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TRADE FLOW ANALYSIS AND DEVELOPMENT STRATEGY OF INDONESIAN LOBSTER EXPORT

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ABSTRACT

Lobster (*Panulirus sp.*) has a great potential to be developed as export commodity. Moreover, there is increasing trend global consumption of fishery products. However, Indonesia faces many challenges in the midst of intense competition in the globalization era. The export volume and value of Indonesian lobster is declined in recent years. This study aims to analyze factors affecting trade flows of Indonesian lobster export and to formulate alternative development strategy of Indonesian lobster export. Data collected from secondary sources and interview with stakeholders related to Indonesian lobster export. This research used export demand function by panel data to analyze trade flow and alternative strategies are formulated using Analytical Hierarchy Process (AHP). Estimation of panel data shows that all the factors affecting trade flow of Indonesian lobster exports to the destination countries (Gross Domestic Product per capita, economic distance, exchange rate, export price, and free trade agreement) significantly affect lobster export value. Based on Analytical Hierarchy Process (AHP) analysis, alternative strategy that has the highest priority is the development of infrastructure and aquaculture technology, followed by trade regulation, and product quality improvement.

KEYWORDS

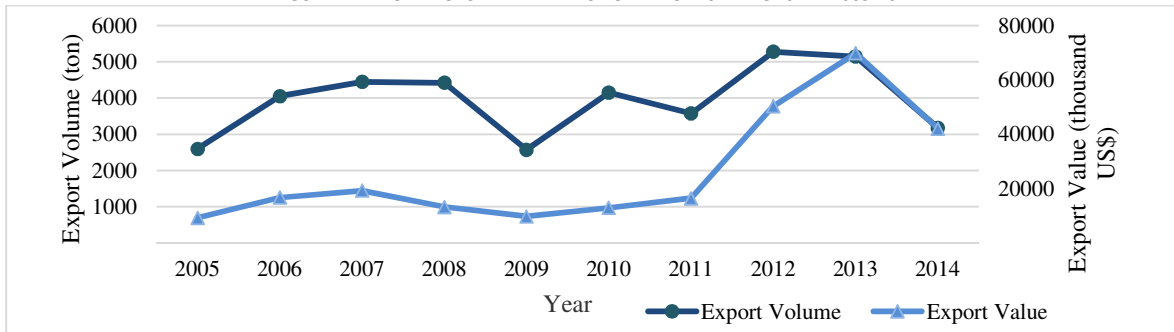
AHP, export demand function, lobster, strategy.

INTRODUCTION

The fisheries sector contributes significantly to the Indonesian economy. It can be seen from the contribution of the fisheries sector to National Gross Domestic Product (GDP). In 2014, the GDP of fisheries subsector contributed 3.37% to the national GDP. In the agricultural sector, the fisheries subsector was ranked second after the food crops in giving the largest contribution to the National GDP. In addition, GDP growth rate of the fisheries subsector was the highest among the other agricultural subsectors. The GDP average growth rate of the fisheries subsector during 2010 to 2014 was 14.31% (Badan Pusat Statistik 2015). Furthermore, the fisheries sector also contributes in generating foreign exchange. Data from the Ministry of Maritime Affairs and Fisheries (2015) showed that the performance of fishery commodities trade balance in the period of 2010-2014 was positive. The export value of fishery commodities grew on average by 5.48% in that period. Indonesian fishery trade performance also supported by increased of world demand to the fishery commodities. The transition of protein consumption trend from red meat to white meat cause the increasing of fishery commodity demand.

One of commodity that could potentially developed for export is lobster, or known as the *udang barong* as the local name. According to Boesono *et al.* (2011), crawfish (*Spiny lobster, Panulirus sp.*) is marine fisheries commodity which has important role as a commodity exports of crustaceans (*Crustacea*) after Penaeid shrimp. Based on data from United States Department of Agriculture (USDA) (2009), in 2006 Indonesia was the fifth largest lobster producer after Canada, the United States, Australia, and the Bahamas. Moreover, lobster is the one of fisheries commodity that has high economic value. The average producer prices reached Rp 211 981 per kilogram in the period of 2011-2014 (BPS 2015). Based World Wildlife Fund for Nature (WWF) (2014), the price of lobster is also influenced by the fishing season, when the season was good, lobster prices are not too expensive. However, when the dry season lobster prices will be more expensive. The price of the most expensive lobster that is when the Chinese New Year because demand is very high and the price can reach Rp 500 000/kg. Besides catching season, the price of lobster is also depending on completeness of legs and will fall when three legs had broken.

FIGURE 1: EXPORT VOLUME AND VALUE OF INDONESIAN LOBSTER 2005-2014



Source: BPS (2015c)

The high global demand for lobster create export market opportunities for lobster Indonesia. Based on Jones *et al.* (2008), lobster export market include countries in Southeast Asia, Hong Kong and Taiwan as the main market, although there are also products that are sold directly to the northern region of China, Singapore, and Japan. However, the export volume of lobster Indonesia has decreased in recent years. In 2014 there has been a decline in exports of fresh and frozen lobster by 38%, from the previous 5 thousand tons to 3,2 thousand tons. In addition, the export value of lobster in 2014 also declined by 40% from the previous year (BPS 2015). This is presumably because the export of Indonesian lobster breeder massively into Vietnam. Therefore, in 2015 the government issued The Regulation of Ministry of Maritime Affairs and Fisheries 1/ Permen-KP/ 2015 about catching lobster. Supported by data from BPS (2015c), that In 2013, Indonesian lobster breeder export to Vietnam amounted to 10.3 tons and increased double by in 2014 to 24.6 tons.

## REVIEW OF LITERATURE

Previously, there are some studies that analyze the factors that affect the export trade flows, such as research conducted by Szczepanski (2010) for shrimp commodity, Anindya (2013) for fish and shrimp commodity to Europe, and Natale *et al.* (2015) for international seafood commodity.

Research conducted by Szczepanski (2010) aims to look at the effect of food safety at the international shrimp trade. This study involves volume of shrimp export as the dependent variable and the independent variables are supply of export countries, GDP, distance, rate, maximum residual levels of oxytetracycline, the common language dummy, and membership in trade associations. The results shows a significant effect on all variables except the variable GDP and EU membership.

Anindya (2013) analyze the factors that affect export value of shrimp and fish to Europe. Based on the result of this study, factors that significant affect export value of frozen shrimp is distance, exchange rate, total population (the population), and price. Meanwhile, the factors that affect the export value of frozen fish is another country's GDP, exchange rate, crisis, price, and European policy.

Analysis of the determinants of international seafood trade is a study conducted by Natale *et al.* (2015). The variables that allegedly affect seafood trade flows is the GDP of exporters and importers country, per capita income of exporters and importers country, geographical distance between the two countries, the production of export countries, the consumption of importers country, and dummy regional trade between the two country.

The final goal of this research is to formulate alternative development strategy of Indonesian lobster export. Alternative strategies are formulated using Analytical Hierarchy Process (AHP). There are some previous research on the development strategy of export using AHP. Dradjat and Bustomi (2009) examined alternative development strategy of Indonesian palm oil exports. AHP hierarchy in this study consists of four levels: factors, actors, objectives, and alternative strategies. Based on the result, the government as a regulator and facilitator of export is very important in the development of palm oil export. In relation to the actors who play an important role, the government became the main actor for the export of CPO. To achieve the desired goal, the actor in the development of CPO export should prioritize infrastructure development strategy followed by the optimization of resources, institutional development, and policy implementation.

Pratiwi (2011) examined business development strategy of Indonesian seaweed for the international market. AHP hierarchy in this study consists of four levels: factors, actors, objectives, and alternative strategies. This research using Focus Group Discussion (FGD) in conducting the preparation of the hierarchy. According to analysis by AHP, recommendation the order of priority strategies that can be applied are 1) the development of processing industry 2) regulation of trade 3) improved product quality 4) increased promotion and cooperation.

## IMPORTANCE OF THE STUDY

This research is expected to be used as consideration in policy of Indonesian lobster export development, in order to increase export lobster Indonesia and expand the target market. For the people, this study is useful as a reference and information of lobster trade so that it can be used as a basis for the development of lobster enterprise in an effort to improve the welfare.

## STATEMENT OF THE PROBLEM

The development of Indonesian lobster export faces several challenges. It can be seen from the decline in the volume and value of export that occurred in the last few years. This is presumably because the export of Indonesian lobster breeder massively into Vietnam. The high economic value of lobster is one of the factors that led to capture of lobster continuously and do not pay attention to the resources and the environment. Beside that, based on observation, the average of volume and value export of Indonesian lobster in the last three years has decreased in almost all main destination countries (Appendix 1). In addition, with the globalization of trade then it will be an opportunity and a challenge for Indonesia to develop the export of lobsters in the International market. This is of course is an opportunity because international trade will become more open with the signing of various free trade agreements between countries. Indonesia opportunities to marketing the lobster products into international market become widely open. But on the other hand, this phenomenon will also become a challenge because its implications for the increasing competition among countries in marketing their products. Not to mention, there are many destination countries that impose non-tariff barriers, such as European Union countries. Countries in the European Union pay close attention to hygiene and health problems and enforce "foods alert system" tightly so that the exporting company should strive to meet the standards of these countries in order to remain competitive and be able to enter the market of their country.

## OBJECTIVES

The main objectives of this paper are:

1. To analyze factors affecting trade flows of Indonesian lobster export
2. To formulate alternative development strategy of Indonesian lobster export.

## HYPOTHESES

Based on the previous research, the hypothesis of this research are:

1. The real GDP per capita has positive effect on Indonesian lobster trade flow.
2. The economic distance has negative effect on Indonesian lobster trade flow.
3. The real exchange rate rupiah to export destination countries has positive effect on Indonesian lobster trade flow.
4. The lobster export price has negative effect on Indonesian lobster trade flow.
5. The free trade agreement has positive effect on Indonesian lobster trade flow.

## RESEARCH METHODOLOGY

### DATA DESCRIPTION

Data collected from secondary sources and interviews with stakeholders related to Indonesian lobster export. Secondary data used is annually time series data from 2005 to 2014 and cross section from several destination countries. Types and sources of data presented in Table 1.

TABLE 1: TYPES AND SOURCES OF DATA

No	Types of Data	Sources
1	Lobster Export Value	UN Comtrade, BPS (Badan Pusat Statistik)
2	Lobster Export Volume	UN Comtrade, BPS (Badan Pusat Statistik)
3	GDP per Capita	World Bank
4	Geographical Distances	www.cepii.org
5	Exchange Rate	World Bank
6	Free Trade Agreements	Ministry of Trade

Meanwhile, the primary data is used to formulate the development strategy of Indonesia lobster export. The selection of respondents using judgmental sampling method. The respondents are from the Ministry of Maritime Affairs and Fisheries, academia/researcher, and businessman.

**METHODOLOGY**

**EXPORT DEMAND FUNCTION**

Indonesian lobster trade flow to the destination countries is influenced by many factors. These factors is analyzed by export demand function using panel data model. There are several techniques to estimate the parameters of panel data model, namely: (1) Pooled Ordinary Least Square/ PLS, (2) Fixed Effect Model, and (3) Random Effect Model. The model used in a study needs to be chosen based on statistical considerations. It is intended to obtain an efficient presumption.

The variables used are expressed in the equation below:

$$\ln X_{it} = \alpha_{it} + \beta_1 \ln GDP_{it} + \beta_2 \ln DIST_{it} + \beta_3 \ln ER_{it} + \beta_4 \ln PRICE_{it} + \beta_5 FTA_{it} + \varepsilon_{it} \tag{1}$$

- $X_{it}$  = Real value of export Indonesian lobster to destination countries (US\$)
- $GDP_{it}$  = Real GDP per capita of export destination countries (US\$)
- $DIST_{it}$  = Economic distance (km)
- $ER_{it}$  = Real exchange rate rupiah to export destination countries (Rp/LCU)
- $PRICE_{it}$  = Lobster export price (US\$)
- $FTA_{it}$  = Free trade agreement between Indonesia with destination countries
- $\varepsilon_{it}$  = error term
- $\alpha$  = intersep
- $\beta$  = slope

**STRATEGY FORMULATION**

AHP was developed by Dr. Thomas L. Saaty in the 1970s to organize information and expert judgement in selecting the most preferred alternative. A complex issue will be resolved within an organized framework, so it can be simplified and accelerated decision-making processes. The working principle of AHP is a simplification of a complex problem that is not structured, strategic and dynamic into a parts are organized in a hierarchy. The importance level of each variable then rated numerically by experts subjectively about the importance of these variables in relative terms compared to other variables. After that, through a several of considerations then synthesized to determine which variable has a high priority which have a role to affect the outcome of the system (Marimin and Maghfiroh 2010).

Steps in AHP methods based on the three principles of AHP by Saaty (1991), namely: the preparation of the hierarchy, prioritization, and logical consistency. The first step is the preparation of the hierarchy based on observation, literature review, and interview related with the condition and problems of Indonesia lobster export. After the hierarchy completed arranged, then it will be assessed by pairwise comparison. The next step is to calculate the logical consistency.

**RESULTS AND FINDINGS**

**FACTORS AFFECTING INDONESIAN LOBSTER EXPORT TO DESTINATION COUNTRIES**

The export of Indonesian lobster to the top eight export destinations is influenced by many factors. These factors need to be identified and analyzed to determine whether they have significant positive or negative effects on the value of exports. These factors are analyzed using gravity model by panel data regression, during the period of 2005 -2014 (10 years) and eight destination countries, so that the number of data observation are 80. The estimation results of factors affecting Indonesian lobster export to destination countries showed in Table 2 Based on the estimation results of data panel, estimation equation of Indonesian lobster trade flow to export destinations is:

$$\ln VX_{it} = -38,123 + 8,176 \ln GDP_{it} - 1,357 \ln DIST_{it} - 3,098 \ln ER_{it} + 0,820 \ln PRICE_{it} + 1,363 \ln FTA_{it} + \varepsilon_{it} \tag{2}$$

GDP, PRICE, and FTA has a positive and significant relationship to the dependent variable (lobster export value). GDP estimated value is 8.1756, it means that if GDP increased by 1%, then lobster export value increased by 8.1756% (ceteris paribus). Coefficient of GDP variable is the largest compared with other variable, this suggests that influence of GDP variable to the lobster export is the largest than the other variables. It shows the characteristics of lobster as a luxury product that lobster demand is increasing along with the increasing of GDP per capita. The results is consistent with the hypothesis and in line with research conducted Ibrahim (2012); Khan *et al.* (2013); and Suryana (2014).

**TABEL 2: THE ESTIMATION RESULTS OF DATA PANEL**

Variable	Coefficient	Probability
Constanta	-38.1227	0.0000
Real GDP per capita of export destination countries	8.1756	0.0000
Economic distance	-1.3572	0.0285
Real exchange rate	-3.0975	0.0000
Export price	0.8195	0.0000
Free Trade Agreement	1.3634	0.0000
Weighted Statistics		
R-squared	0.9763	Sum square resid 76.2206
Prob (F-statistic)	0.0000	Durbin-Watson stat 2.1065
Unweighted Statistics		
R-squared	0.7929	Durbin-Watson stat 2.1518
Sum square resid	62.6148	

Export prices also have a positive relationship, if the export prices increased by 1%, then the lobster export value increased by 0.8195% (ceteris paribus). These results are not consistent with the hypothesis, possible reason for this condition is because the dependent variable used is value of export lobster, so that the export value and lobster export prices had a positive linear relationship. Meanwhile, with the free trade agreement made between the export destination country and Indonesia, the export value of Indonesia lobster is higher 1.3634% than export value without a free trade agreement between the two countries. This is consistent with the hypothesis, and in line with research by Boansi *et al.* (2014) and Natale *et al.* (2015).

Variable DIST and ER has a negative and significant effect on the dependent variable (exports). If the economic distance between export destination with Indonesia increased by 1%, then the export value decreased by 1.3752% (ceteris paribus). The farther the distance between the two countries, it will lead to increased transportation costs, which will increase the price of goods and services to be traded. This results consistent with research conducted by Yuniarti (2007), Akyuz *et al.* (2010), and Setyawati (2015). If the real exchange rate increased by 1%, then the export value decreased by -3.0975% (ceteris paribus). This is not consistent with the hypothesis, this condition is in line with previous studies conducted by Sari (2013) and Sudiwana (2015). It is possible because the characteristics of the lobster as a luxury commodity. So if the price of commodities more expensive, it will be more sought after by the importing country.

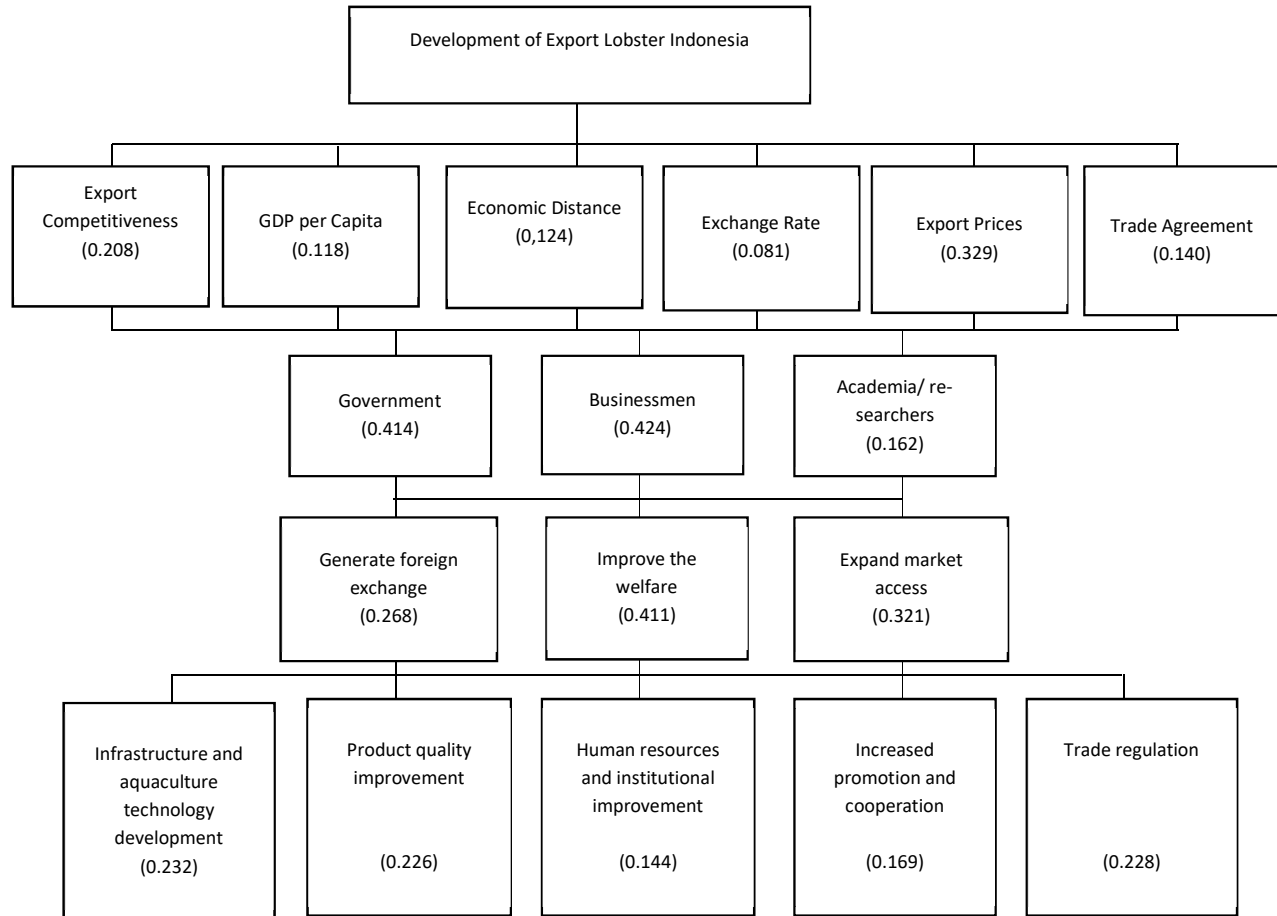
According to Chow and Hausman test, this model has met the criteria with a probability value 0.0000 <5%, FEM is better used instead of REM. In the estimation results, all variables (GDP, DIST, ER, PRICE and FTA) significantly affecting the VX. The coefficient of determination (R<sup>2</sup>) is 0.9763. This means, the changes in export value can be explained by the independent variable amounting 97,63%, while the remaining 2.37% is explained by other factors outside the model. This model does not have a problem of autocorrelation, since the value of DW-stat has met the criteria on 1.507<2.1065<2.228. Multikolinearitas detected by looking at the number of independent variables were significant at 5%. In addition, the value of the correlation matrix between variables is less than 0.8 and less than the value

of  $R^2$  (0.984), so it can be concluded that this model does not have multicollinearity problem. Sum square resid value at weighted statistics is 76.2206 more than sum square resid value at unweighted statistics amounting 62.6148. Thus, we can conclude there is no problem heteroscedasticity. The estimation results of the panel data indicate a probability value of Jarque Bera is 0.5428 thus more than 5% significance level. It can be concluded that the error terms in this model has a normal distribution.

**STRATEGIC DEVELOPMENT OF INDONESIAN EXPORT LOBSTER**

Based on observation, literature review, and interviews related to the condition and problems of Indonesian lobster export, then arranged a hierarchy to formulate export development strategy using AHP (Analytical Hierarchy Process). The result of AHP showed in Figure 2.

**FIGURE 2: HIERARCHY STRUCTURE OF DEVELOPMENT STRATEGY OF INDONESIAN LOBSTER EXPORT**



Alternative strategy that has the highest priority is the development of infrastructure and aquaculture technology. The strategy of infrastructure development can be done with facilitate the breeding and processing industries, construction of port facilities, construction of supporting facilities for the implementation of cold chain system, and the provision of gas stations in the centers vessels catching lobster. Meanwhile aquaculture technology development includes technologies for seed collection and enlargement lobster. Based on Jones (2008), Indonesia can adapt/ transfer lobster enlargement technology from Vietnam. The technology includes seed collection puerulus swimmer, young lobster collection, and construction of hall (place) to aquaculture and feed production.

Trade regulation is the second highest priority that suggested. Trade regulation strategy that can be applied is service improvement and acceleration of export and import licensing, so as to facilitate businesses, especially exporters to conduct its business. Trade licensing that exist today is still tricky and spent a long time. Another strategy through the Ministry of Maritime Affairs and Fisheries is necessary to review the regulatory provisions of catching lobster. Regulation that limit the size of catching lobster is considered detrimental to the farmers because the fact is very difficult to find lobsters the size required under the regulation. As a result, the volume and value of Indonesian lobster export has decreased in recent years.

The third priority suggested is improvements in product quality. This alternative strategy intended to lobster Indonesia so able to meet the standards that have been set so as to have high value and can penetrate the global market. This is in line with research conducted by Batt and Morooka (2003), that consistency of quality is the most important attribute sought by importers of Japanese lobster. The strategy for improving the quality of the product can be done by applying Good Acuaulture Practices (GAP), standardization of product quality that is setting standards of product quality lobster accordance with Indonesian National Standard (SNI) and international standards, and increase in value-added products through incentives for the development of refined products and the development of the variety of products through research and development activities. In addition it is necessary to develop further research in developing methods of aquaculture and creating a quality seedlings lobster.

**SUGGESTIONS**

Based on the result of this research, there are some managerial implication that can be considered are as follows:

- a. For the government, it is necessary to diversify the market, sale and trade missions, and participate in multilateral and bilateral forums. These are as effort to introduce Indonesian lobster products in international market as well as seeking potential buyers. In addition, in order to improve the competitiveness of the lobster, the government needs to develop infrastructure and services that support business activities lobster. Governments also need to review the regulation of catching lobster so that it can remain sustainable while not detrimental to farmers lobster.
- b. For businessmen, the effort that need to be considered to win the competition in the international market is to improve the quality of lobster products to be exported. Lobster exports must be able to meet the standards that have been set so as to have high value and can be highly competitive in the global market, especially the market of countries of the European Union which pays close attention to hygiene and health problems and enforce "foods alert system" strictly.

c. For academics/ researchers, it is necessary to develop market research to find out which country the potential to be developed as the export target. Especially countries that have a high and high intermediate per capita income. In addition, in order to improve product quality researchers also need to develop methods of lobster rearing and create quality seedlings lobster.

**CONCLUSION**

Estimate of panel data shows that all the factors affecting trade flow Indonesian lobster exports to the destination country (GDP per capita, economic distance, exchange rate, export price, and free trade agreement) are significantly affect the value of lobster exports. Based on the pairwise comparison using AHP, alternative recommendations that are prioritized in the development strategy of export lobster Indonesia are infrastructure and aquaculture development technology, followed by trade regulation, and improving product quality.

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**APPENDIX**

**APPENDIX 1: EXPORT VOLUME (TON) AND VALUE (US\$ 1 000) OF INDONESIAN LOBSTER TO MAIN DESTINATION COUNTRIES 2012-2014**

Country	2012		2013		2014	
	Volume	Value	Volume	Value	Volume	Value
China	2 522.82	24 455.63	3 750.87	51 341.09	2 066.38	26 103.98
Hongkong	914.97	7 727.11	459.18	5 033.67	301.77	2 766.61
Taiwan	528.97	8 013.31	359.98	8 246.46	404.25	9 873.92
Japan	543.40	8 288.89	157.76	3 113.59	21.74	355.17
Malaysia	357.95	832.15	197.88	394.69	119.93	260.00
Singapore	124.61	613.78	59.83	421.23	109.32	693.00
Australia	38.19	481.92	58.72	672.23	48.45	550.18
United States	2.84	23.92	4.36	47.20	1.97	24.21

Source: BPS (2015c)

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