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OUTLOOK FOR U.S. AQUACULTURE

David J. Harvey
Agricultural Economist
Economic Research Service
U.S. Department of Agriculture

The theme for the 68th annual Outlook Conference is "new opportunities in agriculture." This seems especially appropriate for the aquaculture session. First, aquaculture businesses are now generally recognized as agricultural operations. Second, with only a few exceptions the history of aquaculture is short and much of its growth lies ahead. These two factors point toward the aquaculture industry itself as an opportunity for agriculture to expand into a whole new area of production.

While many segments are new, aquaculture has developed into a sizeable industry. There is also good reason to believe that the aquaculture industry as a whole should continue to grow through the remainder of the 1990's, but probably at a slower pace than seen in the 1980's. While the industry is expected to grow, the expansion will be neither uniform nor continuous across all the various species. An example is the catfish industry where falling prices reflect grower production outstripping processor ability to market the product without cutting prices. Many segments of aquaculture will have to deal with issues that could constraint their continued growth.

The issues that will affect the aquaculture industry cover almost all aspects of production and marketing. Some of the major issues affect the demand for aquaculture products and others affect the supply. However, many of these issues are interrelated and changes in one area will impact other areas of the industry.

Issues Affecting Future Demand for Farm-Raised Seafood

Basic to the continuing growth of the domestic aquaculture industry is the future demand for seafood products. Here are some of the items that may impact the demand for aquaculture products over the next several years.

Wild-catch supply - Aquaculture production has increased greatly over the last decade but domestic wild-catch is still the largest source of domestic consumption. U.S. landings of edible seafood rose from 3.7 billion

pounds in 1980 to 7.3 billion in 1990, up 97 percent. However, increased landings of Alaska pollock accounted for over 3 billion pounds of the gain. Experts estimate that landings of Alaska pollock are now close to their maximum sustainable yields.

Pollock only yields 15 to 20 pounds of edible product per 100 pounds of fish, so the increase in edible products has been much less than the rise in landings. While higher domestic landings have increased the supply of edible product, exports have risen at an even faster rate. Higher exports and stable imports mean that seafood supplies for domestic consumption have fallen over the last several years.

For most wild-catch species, it is doubtful that the domestic industry can supply significant additional amounts of seafood without endangering its long-run survival. Therefore, increases in demand will have to be met chiefly through rising domestic aquaculture production or greater imports.

U.S. per capita seafood consumption grew over 20 percent between 1980 and 1987. However, consumption peaked in 1987 at 16.2 pounds (edible weight) and in 1990 was 15.5 pounds, the same as in 1986. Even if per capita seafood consumption remained flat during the 1990's, aquaculture sales could still grow. U.S. population growth alone would add 40 million pounds to the demand for seafood each year. This would mean an additional 80 million pounds of farm sales yearly. Also, the aquaculture industry could capture a larger percentage of existing markets, especially in the $5.2-billion seafood import market. Aquaculture is already a major force in some parts of the domestic market. In 1990, fresh and frozen finfish consumption was 6.6 pounds per capita, over 10 percent of which was U.S. farm-raised catfish.

Food safety - The general public has become more and more concerned with the safety of the food they consume. This applies to seafood due to concerns with pollution of ocean waters and how well the product is handled after harvesting. Already some States have warned consumers about the possible dangers of eating raw molluskan shellfish.

However, food safety concerns could have a favorable impact on aquaculture products. Aquaculture producers could benefit from these concerns by promoting their high safety standards. Producers could also develop brand names and associate them with a quality product. Of concern for the inland portion of the aquaculture industry is the use of fertilizers and pesticides on nearby cropland or the presence of these chemicals in water sources.

Food labeling - The food labeling issue deals with making more nutritional information available to consumers for informed decisions about their diets and to more easily compare alternative products. More comprehensive labeling may boost the consumption of seafood in general and aquaculture products in particular because most seafood has less fat and cholesterol than meat and poultry products.

Price of competing products - While media reports have extolled the health benefits of fish consumption, the slowing economy has probably worked against eating more fish. Many seafood products are relatively more expensive than competing protein products, such as poultry, although true price comparisons need to be on an edible weight basis. Between 1986 and 1990, retail seafood prices rose 25 percent, considerably faster than prices for pork (21 percent), or poultry (16 percent). As aquaculture production increases, the production costs for many species will decline or increase at a rate slower than inflation. These may make aquaculture products less expensive relative to other protein sources.

Health issues - Higher consumption of seafood has been promoted from both nutritional and dietary standpoints. Seafood is beneficial for dieters due to its relatively low calorie levels. To take full advantage of this market, aquaculture producers need to promote convenient cooking methods that add as few calories as possible.

A second aspect of the health issue is the fact that most seafood products are low in fats and cholesterol. Some seafood products may also benefit from the linkage of omega-3 fatty acids and a reduced risk of heart disease. Aquaculture nutritional research is currently working on special finishing diets that would boost the levels of omega-3 fatty acids in farm-raised fish.

Foreign markets - Currently, the majority of U.S. aquaculture production is marketed domestically. For most species, the domestic market has provided enough room for growth, but as the industry expands it should not neglect the possibility of expansion in foreign markets. Japan is by far the largest export market for U.S. seafood, but Europe could also prove to be a growth market. Landings of wild-catch seafood in these countries has been flat over the last decade. European countries do have a domestic aquaculture industry, but it is concentrated in the salmon, trout, and mussel area. This might present a market opportunity for some of the other species grown in the United States. The European market has a larger population than the United States, a relatively high standard of living, and an overall seafood consumption level higher than the United States.

The Japanese market accounted for 57 percent of the quantity of U.S. edible seafood exports in 1990, and 64 percent of their value. While the Japanese population is expected to show only slow growth, income levels are strong, and they traditionally are large consumers of seafood products. These factors may favor targeting high-end specialty products to the Japanese market.

Trade - As the domestic aquaculture industry expands its marketing to other countries, it may find itself caught up in conflicts on trade issues. Probably the largest hangup for the continuing GATT negotiations has been trade issues involving agricultural commodities. As aquaculture grows, it may well experience many of the same type of trade issues. An

example of this type of issue was a "dumping" ruling this year against Norwegian salmon farmers. The U.S. International Trade Commission ruled that exports of Norwegian salmon to the United States were subsidized and sold at less than fair market value.

While trade conflicts could involve any number of issues, some of the most likely areas will be: (1) inspection or sanitation, (2) chemical usage, (3) government subsidies, and (4) other non-tariff barriers. The U.S. seafood industry is still struggling with the issue of developing a comprehensive inspection program that would minimize the chances of any harmful product being marketed. Discussions are still centered on the nature of the inspection process and tests used. The domestic industry is trying to ensure that any standards adopted apply to imports.

Trade disputes could arise over what constitutes acceptable levels of contamination. This is not simply an import issue because the United States is also the largest exporter of edible seafood. Companies exporting wild-catch seafood and some domestic aquaculture companies have already had to deal with this issue, but most aquaculture firms are not exporting a large amount of their production.

Closely aligned with the inspection issue is the trade issue of what chemicals or therapeutic compounds can be used in aquaculture operations. This is an especially volatile issue because a number of chemicals have been approved for use in other countries that are not approved for use in the United States. For domestic producers, this would appear to present importers with an unfair advantage. The expressed concern is that if foreign growers want to sell to the United States, they should be held to the same rules as domestic growers and should not be allowed to use chemicals not approved for use in the United States. Like the inspection issue, this is a two-way street--some chemicals used here are not approved for use in other countries. This issue is of great concern to domestic growers because there are relatively few chemicals currently approved for use in aquaculture. Over time, this may become less of a conflict as the aquaculture industry grows and chemical companies try to expand their markets by having their products approved throughout the world.

Other trade issues could include such things as forms of packaging restrictions, environmental restrictions, subsidies, wage rates, and protection of certain species. In its position as both a major importer and exporter of seafood products, the United States could be involved in quite a few seafood trade disputes.

Issues Affecting Aquaculture Supply

Changing industry methods and structure - The domestic aquaculture industry continues to change in response to new technologies used in different growing systems for fish or shellfish and the increasing biological knowledge needed to produce a growing number of species.

U.S. aquaculture growers, who tend to produce only one species each, are divided into three main groups. The first group is of the established industries, such as growers of catfish, trout, and salmon. They are characterized by relatively well developed production systems, climbing output, and falling real prices. Another characteristic of these industries is the increasing sophistication of processors and development of further processed and branded products.

The second group consists of producers raising species that have been somewhat successful commercially, but who are still searching for the best growing and culturing methods. This group is represented by producers of such species as hybrid striped bass, tilapia, and some shellfish. These growers are relatively small, but have rising production levels and many different production methods.

The third group is made up of growers experimenting with species to determine whether they have potential in commercial aquaculture. These species could be totally new to aquaculture or where successful production has not occurred in a farm situation. This category would include walleye, sturgeon, and halibut. This group has only minimal production and additional research is needed on different aspects of the production cycle.

One of the chief questions facing the domestic aquaculture industry is what will be the major farm-raised species in the future. There are two ways to approach this question. First, assume that there are no radical changes in production technology. This would rule out the wide-spread adoption of intensive indoor recirculation systems. In this scenario, the production of fish and shellfish would probably be spread over a wide number of species. Domestic production would still be dominated by the catfish, crawfish, and trout industries, but would add a number of species that are suited to different areas of the country. The common thread between the different species would be relatively high market values and limited wild stocks available. The high market values would provide growers with the incentive to take on the risks of experimenting with new species. The limited wild stocks would allow growers to have positive price expectations.

International aquaculture competition - Presently, most domestic aquaculture producers compete not only with other domestic growers, but with foreign producers of the same product. The two exceptions to this rule are catfish and crawfish--only a very small percentage of their total consumption comes from imports.

Aquaculture production outside the United States is split into two main groups. The first group are producers rapidly adopting more advanced technologies and becoming more intense in their use of inputs and capital. These aquaculture operations are oriented towards producing chiefly for the export markets. This process will probably be duplicated with other high-value products. However, after successful production, farmed output has risen very fast for new species. This

undermines prices and places pressure on growers to improve growing methods and reduce production costs. As growers have adopted new techniques, prices have declined, if not on a real basis then on a nominal basis. The second group of producers are chiefly subsistence farmers or growers selling on the local market.

The United States, Japan, and a few other countries will be the chief targets for the producers of high-value aquaculture products. Therefore, domestic growers of high-value species will face increasing competition from foreign growers and domestic competitors.

International competition in the sale of aquaculture products should increase. While the United States is a major producer of some aquaculture commodities, many countries are strongly supporting fish-farming research and development.

Enhancement of wild stocks - Aquaculture production can help wild species recover from over-harvesting. Mortality rates for fish are highest at the very beginning of their life cycles. Hatchery techniques have been developed to grow salmon until they reach a size where their survival chances are much greater. The release of large numbers of salmon smolts has helped increase the annual harvest.

However, it is more difficult to carry out a stock-enhancement program for species that do not return to spawn in clearly defined areas. A second stumbling block is funding for the hatcheries. Many fisheries stocks are regarded as common property resources. Unless funding for the hatcheries was done through general tax revenues, some method of taxing those harvesting the affected species would have to be developed.

Recently, the Snake River sockeye salmon population was listed as an endangered species. Attempts at population restoration will be made using hatchery raised salmon smolts. When the salmon smolts reach the ocean they commingle with salmon from other spawning areas. Preventing harvest of the endangered population may eventually mean restrictions on salmon harvesting in the Washington and Oregon areas. Restrictions over a wide area, would increase the demand for farm-raised salmon.

Incorporation of new technologies - Research projects underway are aimed at helping growers either reduce production costs or improve product quality. The list of areas where growers are changing production practices to incorporate new developments is extensive.

Efforts are underway in a number of countries to develop deep-water ocean farming systems. Effective deep-water farming techniques would greatly increase the available space for marine aquaculture. Offshore sites would also reduce bottom fouling and visual pollution, two of the major problems with current ocean net-pen aquaculture projects. Researchers are also examining methods of controlling or managing predators and using production sites with low-cost heat sources, such as near power generating facilities or geothermal sources.

Aside from improvements in production systems, the aquaculture industry is looking to improve the productivity of the fish and shellfish. One area is the development of hormones to control spawning behavior. Hormonal controls are being developed in three areas. First, to achieve spawning in species that will not normally spawn in captivity. Second, using hormones and other techniques to get species to spawn more than once a year. Third, using hormones or other techniques to achieve sex reversals to convert all the members of a population to the faster growing sex.

Much of the media interest in the changes affecting aquaculture have focused on such high-tech issues as biotechnology and gene transfer. But there are still many productivity gains to be achieved through better nutritional programs. There are only a few basic kinds of fish feeds presently available, those developed for catfish and those developed for trout and salmon. Growers of other species are essentially using one of these two feeds or ones that has been only slightly modified.

Gains in nutritional advances will come on many fronts. First, development of feeds specifically tailored to the needs of new species will increase the productivity of those species. Second, new feeding strategies will promote better growth or cut down the amount of fat in the product. Third, experimental trials are under way to develop feed formulations that use lower cost ingredients or byproducts from other industries.

Water availability - Water must be available in the right quantity and quality. In many areas, water availability could be a limiting factor on aquaculture expansion as the competition for water resources intensifies. In all cases, growers will be pushed to incorporate methods that maximize production from a given water resource.

Water recirculation - The continued research and interest in water recirculation is a response to possible water constraints. In its ultimate form, the only water needed would be to replace water lost through evaporation and the removal of fish manure. Except for limited production of some high-value species, water recirculation systems have not yet proven economical. Successfull systems would open up aquaculture production to almost any area of the country.

Therapeutic compounds - Very few compounds have been approved for use in aquaculture operations. New therapeutic drugs to combat fish diseases are being tested, but the question is whether the market for such products will be large enough to justify the cost.

The lack of therapeutic drugs could constrain domestic aquaculture expansion. As growers seeks to maximize production by raising production levels the crowding stresses the fish and makes them more susceptible to diseases.

Selective breeding - Aquaculture is just beginning to tap the potential gains available through selective breeding, a major means of increasing production efficiency. While fish generally are good feed converters, selective breeding programs are needed to obtain faster growth rates and disease resistance.

Some producers are using sterile fish or shellfish because they grow faster, have year-round marketability, and have the potential to be grown outside their native areas. Sterile fish or shellfish often have faster growth rates because their energy is directed to gains in length and weight instead of sexual development.

Genetic work - Research is also underway in a number of other areas. The transfer of genes from one species to another shows promise. Researchers are investigating the possibility of transferring the genes that control the production of growth hormones from one species to another to develop faster growing fish. However, it may be some time before developments in this field can be used on a commercial basis.

Grain prices - Much of the tremendous growth in the catfish industry has come in years when grain prices were low. With corn and soybean meals the major components of fish feeds and feed costs making up to 50 percent of variable production costs, any rise in grain prices would impact fish prices. However, if aquaculture producers have to pay more for grains, so do competitors in the beef, pork, and poultry industries.

Waste management - Disposal of waste products from aquaculture operations will grow as a problem in direct relation to the expansion of the industry. Problems regarding disposal of waste products can roughly be divided into two areas. First, the producer's problem of managing the waste (uneaten feed and fish manure) produced by the operation. The amount of waste material generated will be directly proportional to production. With increasingly restrictive environmental regulation, disposal of these materials will become a greater problem in coming years.

Stricter controls will pressure producers to reduce wastes as much as possible. Reduction of waste per pound of production can be accomplished by fish that are more efficient feed converters. Other avenues to explore are feeding methods that result in less wasted feed.

The second half of the waste product problem falls on the processor. With more total production being sold as fillets or other further-processed products, the waste disposal problem of the processor grows. The lower yields on filleted products result in a greater volume of waste products. One solution would be to develop uses for waste products as inputs in the feeds of other animals. Current examples are the use of some catfish processing waste in poultry feeds and research on the feasibility of composting fish waste.