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IMPACT OF MAIZE IMPORT TARIFF POLICY CHANGES ON PRODUCTION AND CONSUMPTION IN INDONESIA: A MULTIMARKET MODEL ANALYSIS

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Abstract

The purposes of this study is at analyzing the impact of maize import tariff policy changes on production and consumption in Indonesia. Three groups of households were assessed in this studi, namely: (1) large scale broiler farming, (2) small scale broiler farming, and (3) other households. Employed data in this study were classified into 3 types: (1) production and input, consumption, and household income, (2) inputs and outputs, and (3) elasticities. The abolishment of the import tariff policy on maize had an impact on increased maize imported and decreased maize price. Decreased domestic maize price was responded by maize farmer through lessing maize planted area and fertilizer input uses that had impact on the declining in maize production. On the other hand, this policy had positive impact on production of rice, chicken meat, and eggs which led to increase incomes of small scale broiler farming and agricultural sector, as well as national. It furthermore increased the consumption for maize, chicken meat, and eggs in Indonesia.

Key words: *Maize, import tariff, production, consumption, multimarket*

1. Introduction

Consumption rates of meat and eggs tend to increase from year to year. Meat consumption in 2010 increased by 10.42 percent compared with 2009 from 6.29 kg/capita/year to 6.95 kg/capita/year. The same condition was found for eggs consumption, in which it increased by 13.24 percent compared with 2009 (Bureau of Food Security of Ministry of Agriculture, 2012). The fact showed that the demand for meat and eggs continuously increasing has triggered efforts to produce more meat and eggs.

The sustainability of broiler farming business is to some extent determined by the changes in the prices of inputs and outputs. The changes in input prices affect on the decisions of inputs allocation and production by small scale broiler farming. In other words, the amount of chicken meat production depends on the changes in feed prices. The changes

in feed prices depend on the changes in the prices of maize as feed ingredient with a proportion reaching 55-65 percent. If the availability of maize decreases, the availability of raw material for feed industry will decline, and vice versa. Eventually, it will affect chicken meat available. For example, an increased demand for broiler will lead to an increased demand for broiler feed, which in turn has an impact on the increased demand for maize, and vice versa. This phenomenon indicates that the performance of each market is not only determined by internal factors but also affected by the behavior of the other markets.

During the period 2000-2005, maize demand was higher than the production, thereby Indonesia imported maize of between 226 thousand and 1.8 million tons. In 2007, the national maize production was only 13.3 million tons and began being above it national demand of 12.5 million tons. The same condition also occurred during the period 2008-2010. However, imports of maize were still done of 795 thousand tons in 2007 and 300 thousand tons in 2009. Even in 2011, imported maize increased by 3.1 million tons compared with the previous year (1.5 million tons). According to Feed Animal Manufacture Corporation, the increase imported maize because of the difficulty in getting maize from farmers that their location is spread out in the country (Destiana, 2010; FAO, 2011).

Multimarket model is a model that focuses on analyzing direct and indirect effects of changes in price and quantity of a set of interrelated commodities in terms of supply and demand. This economic mathematical approach is suitable to evaluate the government policy in the field of economy (Arulpragasam *et al*. (2003). The World Bank has developed a linkage market model for Senegal, South Korea, and Cyprus to analyze the impact of policy changes in prices, such as changes in the level of subsidy and fertilizer on the productivity of rice, domestic demand, local revenues, stock, trade, and government revenue (Sadoulet & de Janvry, 1995, Braverman & Hammer, 1986, Goletti & Rich, 1998). In the early 1990, a multimarket model analysis was used to measure the impact of policy changes on the poor households (Dorosh *et al*., 1995), and it was focused on analyzing the impact of food imports on the poverty level in Mozambique. In Indonesia Sayaka *et al.*, (2007) conducted a study to assess the impact of import tariff policy changes on the welfare of domestic rice farmers in Indonesia. The research results showed that the elimination of tariff on rice would reduce the supply of rice and decreased farmer household income in rural areas; however, it increased the purchasing power of rice farmers. The opposite condition occurred if there was an increase in rice import tariff. The impact of import tariff on rice market affected the market of food crop and livestock commodities analyzed.

To control the importation of maize and protect domestic maize farmers, the government issued a policy of import tariffs. During the period 1974-1978, 5 (five) percent import tariff was imposed before it was increased to 10 percent in the period 1980-1993. In 1994, the import tariff was lowered and it went back to 5 percent, and in 1995 it was totally removed. However, since 2007, based on Government Regulation No. 7, 2007 concerning the duties of imported goods, the import tariff of maize has been charged 5 percent. This policy has an impact on rice production as a competitor for maize in land usage, and furthermore has an impact on broiler businesses performance that use maize as the main raw material for feed.

Based on the description above, this research analyzed the impact of maize import tariff policy changes on production and consumption in Indonesia with the problem statement is how the maize import tariff policy changes have impacted: (i) the production of food crops and livestock in Indonesia and (ii) the consumption for rice, maize, chicken meat, and eggs in Indonesia. Therefore, the study was conducted with the aims at analyzing the impact of maize import tariff policy changes on: (1) the production of food crops and livestock in Indonesia and (ii) the consumption for rice, maize, chicken meat, and eggs in Indonesia.

2. Methodology

2.1. Data Types and Sources

There are 3 groups of households in this study, namely: (1) large scale broiler farming *(PRSHN)*, (2) small scale broiler farming *(PTRYT)*, and (3) other households *(RTOTH)*. Furthermore, the data were classified into 3 types: (1) production and inputs, consumption, and household income of every commodity, (2) inputs and outputs, and (3) elasticities. The data of production, input use, consumption, income, and prices were gathered from the Central Bureau of Statistics and the Ministry of Agriculture in 2011, while the elasticities data were collected from previous studies (Sayaka *et al*., 2007; Sugema & Roy, 2010).

2.2. Model Formulation

This study employed multimarket model that derived from Lundberg and Rich (2002), Stifel and Randrianarisoa (2004). This models part of partial equilibrium model. This partial equilibrium model was used to analyze the impact of changes in price and quantity in a particular market in household income and expenditures. This model was divided into 6 blocks of equations, namely: (1) price, (2) supply, (3) input demand, (4) consumption, (5) income, and (6) equilibrium condition. The commodities were analyzed in this study consisted of six commodities, namely: rice (rc), maize (m), broiler (br), eggs (lr), urea (ur), and *triple super phosphate* (TSP).

Price Block

Consumer prices *(PC)* are higher than producer prices *(PP)* due to the domestic marketing margin *(MARG*). The consumer price can be calculated by using the following equation:

$$PC_{c,h} = PP_{c,h} * (1 + MARG) \quad (1)$$

where the subscripts c, h, refer to commodity, household type respectively. The border price *(PM)* of the importable products (im) rice and maize are linked to the world price by the exchange rate (er), import tariffs (tm), and the international marketing margin (RMARG).

$$PM_c = \overline{PW_c} * er * (1 + tm_c) \quad (2)$$

The border price *(PM)* of the importable products (im) are linked to the world price by the exchange rate (er), import tariffs (tm), and the international marketing margin *(RMARG).*

$$PC_{c,h} = PM_c * (1+RMARG) \quad (3)$$

The large scale of consumer price differ from the small scale broiler farming by an internal marketing margin *(INTMARG)* that reflects transportation and marketing costs.

$$PC_{c,pr} = PC_{c,p} * (1 + INTMARG) \quad (4)$$
$$PC_{c,rt} = PC_{c,pr} \quad (5)$$

It included a price index for each household group to reflect changes in prices weighted by their shares of consumption:

$$PINDEX = \sum_i PCWT^*_{h,i} \frac{PC_{1h,i}}{PC0_{h,i}} \quad (6)$$

where w is the budget share for each commodity. The superscript on the PC terms refers to periods 0 denote starting prices and 1 end of simulation prices.

Supply Block

Household's supply of rice and maize are determined by a) the total amount of land available to each household; b) the share of that land allocated to the specific crops and, c) the associated yield for the crops. The share of land *(SH)* allocated to a particular crop by household group h is a function of all crop prices:

$$log(SH_{h,f}) = \alpha^{s}_{h,f} + \sum_{ff} \beta^{s}_{h,f,ff}\, log(PP_{h,ff}) \quad (7)$$

where f refers to crop commodities.

Yields *(YLD)* for crops f by household groups h are a function of output and input prices as well as land.

$$log(YLD_{h,f}) = \alpha^{y}_{h,f} + \beta^{y}_{h,f}\, log(PP_{h,f}) + \sum_{iin} \gamma^{y}_{h,f,iin}\, log(PC_{h,iin}) \quad (8)$$

where the coefficients represent the price elasticities.

The total household supply to the market is then determined as the product of the initial area under cultivation, the share of land devoted to the crop, and the yield. Adjustments are made for losses and use of the output for seed (loss), and for any related conversion factors (conv).

$$SCR_{h,f} = \overline{AREA} * SH_{h,f} * YLD_{h,f} * \overline{(1 - loss_f)} * \overline{conv_f} \quad (9)$$

The total supply of each of the commodities is the sum of household supply:

$$SCR_f = \sum_h SCR_{h,f} \quad (10)$$

Household livestock supply is modelled as a function of livestock prices and input prices of livestock feed products, where the subscript ffe refers to livestock feed products.

$$log(SLV_{h,l}) = \alpha^{1}_{h,l} + \sum_{ll} \beta^{1}_{h,l.ll} \quad log(PP_{h,l}) + \sum_{ffe} \gamma^{1}_{h,l,ffe} \quad log(PC_{h,ffe}) \quad (11)$$

Total livestock supply is given by:

$$SLV_l = \sum_h SLV_{h,l} \quad (12)$$

Demand Input Block

Household demand for input *(HDIN)* is a function of output prices *(PP)* and input prices *(PC)*, where the subscript in refers to urea and *TSP*.

Household demand for urea and TSP:

$$log(HDIN_{h,f,in}) = \alpha^{f}_{h,in} + \sum_{f} \beta^{f}_{h,f,in}\, log(PP_{h,f}) + \gamma^{f}_{h,in} log(PC_{h,in}) \quad (13)$$

Total demand for urea and *TSP* are given by:

$$DIN_{in} = \sum_h HDIN_{h,in} \quad (14)$$

Household demand maize for livestock feed:

$$log(HDFE_{h,fe}) = \alpha^{l}_{h,fe} + \sum_{l} \beta^{l}_{h,l,fe}\, log(PP_{h,l}) + \sum_{ffe} \gamma^{l}_{h,fe,ffe}\, log(PC_{h,ffe}) \quad (15)$$

Total demand for maize is given by:

$$DFE_{fe} = \sum_{h} HDFE_{h,fe} \quad (16)$$

Consumption Block

Demand for the consumption items *(HC)* by the household groups, where the i refer to commodities households purchase, i.e. rice, maize, chicken meat, and eggs. *YH* is household income, *PC* are consumer prices.

$$log(HC_{h,i}) = \alpha^{h}_{h,i} + \sum_{j} \beta^{h}_{h,i,j}\, log(PC_{h,j}) + \gamma^{h}_{h,i} log(YH_{h}) \quad (17)$$

Total consumption is given by :

$$CONS_{i} = \sum_{h} HC_{h,i} \quad (18)$$

Income Block

Agricultural income *(YHAG)* for rural households is the sum of crop and livestock revenue minus input costs:

$$YHAG_{h} = \sum_{f}(PP_{f} * SCR_{h,f}) + \sum_{1}(PP_{1} * SLV_{h,1}) - (PC_{in} * DIN_{h,in}) - (PC_{fe} * DFE_{h,fe}) \quad (19)$$

and total household income *(YH*) is the sum of agricultural income and the exogenously determined non-agricultural income *(YHNAG).* The latter component is adjusted by a price index and the price index is as defined in equation (6).

$$YH_{h} = YHAG_{h} + \overline{YHNAG_{h}} * PINDEX \quad (20)$$

Equilibrium Conditions

All commodity markets clear, i.e. the sum of quantity supplied (domestic production plus net imports) is equal to the amount demand for human and livestock consumption.

$$SCR_{f} + SLV_{l} + M_{c} = CONS_{i} + DFE_{c} \quad (21)$$

where *M* equals imports and *CONS* and *DFE* denote human and livestock consumption respectively.

2.3. Model Simulation

The study was conducted with the aims at analyzing the impact of maize import tariff policy changes on: (1) the production of food crops and livestock in Indonesia and (ii) the consumption for rice, maize, chicken meat, and eggs in Indonesia. To answer the purposes of this study, the following simulations were conducted: (1) an increase 10 percent in the maize import tariff and (2) elimination of maize import tariff

3. Results and Discussion

3.1. Production

Maize is a versatile crop being used for direct consumption or as raw material for a diverse range of industrial products, both food and feed. In the sub-sector of food crop, maize is the second largest contributor after rice as a carbohydrate source that is instrumental in supporting food security. Meanwhile, as for its function as the main raw material for feed, maize still could not be replaced by other agricultural products. This is exactly what causes the demand for maize continuously increasing along with the increased demand for livestock products such as meat and eggs.

Most maize cultivations in Indonesia are carried out on dry land. Out of 79 % maize planted area, only around 11 % is in irrigated land and 10 % in rainfed land. However, in last years, the maize planted area in the irrigated land have increased rapidly since producing maize in irrigated land relatively easier than that of in rainfed land. This indicates that rice and maize are quite competitive in land use.

Household farming businesses are not monoculture in nature, they also have other businesses both agricultural and non-agricultural sectors. There are two indicator as characteristic of small scale broiler farming, namely farmer landholding and farmer household income sources. In terms of land holding, the land size owned by farmers is far lower compared to other agricultural enterprises. The land used for farming business was only 8.50 percent. Meanwhile, for other activities and non agricultural business were 83.02 percent and 8.48 percent, respectively (BPS-Ditjennak, 2008). The research conducted by Ilham and Yusdja (2010) showed that the land use of small scale broiler farming households for food crop was 0.455 hectare; in which 52.62 percent for rice, 15.96 percent for maize, 3.27 percent for soybean, and 5.39 percent for cassava, respectively.

The data of rice, maize, chicken meat, and eggs production in three groups of households shown in Table 1. The small scale households *(PTRYT)* produced rice, maize, chicken meat, and eggs of by 2,598.32; 1,107.53; 181.83; and 0.100 (thousands ton), respectively. While the other households only produced rice, maize and eggs of by 23,240.54; 9,211.81; 1,025.91 (thousands ton), respectively. However, the asummed production on the large scale households *(PRSHN)* was focussed only on chicken meat (1,137.12 thousands ton).

Table 1. Household Production of Rice, Maize, Chicken Meat and Eggs in 2011 (000 tons)

Households	Commodities			
	Rice	Maize	Chicken meat	Eggs
PRSHN	0	0	1,137.12	0
PTRYT	2,598.32	1,107.53	181.83	0.100
RTOTH	23,240.54	9,211.81	0	1,025.91
Total	25,838.86	10,319.34	1,318.95	1,026.01

Source: BPS-Ditjennak (2008), Ilham & Yusdja (2010), Directorate General of Livestock and Animal Health (2012), processed

Result of production (Table 1) based on productivities of rice and maize. Productivity of rice on range between 4.207 tons/ha and 5.580 tons/ha, while between 3.5 tons/ha and 4.560 tons/ha for maize. From these data, the small scale broiler farming households were classified at the lowest productivity values of by 4.207 tons/ha for rice and 3.5 tons/ha for maize, based on assuming that the small scale broiler farming households have managed their food crop business as by a side line business or not intensivelly. Meanwhile, the other

households were referred to the highest value of productivity, because in these households group, they have managed their food crop business intensivelly.

3.2. Consumption

The consumption of the three household groups was classified into 3 groups: urban, rural and average of urban and rural groups. Based on the consideration of the average expenditure per capita by category of goods, in which the large scale were referred to the food consumption of urban people, while the small scale households were referred to the food consumption of rural people, and other households based on the average consumption of urban and rural people. The consumption of rice, maize, chicken meat, and eggs in the large scale households *(PRSHN)* were 37,529; 4,792; 2,326; 1,832 (thousands ton), respectively. Furthermore, the consumption of rice, maize, chicken meat, and eggs in the small scale households *(PTRYT)* were 36,288; 17,870; 1,114; 1,268 (thousands ton), respectively (Table 2).

Table 2 Household Consumption for Rice, Maize, Chicken Meat, and Eggs in 2011 (000 tons)

Households	Commodities			
	Rice	Maize	Chicken meat	Eggs
PRSHN	37,529	4,792	2,326	1,832
PTRYT	36,288	17,870	1,114	1,268
RTOTH	24,715.26	7,918.35	1,133.77	1,024.70
Total	24,789.08	7,941.02	1,137.21	1,027.80

Source: Bureau of Food Security of Ministry of Agriculture (2012), processed

3.3. Impact of Maize Import Tariff Policy Changes on Food Crops Production

The result of this research showed that the policy of maize import tariff changes had an impact on food crop production in Indonesia as shown in Table 3. Increasing maize import tariff policy by 10 percent led to decreasing in the volume of maize imported of by 19.77 percent, lowering domestic maize demand, and increasing maize price by 9.523 percent, respectively (Table 3). The rise in maize price caused a decline in the demand for both consumption and feed by 1.498 (Table 6) and 1.525 percent (Table 4), respectively.

The increase in the price of maize was responded by farmers by increasing the land share for planting maize of by 3.0 and 3.007 percent by the households of small scale broiler farming and other households, respectively. In addition, the improvement in the price of maize led to the use of Urea and TSP fertilizer for maize increased by 5.754 and 5.755 percent, respectively, and triggering improvement in productivity by 2.657 and 2.659 on the households of small scale and other households, respectively. The increase in the land share and productivity would cause the increase in national maize production by 5.762 percent. But, on the other side, on increased use of land for maize has a negative impact on rice production by 2.4748 percent. This indicated that when there was an increase in the price of maize, farmers would use part of their rice land for planting maize.

Eliminating maize import tariff had an impact on food crop production in Indonesia in Table 3. It led to the increase in imported maize which amounted by 10.25 percent, and this certainly encouraged the increase in domestic maize supply and lowered the domestic maize price from US $ 0.302 to 0.287. Another impact was the increased demand for both consumption and feed by 0.700 (Table 6) and 0.246 percent (Table 4), respectively.

Table 3 The Results of Simulation of Maize Import Tariff Changes on Food Crops Production in Indonesia

Variables	Base Value	Alternative Simulation			
	5% Tariff	15% Tariff*		0% Tariff**	
	(Unit)	(Unit)	(%)	(Unit)	(%)
PMm (Imported Maize Price)	2346.40	2569.86	9.523	2234.66	-4.762
PCm,p (Maize Price of PRSHN)	2933.00	3212.33	9.523	2793.33	-4.762
PCm,pr (Maize Price of PTRYT)	3519.60	3854.8	9.523	3352	-4.762
PMrc (Imported Rice Price)	6150.40	0	0	0	0
PCrc (Domestic Rice Price)	7688.00	0	0	0	0
$SH_{1,2}$ (Rice Land Share of PTRYT)	0.0780	0.0767	-1.538	0.0784	0.4871
$SH_{1,2}$ (Rice Land Share of RTOTH)	0.5260	0.5173	-1.635	0.5285	0.4828
$YLD_{1,2}$ (Rice Productivity of PTRYT)	4.2070	4.1713	-0.8469	4.2172	0.24126
$YLD_{1,2}$ (Rice Productivity of RTOTH)	5.5800	5.5327	-0.8467	5.593	0.24133
$HSCR_1$ (Rice Production of PTRYT)	2598.32	2534.02	-2.4747	2617.178	0.72577
$HSCR_2$ (Rice Production of RTOTH)	23240.54	22665.36	-2.4749	23409.173	0.72560
$SCR_{1,2}$(Rice Production of Indonesia)	25838.86	25199.37	-2.4748	26026.35	0.72562
$SH_{3,4}$ (Maize Land Share of PTRYT)	0.0250	0.02575	3.0	0.0246	-1.44
$SH_{3,4}$ (Maize Land Share of RTOTH)	0.1596	0.1644	3.007	0.1573	-1.434
$YLD_{3,4}$ (Maize Productivity of PTRYT)	3.5000	3.5930	2.657	3.4581	-1.19771
$YLD_{3,4}$ (Maize Productivity of RTOTH)	4.5600	4.6812	2.659	4.5054	-1.19759
$HSCR_3$ (Maize Production of PTRYT)	1107.53	1171.35	5.7620	1078.56	-2.61573
$HSCR_4$ (Maize Production of RTOTH)	9211.81	9742.60	5.762	8970.85	-2.61577
$SCR_{3,4}$ (Maize Production of Indonesia)	10319.34	10913.95	5.762	10049.41	-2.61576
$HDIN_1$ (Demand for Urea PTRYT)	1.679	1.694	0.893	1.635	-2.620
$HDIN_2$ (Demand for Urea RTOTH)	1049.36	1109.82	5.7619	1021.91	-2.615
$DIN_{1,2}$ (Demand for Urea Indonesia)	1051.04	1111.52	5.754	1023.54	-2.616
$HDIN_3$ (Demand forTSP PTRYT)	0.705	0.711	0.851	0.686	-2.695
$HDIN_4$ (Demand for TSP RTOTH)	440.73	466.125	5.762	429.2	-2.616
$DIN_{3,4}$ (Demand for TSP Indonesia)	441.43	466.836	5.755	429.9	-2.612
IMrc (Net Import of Rice)	4499.991	4896.17	8.804	4321.992	-3.95
IMm (Net Import of Maize)	3182.356	2553.00	-19.77	3508.592	10.25

Note: * increasing maize import tariff of by 10 percent; ** eliminating maize import tariff

For maize farmers, the reduction in maize price as a result the elimination of maize import tariff was responded by reducing the land share for planting maize by 1.44 percent for

small scale broiler farming households and by 1.434 percent for other households, respectively and followed also by reduction in Urea and TSP fertilizers uses of by 2.616 and 2.612 percent, respectively. Finally, it had impact on maize production declaining of by 2.61576 percent. When the maize price goes down, farmers were more interested in increasing the area for planting rice as maize competitor. In this condition, planting rice give more interesting benefit than that of planting maize. This was showed by the increased share of rice planted land for small scale broiler farming households and other households by 0.4871 and 0.4828 percent, respectively. Therefore, when there was a decline in the maize price, farmers would divert their maize planted land to rice farming. Finally, at level of productivity and land share increase, it would lead to the increase in rice production of by 0.72562 percent.

Table 4 The Results of Simulation of Maize Import Tariff Policy Changes on Livestock Production in Indonesia

Variables	Base Value	Alternative Simulation			
	5% Tariff	15% Tariff*		0% Tariff**	
	(Unit)	(Unit)	(%)	(Unit)	(%)
PCbr (Domestic Chicken Meat Price)	27500	27500	0	27500	0
PClr (Domestic Egg Price)	18058	18058	0	18058	0
$HSLV_1$(Chicken Meat Production of PRSHN)	1137.12	1131.96	-0.453	1139.9	0.245
$HSLV_2$(Chicken Meat Production of PTRYT)	181.83	181	-0.456	182.27	0.243
$SLV_{1,2}$ (Chicken Meat Production of Indonesia)	1318.95	1312.96	-0.4536	1322.17	0.244
$HSLV_3$(Eggs Production of PTRYT)	0.100	0.0999	-0.8	0.1033	3.30
$HSLV_4$(Eggs Production of RTOTH)	1025.91	1017.09	-0.8591	1028.42	0.245
$SLV_{3,4}$ (Eggs Production of Indonesia)	1026.01	1017.19	-0.8590	1028.53	0.246
$HDFE_1$ (Demand for Maize PRSHN)	1066.37	1060.92	-0.511	1068.98	0.244
$HDFE_2$ (Demand Maize for Broiler Feeds PTRYT)	227	226.185	-0.359	227.6	0.264
$HDFE_3$ (Demand Maize for Layer Feeds PTRYT)	0.127	0.126	-0.787	0.131	3.15
$HDFE_4$ (Demand for Maize RTOTH)	1292.25	1259.08	-2.567	1295.41	0.244
$DFE_{1,2,3,4}$ (Demand for Maize Indonesia)	2585.747	2546.31	-1.525	2592.12	0.246

Note: * increasing maize import tariff of by 10 percent; ** eliminating maize import tariff

3.4. Impact of Maize Import Tariff Policy Changes on Livestock Production

Feed is the biggest part of the cost of production is about 70%, while the share of other costs such as DOC only 13 percent (Yusdja dan Pasandaran 1998). Feed requirements of broiler and layer in the period 2005-2010 respectively increased by 6.85 percent and 8.31 percent. In 2010 the need of feed for broiler reached 3.51 million tons and 2.06 million tons

for layer chicken. This shows the role of feed in the poultry production. Therefore, in the event of market shocks to the feed industry will greatly affect the performance of broiler and layer.

The result of research showed that policy changes of maize import tariff affects the livestock production in Indonesia as shown in Table 4. When the government increased maize import tariff by 10 percent maize demand either by the large and small scale broiler farming went down by 0.511 and 0.359 percent, respectively. Consequently, the production for broiler from those broiler farming decreased by 0.453 and 0.456 percent, respectively. The same phenomenon also occured in layer business.

In contrast, the elimination of import tariff policy impact on maize caused its price became lower, led to the increase in maize demand for feed by both the large and small scale broiler farming of by 0.244 and 0.264 percent, respectively. This condition triggered the increase in production both at large and small scale broiler farming level of by 0.245 and 0.243 percent, respectively, and increased the national production of meat of by 0.244 percent. It also had a positive impact on the improvement of eggs production of by 0.246 percent.

3.5. Impact of Maize Import Tariff Policy Changes on the Household Income

There were some studies on the linkages markets of maize, feed, and chicken meat conducted using an econometric approach. Kariyasa & Sinaga (2007) conducted a study on the linkage between maize market, feed, and chicken markets in Indonesia. The linkage was created through the domestic prices of maize, feeds, and chicken meat, as well as through the world prices of imported maize, imported feed components, and imported chicken meat. These indicated that price and quantity that occur in a market are not only determined by the market power itself but also by the power of other markets.

Table 5 The Results of Simulation of Maize Import Tariff Policy Changes on Households Income in Indonesia (Million Rupiahs)

Variables	Base Value	Alternative Simulation			
	5% Tariff	15% Tariff*		0% Tariff**	
	(Unit)	(Unit)	(%)	(Unit)	(%)
I. Household Income					
a. $YHAG_1$ (Income of PRSHN)	21888976	21495146	-1.799	22091783	0.927
b. $YHAG_2$ (Income of PTRYT)	22286608	21828241	-2.057	23366945	4.8
1. Rice	15968858.53	155740057	-2.472	16084756	4.7
2. Maize	3115440.07	3143068	0.887	3033903	-0.726
3. Broiler	3201210.80	3110161	-2.847	3247233	2.617
4. Laying hens	997.65	954.37	-4.338	1052.37	1.434
c. $YHAG_3$ (Income of RTOTH)	1049290416	1034191127	-1.439	1053088847	5.485
II. Agricultural Sector Income	1093466000	1077514515	-1.488	1098547575	0.362
III. Non-Agricultural Sector Income	6448679204	6448679204	0	6448679204	0
IV. National Income	7542145204	7526193719	-0.2115	7547226779	0.067

Note: * increasing maize import tariff of by 10 percent; ** eliminating maize import tariff

Increasing maize import tariff policy by 10 percent caused an increase in maize prices. It led to the increase small scale broiler farming income from maize by 0.887 percent, but decrease small scale broiler farming income from rice farming, broiler, and layer business of by 2.472, 2.847, and 4.338 percent, respectively. Furthermore, this policy caused the agricultural sector income *(YHAG)* and the national income *(YH)* dropped by 1.488 percent and 0.2115 percent, respectively.

Table 6 The Results of Simulation of Maize Import Tariff Policy Changes on Households Consumption in Indonesia

Variables	Base Value	Alternative Simulation			
	5% Tariff	15% Tariff*		0% Tariff**	
	(Unit)	(Unit)	(%)	(Unit)	(%)
$HCY_{1,2}$(Consumption for Rice PRSHN)	37.529	37.614	0.23	37.483	-0.122
$HCY_{1,2}$(Consumption for Rice PTRYT)	36.288	36.648	0.99	36.241	-0.130
$HCY_{1,2}$(Consumption for Rice RTOTH)	24715.26	24921.26	0.825	24674.84	-0.163
$CONS_{1,2}$(Consumption for Rice Indonesia)	24789.08	24995.70	0.826	24748.57	-0.163
$HCY_{3,4}$(Consumption for Maize PRSHN)	4.792	4.727	-1.355	4.827	0.734
$HCY_{3,4}$(Consumption for Maize PTRYT)	17.870	17.603	-1.495	17.999	0.725
$HCY_{3,4}$(Consumption for Maize RTOTH)	7918.35	7799.73	-1.499	7973.48	0.690
$CONS_{3,4}$(Consumption for Maize Indonesia)	7941.02	7822.07	-1.498	7996.31	0.700
$HCP_{1,2}$(Consumption for Chicken Meat PRSHN)	2.326	2.3207	-0.227	2.329	0.122
$HCP_{1,2}$(Consumption for Chicken Meat PTRYT)	1.114	1.110	-0.355	1.1152	0.108
$HCP_{1,2}$(Consumption for Chicken Meat RTOTH)	1133.77	1129.84	-0.346	1134.42	0.057
$CONSP_{1,2}$(Consumption for Chicke Meat Indonesia)	1137.21	1133.28	-0.345	1137.86	0.058
$HCP_{3,4}$(Consumption for Eggs PRSHN)	1.832	1.816	-0.86	1.8405	0.465
$HCP_{3,4}$(Consumption for Eggs PTRYT)	1.268	1.2675	-0.042	1.2737	0.448
$HCP_{3,4}$(Consumption for Eggs RTOTH)	1024.70	1024.36	-0.033	1028.77	0.397
$CONSP_{3,4}$(Consumption for Eggs Indonesia	1027.80	1027.47	-0.031	1031.89	0.398

Note: * increasing maize import tariff of by 10 percent; ** eliminating maize import tariff

In contrast, when government issued the elimination policy of maize import tariff decreased the household income of small scale broiler farming from maize by 0.726 percent but increased their income from rice farming, broiler business and layer business by 4.7, 2.617, and 1.434 percent, respectively (Table 5). This policy also resulted the increase in

agricultural income *(YHAG)* as well as national income *(YH)* by which amounted to by 0.362 and 0.067 percent, respectively.

3.6. Impact of Maize Import Tariff changes on Households Consumption

Impact of the increasing import tariff on maize of by 10 percent caused an increase in maize price. As a result of maize price became more expensive, it led to the consumption for maize by the three households went down by 1.355, 1.495, and 1.499 percent, respectively, and then decreased the maize national consumption of by 1.498 percent. Furthermore, this policy also caused the chicken meat consumption dropped 0.227, 0.355, 0.346 percent, respectively, and lowered the national consumption by 0.345 percent. This same phenomenon also occured in eggs consumption.

On the other hand, when government issued of elimination maize import tariff policy caused a drop in maize price and then led to the increase in maize consumption in all household categories. The large scale broiler farming households maize consumption increased by 0.734 percent, and by 0.725 and 0.690 percent from the small scale broiler farming households and other households, respectively. It also caused the national consumption increase by 0.700 percent. The same phenomenon also occured for chicken meat and eggs consumption. Chicken meat consumption by the large and small scale broiler farming and other households were increasing by 0.122, 0.108, 0.057, respectively. Consequently, the national consumption for this kind of meat also increased by 0.058 percent. This policy also resulted the increase in consumption for eggs of by 0.465, 0.448, 0.397, respectively in those three households. As a whole this policy brought the national consumption for eggs increased by 0.398 percent.

4. Conclusion

Elimination maize import tariff policy caused imported maize increase due and its price became cheeper. This policy made the domestic supply of this commodity increased. On the other hand, less attractive of maize price was responded by farmers through reducing maize planted land and fertilizer input uses. The change of this farmer's decision caused production of maize and income from maize farming decline. In addition, this policy that caused maize price to be lower would have positive impact on maize demand for both consumption and feed industry. A side from that, this policy also led to the increase in consumption for both chicken meat and eggs on all household categories, as well as national consumption.

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