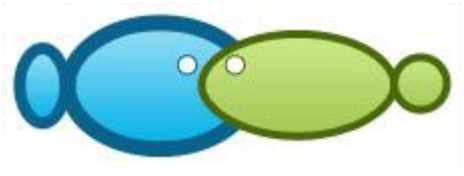

Determination of aquaculture priority commodities based on market competitiveness using multiple tool analysis

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Abstract. Indonesia's economy is currently experiencing a growth slowdown, one of which resulted in a trade balance deficit. Therefore, a breakthrough policy and strategy is necessary to encourage the export of national commodities which are competitive on the global market. The research aimed to analyze the types of commodity-seeded aquaculture compatible with the international trading, by considering its comparative competitive advantage in the global market. The research methods used in this study were quantitative and qualitative with descriptive analysis. Five methods of analysis were used to measure the competitiveness of the flagship commodity in this research, namely: the revealed compared analysis (RCA), the revealed symmetric compared analysis (RSCA), the index trading specialization (ISP), the constant market share analysis (CMSA) and the analysis of the elasticity of demand. The scope of research was limited to a national scale with secondary data over 2013-2017 time period. The comparative and the competitive advantages suggested 4 aquaculture commodities that should be developed as a national foreign exchange source motor, namely: shrimp, seaweed, tilapia, and grouper.
Key Words: comparative and competitive advantage, qualitative and quantitative methods, trade balance deficit.

Introduction. The Indonesian economy is currently experiencing a slowdown in growth due to uncertainty in the global economy. The trade balance deficit in the current account in 2018 is due to a decline in export market demand for Indonesia's leading commodities and a decline in the price of leading commodities in the global market (BPS 2019). To encourage an increase in the trade balance and reduce the growing trade balance deficit, strategies and policies are needed to strengthen the structure of the national, for instance the development of leading non-oil and gas competitive commodities on global markets.

Aquaculture is one of the sub-sectors that can be an alternative source of foreign exchange. Based on the results of economic analysis, the total potential of aquaculture production in Indonesia reaches 100 million tons per year with a production value reaching 210 billion US Dollars (Dahuri 2018). Based on data from the Central Statistics Agency (BPS) in 2019, the average value of the contribution of the aquaculture sub-sector in 2018 to the total value of non-oil exports was 1.13%, whereas when compared to the total value of fishery exports it was 37.71%. The data also shows that despite the global economic slowdown and the trade balance deficit in 2017-2018, aquaculture commodities still make a positive contribution to the national trade balance and national economic growth. This shows that the aquaculture subsector has good resilience to global economic shocks. From the perspective of the carrying capacity of natural resources, the rich diversity of cultural fisheries and the availability of vast potential of fish cultivation in Indonesia can be one of the factors driving the aquaculture subsector as one of the economic pillars in Indonesia in the future. The decrease in fish stocks due to illegal, unreported and unregulated (IUU) fishing in waters is also another reason why the aquaculture sector needs to be the main alternative source of national income from the

fisheries sector (Tran et al 2017). The potential of aquaculture land in Indonesia reaches 17.92 million hectares consisting of 2.8 million hectares of freshwater aquaculture land with its utilization of 11.2%, 2.9 million hectares of ponds with the utilization reaching 20.4% and the potential for marine cultivation 12.1 million hectares with an utilization reaching 2.3%, representing an average utilization around 6.7%. By looking at these conditions, the potential for the development of aquaculture in Indonesia is still very broad and prospective (MMAF 2018). One of the causes of the sub-optimal national foreign exchange income from the aquaculture sub-sector is the government lack of focus on the developing strategies for aquaculture commodities export from upstream to downstream. The current development policy in the aquaculture sector should be focused on commodities that have a comparative advantage and competitiveness on the international markets, by integrating the availability of limited budget allocations, the prospective marketing and the sustainability of natural resources. So far the development of the aquaculture sector is still based on 11 commodities that have been determined at the national level by the Ministry of Marine Affairs and Fisheries (MMAF 2018). The selection of leading export commodities developed for supporting the national foreign exchange is very important.

This study aimed to analyze the types of superior commodities of aquaculture in Indonesia that have the potential of being developed as leading export commodities in order to increase the country's foreign exchange by considering their comparative advantage and competitiveness on the global market. In addition, this study also examined the use of multiple quantitative analysis methods in measuring the comparative advantage and the competitiveness of the aquaculture commodities from Indonesia.

Material and Method

Data analysis framework. The method used in this research is quantitative and qualitative, with a descriptive analysis. The type of data used is sourced from several reports issued by the government and institutional organizations, namely the Ministry of Marine Affairs and Fisheries (2018), the Central Statistics Agency (2019) and the Trade Map (2019). The data used in this study are time series data for 5 years in the period 2013-2017. The contribution of trade space analyzed in this study was approved in 11 major types of aquaculture trade that have been determined by the Ministry of Marine Affairs and Fisheries as the leading competitors in the national aquaculture development, namely shrimp, tilapia, milkfish, seaweed, catfish, grouper, pompano, seabass, shelfish, common carp, gourami (MMAF 2018). The 6-digit HS code was used to determine the type of fish within the scope of this research: shrimp (HS 030617 and 030627), seaweed (HS 121220, 121221, 121229, 130231, 130239), tilapia (HS 030271, 030323, 030431, 030461), grouper (HS 030199), pompano (HS 030289, 030359, 030389), catfish (clarias and pangasius) (HS 030272, 030324, 030432, 030462), seabass (030284, 030377, 030384), milkfish (HS 030199), common carp (HS 030193, 030273, 030325), gourami (HS 030389), shelfish (HS 030721, 030722, 030729, 030771, 030772, 030779, 160552, 160556) (Trade Map 2019).

Comparative advantage analysis. The theory of the comparative advantage was put forward by Ricardo (1817) in his book The Principles of Political Economy and Taxation. In the theory of the comparative advantage, a country can increase its standard of living and income if it specializes in the production of goods or services that have a higher productivity and efficiency (Sa'idy 2013; Gupta 2014). Comparative advantage became a key for the international production and trade patterns determining (Neary 2002). There are several of methods used to analyze comparative advantage, including revealed comparative advantage (RCA), revealed symetric comparative advantage (RSCA), trade specialization index (ISP) and domestic resources cost (DRC) (Cai et al 2009; Aisya et al 2005; Juarno 2012; Saptanto 2011; Sa'idy 2013; Putri et al 2019; Suhana 2019). This study examined the RCA, RSCA and ISP methods to assess the comparative competitiveness of aquaculture commodities in Indonesia.

The RCA is an index that states the comparative advantage which is the ratio between the export share of a commodity in the country's total exports compared with the export share of the same commodity in total world exports (Chandran & Sudarsan 2012). The RCA method is easier to calculate and secondary data is relatively available. It considers the intrinsic advantages of certain export commodities and their consistency with the changes in the economic productivity in a context of a a limited impact of the government interventions, (Batra et al 2005; Allo et al 2017; Setyastuti et al 2018). The RCA calculation method in this study used a formula developed by Ballasa (1965), namely:

$$RCA=(Xij/Xit)/(Xnj/Xnt)$$

Where:
RCA - a comparative competitiveness index;
Xij - the export value of the Indonesian aquaculture fisheries commodities;
Xit - the total export value of aquaculture commodities from Indonesia;
Xnj - the export value of aquaculture fisheries commodities in the world;
Xnt - the total export value of the fisheries commodities cultivation in the world.

RCA value greater than one (RCA>1) illustrates that the share of commodity i in the total exports of a country j is greater than the average share of commodity exports of all countries in the world. This means that the country is more specialized in producing these commodity groups. In contrast, the RCA is less than one (RCA<1), indicating that the country does not have a comparative advantage for certain commodities. Whereas the RCA is equal to one (RCA=1) indicating that the country has a comparative advantage level equivalent to that of most countries in the world.

Determination of the level of competitiveness of a country using the RCA index has a drawback because the resulting value is not symmetrical. Therefore, the revealed symetric comparative advantage (RSCA) index is applied, which is a simple monotonous transformation of comparative excellence (RCA) or Balassa index (Laursen 1998; Allo et al 2017; Setyastuti et al 2018). The calculation formula is as follows:

$$RSCAij=(RCAij-1)/(RCAij+1)$$

Where:
RSCAij – a symmetric comparative competitiveness index;
RCAij - the value of comparative advantage index an aquaculture commodity exported from Indonesia.

The RSCAij index value varies from -1 to +1 ($-1 \leq RSCAij \leq +1$). If RSCAij is more than 0 means commodity i has a comparative advantage, conversely, if RSCAij is less than 0, commodity i has no comparative advantage.

The trade specialization index (ISP) is a general method used as a measure of competitiveness. ISP is an index used to see the tendency of a country to be an exporter or importer country for a certain commodity (Bustami & Hidayat 2013; Allo et al 2017; Setyastuti et al 2018). ISP is a ratio of the difference between the export and the import values of a commodity for a given country compared to the total of the export and of theimport values of that country. This index considers the demand side and the supply side, where exports are identical to the domestic supply and imports are equal to the domestic demand. This is in accordance with the theory of international trade, namely the theory of net of surpluses, where exports of goods occur when there is an excess of these goods on the domestic market. From here it can be monitored whether a product has experienced saturation or is even experiencing growth. ISP can also be used to analyze the stages of the industrialization process and the development of a commodity's trade patterns (Ministry of Trade 2018; Allo et al 2017; Setyastuti et al 2018). Mathematically, this index can be formulated as follows:

$$ISP=(Xia-Mia)/(Xia+Mia)$$

Where:
ISP - a trade specialization index;
X - the value of exports;

M - the value of imports;
i - goods/types of commodities;
a - the country/region.

The ISP index value is between 0 and 1. If the value is positive (above 0 to 1), the said commodity is said to have strong competitiveness or the country/region concerned tends to be the exporting country of the commodity. ISP index can also be used to identify the growth rate of a commodity in trade which is divided into 5 stages (Ministry of Trade Indonesia 2018). First, the introduction stage is when the ISP index value of the latecomer industry is -1.00 to -0.50. Second, the import substitution stage is when the ISP index value rises between -0.51 to 0.00. Third, the stage of export expansion is when the ISP index value rises between 0.01 to 0.80. At this stage, industries in a country produce large-scale production and begin to increase exports. Fourth, the stage of maturity is when the index value is in the range 0.81 to 1.00. Fifth, the stage of re-import is when the ISP index value decreases between 1.00 to 0.00.

To determine the leading export commodities, this research used the product mapping analysis and defined 4 priority groups of leading commodities (Figure 1) (Widodo 2008b; Allo et al 2017; Setyastuti et al 2018). Indicator variables considered in the process of measuring comparative competitiveness are the RSCA index and the ISP index by parameter modification from the one developed by Widodo (2008b).

Priority 2 Have a good comparative and no specialization for export (RSCA>0 and ISP<0.8)	Priority 1 Have a good comparative and specialization for export (RSCA>0 and ISP>0.8)
Priority 4 No comparative advantage and no specialization for export (RSCA<0 and ISP<0.8)	Priority 3 No comparative advantage and specialization for export (RSCA<0 and ISP>0.8)

Figure 1. Product mapping analysis for the assessment of comparative competitiveness (modified from Widodo 2008b).

Priority 1 includes the types of aquaculture commodities that have comparative advantages as well as export specialization. Priority 2 is a type of aquaculture commodity that has a comparative advantage but does not have an export specialization. Priority 3 is the type of cultivation commodity which specializes in exports but does not have a comparative advantage. Priority 4 is the type of aquaculture commodity that has no comparative advantage or export specialization.

Competitive advantage analysis. The analysis of the competitive advantage can be done through a constant market share approach or constant market share analysis (CMSA). CMSA in general is an accounting procedure used to determine the source of export growth from a country compared to the rest world or to a single foreign market (Skriner 2009). The basic assumption of the CMSA model is the competitiveness a country has for exporting one or a group of commodities at the same level, having a constant market share (Widodo 2008a; Benevett et al 2015). As a result, any difference between the actual change in exports of a country and the market sum of competitors is the cause of changes in the composition of exports or competitiveness. A negative value indicates that the country failed to maintain its market share. The effect of competitiveness in the CMSA analysis is more derived from price competitiveness. One of the advantages of the CMSA model over RCA is that it can decompose export changes into several components (Kustiari 2007; Juarno 2012; Bonano 2014). A country's export growth can be separated into commodity composition, market distribution, and competitiveness effects which illustrate the interaction of demand and supply. The use of the CMSA model has limitations, for instance the formula describing the export growth is

an identity equation. Therefore, the reasons for changes in competitiveness cannot be evaluated using only CMSA analysis. Another weakness is that it ignores changes in competitiveness at a moment situated between the two time points used, due to its static and deterministic nature (Juarno 2012). However, this analysis is very useful for examining trends in the competitiveness of the goods produced by a country (Fontoura & Serodio 2017). The CMSA calculation formula is expressed by the following equation:

$$\underset{(i)}{X_{ij}^2 - X_{ij}^1} = \underset{(ii)}{mX_{ij}^1} + \underset{(iii)}{\{(m_i - m)X_{ij}^1\}} + \underset{(iv)}{\{X_{ij}^2 - X_{ij}^1 + m_i X_{ij}^1\}}$$

Where:
X^1ij - Indonesia's aquaculture commodity exports to the world at period 1 (billion USD);
X^2ij - Indonesia's aquaculture commodity exports to the world at period 2 (billion USD);
m - percentage of increase in exports of all fishery commodities world cultivation in period 1 to period 2;
mi - percentage of increase in aquaculture commodity exports i world in period 2;
(i) - market growth factors;
(ii) - commodity composition factors;
(iii) - market distribution factors;
(iv) - competitiveness factor.

Elasticity is an indicator that describes the degree of sensitivity or response of the amount of goods requested or offered due to changes in the factors that affect it. The price elasticity of demand is used to measure what percentage of demand for an item changes if the price changes by one percent. The elasticity of the demand price is formulated as follows:

$$E=\Delta Q/\Delta P*(P1/Q1)$$

Where:
E - the price elasticity of demand;
Q - the value of demand;
P - the price of demand;
P1 - the initial price;
Q1 - the number of initial requests.

The price is said to be inelastic when the value of E<1, while the price is said to be elastic when the value of E>1. The price is said to be elastic meaning the change in the price of an item causes a change in the demand for goods which is quite large. while if E=0, it is said to be perfectly elastic, meaning that at any price the item will still be purchased as needed.

Results and Discussion

Comparative advantage analysis. The results of RCA calculations on 11 major aquaculture commodities in Indonesia in the period 2013-2017 can be briefly seen in table 1. From the table it can be seen that the highest average RCA value is 4.21 and the lowest average value is 0. Table 1 shows that there are 4 commodities with an average value of RCA>1, namely seaweed (4.21), tilapia (2.47), shrimp (3.64) and grouper (1.66). This shows that the average share of Indonesia's exports of seaweed, tilapia, shrimp and grouper commodities is greater than the average market share of fisheries commodities in exports of all countries and the four commodities have high comparative competitiveness in the global market especially in Asia, USA and European (EU) markets. Furthermore, from Table 1, it can also be inferred that the four commodities over the past 5 years have quite high competitiveness in the global market and are not affected by changes in the global economy. This shows that the commodity has a strong resistance to shocks in the global market as one of the criteria in determining a leading export commodity. These parameters need to be considered by the government in

selecting and determining the types of pivotal commodities for increasing the foreign exchange from the aquaculture sub-sector. The existence of budget limitations for the promotion of the aquaculture sector requires a prioritization subsequent to a policy orientation towards the development of competitive commodities on the global market, as a major source of foreign exchange for the country. The aquaculture commodities with an RCA value of <1 have a low comparative competitiveness on the global market, being more appropriate to meet the domestic consumption needs, creating a context for increasing national food security and employment. To increase validity, this study also uses the RSCA index to measure the comparative competitiveness of aquaculture commodities. This is needed so that the comparative competitiveness index analyzed is symmetrical.

Table 1

The value of revealed compared analysis index

No	*Commodity*	*2013*	*2014*	*2015*	*2016*	*2017*	*Average*
1	Seaweed	4.24	4.87	4.35	3.52	4.08	4.21
2	Tilapia	2.34	2.42	2.82	2.53	2.22	2.47
3	Shrimp	3.87	3.75	3.70	3.50	3.37	3.64
4	Catfish	0.41	0.20	0.25	0.33	0.23	0.28
5	Grouper	1.27	1.10	1.65	2.15	2.14	1.66
6	Milkfish	0.27	0.27	0.26	0.26	0.33	0.28
7	Pompano	0.12	0.14	0.03	0.06	0.01	0.07
8	Seabass	0.00	0.00	0.00	0.00	0.00	0.00
9	Shellfish	0.15	0.12	0.15	0.15	0.15	0.14
10	Common carp	0.07	0.04	0.16	0.02	0.01	0.06
11	Gourami	2.72	0.00	0.03	0.06	0.00	0.56

Table 2 shows that based on the results of the RSCA analysis there are 4 commodities that have a positive value and RSCA>0, namely seaweed (0.61), tilapia (0.42), shrimp (0.57), and grouper (0.23). These results are consistent with the result of RCA analysis that showed that 4 aquaculture commodites in Indonesia have good comparative advantage in the international market.

Table 2

The value of symmetric revealed compared analysis index

No	*Commodity*	*2013*	*2014*	*2015*	*2016*	*2017*	*Average*
1	Seaweed	0.62	0.66	0.63	0.56	0.61	0.61
2	Tilapia	0.40	0.42	0.48	0.43	0.38	0.42
3	Shrimp	0.59	0.58	0.57	0.56	0.54	0.57
4	Catfish	(0.42)	(0.66)	(0.59)	(0.51)	(0.63)	(0.56)
5	Grouper	0.12	0.05	0.25	0.36	0.36	0.23
6	Milkfish	(0.58)	(0.58)	(0.58)	(0.59)	(0.50)	(0.57)
7	Pompano	(0.79)	(0.75)	(0.94)	(0.89)	(0.99)	(0.87)
8	Seabass	(1.00)	(0.99)	(1.00)	(1.00)	(1.00)	(1.00)
9	Shellfish	(0.74)	(0.78)	(0.73)	(0.74)	(0.74)	(0.75)
10	Common carp	(0.87)	(0.93)	(0.72)	(0.96)	(0.98)	(0.89)
11	Gourami	0.46	(1.00)	(0.94)	(0.89)	(1.00)	(0.67)

The results of the ISP values calculations for 11 major aquaculture commodities in the period 2013-2017 can be summarized in Table 3, where it can be observed that the average ISP value is 1 and the lowest is -0.27. Also Table 3 suggests that Indonesia has a very strong comparative competitiveness in the global market for 8 aquaculture commodities, namely seaweed, tilapia, shrimp, catfish, grouper, milkfish, pompano, and

common carp, whereas seabass, shelfish and gourami have low comparative competitiveness, with an average ISP value of -0.27, 0.54, and 0.60, respectively. Based on the calculation results of the ISP index, the level of commodity trading intensification can also be analyzed: 8 aquaculture commodities in Indonesia are in the maturation stage with an average index value of 0.80-1.00, meaning that Indonesia specializes in exporting these commodities. This also shows that Indonesian imports for these 8 commodities are relatively smaller compared to the exports. Economically, this condition indicates a broad potential for the country's foreign exchange increase from the export of aquaculture commodities, based on 8 alternatives of superior commodities at the maturation stage. Shelfish and gourami, with an average index value of 0.54 and 0.60, are at the stage of expanding exports. While seabass is at the introduction stage.

Table 3

The value of trade specialisation index (ISP)

No	*Commodity*	*2013*	*2014*	*2015*	*2016*	*2017*	*Average*
1	Seaweed	0.80	0.83	0.82	0.77	0.80	0.80
2	Tilapia	1.00	1.00	1.00	1.00	0.99	1.00
3	Shrimp	0.78	0.83	0.81	0.84	0.84	0.82
4	Catfish	0.99	0.99	1.00	1.00	1.00	1.00
5	Grouper	1.00	1.00	1.00	1.00	0.99	1.00
6	Milkfish	1.00	1.00	1.00	0.98	1.00	1.00
7	Pompano	1.00	0.96	1.00	1.00	0.85	0.96
8	Seabass	-1.00	1.00	-0.90	-0.30	-0.14	-0.27
9	Shellfish	0.43	0.48	0.71	0.58	0.51	0.54
10	Common carp	1.00	1.00	1.00	1.00	1.00	1.00
11	Gourami	1.00	0.00	1.00	1.00	0.00	0.60

Based on the results of the quadrant analysis, there are: 4 priority 1 commodities that have an average value of RSCA>1 and ISP>0.8, namely seaweed, shrimp, tilapia and grouper. Then, there are 4 priority 3 commodities: catfish, milkfish, pompano, and common carp, which have an RCA value>0 and an ISP<0.8. There is no commodity that belongs to priority 2 (Figure 2).

Priority 2 -	Priority 1 1. Shrimp 2. Seaweed 3. Tilapia 4. Grouper
Priority 4 1. Sea bass/Barramundi 2. Shellfish 3. Gourami	Priority 3 1. Catfish 2. Pompano 3. Milkfish 4. Common carp

Figure 2. The results of the priority aquaculture commodity in Indonesia using product mapping anaysis.

Competitive advantage analysis. The results of the competitive level analysis are shown in Table 4. CSMA analysis was carried out on 4 priority commodities 1 which consistently have comparable levels of competitiveness in the global market: seaweed, tilapia, shrimp, grouper. Table 4 displays the disaggregation of the commodity competitiveness based on market growth factors, commodity composition, market distribution, with positive scores for the period 2013-2017 and negative scores in 2013 and 2014, for all the four commodities, whereas in 2015 the four commodities had positive competitiveness with the highest value of 33.82 for shrimp. The high

competitiveness of shrimp in 2015 occurred because most producing countries experienced a decline in production due to an early mortal syndrome (EMS) outbreak, while Indonesia was able to properly mitigate the spread of the EMS disease. In 2016 and 2017 shrimp competitiveness was negative, where this condition occured because shrimp producing countries like India, Vietnam and Thailand were able to produce again. Furthermore, shrimp commodities from Indonesia also faced trade barriers and entry fees from several buyer countries such as the EU, USA and Japan, which had negative implications on the price of Indonesian shrimp competitiveness, compared to other producing countries which did have not experienced the impact of barriers and import duty rates. Indonesian seaweed commodities have a high competitiveness in 2015 and 2016 as indicated by the positive value of the competitiveness index, but in 2017 this situation reversed, due to climate problems, diseases, and limited seaweed superior seeds in Indonesia, which have implications for the decline in seaweed commodity exports. From Table 4 it can be seen in 2015-2107 that tilapia and grouper commodities have positive competitiveness. Competitiveness for tilapia is partly due to government policies that have succeeded in mitigating the circulation of Tilapia Lake Virus (TiLV) in Indonesia. Whereas in some countries of world tilapia exporters such as Thailand, Taiwan and Egypt experiencing TiLV disease problems that have implications for decreasing tilapia production in these countries. Therefore, buyer countries switched to products from Indonesia. The governance arrangements for the transport of living fish have a positive impact on the competitiveness of groupers, such as transportation cost efficiency. From Table 4 it can also be seen that there are no commodities with positive competitiveness for 5 consecutive years. This shows that the policy for increasing competitiveness of the aquaculture commodities has not been carried out consistently. Furthermore, the fluctuating competitiveness of the aquaculture commodities in Indonesia is also influenced by the demand, the global market requirements, the uncompetitive selling prices and by external factorssuch as disease.

Table 4

The calculation result of competitive advantage by using CMSA

No	*Commodity*	*2013*	*2014*	*2015*	*2016*	*2017*
	Seaweed					
	Market growth	0.03	0.07	(0.07)	(0.04)	0.04
1	Commodity composition factor	1.70	1.93	(3.60)	(0.64)	1.79
	Market distribution	1.44	5.04	(3.79)	(3.70)	2.68
	Market competitiveness	(3.11)	(6.90)	7.31	4.30	(4.43)
	Tilapia					
	Market growth	0.00	0.02	(0.01)	(0.02)	(0.01)
2	Commodity composition factor	1.70	0.89	(1.51)	(1.04)	(0.53)
	Market distribution	(1.52)	0.86	0.83	(0.79)	(0.87)
	Market competitiveness	(1.69)	(0.87)	1.50	1.02	0.52
	Shrimp					
	Market growth	0.26	0.35	(0.34)	0.09	0.12
3	Commodity composition factor	64.35	30.63	(25.89)	15.74	18.62
	Market distribution	(37.89)	4.36	(8.27)	(6.90)	(6.47)
	Market competitiveness	(26.20)	(34.64)	33.82	(8.76)	(12.03)
	Grouper					
	Market growth	(0.00)	(0.00)	0.01	0.01	(0.00)
4	Commodity composition factor	0.03	0.16	(0.22)	(0.04)	(0.16)
	Market distribution	(0.39)	(0.17)	0.74	0.76	(0.03)
	Market competitiveness	(0.03)	(0.16)	0.22	0.05	0.15

Table 5 presents the results of a demand elasticity comphrehensive analysis. Based on Table 5, it can be observed that the the market demand for the aquaculture commodities

above is unresponsive to the price changes. The seaweed and shrimphad a price elasticity of the demand <1 in 2013, 2015 and 2017, which corresponds to a relatively inelastic demand (<1) suggesting that the price increase on the global market will not affect the demand for the reference period, suggesting that seaweed and shrimp are primary resources for the seafood global market, while tilapia and grouper are secondary resources, perceived as luxury goods whose demand in the global market is affected by price changes. In 2015 the elasticity of shrimp demand from Indonesia was close to zero, indicating that the Indonesian shrimp was perfectly inelastic: the demand of the importing country is not sensitive to the price fluctuations for the reference period, essentially due to the production limitations and volumes lower availability on the global market, in the context ofthe disease which affected major production countries such as Vietenam, Thailand and India. It also proves that shrimp is a primary resource for the developed countries. The global economic slowdown in 2016 in the developed countries had only weak repercussions on the Indonesian shrimp global demand. Table 5 also illustrates that Indonesia, as the largest seaweed producing country in the world, has the opportunity to increase its foreign exchange this prospective commodity whose demand is perfectly inelastic to the price fluctuations. Furthermore, from this table it can also be seen that in the global market the elasticity of demand for Indonesian grouper tends to fluctuate. In 2013, 2015 and 2016, the elasticity value of Indonesian groupers was inelastic, as indicated by an elasticity value of less than 1. In contrast, in 2014 and 2017, the elasticity of demand for Indonesian grouper in the global market turned to more elastic as indicated by an elasticity value greater than 1. Factors affecting changes in the value of elasticity are influenced by changes in prices in the global market and a decrease in the volume of grouper production in Indonesia. Based on the calculation of the average geometric value for 5 years, the elasticity of grouper demand was 0.77, which means the average elasticity of demand for grouper is inelastic. This shows that the grouper has a prospective source of foreign exchange from the aquaculture sector.

Table 5

The value of demand elasticity for aquaculture commodities Indonesia

No.	*Commodity*	*2013*	*2014*	*2015*	*2016*	*2017*
1	Shrimp	0.17	1.77	0.01	1.58	0.72
2	Seaweed	0.35	0.75	0.09	0.97	0.09
3	Grouper	0.52	2.33	0.50	0.38	1.21
4	Tilapia	1.43	2.69	2.10	11.96	5.56

Conclusions. Based on the results of research conducted, the following conclusions can be inferred: 1)This study proves that the use of multiple methods, namely RCA, RSCA, ISP, CMSA and elasticity, is very useful to overcome the limitations of primary data in analyzing the types of export priority commodities of the aquaculture sub sector in Indonesia 2) Based on the comparative advantage and competitive analysis, this study recommends that Indonesian government policy should encourage shrimp, tilapia, seaweed and grouper as superior commodities of the aquaculture subsector, in order to improve the Indonesian foreign exchange balance. These are primary commodities requested on the global market and price fluctuations almost do not affect the demand volumes.

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