

Analysing the Strategies and Level of Economic Creativity in Korean Fisheries

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한국 수산업의 창조경제 역량과 개발전략에 관한 연구

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Abstract

대부분 선진국 수산업은 국가경제에 차지하는 비중은 미미하나 해양생태 보전이나 해양식량안정 등의 중요성을 고려하여 국가개발 전략적 관점에서 큰 관심을 둔다. 그리고 인구나 식량소비 규모에 비해 수산자원이 풍부한 저개발국의 수산업은 국가경제 발전의 주요한 산업적 역할을 수행한다. 최근 한국을 포함한 일부 선진국에서는 창조경제적 수산업을 통하여 새로운 성장동력을 개발하여 수산업의 산업적 역할을 보다 산업화하는 전략적 발전을 지속적으로 추진하고 있다.

수산업의 창조경제적 발전은 주로 수산자원의 합리적 보존관리, 어업인의 소득증대와 어촌사회 복지향상뿐만 아니라 새로운 수산물 시장수요 창출 등에 주안점을 두고 있다. 본 연구에서는 수산창조지수(ICSF; Index of Creativity Space for Fisheries)를 분석하여 수산업의 지속적 개발 내지 회복에 있어 창조경제적 요인의 역할과 중요성을 평가하였다. 수산업의 창조성을 결정하는 수산창조지수(ICSF)는 기술(technology), 재능(talent), 다양성(tolerance)의 결합적 결과로 구성된다. 이를 통하여 창조경제적 측면에서 수산업의 지속적 발전 가능 잠재력을 평가하게 된다.

수산창조지수(ICSF)를 이용하여 한국 수산업이 지니는 창조성을 분석한 결과 대부분 수산분야에서 창조성을 기반으로 하는 지속적 수산업 발전 전략에 높은 관심을 보였다. 특히 한국 수산업은 보다 효과적인 자원 및 어업관리 정책의 이행을 통하여 창조경제적 편익의 증대를 모색하는 전략이 높기 평가되었다

key words : Creative Economy, Index of Creativity Space for Fisheries(ICSF), Creative Economic Benefits

I. Introduction

We cannot give a simple definition of “creativity” that encompasses all the various dimensions of this phenomenon. Indeed, in the field of psychology, where individual creativity has been most widely studied, there is no agreement as to

whether creativity is an attribute of people or a process by which original ideas are generated. The characteristics of creativity in different areas of human endeavor can at least be articulated. It can be suggested that:

- Artistic creativity involves imagination and a capacity to generate original ideas and novel ways

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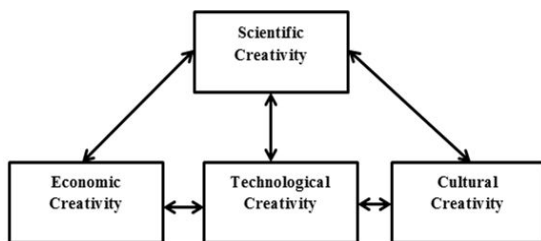
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of interpreting the world, expressed in text, sound and image;

- Scientific creativity involves curiosity and a willingness to experiment and make new connections in problem solving;

- Economic creativity is a dynamic process leading towards innovation in technology, business practices, marketing, etc., and is closely linked to gaining competitive advantages in the economy.

As shown in [Fig. 1] all of the above involve technological creativity to greater or lesser extent and are interrelated, Regardless of the way in which creativity is interpreted, there is no doubt that, by definition, it is a key element in defining the scope of the creative industries and the creative economy.



Source: KEA European Affairs (2006)

[Fig. 1] Creativity in Today's Economy

Innovation is the key factor evolving our world. Innovation drives from ideas. The business of using these ideas called “Creative Economy”. It explains the relationship between creativity and economics. This shows the relationship between creativity and economics in order to create value and social wealth.

According to Richard Florida (2002) “Creative Intelligence” provides new information on the issues of high importance to the future of the world and/or regions. According to the UNCTAD (2010), the creative economy is an “evolving concept,

based on creative assets potentially generating economic growth and development” that consists of “all those activities which have their origin in individual creativity, skills and talent, and which have a potential for wealth and job creation through the generation and exploitation of intellectual property” (DCMS 1998).

As environmental issues that are occurring due to the climate change urges the need of creativity in order to face these challenges. According to Intergovernmental Panel on Climate Change (IPCC) report (2014), climate change poses a great risk to the most populations and existential risk to poor countries as well as small islands whom already struggling with food insecurity and in some cases even civil conflicts. The report cites the effects of higher temperatures and heat waves on essential food sources mostly by lowering the productivity and that might lead to price swings and lack of food supply creating conflicts for countries that already having problems meeting the basic needs of their population. These issues can be one of the major causes of climate change and since the resources are limited the answer can only be found in human’s creative ideas.

To tackle the issue related to lack of food supply the focus should be toward primary industries such as agriculture and fisheries. Using creativity in these kind of industries requires an environment involving broad range of people with different levels of related expertise.

This paper aims to calculate an index to estimate the environments that these industries are more likely to develop creative ideas. We have considered three dimensions for this index (talent, tolerance and technology) and each dimension is made of multiple related components that create an index showing the environment that creative ideas

in fisheries can develop better. After all creativity is the only tool that we can use facing the environmental issues.

We have applied the index (from here and after we called it Index of Creativity Space for Fisheries (ICSF)) for South Korea.

II . Methodology

In this paper we propose a new index seeking to show a space that creative ideas can be developed in order to tackle the climate change issues. The ICSF was developed according to below principals:

① It should be able to analyze different factors and enable comparison across the globe; ② It should be adaptive to work in different levels and different scopes; ③ As environmental issues are more dynamic the index should cover as many aspects as possible. ④ As environmental phenomena are not single dimension the index should be wide rasing for a better policy making

Measuring the creativity is not easy it is a multi-dimension phenomena, this act is even harder for calculating it for environment practices.

The creativity can be improved in an environment that considers three main dimensions mentioned below:

Ⓐ Talent: Creativity can be improved in a place that foster, promote and reward all talents (Landry 2010). Since primary industries are less popular compare to uprising industries such as computer sciences, an environment that improves the talents and drives attention towards fisheries and agriculture sectors can help create more creative ideas in order to solve many problems related to environmental issues.

Ⓑ Technology: Creativity is the motor of

technological innovation. However, in the case of environmental issues; developing new technologies is not an easy task and the technologies cannot be developed with the same pace as the environmental issues happen.

Ⓒ Tolerance¹⁾: The creative region should be able to attract creative talent and retain them(cretive talent) (Florida 2002).

In order to explain more, table 1 shows each dimension's indicators and a description for each indicator.

<Table 1> ICSF- Dimensions, indicators and Descriptions

Dimension	Indicator	Description
Talent	Human Capital	<ul style="list-style-type: none"> ● Number of Fishermen per Capita ● Number of Processing Workers per Capita ● Number of Researchers per Capita
	Education	<ul style="list-style-type: none"> ● Number of Research Institutes and Universities
Technology	Research & Development	<ul style="list-style-type: none"> ● Percentage of R&D for Primary Industries in GDP ● Percentage of Human Resources Working in Primary Industries ● Percentage of GDP paid as fees and subsidies for Primary Industries
Tolerance	Diversity Index	<ul style="list-style-type: none"> ● Number of Male Workers per Capita ● Number of Female Workers per Capita
	Agreements	<ul style="list-style-type: none"> ● Number of Countries per Year

ICSF comprises a variety of quantitative indicators to estimate the creativity performance in country level for fisheries (Table 1). Since environmental issues are complicate and creativity

1) Both creative individuals and businesses play an important role, but they need a favourable environment to create. A place should ensure good conditions for creativity to develop, whether with public support or with a fair regulatory system. With out tolerance creativity is not likely to lead to economic growth as ideas are not translated to the market. On the other hand, the economic success of a creative individual or organization depends very much on the level of easiness of doing business combined with the financial resources available.

is a multi-dimension concept, we felt the need to address the characteristics of this index as efficiently and logically as possible.

We have used 80% of our data for each indicator from Ministry of Ocean and Fisheries website. The remaining 20% of the data was gathered from World Bank, international Labor Organization and OECD reports. The data were not available for some years so we have tried to use the latest data available. To remove the scale effect we used auxiliary indicators such as GDP and population.

For all indicators data is transformed using the Min-Max normalization method. This helped all the data to gain a value between zero and one. The normalization value for country “i” is defined as:

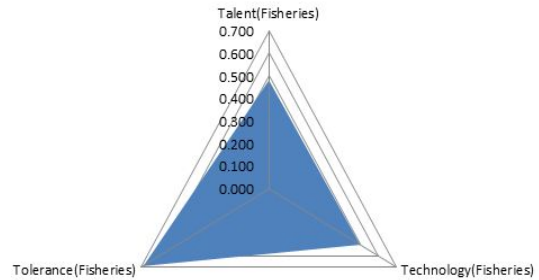
$$N_i = \frac{x_i - \text{Min}(x_i)}{\text{Max}(x_i) - \text{Min}(x_i)}$$

The maximum normalized score is one and the minimum is zero. This might be giving a wrong perception that each dimension has the same important, which is not true. Based on experts opinion unequal weights can be determined. In this study we have considered the same weights and we have applied the ICSF for Korean fisheries sector.

III. Empirical Application of ICSF for Korean Fisheries

In South Korea, fishery is an important sector. According to the Ministry of Ocean and Fisheries (2012) report this sector has 0.03% of total GDP of South Korea, and thousands of people are directly or indirectly are related to this sector. However, the younger generations of Korean were not eager to enter to the fisheries sector and this

made the government bring many fishermen from other countries such as Vietnam and Philippines. This helped increasing the tolerance level for ICSF of South Korea as it is shown in [Fig. 2].



[Fig. 2] Dimensions of ICSF for South Korea

The highest value that can be pointed for ICSF is 1, therefore, values less than 1 show lower score and gap between Korean fishery and ideally creative fishery sector. Looking at the <Figure 2>, we have showed that South Korea is among the countries that have a good level of Creativity Space Index in order to develop its fisheries sector. In the figure the talent part is low since in developed countries such as Korea, there are less attraction from the younger generation to join this important sector. For this reason, the talent part in the ICSF index has lower score among the two other dimensions. In case of technology dimension, like most of the developed countries the fisheries related institutes are shrinking and this causes the technology dimension score not to be more than 0.5.

In the next part we try to explain some of the creative actions that South Korea took in order to save and recover the fish stocks while trying to improve the fisherman’s welfare. As South Korea pay more attention towards its resources we explain some aspects of creative economy that is applied for managing the targeted fish species in Korean

waters.

IV. Managing Fisheries Resources using Economic Creativity

A total of 850 species of fish live in Korean waters. There are 300 to 400 fish species in the marine water around Korea of which over 100 species are of commercial value. The species of fish caught in the East Sea are mainly the Alaska Pollack, Saury, Plaice, Squid, etc., most of which are called current species. Fishing season for squid is usually in the summer when salmon species migrate to the East Sea. The main fishing methods are trawling, jigging, long-lining and gill-netting.

The West Sea (Yellow Sea) has a jagged coast-line and well-developed continental shelf providing good conditions for spawning and growth of fish. The major species that are caught in the Yellow Sea include Yellow Corvina, Hair-tail, Pomfret, Blue Crab, Shrimp and Laver. Also, the main fishing methods are the trawling, stow net, long-line and set-net. The oceanographic conditions of the Korea Strait (South Sea) are much influenced by the warm Tsushima current causing the water in the Korea Strait to be generally warmer than any parts of the Korea coastal seas. Thus, the Korea Strait not only provides suitable sites for aquaculture but also has rich fishing grounds for capture fisheries.

The main species caught in the Korea Strait are Jack Mackerel, Anchovy, Hair-tail, Sardine and Spanish Mackerel; which are caught by trawlers, gill-nets and traps. The cultured species in this area are Oysters, Ark Shell, Laver and Sea Mustards.

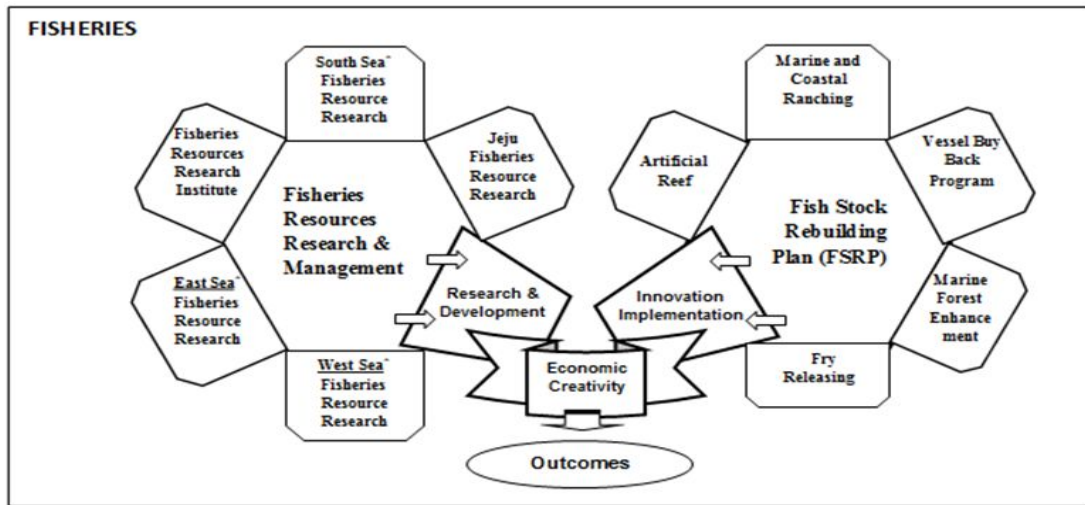
Fishery resources in the coastal and offshore waters have generally been overexploited,

particularly for the commercially important species such as Red-Lip Croaker and Alaska Pollack. Catches have been stagnant during recent years with no significant change, despite the government's efforts in enforcing management programs such as the "buy-back program (decommissioning schemes)" to reduce the fishing capacity since 1994 which did maintain the catch per unit effort (CPUE) almost constant or slight increase over the past 15 years (1994-2012).

Fisheries resources have been protected mainly through governing the mesh size of fishing nets, fishing ground, fishing seasons, etc. The TAC system was introduced in 1999 and has been implemented for 10 species since 2007.

Some species of fish such as common Mackerel, Jack Mackerel and Spiny Top-Shell have been over-exploited to over 90% of their TAC in the coastal and offshore waters of Korea. It appears that the pelagic species such as Mackerels, Anchovies, Squids, etc. are relatively abundant, while the demersal species such as Alaska Pollack have declined due to increased water temperatures in recent years.

In 2005, the Korean Government established the basic plan for the Fishing Stock Rebuilding Plan(FSRP) and its fisheries management policies in order to overcome the limitations of 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 Agreement has come into effect (Lee and Rahimi Midani 2014). [Fig. 3] shows how FSRP has been considered as Economic Creativity and how using this goal has made multiple innovations to improve this sector as well as economic welfare.



[Fig. 3] Path Diagram linking Fisheries to Economic Creativity to Innovation Implementation

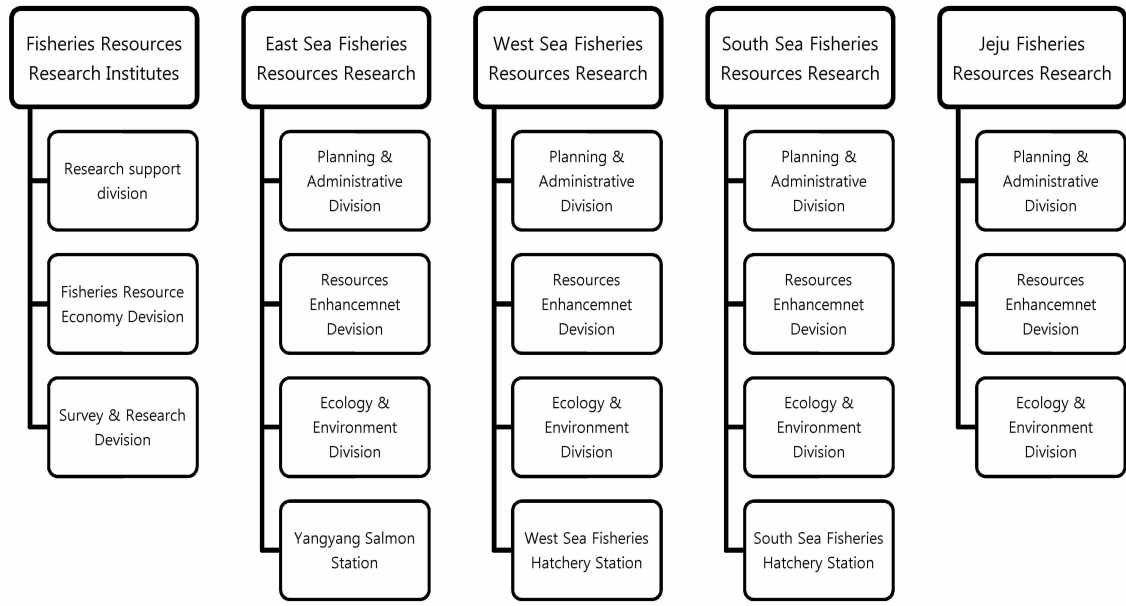
FSRP is the comprehensive plan to rebuild fish stock that is excessively caught to a target level within a certain period of time. More specifically, the policy aims to increase the level of fish stock from the current level to a target level within a rebuilding period, so it consists of a series of 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 (Lee and Rahimi Midani 2014). 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 the 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.

As part of Economic Creativity the FSRP involved multiple research institutes in different areas around South Korea, in order to gather as much accurate data as possible. [Fig. 4] shows each institute divisions.

The institutes that are shown in [Fig. 4] are connected to innovation implementation for FSRP by research and development sectors. The R&D sector duty is to develop the primary sketches in order to clear the path for implementing the best and most efficient ways for FSRP to be developed in South Korea. Of course, the result should be acceptable both in short and long terms.

The main duties of R&D sector in this case are below:



[Fig. 4] FSRP Economic Creativity Leading Institutes' Divisions

① Close and precise survey on ecology and environment of nation-along coastal area to select optimal outcome. ② Listing optimal areas by priority based on scientific data. ③ Developing eco-friendly artificial reefs and analyzing fisheries enhancement effects. ④ Standardization of materials and manufacturing procedures. ⑤ Development and operation of integral management system. ⑥ Developing marine experimental tourism and learning program. ⑦ Developing brand products and marketing strategies to promote resources. ⑧ Marine survey for optimal site. ⑨ Carrying out fisheries resource programs for local governments. ⑩ Stock assessment of the target species. ⑪ Monitoring variation in fish species. ⑫ Monitoring Climate Change effect on the targeted fish species

Innovation part was implemented according to the R&D reports for FSRP. This led to create multiple projects such as Coastal Marine Ranch, Marine Forest, Buyback, Fry Release and Artificial Reef. The main goals of above projects can be

summarized in multiple sections that is explained in <Table 2>:

<Table 2> Innovation Implementation and Outcomes

Implement	Out come
Buyback Program	<ul style="list-style-type: none"> Increasing profitability and lowering exploitation pressures on fish stock Restructure relations among participants in a fishery, creating positive incentives
Marine Ranching	<ul style="list-style-type: none"> Technology for systematic and effective FSRP Marine tourism Practical application of marine ranch technology Promotion of foster a plausible business model
Fry Releasing	<ul style="list-style-type: none"> Improving fishery production and income To enhance fisheries resources and catch Science for hatchery and releasing of fish seeds
Marine Forest	<ul style="list-style-type: none"> Raising public awareness by visualizing benefits To recover ecosystem and fishermen's income Developing natural marine parks
Artificial Reef	<ul style="list-style-type: none"> Improving fishery production and income Provide additional cculture of a variety of species Serve to protect fish stocks from illegal fishing Provides educational and recreational opportunities

One of the features of Korea FSRP is encouragement of community-based self-regulation fishery. The community-based self-regulation fishery improves awareness and understanding of FSRP, better reflects fishermen’s ideas and opinions and leads to 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.

The FSRP of Korea ensures voluntary participation by fishermen by connecting with community-based management fisheries by fishermen’s organizations. Through voluntary participation, fishermen are voluntarily accepting the measures to manage and control the fishing resources, bringing satisfactory results.

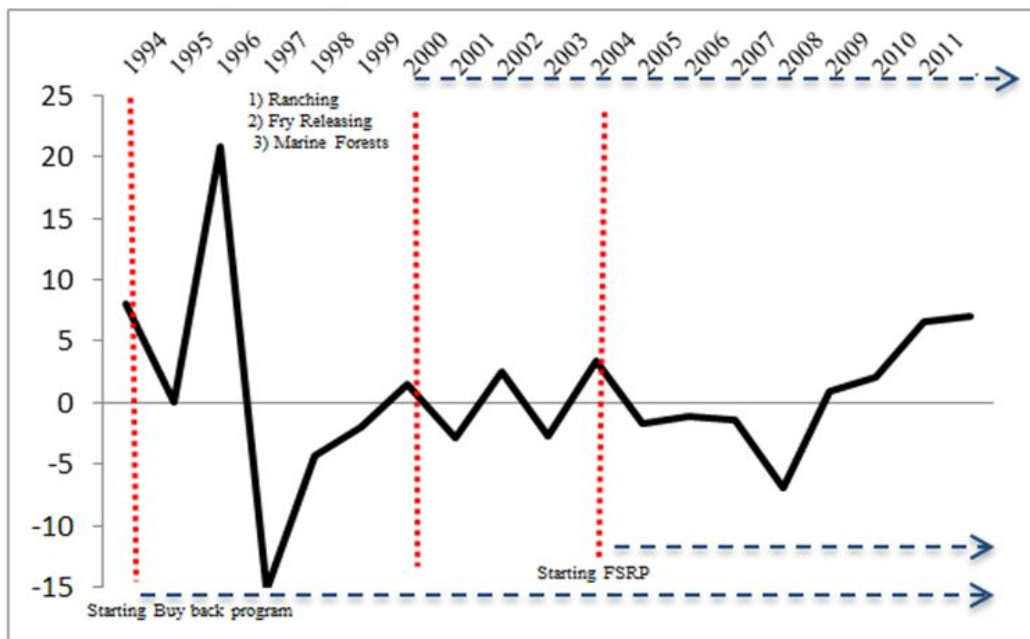
However, strengthened restrictions on fisheries with development of FSRP may cause losses in

fishing income during the recovery periods and inflict limitations on recommending active and voluntary participation by fishermen.

FSRP shows an increase in amount of catch and corresponding economic benefits through pilot projects (Lee and Rahimi Midani 2014). Also, according to the Ministry of Ocean and Fisheries report (2012) as the result of FSRP and related projects the catch level has started increase (Figure 5). [Fig. 5] shows that the biomass level increased from 2009.

The level of fish stocks and catch of target species have so far been increasing due to 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.

As the result of economic creativity the biomass



[Fig. 5] Percentage Change in Biomass level for Coastal and Offshore Fisheries

<Table 3> Economic Effectiveness by Target Species of FSRP

Unit: M/T, US\$million

	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
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
A	573	10099	277	54	444	3939	12046	966	9466	0
B	2.57	9.05	15	27	6.3	3.6	2.9	6.3	5.3	3.1
C	1.5	91.4	4.2	14	2.8	14.1	34.8	6.1	50	0

* A: Recovered Volume (Average per year).

B: Price(2011)(\$/Kg),

C: Increase Revenue

** ① Sandfish ② Blue Crab(Swimming crab) ③ Octopus ④ Tokobushi Abalone ⑤ Skate Ray ⑥ Cod ⑦ Yellow Croaker ⑧ File Fish ⑨ Korean Flounder ⑩ Purplish Washington Clam.

Source: Lee and Rahimi Midani, 2014

in coastal and offshore section also increases as Lee and Rahimi Midani (2014) showed in <Table 3>, conducting FSRP has increased the fisherman profit as well as helping the stock to recover faster.

V. Conclusion

In many developed countries such as Korea, fishery is rarely a strategic sector for national economic development. In well-managed fisheries, high resource rents can be generated and used to finance investments within or outside the sector. The sight of fishing activities (e.g. ports, fishing boats, and landing sites and fish markets) is attractive to many people and often has considerable aesthetic value to both those living permanently in the area and tourists. In this paper we have tried to draw attention toward the role of creativity in developing and/or recovering the

fisheries sector by creating ICSF index. The index shows three dimensions for conducting a creative space and has been implemented for South Korea.

In addition to its direct contribution, the fisheries sector is often responsible for significant indirect multiplier effects on economic development. First, through intra-sectorial interactions, e.g. between capture fisheries and activities such as net-making. Second, fishing or fish farming is often undertaken next to other economic household activities including farming and small trade.

These multiple economic occupations not only bridge the often-great seasonality in the abundance of fishery resources, but also insure against risks of failing production in any one of these activities.

Moreover, these complementary pursuits may in some cases determine part of the fisheries sector dynamics; for example, the supply of capital and labor of the fishing activity may evolve in close relation to agricultural activities undertaken by the

household.

The infrastructure developed for fisheries (feeder roads, landing sites and coastal havens, water-retaining ponds) tends to trigger further economic developments in other sectors such as tourism or agriculture.

An important contribution of the sector is the employment opportunities it generates, especially in remote and marginal areas. And not only in fishing but also in boat-building and maintenance, mechanical workshops for engines and gear, net-making and repair, handling, processing, packing and transport.

As we have showed in case of South Korea, positive impacts result from the fishing and aquaculture activities. The presence of set fishing gear or aquaculture installations can be an impediment to navigation and tourism and the development of these activities cooperating for space needs to be carefully integrated. The more considerable and substantial contribution of fisheries is the supply of highly nutritious animal protein for human consumption and the employment and income generation in often remote coastal areas in South Korea. The growing importance of recreational fishing is also notable, especially as its contribution to economic benefits is often difficult to assess and still insufficiently recognized.

We hope that by conducting more researches on

fisheries sectors we can gain more data and build an ICSF for Korean fisheries.

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