STRATEGY FOR STRENGTHENING THE COMPETITIVENESS OF KOREAN AQUACULTURE

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ABSTRACT

The aquaculture industry in Korea is currently faced with internal and external challenges. The industry faces restrictions not only in terms of the fisheries subsidies needed for fishery activities and facilities by the World Trade Organization (WTO)/DDA negotiation, but also the intensification of the sanitary inspection on exporting fishery products by importing government authorities which weaken the competitiveness of Korean fishery products in the international markets. Internally, natural disasters such as red tide and typhoon have occurred repeatedly and the amount of imported fishery products has continued to increase due to the conclusion of the FTAs. In particular, the increase in imported cheap live fish has caused the collapse of prices of domestic live fish. The National Fisheries Research and Development Institute (NFRDI) in Korea have been implementing four strategic projects since 2004 to develop an eco-friendly aquaculture technology and to cut down on labor costs.

Key words: NFRDI, aquaculture cost-saving measures, extruded pellets, moist pellets

INTRODUCTION

The amount of imported live fish increased by 6.8 times from 7,982 tons in 1998 to 54,486 tons in 2004. However, the occurrence of food poisoning during the summer season has dulled the consumption of seafood. Furthermore, the decrease in the number of workers in the aquaculture industry (from 133,147 persons in 1985 to 40,609 persons in 2004) and the increase in the production costs drove the Korean aquaculture industry into a tight corner.

The National Fisheries Research and Development Institute (NFRDI), the sole comprehensive national fisheries research institute in Korea, has been performing four strategic projects since 2004. The main objectives of the planned projects are: complete substitution of moist pellet mixed with raw fish to extruded pellet for fish culture, development of disease-tolerant and rapid- growing species to improve production efficiency of the fish culture, development of low price and high-efficient fish disease vaccine to reduce cultured fish mortality, and development of automatic cultivation system to cut down labor costs.

NFRDI also tries to adopt the offshore aquaculture system as an eco-friendly aquaculture technology to prevent damages caused by typhoon and red tide, to reduce coastal area contaminations, and to turn over the family-scale fish culture to the enterprise-scale fish culture.

FOUR STRATEGIC PROJECTS FOR AQUACULTURE

Development of environmentally sound and high-quality extruded pellet

In 2005, the total amount of cultured fish in Korea was 80,935 tons. Among them were olive flounder (*Paralichthys olivaesius*) which comprises almost 50 percent, and black rockfish (*Sebastes schlegelii*) and sea breams, 26 percent and 13 percent, respectively. The cost of feed in fish culture takes about 40 to 50 percent of the whole production expenses.

In the same year, a total of 570,000 tons of fish feed were used for the fin fish culture in Korea. Four hundred sixty thousand tons of moist pellet and 110,000 tons of extruded pellet were used. The extruded pellet used only occupied 19.3 percent of the total fish feed amount. Avoidance of using extruded pellet seems to be caused by lack of belief of the effectiveness of extruded pellet by fish farmers and most of them who are involved in fish culture have no concept of the environmental contaminations that can be derived from the use of moist pellet. The use of extruded pellet is highly recommended because it can prevent environmental contaminations in the coastal areas and over-catching of fisheries resources.

For a more eco-friendly aquaculture environment conservation, the increase of extruded pellet usage is deemed necessary. NFRDI has been performing both studies for increasing fish feed efficiency and establishing a fish feed allowance system.

As a part of the standardization of fish feed, NFRDI has identified the nutrient requirement of flounder (adult stage) and development of feed allowance system in flounder culture. Also, NFRDI has developed two kinds of extruded pellets for flounder (juvenile and adult stage) and one extruded pellet for rockfish (juvenile stage). These outputs are being used in the Korean aquaculture industry.

NFRDI will conduct a project to identify nutrient requirement of flounder at each growth stage and every season, and will try to establish a feed allowance system for flounder culture based on research outcomes. NFRDI will also expand field application experiments of extruded pellet continuously and induce expansion of extruded pellet use through the introduction of good or excellent cases of extruded pellet use.

The Korean government is supporting fishing households through the extruded pellet direct-pay system to promote the use of extruded pellet. Under this system, the government is compensating the fish farmers for the 50 percent of extruded pellet purchase cost.

Development and practical use of fish disease vaccine

The mortality rate of cultured fish in Korea varies every year but has totaled to about 10 percent. The fish disease control has been focused on the direct disease treatment rather than disease prevention. For a more efficient disease control, NFRDI has been conducting researches on the development of fish disease vaccine to convert the existing disease treatment system to disease prevention system. The research achievements concerning vaccine development by NFRDI are as follows.

NFRDI has developed a *Streptococcusis* inactivated vaccine for flounder and transferred the right of technology to two pharmaceutical companies in Korea. The disease prevention efficiency rate of a developed vaccine against a target disease was estimated to be 70 percent since the start of the application.

NFRDI also has developed both *Streptococcusis-Edwardsiellosis* mixed inactivated bacterial vaccine for flounder and recombinant protein vaccine against parrot fish iridovirus in 2005 and the patent application is being processed.

In 2006, NFRDI has a plan to develop a mixed vaccine effective for *Streptococcusis* and *Edwardsiellosis*. A mixed vaccine for VHSV and *Streptococcusis* will be developed that can prevent these diseases in 2007. In addition, a triple multi-vaccine for *Streptococcusis, Edwardsiellosis*, and *Vibriosis* will be developed by NFRDI in 2008.

Genetic improvement of growth and disease resistance

NFRDI has been performing a few research projects to develop a rapid growth and disease-tolerant flounder and abalone since 2004.

A parentage assignment technique for flounder is one of the achieved results of the projects since 2004. Then, a mating scheme for family production was established and F1 was produced by a mating plan in 2005.

A total of 287 flounder families were produced composed of a nucleus population that shows genetic diversity and an aquaculture family that has rapid growth characteristics. The research results can be used for the mass production of genetically-improved young flounders.

By 2008, the growth rate of flounder is expected to improve by 1.2 times according to the intrabreeding guidance which will be established in 2007.

A total of 813 individual abalones were collected from 11 different regions in Korea and the genetic diversities were identified and produced half-sib family. A genetic evaluation of the collected abalone such as growth trait is being conducted.

In the case of abalone, the growth rate can be increased by 1.2 times in 2008 through genetic capacity evaluation, genetic parameter estimation (2006-2007), and establishment of mating design for the next generation (2007).

Development of management system for automatic fish culture

For an aquaculture cost-saving measure, both seawater recirculating system and automatic feeding system are being developed by NFRDI.

In recent years, damages in the land-based culture system in Korea have occurred repeatedly by red tide, typhoon, etc. Cost needed for water supply was identified as one of the main causes that make financial management worse. To solve these problems, low-cost and high-efficient water recirculating filter system is being developed.

Research shows that a low-cost and high-efficient foam separator, a three-phase fluidized bed filter, and an automatic feed supply machine have already been developed.

NEW CHALLENGES IN KOREAN AQUACULTURE AND OFFSHORE CULTURE

In order to achieve sustainable development of aquaculture, first of all, the conservation and management of farming grounds are inevitable. For this reason, the concept of an "ecosystem-based aquaculture" has been circulated throughout the world. To solve repeated problems occurring in coastal aquaculture areas like damages by red tide and typhoon and to reduce environmental contaminations in the coastal areas, NFRDI tries to develop an offshore aquaculture system.

A project called "industrialization of the offshore aquaculture system" was started according to the integrated coastal and ocean resources science and technical arrangement concluded between the Ministry of Maritime Affairs and Fisheries (MOMAF) of Korea and NOAA of United States.

In order to conduct this project, NFRDI introduced the offshore fish cage set developed by NOAA. More specifically, NFRDI introduced all six offshore aquaculture cage sets in 2005-2006. The cages were set up in the offshore area, 4.5 km away from the shore line of Jeju island in Korea.

In July 2005, for an experimental culture, 705,000 Parrot fish weighing 124 g were placed in the cages. It weighed 350 g when it was harvested from March to June. An economic analysis on the production performance of the system is being evaluated. In 2006, 1,200 small Parrot fish weighing 10-20 g were placed in the cages and are being cultured.

In order to expand the offshore aquaculture system, target species appropriate to the regional environment of the east, south, and Jeju area should be identified and selected. At the same time, NFRDI will do its best for the development and expansion of practical use of Korean style offshore aquaculture system.

However, for a continuous expansion of the enterprise-scale offshore aquaculture system, target species have to be differentiated from those cultured in the coastal areas by small-scale farmers. Migratory fish species are highly recommended for an offshore aquaculture system. In addition, the development of technologies for juvenile production and culture for migratory fish species such as Giant croaker (*Nibea japonica)*, Cobia (*Rachycentorn canadum)*, Tuna (*Thunnus thynnus)*, and Striped Jack (*Pseudocaranx dentex)* should be accomplished.