

DOUBLE-DUTY GREENHOUSE

This project has shown how fish and vegetables can be produced year-round in the same facility

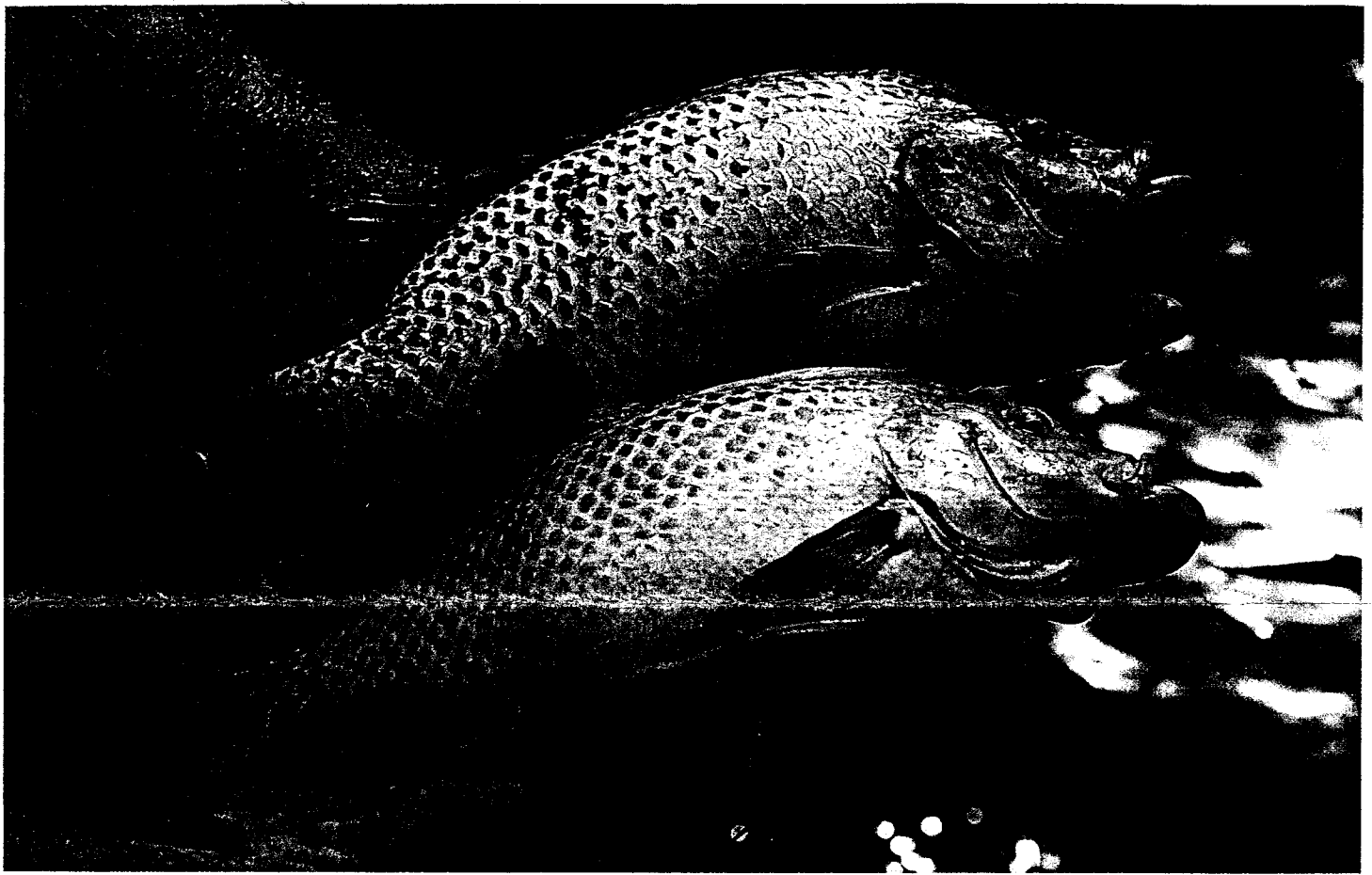
By successfully raising fish and vegetables for two years in a single intensive, integrated production facility, Boone Mora has shown that it's possible for a farm family to make a living with just a quarter-acre greenhouse.

Mora is a jack-of-all-trades who has done some farming and also has held a variety of positions in the public sector. In 1992 and 1993, he operated a demonstration greenhouse near Bath, N.C., that was owned by the Mid-East Resource Conservation and Development Council. The council is a non-profit organization set up to find environmentally sound alternative income sources for Southeastern Coastal Plains farmers with a small land base. ♪

Left: Boone Mora added PVC pipe and chain to a seine so he could harvest fish from his V-bottom fish tanks.

Below: Strings suspended from a ceiling trellis accommodate vertical growth of European cucumbers.





Jean Mora helped her husband harvest the valuable crops of tomatoes and cucumbers they produced last year.

The organization has received technical assistance from North Carolina State University.

The greenhouse measured 100x100 feet, and included two 26,000-gallon fish tanks. The tanks were built by digging pits with V-bottoms and lining them with plastic.

"We stocked the tanks with male hybrid tilapia, which are hardy, fast-growing fish," Mora says. "Alongside the fish tanks, we grew vegetables in sand beds. Every hour during daylight, pumps automatically re-

moved water containing feed and fish wastes from the bottom of the tanks. The water was delivered to the beds and used to irrigate the vegetables."

The nutrient-rich water was filtered as it seeped through the sand beds. The sand was inoculated with bacteria that convert ammonia to nitrates, which can be used by plants. The filtered water went into a series of drainage lines that delivered it back to the fish tanks. The pump system recirculated the water repeatedly between the fish tanks and the vegetable beds.

"Once a week, I topped off the

fish tanks with fresh water," Mora says. "What's neat about this kind of system is that everything is produced organically. The fish wastes are a great source of fertilizer for vegetables."

High-value veggies. During the two-year demonstration project, Mora's main crops were tomatoes, European cucumbers, and European peppers. He also experimented with okra, baby cucumbers, and passion fruit.

"I wholesaled the fish and vegetables to supermarkets in my area for about \$1 a pound," Mora says. "With this size of greenhouse, anyone with good management skills has the potential to produce around 100,000 pounds of vegetables and 50,000 pounds of fish a year. Using their own labor, they could build and equip this size greenhouse for about \$40,000. After servicing debt, covering operating expenses, and paying himself and others for their labor, a producer should easily be able to net \$25,000 to \$30,000 a year with this kind of greenhouse setup.

"A North Carolina State University student named Mark McMurtry came up with the idea of raising fish and vegetables

Mora decided to raise male hybrid tilapia because of their high feed-conversion rates and mild taste.

together in this type of recycling system six years ago," Mora adds. "McMurtry and the university research staff there figured out the ideal ratio of plants to fish in the system. Then we came in and scaled up their research to a commercial-size operation."

Unless a person has a large amount of capital to invest, Mora doesn't recommend starting out with a large greenhouse. He says a producer might be wise to begin with a smaller 30x50-foot or 30x100-foot greenhouse until he or she works all the bugs out of the system. Mora notes that it's easy to expand later.

"The only way to make a living with this type of system is to produce high-value crops and fish for niche markets," Mora says. "Over 1,500 people have toured the demonstration greenhouse, and now some are starting their own enterprises. We ended up selling the demonstration greenhouse to a vegetable grower. But I'll soon build another greenhouse and start producing fish and veggies again in my own backyard."/Dennis McClintic