An analysis of to deliver cheap nutritious products: National Fish Barn Program

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Abstract. There is a program called the national fish barn (Lumbung Ikan Nasional), which aims at delivering fish to consumers from the the country’s most productive fishing areas, namely Maluku. The program has focused on the preparation of integrated ports and concerns aspects of the readiness of the participating districts and cities. This paper was based on a research conducted in January – March 2021, with an objective to assess their readiness indexes, covering five related dimensions: ecological, economic, social, institutional, technological. Analytical tools used in this study were multi dimentional scaling and prospective analysis. The multidimensional scaling (MDS) data was obtained through mail surveys involving fisheries service officials in 11 districts and cities. Applyng the same technique, data collection for prospective analysis involving local university scientests. The results of MDS analysis showed that 11 districts and cities demonstrated readiness indexes categorized as ‘fairly prepared to very prepared’ for the ecological, economic and social dimensions. Challenges are found in the institutional and infrastructure dimensions, where there are a number of districts and cities indexed ‘less prepared’ or even ‘unprepared’. The research concluded with the result of prospective analysis, which then become policy implication of this research; in this case, it is recommended that a number of attributes should receive attention to improve the readiness indexes of participating districts and cities. These attributes are: ‘market opportunity’, ‘business competitiveness’, ‘participation of entrepreneurs’, ‘financial institutions’, ‘information infrastructure’

1. Introduction
Among other protein sources, fish is in the top position, contributing 12.65%, followed by nuts 8.77%, meat 5.91%), and eggs and milk 5.89% [1-4]. This is not surprising, since fish is supplying low-priced protein. The nationally averaged prices of fish (IDR/kg) respectively are milkfish 23,400, skipjack tuna 29,000, gourami 20,100, flying fish 23,300, lele catfish 25,300, tilapia 30,900, patin catfish 24,800, and mackerel tuna 26,300 [5]. Meanwhile, average prices of beef is IDR 129,950/kg., chicken IDR 36,800/kg, and eggs IDR 11,900/kg. [6]. These data clearly illustrate that disruption of the supply of fishery products to consumers will disrupt the condition of people's food intake.
The classical problems of delivering fish from the country’s production centers to the consumers’ concentration are the distance and logistic system. The existing logistic system makes the distance links to very high logistic costs [7-9]. Freight rate from the eastern Indonesia to Java is USD 1,782/40-cuft container [10]. This figure can be linked to a report which compares logistic costs among Asian countries, pointing out inefficiency; logistics costs in Indonesia is about 14% of total production costs, compared to best practice in Japan, which is only 4.88% [11].

The government responded with the National Fish Barn (Maluku Lumbung Ikan Nasional, MLIN) program. The first talks of MLIN emerged in 2010 [12,13] and materialized only in 2021 [14]. Documents [15-18], state that the objective of MLIN is to integrate economy through resource use optimization. These objectives are packaged into activities including building an integrated port in the capital of Maluku, projected to become a hub connecting ports in regencies of the province [19]. The fish are handled and then forwarded to market destinations, domestic and international. This design certainly demands the readiness both of the capital and all participating districts and cities. So, the objective was to assess their readiness indexes, covering five related dimensions: ecological, economic, social, institutional, technological.

2. Materials and methods
Research was done in January to March 2021 using two methodological approaches: Rapfish Multidimensional Analysis [20,21] and Prospective Analysis [22-25].

2.1. Rapfish multi-dimensional scaling
Rapfish Analysis (RAPFISH) was at the outset applied to perform rapid comparisons between fisheries. Recently, this approach was expanded to include dimensions not used in early applications [26]. Now the application has further expanded to other fields such as veterinary [27], environment [28], and agriculture [29]. Referring to this, the Rapfish was adapted in this study to measure levels of readiness of the MLIN program and to include ecological, economic, social, institutional, and technological dimensions. Levels of readiness are said to be 'unprepared' if the ordinance score is below 50, it is said to be 'less prepared' if the ordinance score is more than 50 but less than 65, it is said to be 'fairly prepared' if the ordinance score is equal to 65 but less than 75, and is said to be 'very prepared' if the ordinance score is greater than or equal to 75. Steps and other provisions were done according to the publication of [20], including the ordination and leverage analysis steps. Data were obtained through mail surveys involving 15 respondents representing officials of Fisheries Officers who understood materials covered by the questionnaire and selected purposively from 11 districts/cities in the province. They were asked to provide assessment of of the dimensions' attributes. Their responses were inputted into the Rapfish software to obtain ordination points and leverage attributes.

2.2. Prospective analysis
This analysis aims to refine the selection of key factors provided by the MDS analysis. This was run using the MICMAC software developed by Godet [22,23]. Influences and dependencies of important variables were identified and analyzed using this software. Three steps of MICMAC are (1) identifying variables, (2) analyzing relationships between variables, (3) analyzing key variables [22-25]. The selected variables were sensitive attributes resulting from MDS analysis. This variables were then written in a questionnaire to be filled out by 20 key informants selected purposively based on their understanding of provinve fisheries management. Steps 2 and 3 were done on MICMAC software.
3. Results and discussion

3.1. Ordination of readiness indexes following the rapfish dimensional scaling

The MDS analysis show that based on averaged indexes of the five dimensions, the readiness of the 11 districts/cities ranges from ‘unprepared’ to ‘fairly prepared’ (Figure 1). However, when viewed in detail by dimension, there are a number of districts/cities that have dimensions with a 'lacking' category. Below is an in-depth look at each of the dimensions.

Figures 2 to 6 summarize RAPFISH ordination of Ecological, Economic, Social, Institutional, and Technological dimensions, respectively. Figure 2 shows that for the ecological dimension, one district is indexed as 'unprepared', two indexed 'less prepared', one 'fairly prepared', and 7 'very prepared'. Figure 3 shows that for the economic dimension, three districts/cities are indexed as 'less prepared', two 'fairly prepared', and 'very prepared'. Figure 4 shows that for the economic dimension, one district is indexed as 'less prepared' and ten 'very prepared'. Figure 5 shows that for the economic dimension, two districts/cities are indexed as 'unprepared', four 'less prepared', and five 'very prepared'. Figure 6 shows that there are no districts/cities indexed as 'unprepared', two 'less prepared', one 'fairly prepared', and three 'very prepared'.
3.2. Leverage analysis
For each dimension, there are attributes that are categorized as leverage attributes. These attributes have a sensitive nature, meaning that small interventions on these attributes will bring significant changes to the dimensions concerned. Figures 7 shows the sensitivity of the attributes for the ecological, economic, social, institutional and technological dimensions.

For Ecological Dimension, most sensitive attributes are (1) fish migration range, (2) the size of the fish caught, (3) catch diversity. For Economic Dimension, the most sensitive attributes are (1) business competitiveness, (2) market opportunity, (3) fish catch distribution. For Social Dimension, the most sensitive attributes are: (1) public knowledge of the environment, (2) education level, (3) participation of business actors. For Institutional Dimension, the most sensitive attributes are (1) property right arrangement, (2) financial institution, (3) counseling institution. For Technological dimension, the most sensitive attributes are (1) information system infrastructure, (2) road infrastructure, (3) port infrastructure.

3.3. Prospective analysis
The following are the results of a prospective analysis based on the questionnaires filled out by expert respondents who were selected purposively as intended in the methodology section. These results include (1) strategic attribute analysis for MLIN implementation, (2) direct influence relation between variables, (3) indirect influence relation between variables, (4) variable shifts from direct to indirect effects, and (5) variable shifts from direct to indirect effects.

Figure 8 displays the position of the attribute against other attributes by grouping these attributes into 4 quadrants based on the strength of direct influence and direct dependence on other attributes. As seen in Figure 8, the attributes "market opportunity" and "business competitiveness" and "business actor participation" are categorized as relay variables, which mean they are very sensitive and unstable in influencing the MLIN readiness index. In this case, any intervention to these variables will have a significant impact on the system as a whole. Meanwhile, 'financial institutions', 'fish catch trends' and 'information infrastructure' are classified as determinant variables, which means they will trigger a trigger for the readiness to implement MLIN). Furthermore, "environmental awareness", "road infrastructure”, “fish migration”, and “property regulation” are autonomous variables, which means they
have a relatively small effect. Another result of this analysis is that there are no variables categorized as impact variables in the application of MLIN.

Emphasizing the explanation in Figure 8, Figure 9 shows the relationship of attributes that strongly influence other attributes in the management of fisheries resources in Maluku in the context of readiness as a National Fish Barn. The more lines that go into an attribute, the more strongly that attribute is affected by or dependent on other attributes. Conversely, the more lines that come out of an attribute, the stronger and greater the influence of that attribute on other attributes.

Figure 10 shows that a very strong indirect influence occurs in the attributes of business actors’ participation and ‘market opportunities’. "Business actor participation" provides relatively strong indirect influence on "business competitiveness". ‘Business actor participation’ shows strong influence on other attributes which indirectly affect ‘market opportunity’. Figure 11 shows that there was a shift in the order of several influential attributes. ‘Market opportunity’ drops from position 4 to 5; ‘fish catch trend’ decreases from position 5 to 6. ‘Business competitiveness’ increases from position 6 to 4. Figure 11 also shows that shifts occur in terms of indirect effects, among which is a shift in position 'Fish catch trend' from position 5 to position 7. From the dependency aspect, three main attributes, namely 'market opportunity', ‘business competitiveness' and 'business player participation' remain consistent as the dependent variable. This analysis also shows that there is a shift in the position of the variable after taking into account the indirect effect. These shifts occur in in the same quadrant. 'Business
competitiveness’ shifts quite sharply in its effect, while ‘information infrastructure’ shifts in the degree of dependence between variables from direct to indirect effect. The shift in these attributes still occurs in the same quadrant except for ‘information infrastructure’, which shifts from quadrant 1 to 2. This shows that the attribute of ‘information infrastructure’ has a fairly strong influence and dependence.

**Figure 8.** Direct influence/independence map

**Figure 9.** Direct influences between variables

**Figure 10.** Indirect influences between variables

The result of MDS analysis presented earlier shows a better current situation as compared to finding of similar research [12,13], but some crucial problems still remains. This results of the prospective analysis has provided an opportunity for policy makers to narrow down their choices on the basis of several additional justifications. The point here is here this result provides direction to policy makers on how they can improve preparedness. This does not negate the importance of requiring that not a single district/city is allowed to have dimensions showing low preparedness.

**4. Conclusions**

It is undeniable that the attempt to deliver cheap protein sources to consumers through the National Fish Barn (Maluku Lumbung Ikan Nasional) program is a strategic idea. Planning documents that have been made available and ongoing physical efforts are expected to support the realization of this strategic idea; however, the results of this study indicate that there is a number of homework that should not be
overlooked. This research clearly identifies aspects that need to be included in the homework list. Indeed, each of these points of homework points have specific challenges to carry out, something that is beyond the scope of this research. The results of this research provide directions on what should be prioritized, by which policy makers are invited to choose among them based on local relevant circumstances, including availability of funds, technical aspects, social aspects and so forth.

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