Advances in Biological Sciences Research, volume 9
Joint proceedings of the 2nd and the 3rd International Conference on Food Security Innovation (ICFSI 2018-2019)

Prospective Strategy for Strengthening the Fish Processing Innovation System in Banten Province

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Abstract **- The fish processing industry in Banten Province has good potential but still has many weaknesses. In an effort to strengthen the innovation system of small and medium fish processing businesses in Banten Province, a variety of prospective strategy scenarios are needed that can describe the various possibilities that will occur in the future. The purpose of this study was to map various perspective scenarios to strengthen the innovation of fish processing SME systems in Banten Province using a participatory prospective analysis approach. The results show that the scenario that is highly expected in the future is an optimistic scenario: (A1) Dissemination of research results spreads among academics, local government, industry, and society, (B1) Certification and standardization can be applied well with the assistance of other stakeholders (C1) Partnership is well established between all innovation actors building, (D1) Business incubators have been established and are running well, and (E1) Technopark has been formed with active participation of all innovation actors.**

Keywords: strategy, prospective analysis, innovation system

I. INTRODUCTION

Indonesia is known to have a strategic role as a country producing fishery products and is also a market for processed fishery products. Fish is a commodity that is not durable or easily decomposes. For this reason, the existence of a fishing industry that can process fish into a semi-finished product or finished product that is ready to be consumed by consumers is becoming increasingly important.

In 2014 the number of fish processing units (UPI) in Indonesia reached 59,503 UPI consisting of 58,526 UPI micro, small and medium scale and 977 UPI large scale. While in terms of a number of products, the number of processed fishery products in 2014 was 5.37 million tons, which consisted of 3.61 million tons of UPI processed micro-scale and medium-scale products and 1.76 million tons of large-scale processed UPI products [1]. From these data, it can be interpreted that Indonesian fishery products processing business activities are dominated by business activities carried out by the scale of small and medium micro enterprises (MSMEs).

Banten Province with an area of about 8,800.83 km2 and a coastline of 517.42 km has a large potential of marine and fisheries resources. Fishery processing business activities in Banten Province are still dominated by small and medium scale enterprises (SMEs) with all their limitations. The quality of products, technology, packaging, and markets develop as they are. There is no innovation in developing fishery processed SME products, while innovation is the key to success in increasing business competitiveness. SME competitiveness comes from the level of innovation, entrepreneurship, human capital, funding sources, market potential, and business strategy [2]

The low innovation capability of the fish processing SMEs is allegedly caused by the lack of collaboration between actors in the innovation system. An innovation system is a unity of a set of actors, institutions, networks, relationships, interactions, and productive processes that influence the direction of development and the speed of innovation and its diffusion [3][4][5][6][7][8]. In other words, the innovation system is a system of technology and information flows between institutional developers and technology users, supported by other related institutions.

In order to implement the strengthening of the SME fish farming innovation system, this research needs to be done which aims to find out the key variables and all the possibilities that can occur, so that in the future it can be designed the right policy strategy. This study uses a participatory prospective analysis which is one technique to analyse various strategies that can occur in the future

From a prospective analysis, information was obtained about key variables in strengthening the innovation of fish processing SMEs. Furthermore, these key factors are used to define and describe evolution possible future for strengthening

the innovation system of fish processing SMEs in Banten Province.

II. METHOD

The research was conducted in Banten Province. The experts of this study were those representing innovation actors from universities, small-medium fish processing businesses, and local governments.

This study uses a prospective participatory analysis method, which is an approach that promotes participatory processes and is able to provide inter-stakeholder consensus [9][10][11][12]. Participatory prospective analysis is designed to find and anticipate change with experts and stakeholders. The results of the analysis issue rapid information that can be used by fellow participants so that policies can be obtained in development [13].

Prospective analysis is the development of the Delphi method that uses expert group opinions for decision making. The stages in the prospective analysis consist of [14] :

(1) Definition of the purpose of the system being studied. The objectives of the system being reviewed need to be specific and understood by all experts who will be asked for their opinions. This is done so that the expert understands the scope of the study and equates the views about the system under review

(2) Identification of factors that influence the achievement of these objectives, which are usually the needs of the system stakeholders studied. Based on the study objectives to be achieved, experts are asked to identify the factors that influence the achievement of these goals. Experts are expected to be able to represent system stakeholders who are studied so that all system elements can be represented. At this stage, the definition of each factor must be clear and specific.

(3) Assessment of the direct influence between factors. All identified factors will be assessed directly between factors.

TABLE I
GUIDELINES FOR ASSESSING PROSPECTIVE ANALYSIS (BOURGEOIS and JESUS, 2004)

Score	Influence
0	No effect
1	Small effect
2	Medium effect
3	Strongly effect

Source : [10]

The results of the combined expert opinion matrix are processed with prospective analytical software using statistical techniques to calculate global direct influence, global dependency, global strength, and weighted global forces. The calculation results are visualized in the Influence Diagram and Dependency between factors as shown in Figure 1

(4) Preparation of circumstances that may occur (state) on the criteria. Based on the dominant factors obtained in stage 3, the conditions that may occur in the future are drawn up. For each factor one or more conditions can be made with the following conditions: (1) the situation must have a great opportunity to occur in the future and (2) the state is not the level/size of a factor (small, medium) but is a description of a factor

(5) Preparation of scenarios. The scenario is a combination of mutually compatible factors

(6) Scenario analysis and strategy development. Based on the scenarios that need to be discussed in the scenario that is discussed

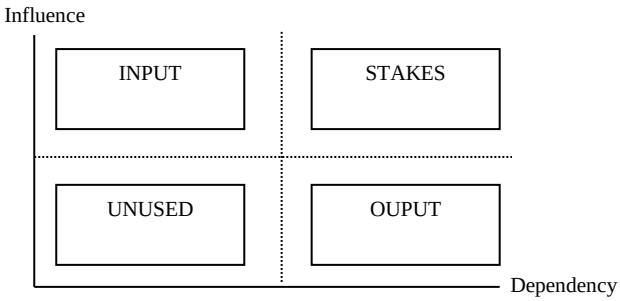

Figure 1.
System effect and dependency diagram

III. RESULT AND DISCUSSION

A. Participatory Prospective Analysis for Determination of Key Variables

In a meeting, experts or participants were asked to identify the key variables that were considered to be the most influential in strengthening the innovation system of fish processing SMEs in Banten Province. Based on these parameters, problem identification is done so that the variables that need to be observed are 13 variables (Table 2).

The variables contained in Table 2 are defined. These variables are the result of discussion and consensus reached by participants. In this case, the most decisive variable in the formulation of the model for determining the SMEs of fish processing innovation system is unknown. The influence between variables can also not be described, so all variables have the same importance and strength to the system. On the other hand, it is necessary to note the difference in the level of influence of variables to determine variables that need to be intervened as entry points for effective planning.

Based on 13 variables in Table 2, participants returned to discussion and consensus gave a score on cross-effects between variables, which were analysed using a matrix [10], with the help of Microsoft Excel software. This process is carried out to observe the direct influence/dependence (I / D) of each variable with other variables, using a consensual valuation approach. Valuation of direct effects on variables against other variables is obtained using a scale from "0 = no effect" to "3 = strong effect". The values that have been discussed and agreed upon by the participants are directly entered into the I / D matrix. The score of the cross-linked

effect from the agreement is presented entirely in Table 3 and Figure 2

TABLE II
INFLUENCE VARIABLE ARE IDENTIFIED AND DEFINED BY PARTICIPANT

No.	Variable	Description
1.	Certification and standardization	Certification is a written guarantee issued by the certification body; standardization is related to appearances, such as size/volume, color, water content and so on determined by the seller and buyer.
2.	Technopreneurship-based curriculum	Higher education curriculum that aims to create modern entrepreneurs based on knowledge
3.	Technology-based SMEs	SMEs whose production and marketing processes are based on knowledge
4.	Dissemination of research results	The process of communicating the results of research through the media
5.	The partnership between innovation actors	Communication, interaction, and collaboration produce synergies between innovation actors
6.	Retail marketing policy	Policies issued by regional governments for easy access to SME product retail marketing
7.	HR Innovator	Researchers who produce innovation, from universities, research institutions, local governments, and industries.
8.	Training and coaching	Training and coaching for SMEs from elements of local government, universities, research institutions, and industry
9.	Business incubator	institutions that help entrepreneurs by facilitating the application of innovation to related industries so that they can survive in a real business environment
10.	Funding agency policy	Policies from institutions that provide input on investment and working capital for SMEs and other innovation actors.
11.	Technopark	an integrated area that develops technology and innovation for research, which combines industry, universities, and research centers, in one location that enables the flow of information and technology more efficiently
12.	Patents and Intellectual Property Rights	The protection provided by the state to the inventor for the results of his invention in the field of technology
13.	Innovation infrastructure	Work facilities needed to produce new innovations, such as laboratories, materials, and materials, software

From the presentation of the results of the analysis of the direct and indirect (total) influences shown in Figure 2, five variables can be chosen which are the most influential variables, namely Certification and standardization, Partnership between actors of innovation, Dissemination of research results, Business Incubators, and Technopark. This is consistent with the weighted global strength values of each variable, where the five variables have a higher value than the other eight variables (Table 3).

TABLE III
SCORE THE STRENGTH OF A WEIGHTED GLOBAL VARIABLE

No.	Variable	The strength of a weighted global variable
1.	Certification and standardization	1.67
2.	Technopreneurship-based curriculum	0.88
3.	Technology-based SMEs	0.70
4.	Dissemination of research results	1.96
5.	The partnership between innovation actors	1.53
6.	Retail marketing policy	0.49
7.	HR Innovator	0.66
8.	Training and coaching	0.64
9.	Business incubator	1.40
10.	Funding agency policy	0.82
11.	Technopark	1.02
12.	Patents and Intellectual Property Rights	0.59
13.	Innovation infrastructure	0.64

In table 4, all variables are sorted based on the value of weighted global strength. In the first rank with the biggest weight is the variable that is the dissemination of research results. Dissemination of research results is the process of communicating the results of research through the media, with broader goals with the aim of changing target behaviour. The results of research from universities and other research institutions must be an innovation and technology that is beneficial to society, must be able to be streamlined and commercialized into industry, because innovation is the nation's demand for increasing independent economic growth.

TABLE IV
SCORING SEQUENCE THE POWER OF WEIGHT GLOBAL VARIABLES AGENCY

No.	Variable	The strength of a weighted global variable
1.	Dissemination of research results	1.96
2.	Certification and standardization	1.67
3.	Partnership between innovation actors	1.53
4.	Business incubator	1.40
5.	Technopark	1.02
6.	Technopreneurship-based curriculum	0.88
7.	Funding agency policy	0.82
8.	Technology-based SMEs	0.70
9.	HR Innovator	0.66
10.	Innovation infrastructure	0.64
11.	Training and coaching	0.64
12.	Patents and Intellectual Property Rights	0.59
13.	Retail marketing policy	0.49

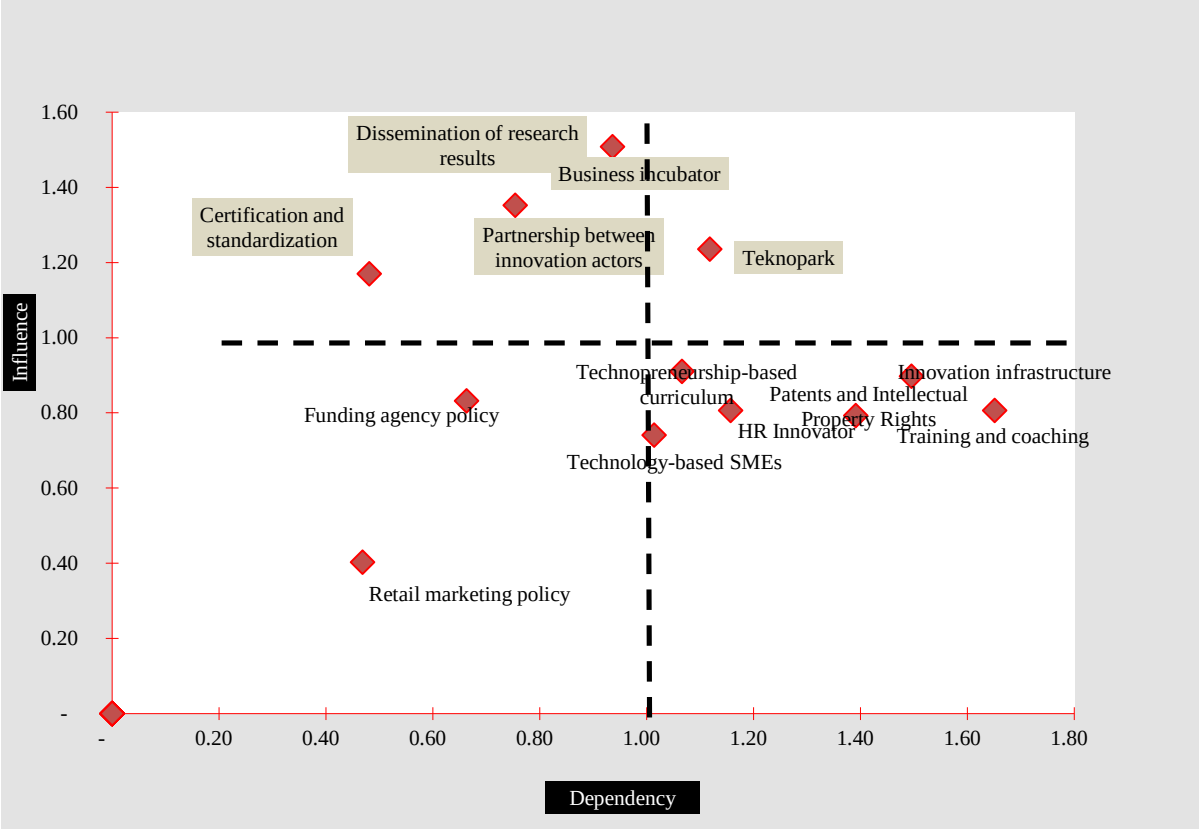

Figure 2.
Importance of factors that influencing the strengthening of fish processing sme innovation system

From the research results, dissemination is needed to ensure more parties know our research and the publications that have been produced. This stage abroad is also often called science communication. In practice there are many ways, presenting them in various research seminars, uploading them online in an open repository, creating newsletters with a list of publications, to actively disseminating them on social media. The output of dissemination in the form of our work was found by other parties to be read, applied and evaluated [15].

Variables with the second biggest weight are certification and standardization. Certification is a written guarantee issued by the certification body; standardization is related to appearance, such as size/volume, color, water content and so on determined by the seller and buyer. According to the Fisheries Law 31/2004 all fish processing businesses must meet the requirements of good fish processing, fisheries food quality and safety assurance systems. SMEs need to understand about Good Manufacturing Practices (GMP) where GMP is a guideline for how to produce food with the aim that producers fulfill the requirements - requirements for producing quality food products in accordance with consumer demands. Food products are said to be of good quality if they have at least met the standards and can provide satisfaction to personal consumers. By producing quality and safe food for consumption, public trust will increase and the food industry concerned will grow rapidly [16].

Fish processing SME certification is proof of the quality and feasibility of consumption of processed fishery products to improve competitiveness. Feasibility Processing Certificates are given to micro-small and medium-scale fish processing units that have implemented good processing practices (GMP) as evidenced by an audit of the Standard Sanitation Operating Procedure (SSOP). Products from fish processing units that have obtained Feasibility Processing Certificates will get the marking on the packaging. In addition, the SME has the opportunity to be proposed to join the SNI marking program from the Product Certification Institute of the Ministry of Maritime Affairs and Fisheries.

According to the results of research of [17], the preparation and implementation of production SOPs, ownership of PIRT certificates, and halal, good packaging usage and attractive designs can improve product quality and competitiveness. For this reason, small and medium business actors need to receive education and assistance in implementing food safety standards so as to produce safe and quality products

In the third rank is the partnership variable between innovation actors. The partnership between actors of innovation is communication, interaction, and collaboration which results in the synergy between innovation actors, namely the government (government), industry (business), academia (academia) and society (civil society) which are also called Quadruple Helix. According [18], the Quadruple Helix is a collaboration between four sectors, namely (government), industry (business), academic (academia) and society (civil society) which play a role in encouraging the growth of innovation and the excellence of product competitiveness. The Quadruple Helix concept is to develop Triple Helix by integrating civil society and integrating innovation and knowledge.

The role of government is as an institution that has industrial development authority, as well as linkages in the substance and administrative linkages. The synergy between departments and agencies in the central and regional governments is needed to achieve the vision, mission, and goals of industrial development. The role of a business or company is as an organizational entity created to provide goods or services to consumers. Universities and other research institutions are a source of innovation and knowledge. Civil society plays an important role as a supporter of environmentally friendly markets through changes in lifestyle, consumption behavior, participation in institutional arrangements that spur social and institutional innovation [18].

Furthermore, the business incubator variable, which is an institution that helps entrepreneurs by facilitating the application of innovation in related industries so that they can survive in a real business environment [19]. Incubators can also be used as a bridge of interaction between sources of innovation (community research institutions) and users (especially entrepreneurs) in the development of further innovation. There is no synergism between research institutions (universities) and business incubators, as well as the number of business incubators that have stagnated. University research is also often not marketable or not "selling power", even research orientation tends to be inconsistent with market needs.

The last variable of the five variables with the biggest weight is Technopark. Technopark is an integrated area that develops technology and innovation for research, which combines industry, universities, and research centers, in one location that enables the flow of information and technology more efficiently. The results of research to become an innovation and technology that is beneficial to society, must be able to be streamlined and commercialized into the industry, because innovation is the nation's demand for increasing independent economic growth. The aim of Technopark is to create a permanent link between higher education (academics), industry/business / financial actors, government and society.

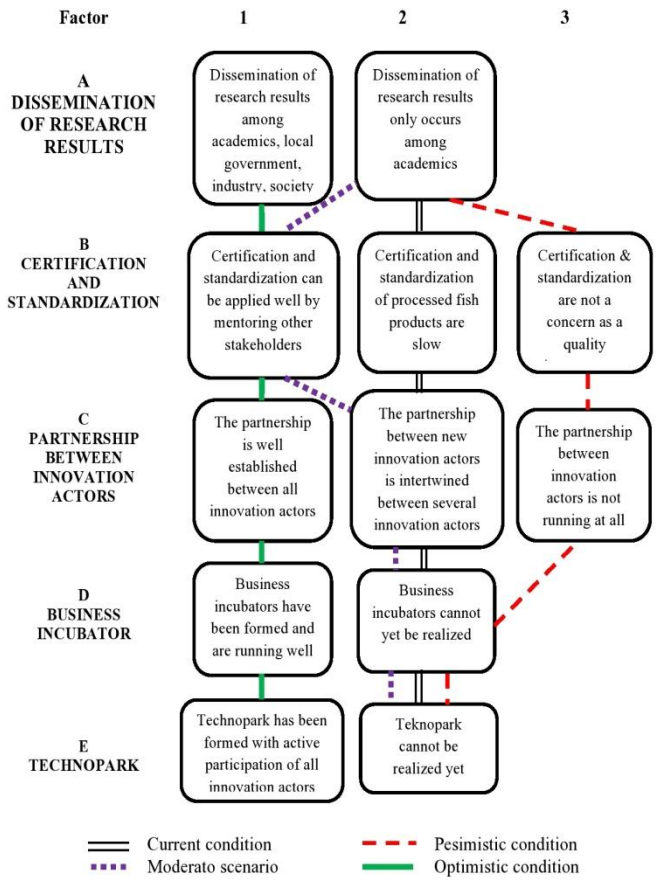

Figure 3
Scenario mapping strengthening fish processing innovation system

B. Operational Scenario Recommendations

The main outcome of the preparation of scenarios for strengthening the innovation system of SMEs in fish processing is to obtain operational recommendations that are expected to occur in the future (Figure 3) Based on the analysis of operational scenarios, it is obtained that the scenario that is highly expected in the future is scenario 1, which is the best scenario (optimistic): (A1) Dissemination of research results spreads among academics, local government, industry, and society, (B1) Certification and standardization can be applied well with the assistance of other stakeholders (C1) Partnership is well established between all innovation actors building, (D1) Business incubators have been established and are running well, and (E1) Technopark has been formed with active participation of all innovation actors

Next scenario 2 is a moderate scenario, which is a mid-scenario that is developed with the minimum requirements so that the intended conditions can be achieved. The situation of this moderate scenario is (A2) Dissemination of research results only occurs among academics only (B1) Certification and standardization can be applied well with the assistance of other stakeholders (C2) Partnerships between new innovation

actors are intertwined between several innovation actors (D2) Business incubators have not can be realized (E2) Technopark cannot be realized

While scenario 3 is a pessimistic scenario, which is the least expected scenario to occur in the future. Pessimistic scenarios include: (A2)) Dissemination of research results only occurs in academics only (B3) Certification and standardization are not a concern as part of quality improvement (C3) Partnerships between innovation actors are not running at all (D2) Business incubators cannot be realized (E2) Technopark cannot be realized.

IV. CONCLUSIONS AND RECOMMENDATIONS

From this study, the prospective participatory analysis produced five main variables, namely dissemination of research results, certification and standardization, partnerships between innovation actors, business incubators, and Technopark. Based on the analysis of operational scenarios, it is obtained that the scenario that is highly expected in the future is scenario 1, which is the best scenario (optimistic): (A1) Dissemination of research results spreads among academics, local government, industry, and society, (B1) Certification and standardization can be applied well with the assistance of other stakeholders (C1) Partnership is well established between all innovation actors building, (D1) Business incubators have been established and are running well, and (E1) Technopark has been formed with active participation of all innovation actors.

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