Strategy for strengthening the competitiveness of Korean aquaculture

Mi Seon PARK

Headquarters for Bioscience and Technology

National Fisheries Research & Development Institute

Busan, Korea

parkms@nfrdi.re.kr

The aquaculture industry in Korea is currently faced with very hard challenges in and outside of the country.

Externally, not only restrictions on the fisheries subsidies needed for fishery activities and facilities by the WTO / DDA negotiation, but also intensification of the sanitary inspection on exporting fishery products by importing government authorities weaken the competitiveness of Korean fishery products in the international markets.

Inside of the country, natural disasters such as red tide and typhoon have occurred repeatedly and the amount of the importing fishery products has continued to increase due to the conclusion of FTAs. In particular, the increase in importing of low price live fish has caused to collapse the price of domestic live fish. The amount of importing live fish was increased by 6.8 times from 7,982 tons in 1998 to 54,486 tons in 2004. In addition, the occurrence of food poisoning during summer season has dulled the consumption of seafood. Furthermore, the decrease of the number of workers in aquaculture industry (133,147 persons in 1985 → 40,609 persons in 2004) and the increase of the production cost drive 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, have been performing 4 strategic projects since 2004. The main objects of the planed projects are summarized as follows; complete substitution of moist pellet mixed

with raw fish to extruded pellet for fish culture, development of disease tolerant and rapid growth 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 coats.

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

l. Driving of the 4 strategic projects for aquaculture cost saving

1. Development of the environmentally sound and high quality extruded pellet

In 2005, the total amount of the cultured fish in Korea was 80,935 tons, among which olive flounder(Paralichthys olivaesius) took almost 50%, black rockfish(Sebastes schlegelii), and sea breams was 26% and 13%, respectively. The cost of feed in fish culture takes about 40~50% of the whole production expenditure.

Total 570 thousand tons of fish feed were used for the fin fish culture of 2005 in Korea. Among feed, moist pellet and extruded pellet used were 460 and 110 thousand tons, respectively. The amount of extruded pellet used was only occupied 19.3% of the total fish feed amount. Avoidance of using extruded pellet seems to be caused by disbelief of effectiveness of extruded pellet and most farmers involved in fish culture had no conception of the environmental contaminations that can be derived from moist pellet use. The use of extruded pellet is highly recommended because the extruded pellet can prevent the environmental contaminations in the coastal areas and over-catching of fisheries resources.

For more stable fish feed secure and eco-friendly aquaculture environment conservation, the increase of extruded pellet usage is positively necessary.

NFRDI has been performing both studies for increasing a fish feed efficiency and establishing a fish feed allowance system.

As a part of the standardization of fish feed, NFRDI has identified 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 also will expand field application experiments of extruded pellet continuously and induce expansion of extruded pellet use through introducing good or excellent cases of extruded pellet use.

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

2. Development and practical use of fish disease vaccine

The mortality rate of the cultured fish in Korea is variable every years but has totaled about 10%. The fish disease control has been focused on the direct disease treatment rather than disease prevention. For more efficient and positive disease control, NFRDI has been conducting researches on the development of fish disease vaccine to converse the existing disease treatment system to the disease prevention system.

The research achievements concerned about 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% from the experiment of field 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 develope 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.

3. 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. And then, a mating scheme for family production was established and F1 was produced by a mating plan in 2005.

All 287 families were produced and they are composed of a nucleus population that shows genetic diversity, aquaculture family that has rapid growth characteristics, release family that has natural genetic diversity. The research results can be used mass production of genetically improved flounder juvenile.

In 2008, the growth rate improved (1.2 times) flounder will be produced according to the intrabreeding guidance which will be established in 2007.

All 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 case of abalone, the growth rate can be increased by 1.2 times in 2008 through genetic capacity evaluation, genetic parameter estimation (’06~’07), and establishment of mating design for the next generation (’07).

4. Development of management system for automatic fish culture

For an aquaculture cost saving, 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 and Typhoon etc. Cost needed for water supply was identified as one of the main causes that make financial management worse. To solve these problems, a low cost and high efficient water recirculating filter system is being developed.

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

Ⅱ. The new challenge of Korean aquaculture, offshore aquaculture

In order to achieve a 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 spread in 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 Ministry of Maritime Affairs and Fisheries (MOMAF) of Korea and NOAA of USA .

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 ㎞ away from the shore line of Jeju island in Korea.

In 2005, for an experimental culture, all 705 thousand Parrot fish were input in the cages on July (124g) and were harvested during March to June (350g) in 2006. An economic analysis on the production performance of the system is being evaluated. In 2006, all 1,200 thousand small Parrot fish (10~20g) were input in the cages and are being cultured.

In order to expand the offshore aquaculture system, target species appropriate to the regional environment of each East Sea, Southern Sea, and Jeju area should be identified and selected. At the same time, NFRDI will do best for 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)*, Striped jack (*Pseudocaranx dentex)* should be accompanied.