrown on the compost heap and immediately devoured by healthy farm cats.

A minimum of electricity is used to minimize costs, and because the solar greenhouse design doesn't require it. When the sun shines, the temperature in the greenhouse can reach 97 degrees (36 C) even in the cold of a Missouri winter. When Tom experimented with submersible heaters for the tanks and high pressure sodium lights to augment daylength last winter, electric bills soared to over \$400 a month. Fortunately, heaters and lights proved unnecessary. Typically, electricity costs about \$100 per month for the larger greenhouse and about \$12 to \$16 per month in the attached solar greenhouse. The Speraneos are seeking research grant money to experiment with photo

voltaic power to free their bioculture system from dependence on public utilities.

Tom does all he can to maximize the use of solar energy. The fish tanks are colored black to hold in heat. "Warm water, high level of nutrient and frequent flow are what allowed me to grow tomatoes all through the winter," despite the reduced light, Tom explained. In fact, when the smaller greenhouse began operation, local organic growers were astonished with Speraneo's giant, winter-grown Hawaiian cucumbers.

Simply Spectacular Results

Market incentives motivate the Speraneos to coax maximum performance wherever possible from every component of the system. Their superior quality fish and produce bring top dollar. For every pound of feed the fish get, 1.12 pounds of fish is produced. The Rocky Mountain White variety of tilapia yields up to 44 percent of its weight in fillet, making it superior to other varieties. For every pound of fish produced, 40 to 70 pounds of herbs and vegetables are harvested.

The Speraneos have discovered they can increase basil production and sell a fresher product by cutting plants off at the stem rather than just topping the plants. This adds 40 percent more weight to plants sold. Their clean, blemish-free basil is attractive to wholesalers. They harvest about 54 pounds each week and are working to fill a market demand for several hundred pounds a week. Similarly, though they produce about 100 to 150 pounds of tilapia per week, demand is so great they could sell up to 7,000 pounds.

Simply Different

The Speraneo system is unique due to the absence of technology usually thought to be necessary for integrating hydroponics with aquaculture. The system's design offers unheard of flexibility. It can be operated on a small scale by backyard hobbyists, or on a large scale by commercial growers.

A few skeptical university professors and fisheries experts thought it sounded too good to be true. "They told me I couldn't do it in the big greenhouse," Tom said. "They didn't think I could repeat what I'd done there, but I've repeated it six times," referring to the six nodes in the large

greenhouse. The results are self evident. In fact, Jack Robinson, a Mississippi producer who supplies the Speraneos with their tilapia, is now operating a similar system to use millions of gallons of effluent.

Tom is careful to separate himself from "aqua-shysters" who sell expensive, high-tech "turn-key" systems that promise ease of operation and large financial rewards. He gets numerous inquiries from people wanting to know about specific systems. "I just ask them to find somebody who's running one successfully."

Large corporations have tried high-tech, multi-million-dollar systems and failed due to power outages, overcrowded conditions, or because they did not allow for tilapia's prolific breeding habits. Natural and organic elements in the Speraneo system function as buffers to protect the fish and plants in the event of an electrical outage such as those that sometimes occur during severe weather.

A Step Ahead

Tom is absolutely sure he's doing the right thing. He's operating a growing family business in an environmentally sound way at a time when conventional agriculture's future is uncertain. "We don't need another Oklahoma," he said in reference to the dust bowl days of the 1930s.

Tom doesn't claim to be an idealist. S & S Aqua Farm must function and compete in a very real world. "My sister-in-law asks me, 'How do you know this thing is going to work? What happens if it doesn't work?' I think about that 20 times a day," he said. "But I'm doing what I have to do. I'm betting everything I have that this thing will expand." He added philosophically, "You're never licked until you quit. You can't fail at what you don't finish."

The Speraneo system is evidently good for humans as well as for plants and fish. "I'm immensely enthused with what I'm doing and I guess if you're enthused with what you're doing and happy with life, you're a step ahead of the devil all the way." Though his former occupation gave him the opportunity to visit several places around the world, he's convinced Missouri is where he wants to be. His pace of life isn't as stressful as it once was. "I've probably added 20 or 30 years to my life by being where I am now. I've never been happier."

The Speraneos believe so strongly in what they're doing that they have not been dissuaded by a few lucrative financial offers. It's not as though they couldn't use the money, but "I don't want somebody else to control 51 percent," Tom explained.

S & S Aqua Farm may be off the beaten path, in more ways than one, but well over 2,000 visitors have sought and found it. Seven loads of school children came for tours near the end of last school year. Their visitors have include everyone from curiosity seekers to experts in the field. They have received hundreds of letters, sometimes more than a dozen a day. Calls from around the world have come from people and organizations wanting them to set up similar systems in such places as New York, Alaska, New Zealand and Somalia. Tom has been asked several times to teach courses and present seminars, despite his lack of formal training in hydroponics or aquaculture.

A Better Tomorrow

The Speraneos are planning to build a still more efficient four-node greenhouse for around \$7,000 that may employ three or four more people. One of Tom's goals is to create jobs, starting locally. They may soon produce a video and definitely want to publish a book, but don't want to be rushed into it. Tom wants to complete a year or two of experiments first.

Genuine progress can't escape public notice for very long. The Speraneos are daring to do something truly revolutionary. "There is a better tomorrow for anyone who'll dare to take it," Tom said confidently. "I want to hand down something better than what I've had to my children." As a trail blazer in bioculture food production, Tom may very well be handing down something better to all of us. 🌱

For more information on the Speraneos' bioculture system, contact: S & S Aqua Farm, Rt. 1, Box 747, West Plains, MO 65775, or call (417)256-5124. When writing, please send a self-addressed, stamped envelope.

John Wesley Smith is a freelance writer now in the process of establishing Destiny Aqua Gardens, modeled after the Speraneo system.