

## National Comprehensive Approaches for Rebuilding Fisheries in South Korea

*Sang-Go Lee and Amaj Rahimi Midani*

Department of Marine Business and Economics, Pukyong National University,  
599-1 Daeyeon 3-Dong, Nam-Gu, Busan, 608-737, South Korea

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**Abstract:** Korea's coastal and offshore fisheries have experienced reduction in their catch in the early 2000. The amount of catch from coastal and offshore fisheries dropped from 1.7 million tons in 1986 to 1 million tons in 2004 [1]. To address such catch reduction, fish stock enhancement programs have been constantly developed and implemented. However, as fish stocks have been estimated to decrease since 2000 in spite of various management measures, the Korean government genuinely acknowledges the necessity to enhance fisheries productivity through the recovery of depleted fish stocks. Based on such acknowledgement, a fish stock rebuilding plan (FSRP) combined with conventional fish stock enhancement programs were established in 2005. The FSRP-based fisheries management policy in Korea carries great significance, for it has changed the focus of policy from simply maintaining the status quo to stock recovery and it allows relevant stakeholders to get actively involved in the procedures of establishing and promoting the plan, leading to effective implementation of the plan. While the current FSRP is operated by species, if the FSRP can be gradually expanded to encompass the whole ecosystem, it will greatly contribute to more effective management and fish stock recovery for all species in offshore and coastal waters surrounding Korea.

**Key words:** Fish Stock Rebuilding Plan • South Korea • Stock Depletion • Effective Management

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### INTRODUCTION

Based on the licensing system of fishing vessels and fisheries, the Korean government has traditionally used the technical measures such as closed time, closed area, mesh size regulation, etc. as well as input control to manage fish stock and the fishing industry for the last century

Although each species situation is different, the stock assessment conducted in coastal and offshore areas in Korea has shown that total fish stock has consistently decreased, from 10 million tons in 1980 to 7.9 million tons in 2004, Cho [1]. In addition, if the current catch ability remains unchanged, it is likely that the total fish stock would be even further reduced to 3.9 million tons in ten years.

In particular, it was found that the rate of adult fishes among main catch species has declined to lower than 20% in 2000s. This indicates that reproductive capacity of fish

stock has been drastically declined, which not only aggravate the trend of the decrease of fishery resources but also increases the proportion of low-grade catch.

The main reasons to reduce the fish stocks and catches may include habitat destruction by contamination of marine environment and climate change and ecological changes in fish species. In addition, due to geographical characteristics of fishing grounds, joint management with adjacent nations has not been effectively conducted.

Regarding the management aspect, traditional fisheries management policies had focused more on maintaining fishing orders and arbitrating among fisheries than recovering stocks. Management policies based on stock data and strict management and control of fisheries activities had also insufficiently implemented.

Particularly, the feature of multi-species/multi-fisheries in coastal and offshore fisheries sets the limitation in developing and implementing management policies considering the characteristic of each fish

species. The failure of effective prevention in overfishing of juvenile fishes due to mixed fishing is also considered as one of the causes of reduction and depletion in the resources.

Against these backdrops, Korean government set fish stock rebuilding as a main objective of the fisheries policy. To effectively achieve this objective, Korean government established Fish Stock Rebuilding Plan (FSRP) combined with conventional management measures and stock enhancement programs in 2005, Kim [2].

This study is intended to introduce the processes and the contents of the Korea's ecosystem based FSRP and its fisheries management policy in more details. It is also to reveal any current issues in the promotion of the FSRP and its fisheries management policy and to propose an improvement plan to achieve the effectiveness of the FSRP and its fisheries management policy [3].

In this study, the concept, objectives, operational plans and the FSRP and its fisheries management policy are examined and biological and economic effects of FSRP were analyzed [4]. Using the analysis, some issues derived from operation of FSRP and suggestions for efficient management in the future were provided. Finally, the paper ends with a brief conclusion.

### **FSRP Legislative Policy and Science Framework**

**FSRP Legislative and Policy Framework:** Since Korea's fisheries law is complicated and fractionized into 3 Presidential decrees and 15 Ministerial ordinances, it is hard for fishermen to fully understand and follow the fisheries law. Moreover, some standards in the law set in 1960s when fishery resources were abundant are still applied. Even some measures are contradictory to current fishery resources management measures and fishery resource rebuilding plans.

In this context, the government established and announced "Fisheries Resources Management Act" on April 22, 2009 to conduct comprehensive and systematic fisheries resource management and to establish and implement fisheries resource recovery plan. The objectives of the Fisheries Resource Management Act are to strengthening research and assessment of fisheries, establishing and implementing fish stock rebuilding plans and continuous implementing resource management including fisheries resource fish stock enhancement [5].

The Act incorporates protection and management of resources parts from conventional Fisheries Act and a resource creating part from Promoting Nurturing Fisheries Act.

The characteristics of the Fisheries Resource Management Act [6] are as follows:

- Research and assessment on fisheries resource shall be conducted every year.
- A basic fisheries resource management plan shall be established every 5 years for comprehensive and systematic recovery and management of fisheries resource.
- Institutional ground for self-regulated fisheries resource management such as settlement of dispute was established.
- International rules such as promoting international cooperation, information sharing on fisheries resource management, using environmentally-friendly fishing methods, precautionary approach are incorporated into the Act.

Key terminology of the Fisheries Resource Management Act is defined as below:

- "Fishery resources" means the marine plants and animals which are useful for national economy and people's living
- "Fishery resources management" means the acts to protect, recover and create fishery resources.
- "Total allowable catch" means annual catch limit allowed catching a certain fish species.
- "Fish stock enhancement" means acts that artificially enhance fishery resources including putting artificial reef and seaweed forest which can improve reproduction of marine living organism.
- "Marine ranching" means a certain area where some equipment are placed to facilitate fishery resources

The Ministry for Food, Agriculture, Forest and Fisheries (MFAFF) created the Fishery Resources & Environment Division to develop and implement comprehensive fish stock rebuilding plans. In addition, the National Fisheries Research & Development Institute (NFRDI) established a Fishery Resource Recovery Team to conduct scientific research and resource management and implement resource creation projects.

Under the Fish Stock Rebuilding Plan (FSRP), participation of actual players (fishermen, academia, government, researchers) is encouraged at all process of development, implementation and assessment of FSRP. In addition, decisions for development and implementation of FSRP are made at the Science Committee (SC) and the Fishery Resource Management Committee (FRMC), which were newly organized for FSRP.

**FSRP Scientific Framework:** In specific ecosystem based FSRP, the management and recovery of fishery resources are attempted by dividing them to recovery target fish and management target fish with consideration of stock condition by species of fish. That is, for fish whose stock has drastically decreased, a fish stock rebuilding plan is set up and promoted, while a management plan is set up and promoted for fish with low decreasing rates. Here, when TAC target species are key staples, intensive management is to be provided with the when the total allowable catch(TAC) management policy. The selection of species for stock rebuilding and the recovery target quantity are determined through a series of steps of understanding the condition of fishery and biological resources in offshore and coastal seas; examining applicable materials and recovery target fish; classifying fish to recovery target fish and management target fish; and setting the target quantity of recovery for each stage.

Except for a few species, in most cases, information available to evaluate the state of fish stock by species is only the catch data by year. To evaluate the state of fish stock by using the catch data by species, according to the method used by Garibaldi and Caddy [4], the three-year moving average of the fishery-related data was analyzed. Then, when the current level of catch is less than 20% to the maximum value of moving average, it was categorized as a depleted resource. From the first analysis, the species of fish decreased by 30% and lower were selected recovery target species.

Meanwhile, since fish stock considerably decreased before the 1990s, the data from the first analysis could not properly reflect the state of stock by species, so the fluctuation trends of catch by species were analyzed to add more recovery target species. That is, with consideration of the characteristics in the fluctuation trends of catch, they were divided (i) increasing, (ii) stable, (iii) fluctuation, (iv) decreasing after increasing, (v) decreasing, (vi) low and(vii) very low; and the species which are in (v), (iv) and(vii) situation were finally selected as recovery target species. Among the species excluded from recovery target species, the rest were selected as management target species.

Currently, for recovery target species (sand fish, blue crab(swimming crab), octopus, Tokobushi Abalone, Skate Ray, Cod, Yellow Croaker, file fish, Korean flounder, Purplish Washington Clam), stock research and assessment are conducted and its stock amount and MSY are estimated. Based on those research and estimations, recovery target for each stage and recovery periods are set.

Research and assessment are carried out to find fishery resources which need comprehensive and systematic management. Measures such as fish stock rebuilding plan, TAC, or designation of protected waters are implemented through research and assessment plans. For systematic implementation and management of FSRPs, a Total Fishery Resources Information Database has been developed and operated. The Total Fishery Resources Information Database includes fishery resources information by ecological, habitat and fishing statuses. Based on the Database, an effective scientific research assessment system is built.

Currently, to build more effective scientific research and assessment system for better development and management of the FSRP, Korean Central government and local government divide the role in research and assessment considering characteristics of each species and strengthen human resources on stock research and assessment. Research, assessment model and manuals fully considering characteristics of each species are developed. In addition, when stock assessment by species is conducted, ecological changes including climate change are taken into account. The stock assessment by species is provided as a basic data for developing and implementing the FSRP.

**Fish Stock Rebuilding Plans(FSRP):** In 2005, the Korean government established the basic plan for the FSRP and its fisheries management policies in order to overcome the limitations with the conventional fisheries management policies and to achieve an actual recovery of fishery resources within EEZ since the UN Convention on the Law of the Sea, Korea-Japan/Korea-China Fishing Agreements have come into effect.

FSRP is the comprehensive plan to rebuild fish stock that is excessively caught to a target level within a certain period of time. More specifically, the policy aims to increase the level of fish stock from the current level to a target level within a rebuilding period, so it consists of a series of specific and scientific fish stock management programs including selecting the most effective fisheries management measure as well as complimenting any necessary fishery management supports.

Korea's FSRP has been established from a holistic approach at the national level and it also has adopted an ecosystem-based approach to fisheries management explicitly as a policy framework [7].

It was primarily aimed to achieve fish stock recovery by overcoming the limitations of the conventional fisheries management policy, so it is different from the conventional fisheries policy in many ways.

First, because the conventional fisheries management policy does not have a clear goal of stock rebuilding, FSRP specifies the target fish stocks for recovery in policy.

Second, the conventional fisheries management policy was not implemented based on scientific research and evaluation on fishery resources; for FSRP specifies, type and what content of a fishery management measure will be used after analyzing the condition of fish stock by sea area and by type of fish and establishing a clear stock rebuilding goal and rebuilding period with consideration of the characteristics of target resources.

Third, under the conventional fisheries management system, the policies were established on the initiative of the central government, restricting the participation of fishermen. However, the new FSRP premises the voluntary participation of fishermen, allowing fishermen to voluntarily participate in setting up and executing the plan as well as making them responsible for the outcome.

Fourth, in the application of the conventional fisheries management measures, any analysis before and after the application was absent so it was difficult to operate it with efficiency. But FSRP requires an analysis on a management measures by species, type of fisheries and sea area before and after an operation so that fisheries management measures can be utilized more effectively.

The overall objective of FSRP and its fisheries management policy is to enhance the total fish stock to the level of 10 million tons by 2017 in order to maintain the stable catch limit of 1.3 million tons annually in offshore and coastal fisheries [8]. It is expected that this aims to reach the optimum quantity of fishery resources that the ecosystem in Korea offshore and coastal seas can retain, to break the chains of a vicious cycle of resource exploitation and the aggravation of business conditions of fisheries and to maintain a stable fishery production.

Under specific ecosystem based FSRP, considering the stock condition, recovery target fish and management target fish were designated. For fish which stock has drastically decreased, a fish stock rebuilding plan is set up and promoted, while a management plan is set up and promoted for fish with low decreasing rates. If it is a TAC target species, intensive management is provided with the TAC management. The selection of species of fish for stock rebuilding and the target quantity of recovery are determined following the steps of understanding the condition of fishery and biological resources in offshore and coastal seas; examining applicable materials and recovery target fish; classifying fish to recovery target fish and management target fish; and setting the target quantity of recovery for each stage.

It is impossible to establish and promote the FSRP for all recovery target and management target species in the current policy conditions with insufficient scientific research and review system of fishery resources and a lack of fish stock management organizations in local governments. Therefore, including the stage to establish a basic planning, the fish stock rebuilding plans are divided into mid-term and long-term plans. That is, the creation of foundation and the establishment of a system for the operation of FSRP will first allow the mid-term goal to be achieved and then the expansion and settlement in the long-term period can raise the effectiveness of the policy.

Operational objectives and promotional strategies for each FSRP stage are: Stage 1– mid-term and long-term basic planning (2005); Stage 2– the establishment of fish stock recovery system through a pilot program of fish stock recovery (2006-2012); Stage 3– the settlement of the fish stock recovery system through the expansion of the ecosystem based FSRP (2013-2017) (Table 1). Also, in order to reach the target volume, a pilot project, the reinforcement of fish stock research & evaluation by species and pre- and post-management for fisheries management measures will be executed step by step.

The Korean government has traditionally managed fisheries and fish stock through technical measures such as closed time, closed area, mesh size regulation, as well as input control based on the licensing system of fishing vessels and fisheries. In addition to the technical regulations and fishing efforts control, the vessel buyback program has been implemented since 1994 and the output control is also used by adopting the total allowable catch (TAC) policy since 1999.

Besides these fisheries management measures, fish stock enhancement programs such as artificial reef (1971), fry releasing programs (1976), marine ranching program (2001) and seaweed forest program (2002) have been also launched in order to increase both fishery resources and fishing income for offshore and coastal fisheries.

Government-led fisheries management had shown some negative aspects such as deepening fishermen's reliance on the government, weakening of ownership, overfishing of resources and confusion in fishing orders. Limited human resource and budget brought limitations to effective response to such problems.

Accordingly, the Korean government introduced a new self-management system in which fishermen voluntarily make decisions on management and use of resources in order to receive support from government on fishery resource management and to administer a

Table 1: FSRP Operational Plan by Stage

Stage	Operational objectives	Enforcement Strategies
Stage 1 (2005)	Establishment of Basic Mid & Long term FSRPs and Institutional Improvement	[Establishment of a Master Plan] Institutional improvement for implementing FSRP Establishment of annual mid and long-term FSRP Enactment of new 'Fisheries Resource Management Act' Set up Fish Stock Rebuilding Teams to fully implement FSRPs Selection of species for pilot projects and establishment of FSRPs for 2006
Stage 2 (2006-2012)	Implementation of FSRP for Species	[Mid-term Plan] Establishment of targets that can maintain a total catch at 1.2 million tons Implementation of pilot projects for 7 species by 2007 Establishment and implementation of FSRPs for 20 species by 2012 Annual implementation of basic research including bio-ecological research
Stage 3 (2013-2017)	Settlement of FRSP-based Fisheries Management System	[Long-term Plan] Achievement of targets that can sustain a total catch at 1.3 million tons Implementation of annual FSRPs for all recovery target species Transition from establishment of species-based FSRPs to ecosystem-based FSRPs Review and revision of FSRPs Source: Ministry of Maritime Affairs and Fisheries [8]

sustainable fishing through ownership awareness and independence of fishermen. A fishermen-oriented and community-based fisheries management has been implemented in 63 self-fishing communities since February 2001 and the number of participating communities has expanded to 579 as of 2007.

In community-based fisheries management, the fishing community is responsible for its own fishing management and adjusts fishing activities. If disputes occur between communities, industries or regions in promotion of community-based management fisheries, a self-control conference is operated by the private to voluntarily resolve the problems through consultations and discussions. A public fishing village guidance serviceman was appointed for each participating community from Fisheries Office to provide technical guidance and advices to self-management communities. Also, private consultants with diverse experiences in fishing industries provide 1:1 customized education to communities that either show poor progress or newly participate in community-based fisheries management, inducing substantiality by suggesting problems and alternatives of communities.

Under the new FSRP, unlike the former government-oriented fisheries management system, a joint management system is established where actual actors in fisheries can participate to establish, execute and evaluate basic plans. Accordingly, under the ecosystem based FSRP, it is planned that roles and functions will be efficiently distributed among central government, local governments, research institutes and fishermen.

Furthermore, the Science Committee (SC) and the Fishery Resource Management Committee (FRMC) were newly organized for the joint participation and role assignments of those who are related to fisheries. The SC consists of experts from diverse areas (resources, ecology, statistics etc.) to establish and promote a recovery plan based on the various and collected information from different scientific areas and it is in charge of making suggestions of measures needed for fish stock rebuilding based on the data from research and review from the scientific point of view. It is planned to carry out the operation of the plan by having four zones – East Sea, West Sea, South Sea and Jeju Island and making a committee for each sea zone.

The FRMC is in charge of an intensive management of target species and it is composed of about 10 persons from government officials, academic scholars and fishermen related to those species. The head office is housed in MIFFAF and the Federal Fishery Resource Management Committees (FFRMC) supervises commercial species and migratory species, the Local Fishery Resource Management Committees (LFRMC) supervises the coastal sedentary species.

The NFRDI conducts a scientific research on fish stock for recovery target species and makes suggestions and then the FFRMC and LFRMC make action plans for fish stock rebuilding. Afterwards, the FFRMC and LFRMC reads all suggestions made by participants from nongovernmental, governmental and academic fields to determine effective fisheries management measures for fish stock rebuilding.

Then, the FRMC requests the central and local governments for an approval of the FSRP. Upon the approval, the FSRP can be pushed forward in a full scale. The FFRMC and LFRMC and the SC annually review and evaluate the progress of the FSRP and recommend any revisions or supplementary items for individual policy.

In the past fisheries management in Korea had the purpose of resolving disputes between fisheries, maintaining fishing order and increasing fishing income of fishermen according to the multi-fisheries/multi-species characteristics. Accordingly, resource management also enforced measures for fishing effort for each fishery and technique restrictions instead of managing individual species separately. Artificial reef programs were actively implemented to increase overall fishery resources of the coastal seas from the viewpoint of overall ecosystem. In addition, commercially important species were specially managed and increased through the fry releasing program.

However, interests on policies for management and recovery of individual species increased ever since enforcement of plans to recover fishery resources and such effort is characterized by emphasis on 'durability of fisheries' through management of individual species in connection with conventional stock enhancement programs. That is, unlike other nations, recovery of fishery resources is not only promoted through direct restrictions (or entire suspension of fisheries for fast recovery of resources) on fishing activities. Instead, while maintaining fishing activities through restrictions on individual fishery resources based on ecological system and fishery resources, the system allows effectively and quick recovery of resources. As a result, suspension or contraction of fishing activities due to resource recovery can be minimized. Accordingly, fishing business can be maintained with relative stability while promoting resource recovery at the same time.

Another characteristic of Korean ecosystem based FSRP is that it premised voluntary participation of fishermen by connecting with community-based management fisheries. Self-management fisheries of Korea newly systemized the traditional management of fishing community focusing on fishing village communities. In this system, fishermen communities make voluntary decisions for them to manage and use available resources. Such community-based management fisheries can be linked with fish stock rebuilding plan to actively reflect the opinions of fishermen in establishing the plans and to

obtain active participation and cooperation of fishermen in management. In particular, it is advantageous in that the efficacy of FSRP can be maximized through voluntary acceptance of restrictions for resource recovery and self-control on unlawful fishing.

#### **Economic and Social Aspects of FSRP**

**Economic Aspects of FSRP:** It is difficult to clearly describe the effects of FSRP conducted since 2006. Accordingly, the subject was limited to fisheries that had been selected as pilot projects for FSRPs for 2006~2007 to briefly analyze biological and economic benefits from accomplishment of recovery objective.

10 FSRPs have been established until now and are being implemented, including sandfish, blue crab (swimming crab), octopus and tokobushi abalone in 2006, skate ray, cod and yellow croaker in 2007 and filefish, Korean flounder and purplish Washington clam in 2008. These species were selected according to the recovery target standards based on catch in 2004. Objective recovery amounts for each step were configured. Comparing the catch in 2004 and 2007, the amount was increased in most of species. Though such increase in the catch cannot directly be stated as a result of performing fish stock recovery plans, it probably has resulted from control of fishing effort under the plan, protection of spawning grounds and active stock enhancement programs. In Table 2 we can see the status of Target species since the beginning of the program. The catch amount increased in most cases so the fishermen are more confident about the future catches.

In addition, due to the limitations of available data on anticipated economic effects, increase in fishing income from FSRP was simply analyzed. Once the amount of catch of 2004 is subtracted from the objective amount of catch for the each year, recovery amount during the period can be calculated. Once this amount is multiplied by average market price, annual increase in fishing income for each species can be calculated. As a result of analysis, total fishing income increase in 2008 is estimated to 206.3 million USD.

Based on stock assessment for each species, bio-economic modeling is used for analyzing economic impact changes and achieving target during stock recovery period. In particular, uncertainty of biological and economic factor is fully considered in analyzing the bio-economic modeling. It is used for selecting effective stock rebuilding measures on the basis of impact assessment for various fishery management measures.

Table 2: Economic Effectiveness by Target Species of FSRP

	Sandfish	Blue Crab	Octopus	Tokobushi		Yellow			Korean	Purplish
				Abalone	Skate Ray	Cod	Croaker	File Fish	Flounder	Washington Clam
2004	2472	2683	5953	19	259	2641	17570	1267	12038	5380
2005	2401	3714	7637	66	255	4272	15272	1055	15319	6534
2006	2647	6894	7894	54	392	6810	21428	1071	19879	3399
2007	3769	13606	12033	62	375	7533	34221	2998	24340	3422
2008	2720	17596	11838	102	1343	5395	33200	2631	20162	2672
2009	3939	31302	15386	34	3254	6870	34033	8280	19687	1918
2010	4236	33193	10813	27	4131	7289	31931	3475	20107	1950
2011	4236	26608	10421	3	2925	8585	59226	1606	20017	2314
Recovered Volume										
(Average per year)	573	10,099	277	54	444	3,939	12,046	966	9466	0
Price(2011)(\$/Kg)	2.57	9.05	15	27	6.3	3.6	2.9	6.3	5.3	3.1
Increase Revenue	1.5	91.4	4.2	1.4	2.8	14.1	34.8	6.1	50	0

\* Swimming crab Unit: M/T, US\$ million

Source: Ministry of Food, Agricultural, Forestry and Fisheries [9]

**Social Aspects of FSRP:** One of features of Korea fish stock rebuilding plan(FSRP) is encouragement of community-based self-regulation fishery. The community-based self-regulation fishery is improving awareness and understanding for FSRP, better reflecting fishermen's ideas and opinions and leading active participation and cooperation of fishermen in implementing FSRP. Through active participation and self-regulation of illegal fisheries from fishermen, the effectiveness of the FSRP is maximized [10].

For example, when sandfish was selected as target specie under the FSRP, to induce active and voluntary participation of fishermen and maximize effectiveness of the FSRP, an agreement between fishermen organizations and fishery resource management committee was concluded in connection to community-based management associations. Voluntary agreements by fishermen were implemented on amount of fishing gear by vessel, limitation on trip days of fishing and appointment of spawning protection regions. Ways to promote active participation of fishermen on the recommendations are discussed at the science committee. As a result, various fisheries restrictions are being observed well and the cases of unlawful fishing have greatly reduced.

The FSRP of Korea presumes voluntary participation of fishermen by connecting with community-based management fisheries by fishermen organizations. Through voluntary participation, fishermen are voluntarily accepting the measures to manage and control the fishing resources, bringing satisfactory results. However, strengthened restrictions on fisheries with development

of FSRP may cause losses in fishing income during the recovery periods and inflict limitations on recommending active and voluntary participation by fishermen.

Accordingly, measures to support fishermen through stabilization of fishing business during such recovery periods are being considered in order to induce active participation (for example, supports for reduction in fishing effort such as limitation on the number of fishing days and suspension system, improvement of fishing grounds for selective fishing of small sized fishes and avoidance of mixed fishing, aids for expenses on disposition of fishing gears and support system on training of fishermen).

Under community-based self-regulation fisheries, consultant experts on fisheries who have in depth knowledge and experience on fisheries as well as local governments, will provide excellent education and consultations to fishermen. Also, as a management and operational system for each FSRP, Fishery Resource Management Committee was set up. The Committee has made efforts to improve fishermen's awareness and to provide assistant. In addition to that, the Committee has strengthened public relations on fish stock rebuilding.

**Some Challenges of FSRP:** As described above, FSRP of Korea has not been in operation for long and therefore accompanies difficulties in judging the results. However, the amount of resource and catch of target species have so far been increasing with management by the science committee and regional fishery resource management committees, voluntary observance of recovery measures by fishermen, supplementation of conventional fishery

management measures and fish stock enhancement programs. However, there are several challenges to enforcement of FSRP pilot projects and such challenges can be summarized as follows.

First, while diverse data on the causes of reduction and depletion in fishery resources must be collected and effective plans must be established based on such data, the lack of available data brings limitation in establishment of plans to maximize resource recovery. In addition, the number of species that can be evaluated is limited, resulting in limitation on expansion of plans based on evaluation results of resource amount. Accordingly, investigation and data collection on resources, environment, ecology and production must continuously be expanded to more accurately and comprehensively examine various causes of reduction and depletion in fishery resources.

Second, properly functioning policy measures must be selected and utilized for actual recovery of resources. Particularly in the recovery of fishery resources, though direct restrictions on fishing activities to lower fishing pressure are necessary, policy measures that improve marine environment and reduce contamination of fishing grounds must be accompanied simultaneously. The current FSRP emphasize policies that reduce the fishing pressure and increase resources; they tend to neglect reclamation projects, ocean bottom sand gathering businesses and waste (garbage) disposal in the seas that can contaminate the coastal fishing grounds. Although the departments that enforce such matters differ, related enforcement departments must mutually cooperate to maximize the efficacy of resource recovery plans.

Third, as indicated in limitations of conventional fisheries management, coastal fisheries of Korea show incomplete fulfillment of FSRP on individual species due to multi-species/multi-fisheries characteristics. Accordingly, the effects of ecosystem based FSRP for individual species on other related species must also be taken into consideration. Furthermore to accomplish recovery of overall fishery resources, FSRP must gradually be established. Means to systematically manage related multi-fisheries must also be looked for.

Fourth, as in the case introduced earlier, FSRP of Korea presumes voluntary participation of fishermen by connecting with community-based management fisheries by fishermen organizations. As a result, fishermen are voluntarily accepting the measures to manage and control the fishing resources, bringing satisfactory results. However, strengthened restrictions on fisheries with development of FSRP may cause losses in fishing income

during the recovery periods and inflict limitations on recommending active and voluntary participation by fishermen. Accordingly, measures to support fishermen through stabilization of fishing business during such recovery periods must be considered in order to induce active participation (for example, supports for reduction in fishing effort such as limitation on the number of fishing days and suspension system, improvement of fishing grounds for selective fishing of small sized fishes and avoidance of mixed fishing, aids for expenses on disposition of fishing gears and support system on training of fishermen).

Fifth, major coastal and offshore species of Korea are jointly utilized in the EEZ of East Sea, West Sea and South Sea by Korea, China and Japan. Therefore, operation of FSRP only by Korea cannot obtain complete efficacy in resource recovery. A joint regional fisheries management system between Korea, China and Japan must be established in the future to mutual cooperate on large marine FSRP between adjacent nations.

## **CONCLUSION**

The newly established FSRP and its fisheries management policy are meaningful for it realizes the limitations of the conventional fisheries management policy and it changes the policy focus by shifting the objective of fisheries management policy from the maintenance of fishery order or the fishery adjustment to fish stock recovery. And establishment of FSRP that can more effectively and quickly recover the fishery resources through controlling of individual resources based on creation of ecological system through traditional stock enhancement programs is also meaningful. Furthermore, preparation of a new management system for ecosystem based recovery of fishery resources and promotion of participation of fishermen by connecting with traditional self-management fisheries can also be considered as important. This new fisheries management policy could satisfy international recommendations including the 1995 FAO Code of Conduct for Responsible Fisheries, so a prospect is that the policy would make a strong contribution to the management and rebuilding of domestic fish stock.

The FSRP is showing an increase in amount of catch and corresponding economic benefits through pilot projects. However, it has yet to improve many aspects including a system of research and evaluation of fish stock, scientific analysis of the effects of the fisheries management measures, a management system involving



active participations of fishermen and the establishment of fishermen support system. Also, there are many who voice their concerns on if the fixed mid-term and long-term target numbers can be actually achieved.

Instead of a hasty conclusion of the FSRP and its fisheries management system, if we can address these problems to strengthen the policy, the sustainable and stabilized development of fisheries, which actively utilizes the characteristics of fish stock, can be promoted. Also, in order to achieve an expected success in practical stock rebuilding, confining the policy development for the FSRP to Korea may present the limitations due to particular characteristics of fishery resources. Thus, it is important to continue this endeavor for fish stock recovery with adjacent countries like China and Japan. Japan in particular has implemented the FSRP since 2001, so if a FSRP is established and effectively implemented jointly by Korea and Japan for fishery resources migrating between the two countries, the effects of an effort to fish stock recovery in offshore and coastal seas around Korea could be maximized. Also, while the current FSRP is operated by species, if the FSRP can be gradually expanded to encompass the whole ecosystem and this FSRP may be more effectively managed and rebuild fish stock for all species of fish in offshore and coastal waters surrounding Korea.

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