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Impact of The Rising Rice Prices On Indonesian Economy

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Abstract

The purpose of this research is to analyzes impact of the rising rice prices on sectoral economic performance and welfare in Indonesia by using Computable General Equilibrium Model (CGE) based on Social Accounting Matrix (SAM) of 2008. Economic sector of Indonesia is agregated into 22 sectors using Constant Elasticity of Substitutioon (CES) production function and 8 groups of households using Cobb-Douglasss utility. The result shows that rising price of 5 – 15 percent will increase domestic output of paddy,beans, and other food commodities, forestry, fishery, food and beverage industry, rice milling, spining and textil industry, wood industry, fertilizer, and pesticide. While the sector is declining domestic output of plantation sector, mining, paper industry, chemical and others, restaurants and hotels, and government.On the other hand, the increase of rice price decreases export, but it increases a whole import. The household real income increases, while group of households welfare decreases as the rice price increase. The government should be aware of the rising rice price,because it will harm the households.

Keywords: rice price, sectoral economic performance, households welfare, CGE

1. Introduction

The development of agricultural sector influences other sectors, both linked to past and future. The growing agricultural sectors will develop upstream sector such as industriy of input provider and agriculture machinery. Moreover, downstream sector or industries that use raw materials from agriculture output are also developing. The development of other sectors which is supported by agriculture will have impact to societies' welfare such as employment, high-income, and finally, it will lead to the increase of societies' purchasing power.

The effort towards improving farmer's welfare operationally is accomplish through empowerment counseling, mentoring, business assurance, rice price protection, protection policies and promotion. Those efforts are relatively necessary, but constraint factors such as the reduced acreage, limited irrigation water supply, the high cost of input, and relatively low price of products need to be well concerned by local government. The situation is acceptable since majority of rice farmers in Indonesia are subsistence, means that they are as both producers and consumers. Therefore, rice quantity sold at the market very depends on surplus of households' consumption, rice prices, and price of other products from other industries needed by the farmers.

The rising rice production cannot be apart from food policy decided by government. Food policy in Indonesia aims to attain food self-sufficiency by improving food production, farming income, nutrient status of society, and ensuring food availability with affordable price (Bulog, 1995).

Price of dry grain harvest (GKP: Gabah Kering panen) and rice which has decided by government increase on every year. Based on President Decree (Inpres) No. 9 of 2002 about rice policy, in 2003 GKP and rice price was 1230 IDR (Indonesian Rupiah)/kg and 2740 IDR/kg respectively. In 2010, price of GKP was 2640 IDR/kg, thus rice price reached 5060 IDR/kg. Then in February of 2012, based on President Decree (Inpres) No. 3 of 2012 on the procurement policies grain/rice and rice distribution by the government of GKP and rice price was 3300 IDR/kg and 6600 IDR/kg respectively.

Furthermore, the rising grain-selling price did not followed by the improving of farmer's income significantly. It is shown by poverty which is only concentrated on villages; even number of the poor in March of 2009 reached 20.62 million people or about 63, 38% of total poor in Indonesia. The rising selling price of grain does not give benefit to the farmers, but to traders who buy grain from farmers and then sell it to the millers. All this time being, bargaining position of farmers was not as well as that of traders, especially in chance of receiving a fair price. However, when farmers act as consumers, they do have a poor bargaining position to the traders.

Since 2010 to 2011, exchange value of farmers (EVF) in Indonesia was relatively better than its base year of

2007. It is shown by EVF indices, which is more than 100 (in September 2011 was 105.17%); although the increase of EVF generally was not significant or too small. According to Sunanto (2008), the low EVF is due to government policy of low Government Purchasing Price (HPP: Harga Pembelian Pemerintah) of grain/rice. If the government increases HPP, it is worried that the poor, who are not a farmer, will not be able to pay the price. However, if the HPP is too low, farmers will loose because selling price of their harvested grain or rice is low.

The increase grain/rice price does not only affect to the farmers, but also consumers who do indirectly involve in paddy production. The increase of rice price will affect expenditure of primary needs. Government does concern well in determining HPP. It wants to both improve producer welfare and protect consumers.

Price policy of rice commodity will affect others performance of sectoral economics and so the societies' welfare. If farmers have a good bargaining position to their harvested commodity, their income will increase as much as rice price increase and vice versa. Moreover, on consumers' side the rising rice price, which is the primary needs (relative income constant), will lead to the decrease of real income (purchasing power decline) so that the poor cannot satisfy their needs.

Price policy aims to keep the price stable; because the unstable price of agriculture product especially rice is an important economic problem. The relationship of rice problems with price policy is an interesting topic to investigate; because in the global economic change, rice price policy will also change as well as internal and external environment changes. Such phenomenons will always occur continuously. Meanwhile, price policy of agriculture products is one of policies, which may influence societies' welfare directly.

The other problems faced in agriculture development are disintegration of agriculture management as a whole agribusiness system, from production-tools sub-system, farming, harvest processing, until marketing subsystem, and supported institution. This condition will impact farmers' welfare, thus do not show the significant improvement. Whereas, the essence purpose of agricultural development is to improve the farmers' welfare.

Rice price policies applied by the government have impact to both producer and consumer; that is welfare improvement in one side but welfare loss in another side. Therefore, we need to investigate the impact of rising rise prices on sectoral economic performance and welfare in Indonesia. To asses the impact of rising rice price to economy generally, this paper study about agricultural sector focused on Computable General Equilibrium (CGE).

2. Rice in Indonesia

Food commodity, especially rice, can be included to subsistent commodity; because the product (Q) is being used to satisfy consumption needs of producer's family or farmers (C), and the surplus is sold to the market (M). Mathematically, the allocation is formulated as (Darwanto, 2007):

$$Q = C+M$$

It can be illustrated by Figure 1, with the horizontal axis OF showing product quantity of subsistent commodity (rice) and vertical axis (OC) showing product consumption or other product which is not produced by farmer's households. Length of OF describes total product (Q) with allocation of households consumption (C), and to allocation to be sold at the market (M).

Supposed that rice production has a relatively huge contribution to households income; thus the product as much as that Q_o will be allocated for households consumption as much as C_o, and the surplus of M_o is sold at the market to maximize utility or welfare of households family (U_o). The classical theory asserts that the product quantity sold to the market by farmers household depends on product price. The higher the price, the more product sold. However, attention to product price is not the only one to be considered in determining quantity size of the product sold at the market. Furthermore, they will still consider about price of other needs which does not produced by farmers household. In the other words, the quantity of product sold at the market depends on needs of cash to buy products or services which do not produced by the farmers' family. For the illustration, it can be explained by price consideration which is reflected by price ratio of Pi = Pr/Pnr, with r = rice, and nr = other goods or as direction coefficient of budget line as seen on Figure 1.

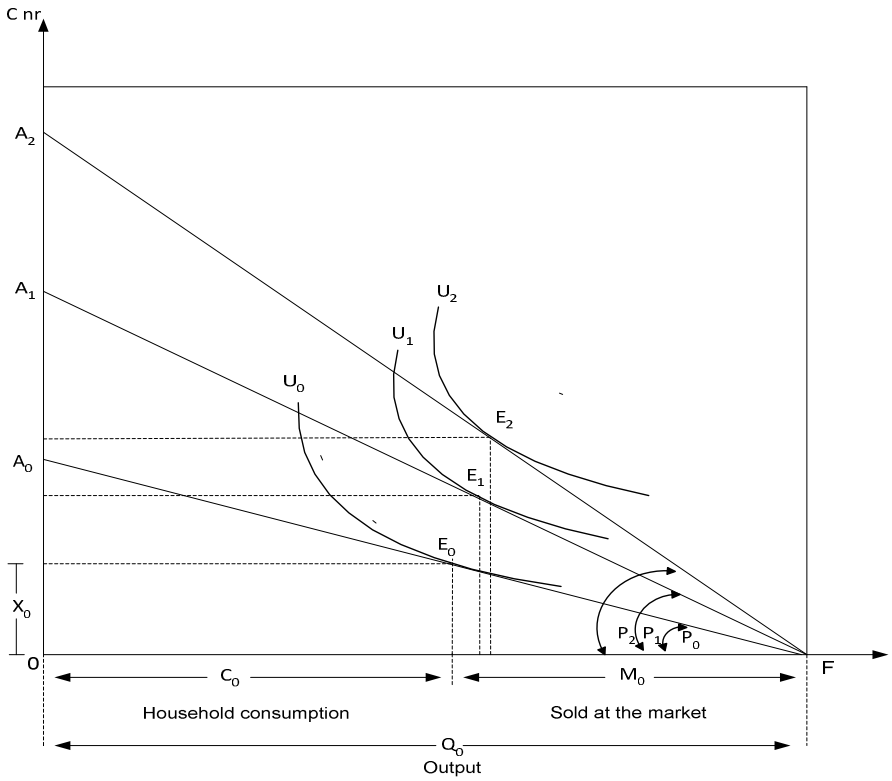


Figure 1. The model of Subsistent Farmers's Output Allocation for Household's Consumption and Sales (Toquero, *et al*. (1975) in Darwanto, 2007)

The higher the relative price of rice compared to other products price, the less product sold at the market. It is because farmers are able to buy other goods by only selling rice in that quantity. On the contrary, the lower the relative price of rice to other products price, the farmers will sell more rice so they can buy other products which are needed by their household. Therefore, if relative price of rice lower than other product, the household's ability to buy other goods declines, means that welfare does decreases. Nevertheless, if it is observed from its availability at the market, it would be increase; because the farmers sell more rice to the market.

Such dilemmatic condition is relatively beneficial for food sufficiency improvement program, considered from side of food availability, and or rice. On other side, it faces the decreasing welfare of farmers household. The worse condition is if product sold by farmers household has caused the lack of consumption for farmers own household in order to satisfy their other needs.

EVF indices can be used as indicator for farmers welfare. The lower EVF, the more products are marketed in order to buy other products which are not produced. Therefore, level of rice avilability of domestic farmers production will be increased. Thereby, level of rice availability from domestic farmers will increase but with the consequence of decreased farmers' welfare, by the asssumption that price at farmers level and price of other goods constant (Haryono, 2008).

Government's efforts to protect farmers from international rice price volatility seems still to be done considering the last two decades is still showing symptoms of fluctuations in international prices and the rate of increase in the domestic price is still higher than the international market price. Domestic price that tends to be higher than international price is is on one side beneficial for domestic farmers, but it lead an international market pressure include effect of illegal import. Furthermore, the increase of rice consumption either caused by an increasing population or consumption level per capita will increase demand of domestic rice. The rising rice price with a greater growth rate compared to domestic production will further encourage domestic rice price increase directly or indirectly will also stimulate the increase of import quantity (Darwanto, 2007).

3. Policy of Price Controlling

This policy is amed to protect rice farmers and consumers through price stabilization mechanism. To protect farmers, since 1970 government has issued floor price for grain and rice. The purpose is to guarantee farmers that their product will be bought within price decided by the government or assigned corporate. The policy does

function as stimulation to increase production. Government issued ceiling price – the highest price prevailed by traders to consumers – to protect consumers. The amount of *ceiling price* is different among regions. It is aimed to support trading distribution between producers area (surplus) to shortage area (minus) and also to assure market price so that it stays in range of consumer purchasing power. Therefore, all societies can acsess rice (Firdaus *et al*., 2008).

Through Decree of President No. 9 of 2002, government change term of base price of grain (HDG: Harga Dasar Gabah) into a Government Purchase Base Price (HDPG: Harga Dasar Pembelian Pemerintah). In this case, government only assurre rice at particular level in defined location, but not assuring minimum rice price at farmers level. HDPG was applied in Bulog warehouse, not at the farm level. Therefore, an increase of base price that occured in 2002 to 1725 IDR/kg or equal to Rp 2790 IDR/kg and it was not significantly affect to farmer's welfare. Moreover, the change of Bulog's status from non-departmental government agency to public company (Perum) also has another consequence of the orientation of the protection of rice farmers.

Government delegates Perum Bulog in Decree of Ministry of Internal Affairs No. 111 of 2007 to maintain stabilization of domestic rice price by implementing HPP and ceiling price. It is also based on Decree of President No. 2 of 2005 which has been revised in Decree No. 3 of 2007 about Rice Policy. Decree of Ministry of Internal Affairs No. 1109 of 2007 which has been effective since August 2007 states that Bulog re-monopolized price control and rice import. It made Bulog had an authority to control all import policies. Bulog had decided policies support such as buffer stock, regulation of import, soft loan for Bulog's patner, and input subsidy, also special mechanism. Government need to apply import regulation as import price continue to distort domestic rice price for some recent years. It is due to rice price in International market was lower than domestic rice price so it triggered rice smugling in Indonesia.

The other types of price policy which still exist are Pure Market Operation (OPM: Operasi Pasar Murni) and Special Market Operation (OPK: Operasi Pasar Khusus). OPM is part of general price subsidy that is applied when rice price too high because of excess demand in market. It is prevailed by cutting a price of 10 – 15% lower than market price. Meanwhile, OPK is implementation of targetted price policy. The initial purpose of OPK is to distribute food aid on the poor who are susceptible to food security in food crisis during 1998 due to the ineffective OPK. OPK is still applied by Bulog and is targetted to the poor. Since 2002, OPK has been changed to Raskin (Beras Miskin: program in an effort to alleviate the effects of rice price increases on the poor). This program is still continously applied as one of social safety network (Firdaus *et al*., 2008).

4. Metodology

This study uses data of Input-Output table (IO) and Social Accounting Matrix (SAM) of Indonesia of 2008, and parameters of hypotheses from prior studies. To evaluate impact of the increase rice price on sectoral economic performance in Indonesia, we use CGE/MPSGE model. This model was developed based on standart model of IFPRI by Lofgren *et al.* (2002).

Model is described as a square shape, which number of equation is equal to number of variable. There are for blocks on standard CGE model, i.e. price, production and trade, institution, and constraint system (Lofgren *et al*., 2002). Each producer represents production sector, and is assumed to maximize profit by constraint of production technology. Each activity uses factor set up to point as marginal product revenue of each factor equal to its wages (or factor price).

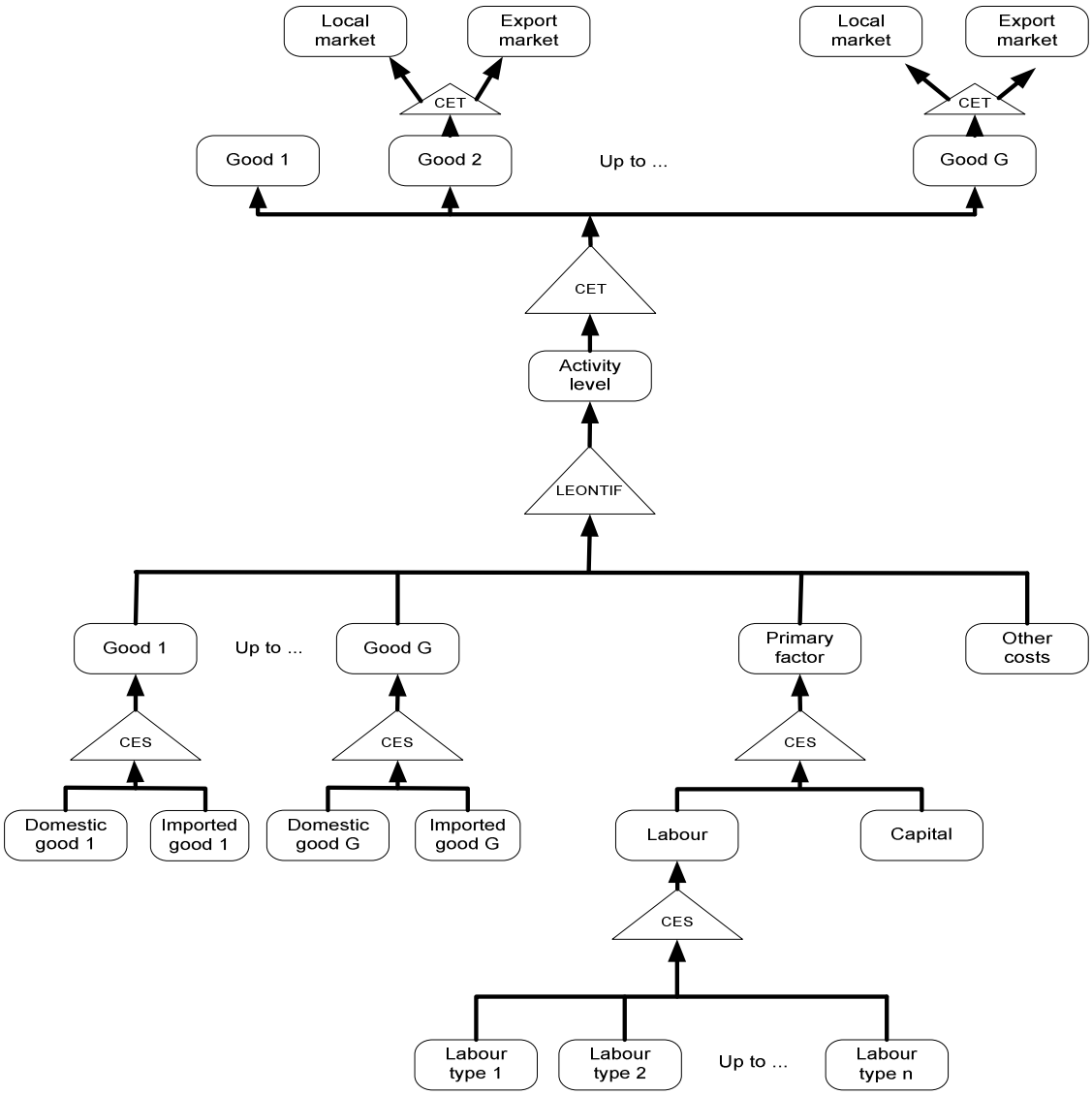
Production function has a nested structure as illustrated on Figure 2, with flow of marketed commodity on Figure 3. On the highest level, activity level is a function of primary factors and agreagate input. Added value and input among agregate, on its moment, are funtion of primary factors and input of each agregate. Finally, intermediate input of import and domestic are separated.

On the highest level, technology is specified by Leontief function on added value and input quantity among agregate of all sectors. Added value is specified by CES function on primary factors. Factor demand on each factor need to be equal to its price, thus we can determine marginal productivity. Input demand among agregate of each activity is CES function of separated intermediate input; therefore, all used intermediate inputs can be substituted between domestic and imported. Total demand of marketed commodity – either consumed domestically or exported – and its product are defined as activity level times constant production of commodity produced on each activity.

Production which is agregatically marketed from each commodity consists of production of it which marketed on each activity on CES production function. Either commodity which is marketed through export or domestic market use constant elasticity of transformation function (CET). The optimal diffusion of export and domestic

sales are derived from first order condition to maximize producer profit of giving two prices and constraint on CET function.

Composite commodity which offered domesitically is sum of domestic production and imported goods. Imperfect substitution of the two resources reflected by their agreagation fuction of CES. It is also called as Armington function. Optimal diffusion of import and domestic output is defined as first order condition to minimize budget of two prices.

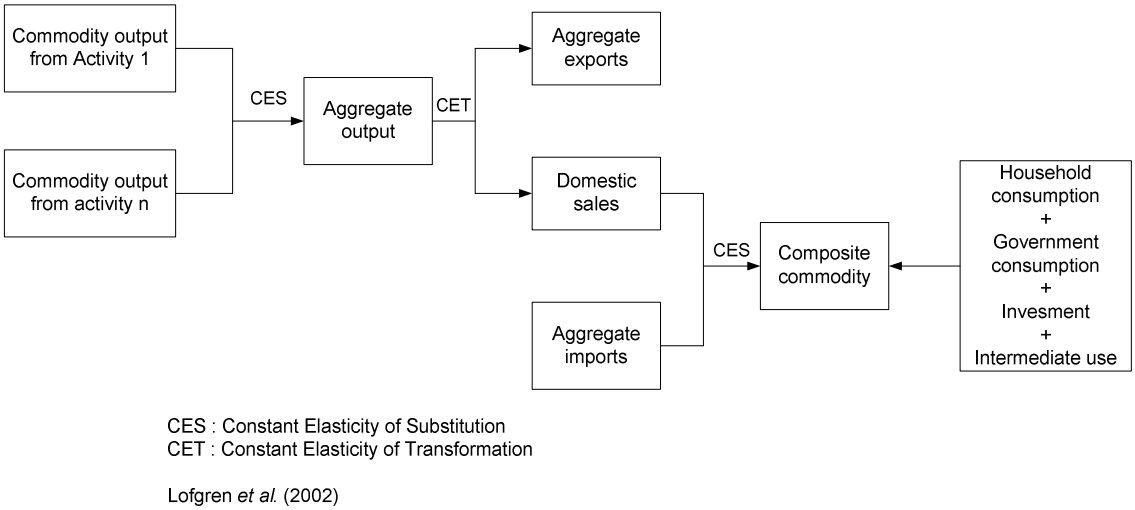


Horridge (2000)

Figure 2. Production Structure

The assumption of imperfect transformation (between export and domestic sales of domestic output), and imperfect substitution (between import and domestic sales of domestic output) enable model to show a better empirical reality of major countries (Armington, 1969).

Total revenue on each factor is defined by sum of activity payment of itself. It flows to domestic institution with a constant share. Domestic institutions are household, firm, and government. Household receive revenue from production factor (directly or indirectly via firm) and transfer from other institutions. Transfer from whole world to household is constant in foreign currency. In fact, all transfer among world and domestic institution and fixed factor in foreign currency.



CES : Constant Elasticity of Substitution
CET : Constant Elasticity of Transformation

Lofgren *et al.* (2002)

Figure 3. Flows of marketed commodities

Household consumption is derived from maximization of their utility function. It covers marketed commodity, buyer on market price that covers commmodity tax and transactional cost, and non-marketed goods (self consumption production). It is possible for a firm to receive transfer from other institution. Government consumption is constant in real term (quantity), while government's transfer to domestic institution (household and form) are Consumer Price Indices (CPI). The total revenue of government is sum of revenue from taxes, and transfer from other institution and rest of the world; and government expenditure is sum of its consumption and transfer. The last instituition is the rest of world which its transfer payment between whole world and domestic institution are recorded, and other fixed factors in foreign currency.

Consumption of household's good is determined by assumption of consumer behaviour. Armington approach (1969) allows variety of goods which is produced domestically and imported goods as imperfect substitution. Therefore, change in relativ price causes some (but not all) substitution between domestic goods and imported goods, based on constant elasticity substitution (CES). In the same way, on export side, based on constant elasticity of transformation function (CET), it is assumed that there is imperfect transformation in production variety, between domestic and foreign market, which is possible to make differences between domestic price of exported goods and its world price.

5. Result and Discussion

In this research, we did a simulation by increase rice price of 5%, 10%, and 15% to examine the impact of the increase of rice price on sectoral economic performance (domestic output, export and import on each sector), and household's welfare in Indonesia.

5.1. Impact on Sectoral Economic Performance

a. Quantity of Domestic Output

In general, increase of rice price has a positive impact on domestic output (Table 1), except on sector of tubers, fertilizer and pesticides industries, and others. When rice price increase of 5-15%, it seems that quantity of domestic output of rice which is produced by rice milling industry will increase of 0.10% (except when rice price increase of 15%). It is responded by milling sector by increasing its production as much as 0.10%. The other sectors that increase its production are beans and other agriculture commodities, fertilizers and pesticides industries (except when rice price increase of 15%), and also services sector There are two sectors that did not change its production, namely corn (except when rice price increase of 10%) and tubers. Meanwhile there is only one sector that its production decrease, namely other industries.

Table 1. The Change of Domestic Output Quantity

No.	Sectors	Baseline (billion IDR)	Changes in Domestic Output Quantity (%)		
			SIM 1	SIM 2	SIM 3
1.	Paddy	161700.00	0.10	0.10	0.10
2.	Beans	14524.60	0.10	0.10	0.10
3.	Corn	73417.32	0.00	0.10	0.00
4.	Tubers	29156.69	0.00	0.00	0.00
5.	Other agriculture crops	881150.20	0.02	0.00	0.04
6.	Rice milling industry	253620.00	0.10	0.10	0.00
7.	Fertilizers and pesticides industries	51833.66	0.20	0.10	-0.60
8.	Other industries	4109130.00	-0.33	-0.60	-0.71
9.	Services	4705260.00	0.24	0.50	0.58

Note: SIM 1: rice price up 5%;SIM 2: rice price up 10%; SIM3: rice price up 15%
Source: own calculations using GAMS/MPSGE

According to the simulation result, rice price muct be controlled somehow; thus the increase less than 10%. Another problem should be concerned is that policy to increase rice price has relatively small effect to the increase of paddy and rice production, and also other sectors. It is even cause the production of industries decrease relatively large. Market structure of rice and paddy and elasticity numbers on each sector has a very important role.

b. Export Quantity

The increase of domestic output which is relatively small in various sector, and in response to the increase of rice price is unable to increase Indonesia's export as shown on Table 2. Whereas, export quantity seems tend to decrease. It indicates two possibilities that: (1) the increase of domestic output more foccused on satisfying needs at domestic market, (2) in general, commodities in Indonesia were produced ineficiently, (3) commodities which are produced in Indonesia unable to compete in international market.

Szeles (2011) also found that export growth of Romanian is depend on 3 main factors: (1) competitiveness of local producers (2) encouragement and support of Romanian production, (3) low exposure at the currency sick. The third factor has direct impact to real income of export.

Table 2. The Change of Export Quantity

No.	Sectors	Baseline (billion IDR)	Changes in Export Quantity (%)		
			SIM 1	SIM 2	SIM 3
1.	Paddy	0.033	0.00	-0.10	0.00
2.	Beans	58.785	0.00	-0.10	0.00
3.	Corn	222.281	-0.10	-0.10	-0.10
4.	Tubers	97.569	-0.10	-0.10	0.10
5.	Other agriculture crops	28258.310	-0.15	-0.28	-0.17
6.	Rice milling industry	267.274	0.00	0.00	0.00
7.	Fertilizers and pesticides industries	2990.072	0.10	-0.10	-0.90
8.	Other industries	1309734.000	-0.38	-0.75	-0.83
9.	Services	140980.400	-0.52	-0.93	-1.01

Source: own calculations using GAMS/MPSGE

c. Import Quantity

The import quantity changes on some sectors due to the increase of rice price (Table 3) shows that domestic production unable to meet domestic needs. It is said that Indonesia was importing all commodities in a huge amount relatively. Although import of other services and industries tend to decrease because by the increase of rice price, but the decrease is very small.

Table 3. The Change of Import Quantity

No.	Sectors	Baseline (billion IDR)	Changes in Import Quantity (%)		
			SIM 1	SIM 2	SIM 3
1.	Paddy	15.614	0.00	0.10	0.00
2.	Beans	8012.348	0.10	0.20	0.20
3.	Corn	835.656	0.20	0.30	0.30
4.	Tubers	150.131	0.00	0.10	0.10
5.	Other agriculture crops	45603.540	0.06	0.11	0.09
6.	Rice milling industry	60.205	0.50	1.00	1.30
7.	Fertilizers and pesticides industries	19743.750	0.10	0.00	-0.60
8.	Other industries	1083235.000	-0.57	-0.02	-1.12
9.	Services	189244.400	-0.05	-0.04	-0.01

Source: own calculations using GAMS/MPSGE

As explained in production structure, domestic demand of intermediate input, final goods, and investment are based on domestic output and import. The fixed rice import shows that the increase of rice price unable to encourage producers to increase their production in a large quantity.

5.2. Impact to household's welfare

The increase of rice prices has a positive impact on income of both households and producer (Table 4), but it has both positive and negative effect on household's welfare. The trend shows that the higher the rice price, the higher the household's real income. However, firms income will only increase about 0.10% if rice price increase as much as 5-10%. There will be no change on firms' income if rice prices increase for more than 10%.
Based on its category, firm's income is the total sum of labor's wages and capital return which contributed by each household. According to Stolper-Samuelson theory, the increase of a commodity relative price will have an impact to the increase of real price of input that is used in processing of related commodity. Therefore, household's income will increase following the rice prices. The research result is supported by Kompas *et al.* (2010) on the effect of rice export policy on national income and the price of rice in Vietnam, that the rising price of rice will cause a rise in the nominal wage rate. The rising level of wages in the labour will increase revenue, but on the farm wage increase will lead to increased production costs.

Table 4. The Change of Households Income

No.	Household Classification	Baseline (billion IDR)	Changes income (%)		
			SIM 1	SIM 2	SIM 3
1.	Farm-worker households	163080	0.40	0.73	0.75
2.	Agricultural-entrepreneur households	645260	0.39	0.78	1.04
3.	Low-income rural households	452930	0.56	1.09	1.34
4.	Non-labor force rural households	158600	0.37	0.74	1.02
5.	High-income rural households	386270	0.44	0.91	1.32
6.	Low-income urban households	637160	0.39	0.78	1.08
7.	Non-labor force urban households	214180	0.43	0.88	1.20
8.	High-income urban households	674800	0.57	1.17	1.63

Source: own calculations using GAMS/MPSGE

Trend that occurs on household's welfare are different from household's income. If rice price increases of 5%, the household's welfare will be increased, unless the unemployement household's welfare in village. If rice price increases of 10%, the more households that its welfare decreases, namely farms household labor, farms household enterprise, non-employement households, and low-income city households. If rice prices increase of 15%, households of non-labor force in village, and low-income households in the city. If rice price increase of 15%, thus it will decrease welfare of households of non-labor force in the city.

The research result is supported by Pudjiastuti *et al*. (2013) of effects of domestic sugar price increase on household's welfare in Indonesia. It is said that the higher sugar price will cause the household's welfare decrease. The increase of a commodity price will decrease the purchasing power of consumer.

6. Conclussion

The rising rice prices of 5 – 15% will increase domestic output of rice and paddy as much as 0.10%, and other sectors, except corn, tubbers, fertilizer and pesticides industries; decrease export quantitiy, except rice miling and other rice sectors; and increase import except fertilizer and pesticide industry, and others services sectors. The real income of households and producers will increase, but the government's real income have no improvement.The household's welfare decrease as higher as that of rice price.

The government needs to pay more attention to those facts, because it would increase domestic output of rice, paddy, and real income of both households and firms. However, it will decrease the household's welfare. Thus, policy of rice self-sufficiency needs to examine the impact of non-price policy either partially or simultanously (combination of price and non-price policy).

The further research on the same topic is possible to use static CGE with different assumption, such as production fuction which is decreasing return to scale, and/or the uncompetitive market. The research using dynamic CGE can be used to analyze the long-term effect.

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