# Cek Plagiasi Agnes Food Self Sufficiency Scenario Of Indonesia: The Impact Of Land Expansion And Increasing Food Prices

*by* Agnes Pudjiastuti
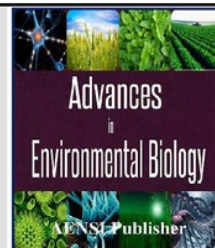
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# Food Self Sufficiency Scenario Of Indonesia: The Impact Of Land Expansion And Increasing Food Prices

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**ABSTRACT**

The purpose of this study is to analyze the economic wide impact of the expansion policy of cropland and increasing prices of rice and maize to food self-sufficiency, balance of trade, and household welfare in Indonesia. Analyses were performed with a static multi sector computable general equilibrium model with 12 production sector based on data from social accounting matrix of Indonesia 2008. The results showed that the policy of expansion of cropland by 5-10% and 10-20% rise in prices of rice and maize have a positive impact on food self-sufficiency, but  the impact on trade balance is not significant. Increasing price on commodities such as rice and maize expected to provide incentives and greater revenue for agricultural households in fact does not cause changes in the welfare of the households. Improved welfare due to the expansion policy of cropland and rising prices of rice and maize is experienced by non-agricultural households in rural and urban areas. Increased production does not create an increase in exports, while imports of food did not change from before. It shows that the increase in production is generally used to meet domestic demand that continues to increase.

**KEYWORDS:** Cropland,  food price, food self-sufficiency, trade balance, welfare

## INTRODUCTION

The provision of food, especially rice, in sufficient quantities and at reasonable prices is the main priorities of national development. Rice is the staple food of more than 95% of the people of Indonesia, and its cultivation provides employment to about 20 million households of farmers in the countryside. With a population of Indonesia predicted to reach 263 million in 2020 and the assumption of rice consumption of 137 kg per capita, the demand of rice in 2020 will reach 35.97 million tons. When domestic production is unable to meet those needs, the dependence on imported food will continue and become burden on foreign exchange.

Various alternative policies developed by the government to achieve food self-sufficiency and independence. One is by extending farmland. National rice production in 2012 reached 69.05 million tons of Unhusked Dry Rice (GKG) or an increase of 3.29 million tons (5.00 percent) compared to production in 2011. The increase in production occurs due to increased harvested area 239.80 thousand hectares (1.82 percent) and the increase in productivity by 1.56 quintal / hectare (3.13 per cent). However, the increase in productivity is driven through various intensification program scenarios, challenged by the demands of the removal of subsidies on fertilizers. Policy on subsidy removal should be done as soon as possible because Indonesia has ratified free trade agreements at both the Asian level (Asean Economic Community/MEA) as well as at world level.

Scenario for food self-sufficiency policy is implemented through new cropland(rice fields) and this will expand the land available for rice fields that is expected to produce more rice. Increased rice production will

lead to higher contribution to gross domestic product. This will reduce Indonesia's dependence on imported rice and it will help improving the trade balance and the exchange rate. A positive trade balance gives Indonesia a greater economic ability to finance imported commodities that do not have a comparative advantage. Higher production rate of rice is expected to bring it more affordable to the public. However, in fact, factors that determine the price of rice have also changed. The population continues to increase so that rice demand is also increasing and pushing up the price of rice. Actually, increasing price of rice and other food commodities will have a positive impact on the household income of farmers and producers as well as providing incentives that encourage the multiplier effect improving the welfare of farm-households but it can negatively affect the welfare of urban households as a consumer.

In a partial approach, adjustments that occur are in response to the changing economic environment, for example due to an increase in supply or commodity prices, thus to rediscover a new balance, it is limited only by commodity prices, *ceters paribus*. The price of other commodities are considered permanent (fixed) or constant or considered to have no association with these commodities. But in fact this is not the case. Within the framework of general equilibrium, referring to the Walras Law, adjustments taking place in a market will interact simultaneously and cause feedback on other markets [16] until a new general balance is found in all markets. Price formation occurs in a particular market generally affects the other markets and, in turn, causes a reaction on the overall economy. So, therefore, it is not appropriate to discuss the balance only with reference to the commodity as demand and supply of the commodity in the market depends on the market price of other commodities [8].

Under the general equilibrium approach, Anindita [1] shows the impact of changes scripted through improved marketing efficiency in agriculture not only on the performance of food security and household welfare in Indonesia, but also on other sectors of the economy. Improving the efficiency of marketing done by improving the performance of farmers to participate in marketing activities, improving information systems of prices and markets, as well as improving transport facilities and infrastructure, cause part of the price received by farmers is higher so as to provide an incentive to increase production, while the price paid by consumers is lower. The realization of stability on food prices, both for producers and consumers, will eventually realize better food availability and food access for the community, which would then be linked to increase in the absorption of food, so that people will be more prosperous. Maipita *et al.*, [10] showed that reducing food subsidy in Indonesia up to 43,2% and divert it to food crops sector can increase its welfare which indicated with reducing poverty up to 0.442%. Those indicated that some policies can influence the price of agriculture change furthermore the expansion land will have effect to the production as well as the welfare of producers and consumers.

Increased in land will increase the production means increase in the supply of commodities subsequently leading to declining domestic prices of commodities. The good side is the manufacturer responds positively by offering the products to the export market. This means that an efficient marketing can improve product competitiveness, trade balance, and the exchange rate. Increasing marketing efficiency to 5-8% will boost economic growth by 1%. Research by Suryadi *et al.* [14], also by using a general equilibrium approach, demonstrates the positive impact on the increase in the domestic price of rice by 5-15% on the domestic production of rice, beans, and other foodstuffs. However, the scenario on the increase in rice prices decreased exports and increased imports of those products; thereby increasing household income, yet decreasing welfare level. Meanwhile, research by Mardiyah *et al.* [11] which focus on trade reform shows import tariff reduction and elimination on food commodities have a positive impact on the increase in domestic product commoditiesof rice, beans, and maize. However, in general, the reduction and elimination of import tariffs on food commodities only weaken food security in Indonesia for increased food production does not encourage exports, but on the contrary, imports of food commodities is increasing.

Previous studies mentioned above indicate the importance of the application of general equilibrium framework in evaluating various scenarios of food security policy because the impact caused by the policy is the main object of the research, and it comprehensively affects other sectoral economic performance. During this time, most of the policy evaluation and research conducted is generally only based on a partial equilibrium.

This study aims to examine the effects of cropland expansion and increasing food prices on sectoral economic performance in Indonesia by using a general equilibrium approach applied through a static CGE model (Computable General Equilibrium).

*Theory of Agricultural Development and Food Self-Sufficiency:*

Agricultural development can be seen as the provision of various things needed for the expansion of modern industrial sectors such as food, savings, and others. Meanwhile, in an open economy, the variety includes up to foreign investment, imports, and others. Thus the role of agriculture is much more complex. The role of agriculture in economic development is very important [5] because most members of society in poor countries are dependent on the sector. Therefore, the only way to improve the lives of people in this country is to improve the welfare of the farming community. This can be done by increasing the production of food crops

and cash crops or increasing prices received for the products produced by these groups. However, not every increase in output will provide better-off effects for the majority of the rural population engaged in agriculture.

Efforts to achieve agricultural development in Indonesia is always constrained by the limited availability of development infrastructure and development of the reservoirs; weak technology transfer system; limited access to business services, especially in term of capital; and long agricultural marketing chain; as well as problems related to a decrease in the quality and quantity of agricultural land resources. In terms of quality, agricultural land in Indonesia experiences enormous fertility degradation resulting from the use of inorganic fertilizers. Cropland degradation has caused a decline in land productivity. Meanwhile, in terms of quantity, land conversion occurs more frequently in Java as culture teaches where parents todistribute land among their children, so reduction in the size of agricultural land as it is converted into industrial land and buildings continues to happen.

One scenario the government does to meet the target of food self-sufficiency is bycreating new rice fields, replacing non-food crops with food crops, as well as revitalizing and building new reservoirs to compensate for the decline in land productivity. Rice self-sufficiency will be achieved when rice production is 73 million tons of milled rice, equivalent to 43.8 million tons of rice, with cropland area of 7.1 million ha (harvested twice). Actually, when the rice production is 8 tons/hectare, then the area of 7 million ha harvested twice, 110 million tons of milled rice will be available. However, because there is the possibility of pests and diseases, drought and crop failure or other consequential matters, these achievements could be lower. For maize, the 2017 production is targeted to reach 20 million tons by adding 400,000 hectares of land. Production of maize is currently not eligible for industries, so importing maize is still the best choice available.

According to Arifin (2015), rice production in 2014 has reached 70.6 million tons of unhusked rice (equivalent to 40 million tons of rice, with the most conservative conversion rate of 0.57). If the rice consumption rate is estimated to 124.8 kg per capita per year, the total consumption of rice for 250 million people in Indonesia is 31.2 million tons. Mathematically, Indonesia has reached a surplus of almost 9 million tons, meaning there is no longer any question of self-sufficiency in rice.

## MATERIAL AND METHODS

Approach of general equilibrium which is the basis of this study is formulated into a static CGE (Computable General equlibrium) model adapted from a model developed by Deveragan *et al* [3], Soudolet and Janvry [13], Lofgren *et al*. [9] and Hosoe *et al*. [4] with the assumption of constant returns to scale and perfect competitive markets. Data are obtained from the Social Accounting Matrix (SAM) and Table I-O Indonesia in 2008, as well as some substitution parameters obtained from a variety of previous studies.

Here what we have in the model: 12 groups of production sectors or commodities. The primary factor consisting of land, capital, and labor which are mobile sectorally; as well as the institutions consist of eight groups of households, companies, and government. Intermediate inputs used in production and final commodities consumed by the institutions are not perfect substitutes and are aggregated become commodity inputs between composite and composite commodities based on the assumption by Armington [2]. With the same approach of Armington assumption, domestic product generated by the production sector is transformed into domestic production and export in accordance with the purpose of marketing.

Formulated policy simulation through cropland expansion scenarios for each of the agriculture sector is 5% and 10%; as well as the rising prices of rice and maize respectively by 10% and 20%.

Processing and analyzing data on static CGE model is finished with GAMS or MPSGE programs resulting in benchmark balance and counterfactual balance in pairwise comparison to evaluate the impact of the changes in acreage and prices on the economy sectors.

## RESULTS AND DISCUSSION

*The impact of cropland expansion and increasing prices for rice and maize on domestic production:*

The expansion is intended to provide a wider cropland for agricultural commodities that are expected to increase production. The ratio of benchmark expansion of 5% for rice and maize refers to the calculation that with the expansion, self-sufficiency in rice and maize can be met.The results of the analysis are presented in Table 1. It shows that if cropland of rice and maize increased by 5% (SIM1), almost all the production of food crops will increase, unless for tubers. Rice production increases for 0.3%, while the production of maize is up to 0.17%. When the rice and cornfieldis expanded again to 10% (SIM 2), almost the entire production of food crops increases, except for maize production. Rice production will rise slightly higher at 0.45%. Empirical evidence indicates the existence of a tradeoff between the land for rice farming and maize. Increased food production that uses the same areas as rice and maizecannot be done only through the expansion of cropland, but must be supported by new cropland or revitalize abandoned land, which is quite large.

**Table 1:** The impact of cropland expansion and increasing prices for rice and maize on domestic production

| No | Sector | Baseline (IDR Trillion) | Percentage of Changes | | | | | |
|----|--------|------|-------|-------|-------|-------|-------|-------|
| | | | SIM 1 | SIM 2 | SIM 3 | SIM 4 | SIM 5 | SIM 6 |
| 1. | Rice | 664 | 0.30 | 0.45 | 0.45 | 20.33 | 10.39 | 20.33 |
| 2. | Beans | 82 | 2.44 | 2.44 | 2.44 | 2.44 | 2.44 | 2.44 |
| 3. | Maize | 592 | 0.17 | 0.00 | 9.97 | 19.93 | 9.97 | 19.93 |
| 4. | Tubers | 214 | 0.00 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 |
| 5. | Other crops | 1,371 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 |
| 6. | Other crops | 10,929 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| 7. | Rice milling industry | 2,544 | 0.12 | 0.12 | 0.08 | 0.08 | 0.08 | 0.08 |
| 8. | Food and beverage industry | 53,087 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| 9. | Fertilizer and pesticide industry | 163 | 0.61 | 0.61 | 0.61 | 0.61 | 0.61 | 0.61 |
| 10. | Other industries | 18,904 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11. | Trade, hotels, and restaurants | 14,171 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12. | Service | 45,675 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 |

Note:
SIM 1: Expanding cropland for rice and maize by 5%
SIM 2: Expanding cropland for rice and maize by10%
SIM 3: Increasing price for rice and maize by 10%
SIM 4: Increasing price for rice and maize by20%
SIM 5: Expanding cropland for rice and maize by5% andincreasing price for rice and maize by10%
SIM 6: Expanding cropland for rice and maize by 5% andincreasing price for rice and maize by20%
Source:Secondary data analysis, 2015

Cropland expansion for rice and maize affects not only the agriculture sector, but also other sectors that exist in the Indonesian economy. This policy will have a positive impact of 0.2 to 0.12% of the industrial sector of forward and backward linkages, except for other industries. Industries with forward linkage rice milling industry as well as food and beverage industry, and industrial sector which has backward linkage is fertilizer and pesticide industry. However, these policies have a negative impact on the service sector.Meanwhile, the scenario of increasing commodity prices is intended to increase the income of farm households as producers and an incentive to continue to improve production. Simulation of rice and maize price rise of 10% (3 SIM) and 20% (SIM 4) shows a positive impact in the form of an increase in production not only on rice and maize, but also in almost all sectors of the economy.If the scenarios of expansion and increasing commodity prices are combined simultaneously (SIM 5 and SIM 6), the impact on the domestic production will be even greater. Rice production increases respectively to 10.39% and 20.33%, while maize production increases to 9.97% and 19.93%. Domestic production of other sectors also increase, except for the service sector decreases of 0.02%. In general, the policy of expansion and increasing commodity prices of rice and maizehas a positive impact on food self-sufficiency program and is able to become a lever of production throughout the agricultural sector and the industrial sector.

*The impact of cropland expansion and increasing prices for rice and maize on export and import:*

Referring to the SNSE data in 2008, Indonesia does not export rice because the domestic production is not able to meet the needs of the country or, in other words, Indonesia is still dependent on imports to cover the shortfall of production or as a buffer stock. Simulation of policy under the cropland expansion scenario and increasing prices of rice and maize successfully promoting increased production has not been able to initiate exporting rice and increase the export of maize (Table 2). Increase in production still focuses to meet growing domestic demand in line with population growth, increased revenue, lower price paid by consumers as the positive impact of the efficiency of marketing, as well as changes in other determinants of demand. Simulation of policy under the cropland expansion scenario and increasing prices of rice and maize has even decreased the export of beans and products from the food and beverage industry, while export of tubers and products of other industries increases.High domestic demand for food causes Indonesia to continue beingdependent on import. The good side, amid the high demand for food, the positive impact of cropland expansion and increasing prices for rice and maize is an increase in domestic production of rice and maize leading to decreased import, except for the food and beverage industry, and reduced import of products from other industrial sectors, trade, hotels and restaurants, as well as the service sector. However, the phenomenon of declining exports and rising imports of food and beverages needs special attention for an increase in the production seems to still not be able to compensate for the increasing domestic demand for the products of that particular sector.

**Table 2:** The impact of cropland expansion and increasing prices for rice and maize on export

| No | Sector | Baseline (IDR Trillion) | Percentage of Changes | | | | | |
|----|--------|------|-------|-------|-------|-------|-------|-------|
| | | | SIM 1 | SIM 2 | SIM 3 | SIM 4 | SIM 5 | SIM 6 |
| 1. | Rice | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2. | Beans | 0,6 | -1.53 | -1.53 | -1.54 | -1.54 | -1.54 | -1.54 |
| 3. | Maize | 4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| No | Sector | Baseline | SIM 1 | SIM 2 | SIM 3 | SIM 4 | SIM 5 | SIM 6 |
|----|--------|----------|-------|-------|-------|-------|-------|-------|
| 4. | Tubers | 1 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| 5. | Other crops | 7 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6. | Other crops | 104 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7. | Rice milling industry | 7 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8. | Food and beverage industry | 27,931 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 |
| 9. | Fertilizer and pesticide industry | 7 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10. | Other industries | 5,853 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| 11. | Trade, hotels, and restaurants | 85 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12. | Service | 165 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Source: Secondary data analysis, 2015

**Table 3:** The impact of cropland expansion and increasing prices for rice and maize on import

| No | Sector | Baseline (IDR Trillion) | Percentage of Changes | | | | | |
|----|--------|-------------------------|------|------|------|------|------|------|
| | | | SIM 1 | SIM 2 | SIM 3 | SIM 4 | SIM 5 | SIM 6 |
| 1. | Rice | 19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2. | Beans | 49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3. | Maize | 12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 4. | Tubers | 2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5. | Other crops | 69 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6. | Other crops | 2333 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 7. | Rice milling industry | 58 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8. | Food and beverage industry | 4,461 | 0.07 | 4.15 | 4.15 | 4.15 | 4.15 | 4.15 |
| 9. | Fertilizer and pesticide industry | 263 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10. | Other industries | 13,461 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 |
| 11. | Trade, hotels, and restaurants | 3,465 | -0.03 | -0.03 | -0.03 | -0.03 | -0.03 | -0.03 |
| 12. | Service | 9,034 | -0.04 | -0.04 | -0.04 | -0.04 | -0.04 | -0.04 |

Source: Secondary data analysis, 2015

*The impact of cropland expansion and increasing prices for rice and maize on household welfare:*

Based on the analysis performed, thepolicy of cropland expansionand increasing prices of rice and maize turns out to have no impact on the welfare of domestic farm laborers and domestic agricultural entrepreneurs (land owners) in rural areas as the target of increasing income (Table 4). Expansion becomes a burden because it is followed by the demand to use larger quantities of inputs; meanwhile, the unit price of inputs used in the production also goes up due to rising prices of rice and maizeleading to higher production costs. Additional income because of increased production and price increases become meaningless for the additional cost of production, that in the end, it has no impact on the welfare of farm households.

**Table 4:** The impact of cropland expansion and increasing prices for rice and maize on household welfare

| No | Sector | Baseline (IDR Trillion) | Percentage of Changes | | | | | |
|----|--------|-------------------------|------|------|------|------|------|------|
| | | | SIM 1 | SIM 2 | SIM 3 | SIM 4 | SIM 5 | SIM 6 |
| 1. | Farm laborers | 57 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2. | Agricultural entrepreneurs | 432 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3. | Low income in rural areas | 297 | 0.34 | 0.34 | 0.34 | 0.34 | 0.34 | 0.34 |
| 4. | Non labor force in rural areas | 19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5. | High income in rural areas | 187 | 0.53 | 0.53 | 0.53 | 0.53 | 0.53 | 0.53 |
| 6. | Low income in urban areas | 415 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 |
| 7. | Non labor force in urban areas | 16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8. | High income in urban areas | 421 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Source: Secondary data analysis, 2015

Group of rural households whose welfare improved due to expansion policy and and increasing prices for rice and maize are low-income households and high-income households. Low-income households based on SNSE 2008 comprise of households of lower employers, clerical workers, pitchman, casual employees such as in the field of transportation, personal services, unskilled laborers; while high-income households consist of upper classemployers, non-agricultural entrepreneurs, managers, military, professionals, technicians, teachers, clerical workers, and sales elite. Meanwhile, urban households whose welfare increases are low-income households.

*Conclusions:*

Cropland expansion policy by 5-10% and increase in prices of rice and maize by 10-20% have a positive impact on food self-sufficiency because of increasing domestic production of commodities of rice, beans, maize, tubers, and other crops, as well as the milling industry products and the food and beverage industry. However, the impact on the trade balance is not significant. Increased production does not create additional export, except for tubers, yet the nominal is not great. Exports of beans even decline. Meanwhile, imports of food do not

change from before. It thus shows that the increase in production is generally used to meet domestic demand that continues to increase.

The price increase on rice and maize expected to provide incentives and greater income for farm households do not cause changes in the welfare of the household. Households whose welfare improve due to cropland expansion policyand increasing prices for rice and maizeare not farm households in rural and urban areas.

## ACKNOWLEDGEMENT

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