Fishing lesson

By **LEN WILCOX**

FISH farms are being created not only on land, but in lakes and oceans around the world. Saltwater as well as freshwater fish are now being farmed. It is a new industry fraught with challenges and pitfalls, but also great rewards.

"These days, when you buy fish at a market or in a restaurant, unless it is labeled as wild-caught, it came from a fish farm," says John Young, the Sanger, Calif.-area owner of J and J Aquafarms. "Wild-caught salmon, for example, is seasonal and costs substantially more than farmed salmon. Farmed salmon is a consistent, year-round, good-tasting product that fills a huge void."

Young is the technical adviser for a project on aquaponics, a science combining aquaculture, or fish farming, and hydroponics, growing plants without soil, at Sanger (Calif.) High School, near Fresno.

Ocean questions

Some of the large fish farms built out on the oceans have been criticized for polluting waterways due to the large numbers of fish kept in small areas. A WorldWatch Institute report says a poorly run fish farm on the ocean could devastate wild fisheries. The report says a fish farm with 200,000 salmon would release about as much contamination as the raw sewage generated by as many as 60,000 people.

Efforts to regulate offshore fish farming have led to the formation of private and governmental groups that are developing best practices guidelines. The Global Aquaculture Alliance now certifies the companies who meet its Best Aquaculture Practices, or BAP, standards.

The difference

Unlike ocean fish farms, an aquaponics system is a closed circuit: The water remains with the fish and vegetation. The water is cycled through the vegetation "grow bed" using an autosiphon system that allows the bed to fill with water, then drain, so the root systems are not constantly in water. The fish waste contains substantial amounts of nutrients to feed the plants.

"This will work well with leafy plants, such as lettuce, which is what we planted in our first experimental beds," says Young. "But fruiting plants need additional nutrients. However, it may be that some or all of these needs can be met with changes in the fish food."

The first two study phases at Sanger High are complete, but more lie ahead.

"Our first goal was to test our system and gain experience with the equipment," says instructor Audrey Bonomi. "Our ag mechanics teacher, Greg Ravy, designed the framework and his students modified the tanks. With John Young's help we designed the plumbing and chose lava rocks as our first growth media. The fish we chose were carp and bluegill." Ideally, the fish grow to frying-pan size before being harvested. "Our first real experiment was to try different types of lettuce to determine growth rates, and which would work best," she continues.

Not only did students gather good data about aquaponics as well as plant and fish growth, but also, Bonomi says, their first crop was a complete success. "It was some of the best leaf lettuce I ever tasted, and the size and quality was terrific. One of the best things was, we had not one weed in the crop. We had some gnats in one area, and an occasional spider, but no other pest problems. We grew these totally organically, with no pesticides used at all."

Next step

The next step is to grow a fruiting crop. Tomatoes have been planted, and the students will continue to measure and monitor the crop's progress.

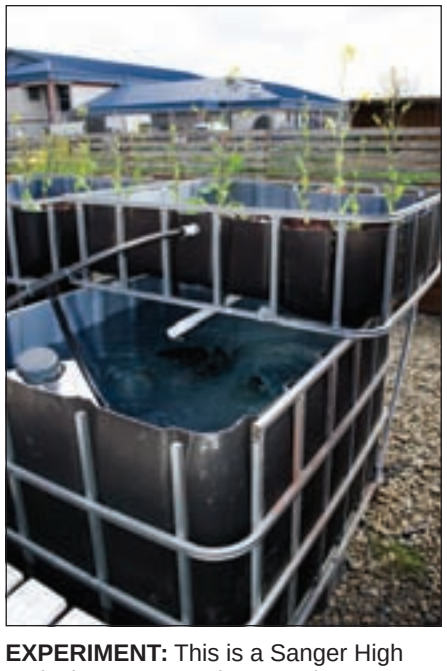
"With the aquaponics, my ultimate goal is to grow crops for three seasons: spring, summer and winter. We want to put our crops in our own farm store that sells wholesome, organic vegetables," Bonomi says.

Wilcox writes from Sanger.

Key Points

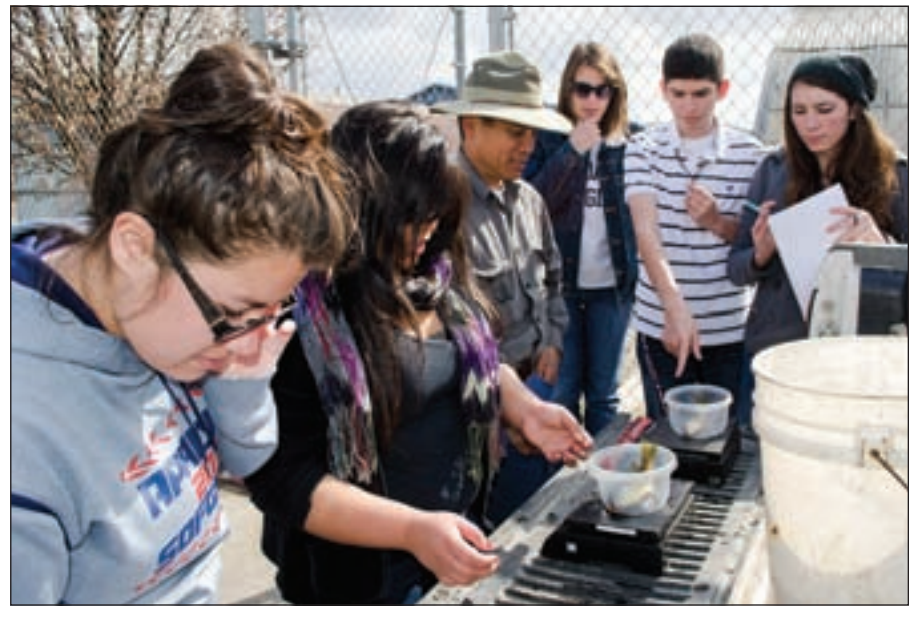
- Unless a fish is labeled "wild-caught," it came from a fish farm.
- Unlike ocean fish farms, an aquaponics system is a closed circuit.
- In aquaponics, fish are raised in the bottom tank to fertilize the crop on top.

WELL-ROOTED: These are the roots of tomato plants growing for the next round of experiments in an aquaponics tank.



EXPERIMENT: This is a Sanger High agriculture aquaponics experiment.

LEARN BY DOING: This Sanger High agriculture aquaponics tank grows lettuce at the school. Fish grown in the bottom tank fertilize the plants grown in the top.



FISH TEST: Sanger High ag students weigh and measure the fish at the start of their aquaponics project. From left are Erin Paz, Bianca De La Cruz, adviser John Young, instructor Audrey Bonomi, Estevan Brown and Leila Kimbler-Cantu.