The Rise in International Food Prices:
The Impact on and Policy Implications for Indonesian Food Security

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Contributed Paper at the

Thirteen Annual Conference on Global Economic Analysis

United Nations Conference Centre, Bangkok, Thailand, June 9-11, 2010

ABSTRACT

The rise of international food prices have always been a challenge for Indonesia, especially when they apply to products important for food security. The impact of increased price on Indonesian macro and sectoral economic performance is evaluated with a computable general equilibrium model for Indonesia. In addition, a simultaneous equations model (2SLS) is used to assess the economic behavior and the impact of increased price at the farmer household level.

The results reveal that increased price is associated with an increase in real GDP, real household consumption, real wages of farmers and the consumer price index, and sustained food security for rice and maize. However, for soybeans higher prices led to decreased food security because of the high import share. At the level of Farmer Households (RTP), an increase of international food prices is associated with increases in consumption, farm wages and income.

The policy of strengthening Indonesian food security can be implemented through coordinated agricultural policy within central and local governments, improvements in agricultural infrastructures and institutions, and by strengthening and adopting research and development to improve food crop productivity.

Keywords: International Food Price, Food Security, CGE model, 2SLS

1. Background

Identification the current global economic situation is associated with global economic slowdown. IMF (2008) projected global economic slowdown will be persistent until the second semester in 2008 before experiencing a gradual recovery in 2009. The economic turbulence is not just happening in developed countries as the locomotive of world economy, but also in developing countries with similar phenomenon. Developing countries are predicted to be more struggles to maintain their growth above the trend of world economic growth.

In many countries, the main trigger factor of inflation is the soaring prices of food and fuel oil. Prices of food commodities have increased prices dramatically since the year 2005. FAO (2008) compile multi-factors that are behind these crucial issues in a simplification of supply and demand. The supply side factors include: Firstly, climate change has contributed to higher risk on food crop production. Secondly, limited global food reserve has implications for price increases. Historically, there has been a gradual reduction in food supply of cereals since the mid 90's. Weather-related production shortfalls have been identified as a major factor underpinning world cereals prices, especially in Australia, U.S., EU, Canada, Russia and Ukraine (OECD-FAO 2007). The back-to-back droughts in Australia in 2006 and 2007 reduced grain exports by an average of 9.2 million tons per year compared with 2005, and poor crops in the EU and Ukraine reduced their exports by an additional 10 million tons in 2007. The production shortfall was most significant in wheat, where global production declined by 4.5 percent in 2006 and then increased by only 2 percent in 2007. Global oilseed production rose by 5.4 percent in 2006/07 and declined by 3.4 percent in 2007/08. Thirdly, international energy prices cause higher intensity of rising food prices because fuel not only crucial for on farm activity, but also on the distribution and transportation activities. The combination of higher energy prices and related increases in fertilizer prices and transport costs, and dollar weakness caused food prices to rise by about 35-40 percentage points from January 2002 until June 2008 (World Bank, 2009).

Meanwhile, demand-side factors that affect food commodity prices signals include: **Firstly**, the transformation of demand for food commodities (carbohydrate) to the more protein based food such as livestock products (egg, meat, and dairy products). Again, the dietary transformation implies the excess demand in the international cereal market. **Secondly**, biofuels have contributed to conversion of food into biofuels, particularly on sugar, maize, cassava, oil seeds, and palm oil. High fluctuation on fuel's international market has developed biofuels as an alternative source of energy. The rapid rise in oilseed prices was caused mostly by demand for biodiesel production in response to incentives provided by policy changes in the EU beginning in 2001 and in the U.S. beginning in 2004.

The portrait of the development of international agricultural commodity prices which has become the barometer for Indonesia's agriculture performance is inevitably like a spinning wheel. After reaching its peak in 2008, the development of international food commodity prices (except for sugar and meat) went through a turning point and decrease on various levels (Table 1). The Crude Palm Oil (CPO) experiencing largest price decrease and followed by rice.

Table 1. The Development of International Agricultural Commodity Price Growth (in Percentage)

Agricultural Commodities	International Price				
	2007	2008	2009	January 2010	February 2010
CPO (U$/mt)	719	863	664	742	754
Rice(US$/mt)	332	700	589	598	585
Soybean (US$/mt)	317	453	379	359	345
Maize (US$/mt)	163	223	166	167	162
Wheat (US$/mt)	255	326	223	201	194
Sugar (Cents/lb)	10.0	12.5	18.2	28.0	26.4
Beef (Cents/lb)	118	121	120	134	142

Source: IMF (2010)

The volatility of international agricultural prices are assumed as a new pattern that has never happened in the last three decades. Although international agricultural commodity price volatility tends to subside since the end of 2008, but projections indicate that international agricultural prices (at least until the medium term) will not be returned to the level of "normality", so it will be relatively higher compared to historical price levels. Indonesia as a nation overwhelmed by the abundance of agricultural resources will gain benefits that are significant to the Indonesian economy through the increase of export, production, government income, and poverty alleviation.

Unfortunately, Indonesia is assumed unable to maximize the transitive price shock to be an opportunity to increase the economic performance because: **firstly**, the productions of prime export commodities are concentrated with low added value characteristics and low supply response. The majority of export commodity growth is based on price changes instead of quantity changes. This explains the low response to price changes. **Secondly**, the government is more focused on allocating the profit of international commodity price fluctuations on subsidy transfer, which is very different from the government in the 70's who prefers to focus on productive investments such as: infrastructure, irrigation, and agricultural services (World Bank, 2009).

On micro level, agricultural commodity prices volatility has a potential to negatively affect various segments of the economy. Moreover, Indonesia still faces poverty-related problems. From Susenas data (Figure 1), it can be seen that poor households, particularly the poor household group that below poverty line spent most of their income to accomplish food with rice 22.4% and other foods 34.7% (see figure 6). However, only 24.4 , 6.5 and 2.4 per cent of total expenditures they used for other non-food, electricity, water, gas and kerosene. This reveals that there will be significant impacts of the rising of food price.

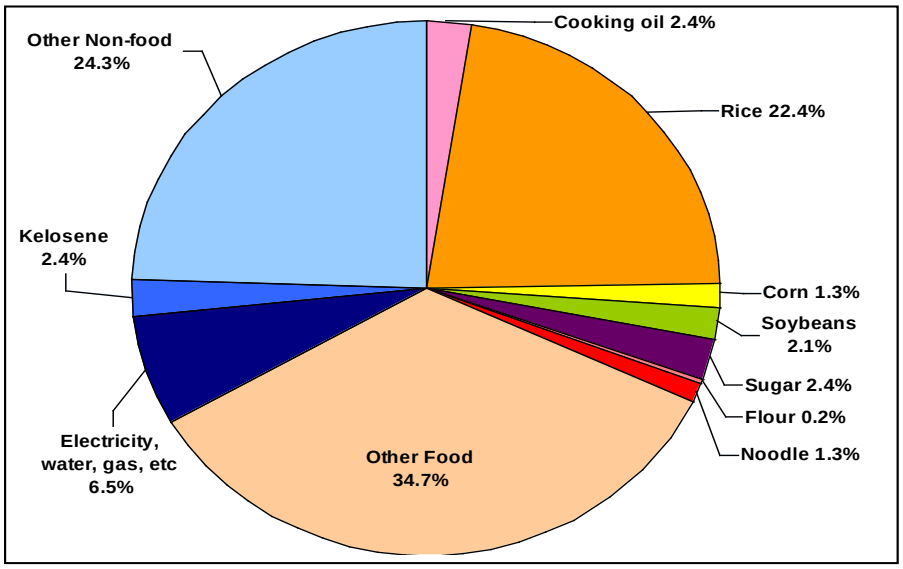

Figure 6. Poor Household Expenditures

Source: Susenas 2007 Panel

The reality of Indonesian food consumption pattern shows that the per capita food consumption is focused on rice (creating the impression of "*single staple food*") with the consumption/capita/year reaching 130-139 kg/capita/year. Whereas other food consumptions are relatively less, such as: maize (62.0 kg/capita/year); soy beans (9.10 kg/capita/year); sugar (15.6 kg/capita/year); chicken (4.5 kg/capita/year); egg (3.5 kg/capita/year); beef (7.10 kg/capita/year); fish (21.8 kg/capita/year) and milk (8 liter/capita/year). Moreover, the food self-sufficiency issue is more chronic because of the large share of food sufficiency from importation source. In the period of 2004 – 2006 the import of rice reached 0.74 percent; soy beans 60 – 65 percent; maize 10.9 percent; sugar 19.7 percent; milk 92.0 percent; and beef 4.1 percent (BPS, 2008).

The focus of this research is in identifying "the impact of international agricultural prices volatility" in the "food security" concept. An operational approach of "food security" is assessed through the integration of the impact of food security in the macro and micro levels. With this approach, the household food security is integrated with the growth of macro economy and national food market which are assumed to be affected by the international agricultural commodity market volatility. Simatupang (2007) argued that this integrative view is based on: **firstly**, the family income - especially families with low income - will be raised by economic growth. This means that the economic growth should be more pro-poor; **secondly**, the food market is integrated both spatially and vertically, so the so-called national food market is an aggregate of micro markets in the community level; **thirdly**, agriculture and rural development is the driving of pro poor growth as well as the anchor of food market stability. Because agricultural sector is dominated by the food cops sub-sector, food market stability should be obtained in order to strengthen food security and foster economic growth.

2. Specific Objectives

Facing an increase of the international food prices along with its inherent risks, a serious implication may increase the vulnerability of Indonesian food security. Security concept which includes "food availability and the society's accessibility to equitable and affordable food" as stipulated on the mandate of Decree **Number 7/ 1996** will be more obstructed. The transmission of food commodity prices instability versus food security is crucial to be studied if the focus of the analysis is concentrated on the micro level (farmer's household/RTP).

The dualism of the RTP role as a producer and consumer of food consequences welfare effects that should be questioned. In fact, the majority of Indonesian low-income society lives in the rural areas and works in the agricultural sector. In 2006, the population of poor Indonesians are about 39.10 million (17.7 percent) and 63.4 percent of those lives in the rural areas and are mostly **small scale farmers** or land ownership < 0.5 Ha (Department of Agriculture, 2008). The poverty rate in the agricultural sector or **RTP** will automatically affect the food security in the household level and low investment, low capital, also low expenses for education, health, and family savings. Based on the background, the substantive objectives of the research are:

Firstly, analyze the impact of international agricultural price increase on Indonesian macro and sectoral economic performance: the perspective of food security **Secondly,** analyze the impact of international agricultural price increase on food production and consumption patterns in the farmer's household (RTP) level.

3. Methodology

3.1. Wayang 2005: Empirical Features

The structure of the model itself is relatively conventional. *Wayang 2005* belongs to the class of general equilibrium models that are linear in proportional changes, sometimes referred to as Johansen models, after the seminal work of Johansen, which also used this approach. *Wayang* shares many structural features with the highly influential ORANI general equilibrium model of the Australian economy (Dixon, *et al.* 1982), which also belongs to this Johansen category, but these features have been adapted in light of the realities of the Indonesian economy.

Industries

The national model contains 74 producer goods and services produced by 74 corresponding industries - 21 agricultural industries, 9 mining industries, 14 food processing industries, 25 manufacturing and utility industries and 5 service industries. Each industry produces a single output, so the set of commodities coincides with the set of industries.

Commodities

Wayang 2005 contains two types of commodities - producer goods and consumer goods. Producer goods come from two sources: domestically-produced and imported. All 74 producer goods are in principle capable of being imported, although some have zero levels of imports in the database, services and utilities representing most of the examples. The 20 consumer goods identified in the model are each transformed from

the producer goods, where the proportions of domestically produced and imported producer goods of each kind used in this transformation is sensitive to their (Armington) elasticities of substitution and to changes in their relative prices.

Factors of production

The mobility of factors of production is a critical feature of any general equilibrium system. 'Mobility' is used here to mean mobility across economic activities (industries), rather than geographical mobility. The greater the factor mobility that is built into the model, the greater is the economy's simulated capacity to respond to changes in the economic environment. Four types of labor are identified: farmer, operator, administrator and professional. All four types of labor are assumed to be fully mobile across all sectors.

Households

The model contains ten major household categories - seven rural and three urban - differentiated by socio-economic group, as identified in the 2005 SAM. The sources of income of each of these household types depend on their ownership of factors of production and are estimated from the household income and expenditure survey called *Susenas*.

Policy Simulation

The shock is exogenous changes to international agricultural prices. The short-run simulation is the actual price increase observed over the period 2005 to 2008, expressed as total percentage change in the price of the commodity concerned relative to the Manufacturing Unit Value Index.

Table 2. The Magnitude of International Agricultural Commodity Price Changes (in Percentage)

Agricultural Commodities	Short Run Changes (2005-2008)
Rice	109.3
Wheat Flour	91.0
Other Flour	18.0
Maize	125.5
Soybean	91.6
Soybean Products	29.2
Other Cereals	18.0
Other Food Crops	18.0
Sugar	15.9
Palm Oil	123.1
Cocoa	53.0
Animal Vegetable Oil	94.2
Coffee and Tea	41.5
Other Food	16.0
Tobacco	3.1
Rubber	71.0
Rubber Products	40.8
Livestock Products	2.5

Short-run closure

The current account deficit is assumed to be endogenous, meaning that its size can change with the impact of the shocks. The volume of rice imports is fixed exogenously, reflecting the official ban on rice imports introduced in 2004. In recognition of the fact that increases in the international price of rice could otherwise induce exports of rice and that these exports are currently banned, the volume of rice exports is similarly held fixed, by means of an endogenously adjusting export tax.

3.2. Farmer Households Economic Model (RTP)

The econometrics model is used to analyze the behavior of Farmer Households (RTP) of rice, maize, and soybeans through simultaneous equation system. The model is specified into four blocks namely: (1) Production, consist of Production, production area and productivity equations, (2) Input production, consist of fertilizer and labor equations, (3) Equation of farmer households (RTP) income, (4) Equation of food consumption, non food, savings and investment. A purposive survey is conducted to identify the impact of international food commodity price fluctuations to Farmer Households level. The farmer household samples were collected in two villages which have the big share on rice and maize volume in Garut, West Java, Indonesia with total 68 respondents.

Model Specifications of Production and Consumption Patterns of Rice and Maize Farmer Households

Equation 1- Block of Production Consists of Area Production and Productivity

Production equation in the study is formed by the structural equation of production (A). Structural equation of the level of productivity is denoted by Q. Total production is the multiplication of the production area (Ha) with productivity, thus the total production of rice and maize can be described by equation yield = A * Q

Equation 2 - Block of Input Consist of Fertilizer and Labor

Structural equation of input consists of Unpaid labor (*TKK*), Paid Labor (*TKN*) and Use of Fertilizers (*Urea, TSP,* and *KCl*) for each commodity. The use of labor (paid and unpaid) is determined by working hours within the year of observation, which is 2008. The price level for inputs (fertilizer and labor) and output prices is the actual producer price (RTP).

Equation 3 - Block of Income

The on farm income of RTP (ICP) and total income of RTP (ICTOTAL) are equation of identity, while off-farm income (ICNPERT) and the supply of agricultural labor (TKPERT) is a structural equation. Non-agricultural income constitutes all types of revenue received RTP other than on farm activity. Including income received from land rent and other income assets. Thus, total revenue RTP (ICTOTAL) consist income from on agricultural and non-agricultural sectors, in addition to income assets.

Equation 4 - Block of Food Consumption, Non Food Consumption, Savings and Investments

Household food consumption (KONSPG) is derived from consumption of own farm and consumption which are purchased in the market. Food consumption consists of consumption of carbohydrates and protein such as rice, tubers, instant noodles, side dishes and edible oils. Non-food consumption (KONSPAG) consist cigarettes, toiletries, fuel, and cost for electricity. Family savings (SAVING) in this study is saving in the bank, as well as changes in family assets during the period. Expenditures for education and health expenses (ISDM) in this study were separated from spending on consumption. The idea is that education and health costs will improves the quality of human resources within the family or the human resource investment (ISDM). Other type of investments in this study is investment on agricultural equipments (INVALAT) during the year of observation.

4. Impact of International Agricultural Price Increase on Indonesian Macroeconomic and Sectoral Performance: The Perspective of Food Security

The impact of scenario of international agricultural price increase on macroeconomic performance can generally be seen through the changes in the sign and magnitude of macroeconomic variables such as national output (proxied by real GDP), inflation (GDP deflator). The behavior of the real GDP itself can be analyzed from either the income side or expenditure side approach. From expenditure side, real household consumption increases in each case but real GDP barely changes. When international prices change the more favourable terms of trade are not accounted for in calculating the value of national output, measured as real GDP. Base period prices are used. Although real GDP remains virtually unchanged, the improvement in the terms of trade means that higher levels of domestic consumption are now possible. Real household consumption is a much better welfare indicator than real GDP when the external terms of trade are the source of the shock.

From the income side of GDP, administrator and profesional labors will obtain the highest negative impact (-5.07 and -5.39 percent) from the international agricultural commodity prices increase. Eventhough Indonesia has resource endowment to produce the agricultural product, the high international price on agriculture could not give the positive impact on the Indonesia net export. An increase of consumption is fulfilled by an increase on import volume (2.26 percent). An increase of inflation because of high domestic commodity price also contribute to the low competitiveness of Indonesian product, even though there is a real devaluation.

Table 3. The Impact of International Agricultural Price Increase on Indonesian Macroeconomic Performance (Percentage Change)

Macroeconomic Variables	(Percentage Change)
Real household consumption	2.24
Real GDP	0.10
Export volume index	-1.84

Import volume index	2.26
Terms of trade	3.17
Real devaluation	-4.32
Real wage of farmer	17.13
Real wage of operator	-0.27
Real wage of administrator	-5.07
Real wage of professional	-5.39
GDP Deflator	6.78

Source: Author's Simulation

The impact of international agricultural price increase at sectoral level can be seen from commodity prices and output (see Table 3). It shows that the impacts on outputs vary among sectors, but generally almost all of agricultural sectors face the positive impact of output. Soybean, Palm, and animal vegetable oil consequence the highest response to the price with positive percentage change in output. However, for other sectors such as cassava, fruit and vegetables, and other food crops which compete with the sector that has a high international price reduce its output. This occurs since the farmers are reasonable to response to the high price and shift to "attractive" sectors.

Among food commodities, rice is becoming the most strategic commodities in Indonesia. These products involve 15 million farmers and are consumed by 220 million people (TREDA 2008). Rice supply is the major focus on Indonesia's food security policy. Rice imports have attracted the most prominent discussion and policy debate. and draw attention to the conflict between protecting both domestic consumers and local farmers at the same time (Timmer and Simatupang 2008).

Focused on on rice performance, the rice spiraling price will not cause a massive expansion on production. On the other hand, the output is decreasing with slight magnitude (-0.48 percent). Trade restriction (import and export ban), has separate domestic and international market. Government of Indonesia believes that the rice isolation will protect producer as well as preserve domestic supply. The policy seems reasonable even if Indonesia could export rice to international market because of price disparity. Rice surplus in Indonesia is "artificial" because rice surplus condition is only happened for approximately 6 months within one year. Some of the key drivers to boost the rice's supply response are underperformed; such as lack of investment on agricultural infrastructure, low replication of Research and Development, scarcity of fertilizers. Considering the characterization of rice economy, it could be postulated that the transmission elasticity of rice from international to domestic market is relatively small. Therefore, Indonesia would still manage food security on rice.

Table 4. The Impact of International Agricultural Price Volatility on Indonesian Sectoral Performance (Percentage Change)

Sectors	Output	Export	Import
Paddy	-0.49	-28.17	95.13
Maize	7.67	146.42	-583.14
Cassava	-1.35	0	0
Soybeans	119.62	94.74	-106.27
OthFoodCrop	-2.03	-6.98	25.28
Fruitveg	-8.23	-31.35	114.55
CerealFdCrp	-1.17	-4.62	26
Sugarcane	0.61	-19.03	32.88
Coconut	9.88	-21.74	119.47
OilPalm	42.83	98.84	-120.61
OthEstCrop	-7.40	-16.61	0.49
Tobacco	1.45	3.03	0
CoffeTea	7.94	21.36	-44.12
Clove	0.53	-20.44	37.45
Cacao	25.12	26.59	-40.18
OthAgric	0.57	14.46	-8.76
AnmlVegOil	47.79	56.62	-176.22
Rice	-0.48	0	0
WheatFlour	27.24	38.3	-215.59
OthFlour	2.18	2.73	-16.9
Sugar	0.7	1.5	-3.29
PeeledGrain	-5.71	-4.78	24.72
SoybeanProd	-2.18	3.35	-38.33
OthFoodInd	3.65	-0.1	-0.55
AnmlFeed	-3.44	-5.36	3.46

Source: Author's Simulation

Meanwhile, the price incentive of Crude Palm Oil (CPO) that arouse in the international markets to make upstream to downstream producers of palm oil output increase (42.83 percent) and response with substantial exports (98.84 percent). The momentum is also projected to give a tremendous positive impact on soybean's output by 119.62, and increase export by 97.74 percent. However, the condition is not adequate to reduce the reliance on importation. This is due to the existing performance of soybean demand is fulfilled by import (Table 5). Therefore, exports increased by 97.74

percent in essence scale will only increase the existing level of soy exports of Indonesia with a small portion (Table 5). Indonesian maize exports increased by 146.42 percent due to declining stocks of cereals supplies to meet demand of biofuel in international market. Nevertheless, the database of sectoral export of maize showed that Indonesia only shows a relatively small value that amounted to 71 million Rupiah (Table 4) so that the export trend will not the maize security in Indonesia.

Table 5. Database of Indonesian Sectoral Output, Import, and Export on 2005 (in Million Rupiah)

Sectors	Output	Import	Export
1 Paddy	82171,11	0,66	0,01
2 Maize	12783,46	46,36	71
3 Cassava	3012,38	0	0
4 Soybeans	2510,17	3286,23	3,63
5 OthFoodCrop	5538,46	15,7	92,98
6 Fruitveg	21520,66	226,73	330,77
7 CerealFdCrp	1313,2	7906,68	30,71
9 Sugarcane	6473,51	1,9	0,42
10 Coconut	5653,1	0,17	177,05
11 OilPalm	19091,57	38,23	166,16
12 OthEstCrop	4538,06	5889,58	1886,7
13 Tobacco	1824,4	0	0
14 CoffeTea	5660,36	23,24	3918,76
15 Clove	2248,57	0,01	119,96
16 Cacao	918,07	398,63	3979,9
17 OthAgric	311,67	14,53	137,01
18 Livestock	38516,46	236,77	278,21
19 WoodFrstPrd	21459,16	349,06	2132,92
20 SeaFishPrd	15601,3	12,1	3357,77
21 LandWtrFish	9407,66	0,52	398,26
33 AnmlVegOil	32887,9	146,67	41200,73
34 Rice	25864,61	39,74	106,03
35 WheatFlour	10815,75	369,86	116,2
36 OthFlour	5481,4	42,89	760,97
37 BkryPasta	2742,47	3,42	1089,43
38 Sugar	8561,75	1455,76	273,63

39 PeeledGrain	2326,38	14,78	341,62
40 ChltCofeeTea	8457,44	89,14	3278,02
41 SoybeanProd	3594,22	0,67	44,7
42 OthFoodInd	9273,4	641,47	3042,13
43 AnmlFeed	23529,74	1736,72	79,42

Source: The 2005 Input-Output Table of Indonesia

5. The Impact of International Agricultural Price Increase on Food Production and Consumption Patterns on the Farmer's Household (RTP) Level

5.1. Food Consumption Pattern in on the Farmer's Household (RTP) Level

The major allocation of total income of farmer's households respondents in both villages (Desa Sindang Galih and Karangsari) is classify to food an non food consumption, and the rest is allocated for agricultural investment, investment on human resources, and saving. Table 6 presents the decomposition of expenditure of Farmer's Households. As it is expected, the table reveals that consumption for food reach theportion . The value of food consumption is calculated based on market price and about 15-20 percent of the food consumption is fulfilled by on farm activity (rice and maize).

Table 6. Total Expenditure for Food and Non Food Consumption in 2008

\	Villages	
	Sindang Galih (Rp)	Karang Sari (Rp)
Food Consumption	8.236.968	8.944.633
Non Food Consumption	4.062.845	5.575.081
Total Consumption	12.299.813	14.519.714
Members of the Household	5	4

Source: Author's Simulation

The concept of food security is reflected by food availability and household's purchasing power. In this study household's purchasing power is proxied by the average of food consumption per capita, which is converted with rice. One kilogram of rice contains 360 Kkal energy and 6,8 grams of protein (Asmarantaka, 2007). From the information in Table 6, we can calculate average food consumption per capita (Table 7) by divide food consumption with members of the households. After the conversion with rice, it can be concluded that farmer's households samples (RTP) in *Desa Sindang Galih* and *Karangsari* are "*secured*" based on that existing food consumption pattern. The average food consumption per capita are exceeding the technical coefficient. The

technical coefficient of “food security” in farmer’s household level is equivalent with 2500 Kkal of Energy and 55 grams of protein.

Table 7. Average of Food Consumption Per Capita on Farmer’s Household Level

	Sindang Galih	Karang Sari
Food consumption (Rp) :		
- average food consumption per capita /year	1 .647. 394	2 .236 .158
- average food consumption per capita/day	4. 513	6 .126
Rice Price (Rp/Kg)	4. 340	4 .350
Conversion average food consumption per capita/day with rice	1,04	1,41
Energy equivalent (Kkal)	3.744	5 .076
Protein equivalent (Gr)	7,072	95,88

Source: Author’s Simulation

5. 2. The Impact of International Agricultural Price Increase on Food Production and Consumption Patterns in the Farmer’s Household (RTP) Level

Maize area of production (AJG) is positively correlated highly and influenced by the cost paid and unpaid labors. Rice price have a significant negative correlation with Maize area of production. On the other hand, price of maize have a positive relationship with Maize area of production, although not significant

The use of urea fertilizer for maize and rice determined by output prices, fertilizer prices itself, and the area of production with relatively high coefficient of determination. When there is a price fluctuations of rice, maize and urea prices, will affect the use of fertilizers and consequently decrease the productivity level of maize and rice.

The equation for labor on maize is better than rice, on both paid and unpaid laborers, since it has higher determination coefficient. Use of labor determined by the total production area (maize and rice) and the number of family members. Non agricultural income (ICNPERT) is influenced by health-education expenses (ISDM) and Consumption (KONST). This means that higher costs for health and is fulfilled by revenues from non agricultural sectors. It suggests that income from the agricultural sector has been incapable to fulfill the full cost of farmer households. Total consumption expenditure (food and non food) is determined by total income (agricultural and non agricultural sectors), number of families (JK). While Savings (the SAVE) having a positive relationship with income outside agriculture (ICNPERT).

The high agricultural price simulation is represented by 20 percent rise for rice and maize rose by 0.25 per cent. The impact will increase total consumption, while

income from of non agricultural sectors and the savings decrease. Expected productivity of maize and rice increase and boost farmer households income from agricultural sectors. Because total consumption is strongly influenced by total income, the decline of non agricultural income is compensated with agricultural income from rice and maize.

6. Conclusion and Policy Implications

The impact of agricultural price volatility has drawn concern for Indonesian food security. *Wayang 2005* Computable General Equilibrium is assessed to analyze the Indonesian macro and sectoral economic performance from food security perspective. In short-term, the simulation will increase real GDP, real household consumption, real wages of farmers and the consumer price index. Detailed analysis on sector level which focusing on four commodities such as rice, maize, soybean, and CPO explain various implications. For rice as case study, Government has undertaking the protective actions by apply trade (import and export) ban and the output is decreasing with slight magnitude (-0.48 percent). Therefore, Indonesia is capable to maintain food security on rice. Maize and palm oil has relatively same response due to the price volatility. Production and export will increase, while imports declined. Different implications occurred for soybean. Despite of the enormous increase on production and export, the existing database to meet the consumer demand is heavily relying on importation.

The high agricultural price increase simulation is represented by 20 percent rise for rice and maize rise by 0.25 per cent. The impact of high agricultural price on the household level will increase total consumption, while income from of non agricultural sectors and the savings decrease. The concept of food security is reflected by food availability and household's purchasing power. In this study household's purchasing power is proxied by the average of food consumption per capita, which is converted with rice. After the conversion with rice, it can be concluded that farmer's households samples (RTP) in Sample villages are "*secured*" based on that existing food consumption pattern. To maintain food security, urgent actions required to enhance policy synergy between central and local governments, improve agricultural infrastructure and institutional markets, and by strengthening and adopting research and development to improve food crop productivity.

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