FORUM

Aquaculture Research Is Key to the Future of U.S. Fish Farming

The ancient profession of fish farming, or aquaculture, has been around for 4,000 years. Now, in the 21st century, it is one of the fastest growing segments of American farming.

Because of increasing demand and declining wild harvests, aquaculture now supplies one-third of all the world's aquatic species. That's up from 19 percent in 1990. The value of this global aquaculture industry is nearly $50 billion. Given projected population increases, however, even this level of growth may not be sufficient to meet future demand.

So far, the United States has been a minor player in the aquaculture revolution. Most of the world's farm-raised fish are produced in Asia—70 percent from China alone. Although U.S. production is expanding, led by catfish farming in the Mississippi Delta region, we rank only 10th in the world in aquaculture.

To meet consumer demand, the United States imports over $9 billion worth of seafood and fisheries products annually. The resulting $6.5 billion fisheries trade deficit is the largest of any food and agriculture commodity and the second largest, after petroleum, among natural products.

Clearly, the United States has a major opportunity to further develop a sustainable and profitable domestic aquaculture industry. In addition to ensuring a high-quality, safe, and affordable supply for U.S. consumers, an expanded industry would also reduce dependence on imports and on aquatic resources threatened by pollution and overfishing.

Achieving this goal will not be easy. Aquaculture faces a daunting array of challenges. Over 50 diseases cause more than $100 million in annual losses. For example, infectious salmon anemia recently hit Maine Atlantic salmon farms, threatening an industry that grossed $102 million in 2000. Competition from low-cost foreign imports is undercutting sales of U.S. farm-raised fish, exemplified by growing imports of Vietnamese "catfish," a species not closely related to U.S catfish.

Production costs must be reduced for this country's fish farmers to be internationally competitive. Diminishing stocks of ocean fisheries are compelling the aquaculture industry to seek alternative sources of protein to feed farm-raised fish. Competition for water sources and concerns about water quality require production systems and practices that minimize water use and discharge of wastes into the environment.

Research is the key to meeting these challenges. And Agricultural Research Service scientists are at the forefront. With a current annual aquaculture investment of over $23 million—nearly triple the 1996 level—the agency conducts in-house or cooperative research at 18 locations from coast to coast and in Hawaii.

Our research programs investigate fish health; genetic improvement; reproduction and early development; nutrition; systems for sustainable, environmentally friendly production; and the quality, safety, and variety of aquaculture products for consumers.

This research is making a difference. ARS scientists and partners have developed and released to growers a new catfish line with improved feed consumption and growth. They developed, patented, and transferred technology for a modified live vaccine to prevent enteric septicemia of catfish, the most devastating disease of the catfish industry. They have also developed an injectable vaccine against *Streptococcus iniae*, a major disease agent of tilapia, trout, and hybrid striped bass. They have designed and built a prototype recirculating production system for cultivating cool- and cold-water fish to reduce water consumption and waste discharge.

Some of ARS' newest aquaculture research is in the Pacific West. In Alaska, for example, scientists from ARS, the University of Alaska, the University of Idaho, the Oceanic Institute, and the National Marine Fisheries Service are working together to discover safe, efficient ways to convert byproducts of fish processing into nutritious components of aquaculture feed. This would have the added benefit of reducing the industry's dependence on natural fisheries stocks as sources of protein for farm-raised fish.

In Idaho, scientists from ARS and the University of Idaho are cooperating on a project to develop genetically enhanced barley and oats as nutritious, low-polluting feed sources for rainbow trout and to genetically enhance the trout to effectively use these new feed sources (see story, page 4). The anticipated result: new feeds that lessen dependence on fish-derived feeds and significantly reduce discharge of phosphorus, from fish manure, into the environment.

Another focus is on marine shrimp. In Hawaii, an ARS-sponsored project of the Oceanic Institute is probing the nutritional requirements of marine shrimp. This work will yield new feed technologies to produce shrimp more efficiently and with less environmental impact. U.S. imports of shrimp—exceeding $3 billion annually—are by far the largest contributor to the ballooning fisheries trade deficit. So, a viable domestic shrimp aquaculture industry is a high national priority.

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