

The Analysis of Indonesia Maize Trade Position and Imported Maize Dependency Level In Domestic Market

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Abstract: This paper attempts to analyze local maize performance compare with imported maize and examine some factors influencing imported maize dependency in Indonesia. This research employed the TSI method to measure trade position for competitive advantage perspective, the IDR method to measure percentage of imported maize dependency for comparative advantage, and VECM method to examine factor affecting import dependency. Based on TSI result indicates that Indonesia maize has lower competitiveness rather than maize exporter countries in domestic market. Based on IDR result indicates that Indonesia has low dependency for imported maize (6% - 11%). Cropping area, world maize price, and exchange rate affect import dependency maize in Indonesia based on VECM analysis. However, it seems that Indonesian Government should be more oriented toward improving local maize based on domestic and international condition to compete with import maize and full fill domestic demand.

Keywords: Maize, Import Competitiveness, TSI, IDR, VECM

INTRODUCTION

During the reign of 7th President of Republic Indonesia, the government is targeting Indonesia able to attain self-sufficiency for some staple food in 2017. In an effort to realize national sovereignty and food security, the Government through the Ministry of Agriculture has been designing and implementing self-sufficiency programs for some staple food, including maize. Maize is a commodity of strategic and economic value as well as having the opportunity to be developed in Indonesia because maize is multifunctional commodities [1].

The challenge to develop this commodity is not only due to the internal problems of Indonesia, but also external conditions. One of internal issue is the competition of land use and the principle of comparative advantages has resulted in the production of increasingly limited resources [2]. The average growth rate for maize cropping area is 0.14% by years. This production growth rate lower then Indonesian population growth rate, which is 1.25% by year [3].

On the external side, the challenges of maize development may cause by the opening of trade liberalization. There are 5 countries become main maize exporter in the World market; they are USA, Brazil, Argentina, Ukraine, and Russian [5]. These countries already using agricultural technologies to increase

efficiency their production. But, based on Indonesian Ministry of Agriculture state that the main maize exporter in Indonesia market are Brazil (36%), India (34%), Argentina (21%), USA (5%), China (2%), and others (2%) [3].

The competitiveness concept can be seen from two perspective, they are competitive and comparative advantage. The competitive advantage should be including external factors for each country [5]. The comparative advantage concept is when a country able to specializes to produce a product, it is already support by appropriate resource [6].

Indonesia has to improve maize performance due to maize exporter countries already using agricultural technologies to increase their efficiency. The low competitiveness of Indonesian products, will lead to increase imports flow. The dependence of imported food can threaten social, economic, and political stability, especially for staple food [7]. In the era of the sustainability of the national economic recovery, local maize should be able to supply national food needs and compete with imported maize. With some opportunities, advantages, also the challenges that have been described makes it necessary to analyze national maize henceforth is known formulation of appropriate policies to be applied in this commodity.

METHODOLOGY

This research used secondary data in time series form which is in the 20 years period, from 1996 to 2015. The data that used in this research divided into domestic factors and international factors. The domestic factors consist of maize production volume, maize export volume, maize import volume, maize export value, and maize import value. The international factor consists of maize export and import value from main maize exporter countries in Indonesia market (Brazil, India, Argentina, USA, and China). There are two method used in this research, they are:

Trade Specialization Index (TSI)

The TSI method used to analyze the position or stage of development of a product for competitive advantages side. TSI can describe for one commodity from one country, tend to be exporters or importers. TSI value can be calculated using the formula:

$$TSI = \frac{(X_{tj} - M_{tj})}{(X_{tj} + M_{tj})}$$

Note :

- TSI = Trade Specialization Index
- Xij = Maize exports value in country j
- Mij = Maize imports value in country j

Values of this index have a range between -1 to +1. If the TSI value is positive ($0 < TSI \leq 1$) indicates that commodity has strong competitiveness or that country tend to be exporter. If the TSI value is negative ($0 > TSI \geq -1$) indicates that commodity has low competitiveness or that country tend to be importer. TSI can describe developing stages a commodity in international trading, they are:

- a. Introduction Stage ($-1 \leq TSI < -0.50$)
The condition where Country A as exporter country supply a product to Country B as importer country
- b. Import Substitution Stage ($-0.51 \leq TSI \leq 0$)
In this stage, Country B indicates has low competitiveness and trying to export products not in good quality. But for domestic condition, production less than domestic demand so Country B still tend to be importer.
- c. Expansion Stage ($0.01 \leq TSI < 0.8$)
In this stage, Country B has high production activities and they increase

their export volume. There is excess supply in domestic market.

- d. Maturity Stage ($0.81 \leq TSI \leq 1.00$)
In this stage, Country B as net exporter country has a stable production because of efficiency production by using technology.
- e. Importer Stage ($1.00 < TSI \leq 0.00$)
In this stage, Country B can't compete with country B and there is excess demand in domestic market.

Import Dependency Ratio (IDR)

IDR is a tool that used to see the percentage level of import dependence for a particular commodity in one country. The import dependency ratio can be formulated as follows (Agricultural Data and Information Center, 2009):

$$IDR = \{Mi / (Pi + Mi - Xi)\} \times 100$$

Note :

- Xi = export volume of commodity i
- Mi = import volume of commodity i
- Pi = production volume of commodity i

Vector Autoregressive/Vector Error Correction Model (VAR/VECM)

The VAR/VECM method is used to determine the relationship between variables and the contribution of each - each variable to changes in another variable. This method is done by using JMulTi 4.24 Software. Selection of the model based on the test results of stationary and co-integration test are obtained. To view the stages of data processing by using VAR / VECM can be seen at Figure 4.

In this study will examine the relationship between maize import dependency in Indonesia with domestic and foreign indicators for short term relationship or a long term relationship. So the model is as follows:

$$LnIDR_t = \sum_{i=1}^{k-1} a_i LnCA_{t-i} + \sum_{i=1}^{k-1} b_i LnWP_{t-i} + \sum_{i=1}^{k-1} c_i LnRER_{t-i} + \varepsilon_t$$

Note :

- IDR = Import Dependency Ratio of Maize
- CA = Cropping Area
- WP = World Price of Maize
- RER = Real Exchange Rate

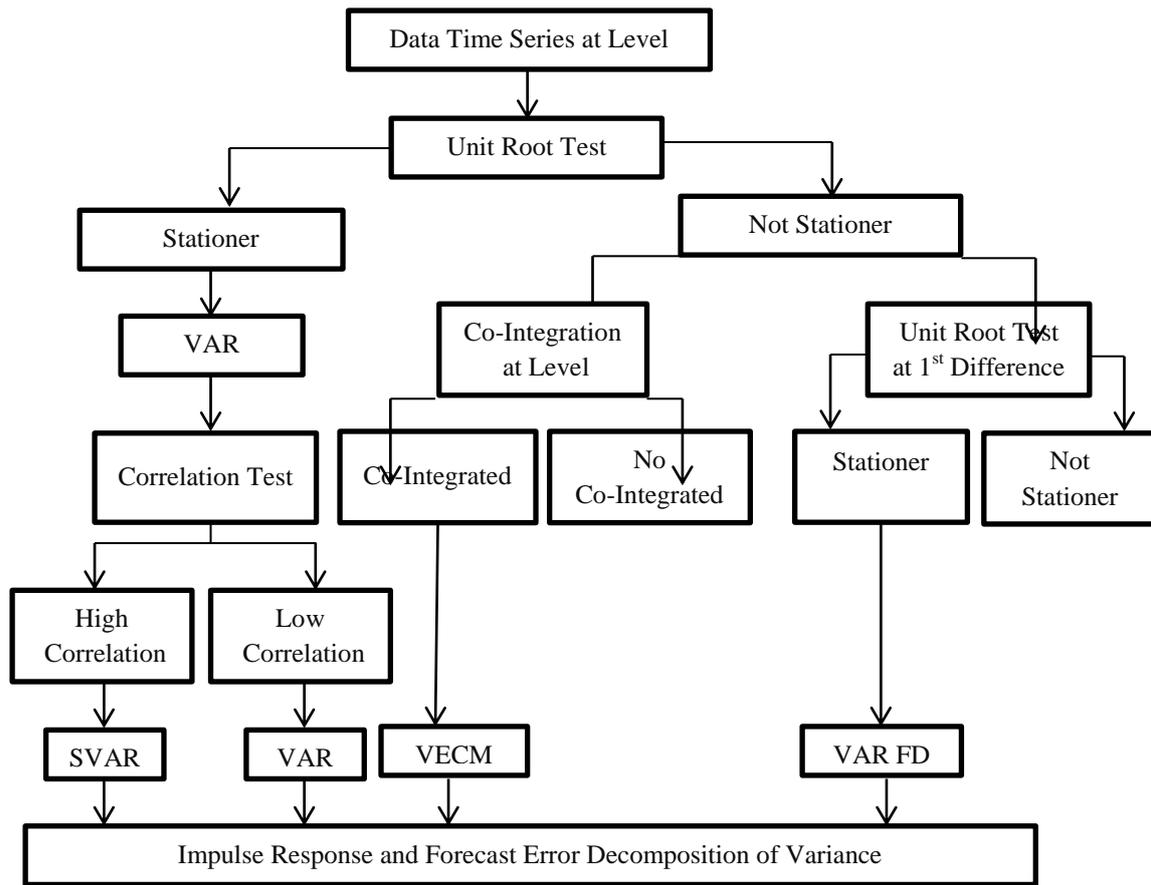


Fig-1: VAR and VECM Analysis Steps

RESULT AND DISCUSSION

Indonesia Maize Trade Position in Domestic Market

In this study, the comparison between TSI of Indonesia Maize with TSI of main maize exporter countries in domestic market will explain. The results of the analysis of maize trade specialization index during the period of 1996 - 2015 for Maize Importer in Indonesia can be seen in Figure 2. Based on the Indonesian Ministry of Agriculture data, Brazil and India have the same contribution rate of maize imports to Indonesia which ranges from 34% to 36%. Brazil and India's import contribution is larger than Argentina and USA, which are 21% and 5%, respectively. But based on TSI value in Figure 2, show that Argentina and USA have TSI values that tend to be stable at +1 annually. While Brazil and India as the main exporting countries of maize are shown in Figure 2 that since the 2000s, TSI value of both countries fluctuated in the range 0.16 to 1.00. Different conditions are shown in China's TSI value, which since 2009 has decreased the value of TSI to near -1.00.

Export competitiveness of a commodity can be influenced by several things such as production costs, land value, transportation costs, and a country's policy. The efficiency of maize production in the United States is better than other countries, because even with high production costs, this is offset by high yields^[8]. The higher USA farmer income may reflect a better infrastructure for marketing and transporting maize which has an impact on export power. The cost of Argentina and Brazil are lower, but maize production levels in these countries less than USA.

Based on Figure 2, India Maize TSI value from 2000 - 2013 is quite good, where the value of TSI is around +1. However, in 2014 - 2015 the value of TSI decreased to reach 0.38 which means that changes in export coverage. This is compatible with Rani et al (2014) study which states that farm-gate acceptance is lower than that of the world market. The absence of protection from the government's price policy makes maize competitiveness in India decrease.

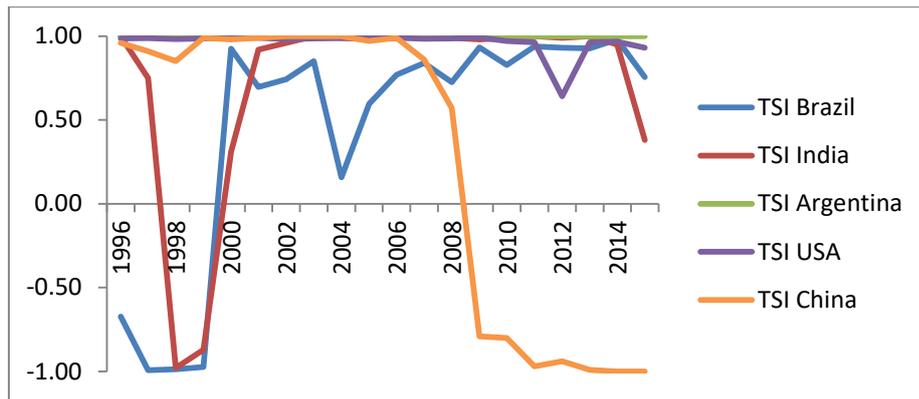


Fig-2: Trade Specialization Index of Maize Exporter Countries in Indonesia

Based on Figure 2, China's TSI maize was in the range of 0.90 in 1996 - 2006, but decreased until 2015 reached -1. The phenomenon of TSI value fluctuation is closely related to export conditions and domestic demand for maize in China. In the period 1995 - 1999 the government subsidized exports to overcome the excess supply of maize in China without decrease local prices [9]. But in 2001 - 2003, as a form of commitment to join the World Trade Organization (WTO), to reduce

subsidized export and ensure that sufficient maize is available for domestic market. The decline of China's export of maize is responded well by USA, which is the void of world stock has been fulfilled by USA. The US maize price is better than China's maize price, making Chinese domestic consumers prefer imported maize compared to local maize. This phenomenon makes the value of China's TSI of maize from 2009 to 2015 ranges from the value of -0.6 to -1.

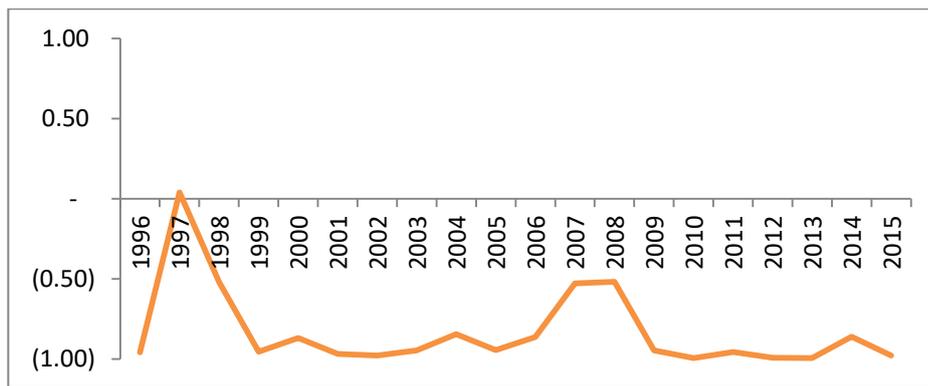


Fig-3: Trade Specialization Index of Indonesia Maize

The Indonesian TSI value of maize in the period 1996-2015 can be seen in Figure 3. Throughout the 1996 to 2015 range, the Indonesian maize TSI score remained at a negative level (-1) except in 1997 which increased by 0.04. TSI with a range of -0.5 to -1 indicates that the commodity is still at the stage of introduction in world trade or has low competitiveness. In simple terms it can be stated that the level of Indonesia is still categorized as a maize importer. The

study how many percentage the level of imported maize dependence in Indonesia can be seen from the analysis of Import Dependency Ratio (IDR)

Indonesia Imported Maize Dependency Level

The IDR approach can see the percentage of imported dependence in a country. The IDR value of maize in Indonesia from 1996 - 2015 can be seen in Figure 4.

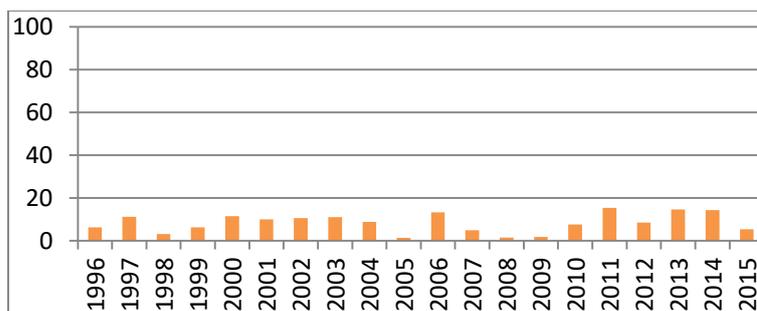


Fig-4: Import Dependency Ratio for Maize in Indonesia (1996 - 2015)

Based on Figure 13, it can be seen that Indonesia's dependence on imported maize in 1996-2004 is based on the value of IDR ranged from 6% to 11% out of 100%. If referring to the result of TSI analysis showing value ranged between -0.5 to -1, then the condition of Indonesian maize should be imported. However, contradictory results indicate that the level of maize imports in Indonesia tends to be low because they are in percentages below 20% out of 100%.

Based on the condition of maize production and consumption in Indonesia, it can be stated that local production is able to meet domestic demand without supply from other countries because average growth of production (3.85%) is larger than average growth of consumption (2.25%). If thoroughly analyzed and linked to international trade this phenomenon can worsen the condition of the maize market in Indonesia. The low competitiveness of local maize when compared to imported maize by showing its value of Indonesian maize TSI as in Figure 12, will make the consumers

choose imported maize. In addition to the consideration of the imported maize price better, consumers prefer imported maize because of its quality. Limitation of import quotas should be done with the increase of domestic products, both in terms of quality and quantity. The blankness domestic stock can increase the price of a commodity, so that farmers do not want to develop this commodity [10].

The Factors Affecting Imported Maize Dependency in Indonesia

Stationary Test

Stationary is an important requirement for applying time series models. If the t-statistic value is less than its critical value, then the data is stationary or does not have the root of the unit (accept H1, reject H0). The critical value used in this study is 10%. All variables used in this analysis must pass the stationary test. If there are variables that are not stationary at a certain level, then those variables will be transformed into other forms, such as 1st or 2nd Difference.

Table-1: The Result of Stationary Test

Level	No	Variable	Critical Value of Mackinnon (10%)	T - Statistic	Note
Level	1.	IDR	-2.57	-2.0022	Not Stationary
	2.	Cropping Area	-2.57	-1.3715	Not Stationary
	3.	Real Exchange Rate	-2.57	-4.0406*	Stationary
	4.	World Price	-2.57	-1.0339	Not Stationary
1 st Diff	1.	IDR	-2.57	-2.8007*	Stationary
	2.	Cropping Area	-2.57	-2.4222	Not Stationary
	3.	Real Exchange Rate	-2.57	-2.5411	Not Stationary
	4.	World Price	-2.57	-2.5901*	Stationary
2 nd Diff	1.	IDR	-2.57	-4.0055*	Stationary
	2.	Cropping Area	-2.57	-3.0142*	Stationary
	3.	Real Exchange Rate	-2.57	-3.0537*	Stationary
	4.	World Price	-2.57	-4.2005*	Stationary

Based on Table 1, show that that all variables have stationary at a 2nd Difference Level seen from the absolute value of T-statistic is smaller than the MacKinnon Critical Values. All variables can be continued to the next stage because all variables are stationary

Co-Integration Test

All of the variables tested in this study have been stationary at the second difference level (Appendix 3) then a co integration test can be performed. Co-integration test in this study using Johansen approach.

Table-1: Johansen Co-integration Test Results

r0	LR	pval	90%
0*	53.74	0.0001	32.25
1*	15.52	0.2020	17.98
2*	3.43	0.5153	7.60

Based on Table 2, it is seen that the model used in this study has only one co-integration equation (1 lag), which is the trace statistic value greater than the critical value ($53.74 > 32.25$). This co integration equation shows that among the variables tested have linear combination relationships that are stationary (co integration) in the long term. Thus, this study can use the VECM model because all the data is stationary and there is co integration between the variables.

Estimation Result of Vector

This study uses significance with a real level of 10%, so interpretation of the results can be done is to see p-value of each variable smaller than 0.1, so it can be known that variables affect significantly. The VECM in the study was used to look at the long-term equilibrium relationship of co integrated equations, so that VECM estimates were performed to determine the relationship of short-term and long-term balance

between variables. In the short term there is a correction error of 1,016 that can be interpreted to go to long-term balance required correction of 1.016%.

Based on Table 2, show that in short term there are some variables affect maize import dependency in Indonesia, they are: Cropping area (t-2), Real exchange rate (t-2), and World price (t-2). The three variables that affected imported maize dependency in Indonesia are factors of 2 years earlier (t-2). The increasing of 1% cropping area, will decrease the dependence of maize imports in short term for the next 2 years by 78.454%. The increasing of 1% real exchange rate will decrease the dependence of maize imports in the short term for the next 2 years by 25.923%. The increasing of 1% maize prices in the world market will increase the dependency of import dependency in the short term for the next 2 years by 14.7%.

Table-2: Estimation Result of VECM

<i>Short Term</i>		
Variable	Coefficient	p-value
Cropping Area (t-1)	31.715	0.230
Real Exchange Rate (t-1)	3.527	0.728
World Prices (t-1)	-3.086	0.643
Import Dependency Ratio (t-2)	-0.253	0.338
Cropping Area (t-2)*	-78.454	0.000*
Real Exchange Rate (t-2)*	-25.923	0.000*
World Prices (t-2)*	14.700	0.004*
<i>Long Term</i>		
Variable	Coefficient	p-value
Cropping Area (t-1)*	-46.015	0.000*
Real Exchange Rate (t-1)*	-22.050	0.000*
World Prices (t-1)*	11.434	0.000*

In long term there are some variables affect maize import dependency in Indonesia, they are: Cropping area (t-1), Real exchange rate (t-1), and World price (t-1). The increasing of 1% cropping area will decrease the dependence of imports of maize on the long term by 46.015%. The increasing of 1% real exchange rate, dependence of imported maize will decrease in long-term by 22.050%. The increasing of 1% maize prices in world market will decrease the dependence of maize imports in the long term by 11.434%.

Impulse Response Function (IRF)

Impulse Response Function (IRF) is used to determine the response of an endogenous variable to a shock within other endogenous variables. This study will look at the response given by IDR to other variable shocks, they are cropping are, world maize prices and real exchange rates in the next 30 periods.

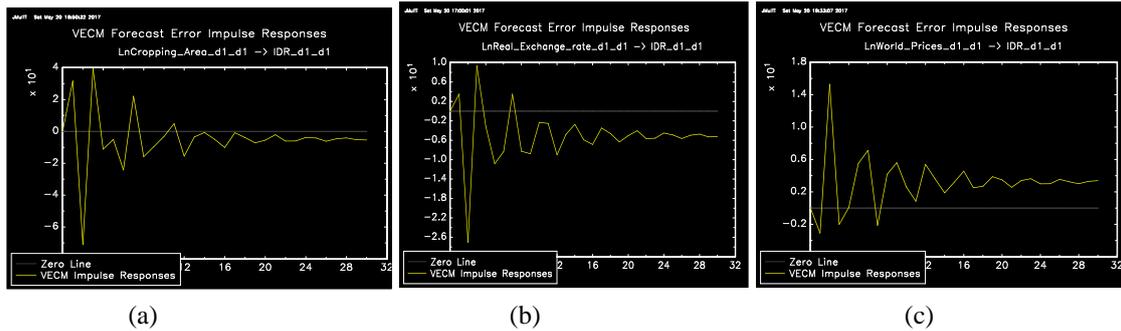


Fig-4: Response IDR to Endogenous Variables Shock (a) Cropping Area; (b) Real Exchange Rate; and (c) World Price

Based on Figure 4a, it is shown that the IDR's response to the cropping area shock in the period 2 to 11 is fluctuated. In the 12th to 30th periods, the IDR response to the cropping area shocks starts to stable with the negative response. Based on Figure 4b, it is shown that in 8th to 30th periods the IDR response to real exchange shocks tend to be stable negative. Based on Figure 4c, in the 8th to 30th periods the IDR response

to the world maize price shock is stable tend to be positive

Forecasting Error of Variance Decomposition (FEVD)

FEVD aim is to explain how much percentage contribution each shock (shock) endogenous variable in affect dependency of maize import. The time period used in explaining this FEVD is 30 periods.

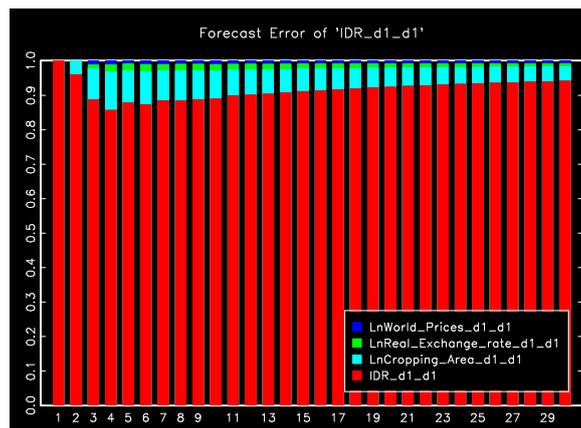


Fig-51: Result of FEDV

During the 30 observation periods, the lowest percentage of IDR influence occurred in the 4th period, which was 86%. While the rest is affected by the cropping area (11%), real exchange rate (2%), and the world price (1%). In Figure 17 it appears that increasing in the contribution of the highest IDR after the fluctuating phase occurred in the 27th to 30th periods, ie 94%. Cropping area decreased until the 30th periods, the statistic result showed its contribution only 4%. While other endogenous variables, namely real exchange rate and world price have stable contribution at 1%.

CONCLUSION

Indonesia maize trade position is lower than main maize exporter countries in domestic market. There are 5 maize exporter countries, they are: Brazil,

India, Argentina, USA, and China. Argentina and USA TSI value are stable and close to +1, indicates these countries have a strong competitiveness in domestic market. Brazil and India TSI value are fluctuate in the expansion stage. China TSI value getting decrease and its TSI value closed to -1. Indonesia TSI value for maize in the range between -0.99 to 0.04 based on this value indicates that Indonesia has low competitiveness and tends to be net importer. TSI value affect contribution of export volume for each country. The country which is has high TSI value, indicate they are allow to export their commodity less than other country, because of Government want to stimulate local maize production by protect their local farmer. Based on comparative advantage result show that IDR of maize in Indonesia in the range between 6% - 11% out of 100%. Limitation of import quotas should be done with the

increase of domestic products, both in terms of quality and quantity to supply domestic demand. In short term there are some variables affect maize import dependency in Indonesia, they are: Cropping area (t-2), Real exchange rate (t-2), and World price (t-2). In long term there are some variables affect maize import dependency in Indonesia, they are: Cropping area (t-1), Real exchange rate (t-1), and World price (t-1). Based on IRF result, IDR response to cropping area and real exchange rate shocks negatively but for world price shock, IDR response positively. Overall endogenous variables such as cropping area, real exchange rate and world price are predicted affect IDR by 4% and 1%, while the rest is influenced by the IDR itself.

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