Agricultural Production and its Implications on Economic Growth and Poverty Reduction

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Abstract:

The objective of the study was to analyze the magnitude of factors affecting Agricultural Production and its implications on Gross Regional Production (GRP) Growth and Poverty Reduction.

Panel data from 6 provinces of center production of paddy of Indonesia for 10 years (2007-2016) were analyzed by Path Analysis method. Productivity of Agricultural Land and Wetland Area has a very strong relationship with Agricultural Production. The productivity of Agricultural Land is the dominant factor and has the significant effect on Agricultural Production.

Agricultural Production has no significant effect on GRP growth rate. Agricultural Production has not been able to reduce poverty. GRP growth rate has the significant effect and is the dominant factor for poverty reduction.

Based on the finding of the research, government policy programs for poverty reduction in rural areas can be done by improving agricultural cultivation technology, the extent of wetland area, increasing of agriculture-based industries and the provision of poverty reduction programs budget.

Keywords*: Agricultural, GRP, Poverty.*

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1. Introduction

Indonesia has the largest economic performance in Southeast Asia since 2000 with a 4.6% annual Gross National Product (GNP) growth rate, and a growth peak of 6.5% in 2011. From 2011 up to now the growth rate declines because of various causes (Figure 1). Compared with two strong countries in the world, the United States and China in 2016, Indonesia's Gross Domestic Product per capita is only 3,827 (USD) compared to the United States of 55,375 USD and China of 7,808 USD. Indonesia has the lowest GNP compared to other countries (Indonesia Investment, 2017; Central Bureau Statistics of Indonesia, 2016).

Figure 1. Growth of GNP Indonesia 2006-2016.
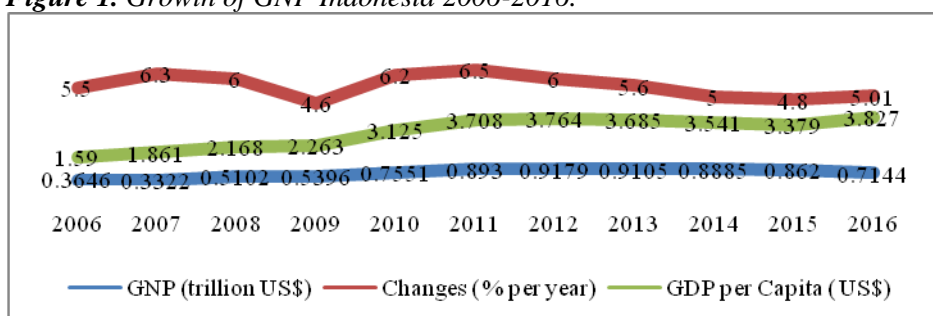
Source: (Indonesia Investment, 2017; Central Bureau Statistics of Indonesia, 2016).

The composition of Indonesian GNP shows a remarkable development, changing from a country whose economy is heavily dependent on agriculture to be more balanced where the manufacturing industry is now more dominant. This shows that Indonesia has reduced its dependence on the traditional sector (agriculture) to further develop the modern sector (industry) (Figure 2).

Figure 2. Development of Indonesia GNP Composition by Sector.
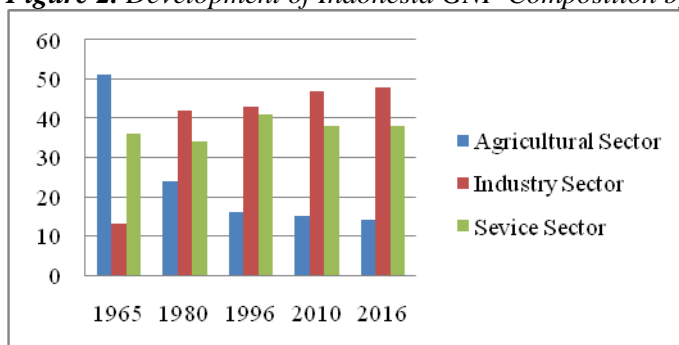
Source: (Indonesia Investment, 2017; Central Bureau Statistics of Indonesia, 2016).

The agricultural sector of Indonesia comprises of large plantation (both state-owned and private) and small holder production modes. The large plantations tend to focus on commodities which are important export products (palm oil and rubber), while

the small farmers focus on paddy, soybean, corn, fruits, and vegetables. The annual agricultural growth of Indonesia increased by 2.9% in 2010 and peak in 2014 by 4%. In 2013 the increase was 3.4% and in 2014 only 2.4% (Indonesia Investment, 2017).

Indonesia is an agrarian country with a population of 260 million, percentage of poor people 11%, unemployment 5.6%, and Gini Ratio of 0.397. Most of the poor are in rural areas with farming livelihoods. The percentage of farm households decreased from 53% in 2003 to 40.2% in 2013 i.e. 25,751,256 households (Agricultural Census, 2013). 68.8% of farm households cultivate food crops, 55.3% are small holder farmers who are farmers with less than 0.25 ha of wetland. The harvested area of 2016 is 15,035,736 ha increased by 6.51% from 2015, the productivity is 52.88 q/ha decreased 0.99% from 2015 and the production is 79,514,492 tons increased by 5.46% from 2015 (Ministry of Agriculture of Indonesia, 2016).

Based on the above description, it can be realized that the poor in Indonesia is still quite large. Indonesia's GNP is still very low compared to many other countries with similar growth. The agricultural sector is growing with declining rate, the contribution to GNP continues to decline. The agricultural sector is still dominated by food crop sub-sectors representing the majority of rural poor households as small holders.

The main objective of this study is to examine the factors that influence agricultural growth and its implications for economic growth and poverty reduction.

2. Literature Review

Schultz began his acceptance speech for the 1979 Nobel Prize in Economics observing: *"Most of the people in the world are poor, so if we knew the economics of being poor we would know much of the economics that really matters. Most of the world's poor people earn their living from agriculture, so if we knew the economics of agriculture we would know much of the economics of being poor"* (Cervantes-Godoy and Dewbre, 2010).

Populations in developing countries whose livelihoods depend on the agricultural sector are typically poorer than those working in other economic sectors. In general, it is a major population living in rural areas (FAO, 2014; Diao *et al.,* 2010). Globally, the rate of poverty has declined steadily, an achievement credited largely to economic growth. But what caused economic growth and how is the role of agricultural growth in poverty reduction is still a question to be answered (Cervantes-Godoy and Dewbre, 2010; FAO, 2009; FAO, 2014).

Agricultural growth has long been recognized as an important instrument for poverty reduction. Many recent studies focus specifically on quantifying the relationship between agriculture and poverty, especially in Indonesia (Tambunan, 2009; Cervantes-Godoy and Dewbre, 2010; Hadiwidjaja and Suryahadi, 2011; Leeuwen

and Foldvari, 2012). Although much research and simulation have been done in many countries the issue still leaves many questions unansewerd.

The economic growth of a country can be measured by its GNP growth rate. The composition of GNP can be grouped into three main sectors: agriculture, manufacture (industry) and service sector. Globally, the share of the agricultural sector in GNP declines. A declining share of agriculture in GNP and national employment is an inevitable consequence of economic progress (Byerlee *et al.,* 2009; FAO, 2014). As their incomes grow, consumers increase their consumption of manufactured goods and services faster than their consumption of food.

Paradoxically, the process is usually accompanied by rising incomes and a lower incidence of poverty among those who depend on agriculture for the living. Lewis (1955) viewed economic development as a process of relocating factors of production from an agricultural sector characterized by low productivity and the use of traditional technology to a modern industrial sector with higher productivity. Lewis's theory was interpreted as advocating industrialization and used to justify government policies that favored protection for domestic industries and taxed the agricultural sector (Byerlee *et al.,* 2009; Janvry and Sadoulet, 2009).

There is the negative relationship between GDP real growth rate and poverty rate in Nigeria (Ukpong *et al.,* 2013). Economic growth does indeed reduce poverty depends very much on how economic growth is defined. Statistically, some studies suggest that the increase in GDP per capita has no significant effect on poverty reduction, but it can increase the level of the poverty line. Even with the measurement of GDP per capita inequality the result still remains biased (Adams, 2004; Castles, 2014). Measurement with Gross Regional Product (GRP) provides more real economic growth conditions. GRP/GDP growth which comes from agriculture is at least twice as effective in reducing poverty compared to GDP growth coming from the nonagricultural sector. This effect for China and Latin America are estimated to be 3.5 times and 2.7 times, respectively. Major declines in rural poverty in both China and India were attributable to rapid agricultural growth following the household responsibility system and market liberalization in the former country and the diffusion of high yield varieties in the latter (Dao, 2009).

In agriculture, yield increases are the main source of output growth, where new land for area expansion is hardly available (Leeuwen and Foldvari, 2012). The limited capital, the low technology of cultivation and the lack of infrastructure, reduce agricultural productivity (Oluwatayo and Ojo, 2016). Good agricultural performance operates to reduce measured poverty through both the income and the price channel (Byerlee *et al.,* 2009; Janvry and Sadoulet, 2009). Agricultural financing through banks and cooperatives helps farmers to meet their agricultural capital (Yusuf, 2014).

The increase of land productivity and labor productivity in agriculture may reduced poverty (Dao, 2009). However, agriculture successes have not been uniform in many countries. In South Asia, while crops plant yields had increased by more than 50%, poverty had declined by 30%, yield and poverty rates had remained unchanged in Sub-Saharan Africa (Dao, 2009).

There is two methods to measure poverty, the direct method and the indirect method or income approach. The direct method indicates whether people satisfy a set of specified basic needs and rights, or in line with their capability approach. The indirect method or income approach determinates whether people's incomes fall below the poverty line - the income level at which some specified basic needs can be satisfied (Alkire and Santos, 2014). The income approach has been implemented in official poverty measures in many countries. Indirect poverty method can be measured by: 1) Head Count Index, simply measures the percentage of the population that is counted as poor often denoted by poverty line, and 2) Poverty Gap Index measures the extent to which individuals fall below the poverty line, as a proportion of the poverty line (Central Bureau Statistics of Indonesia, 2016).

A higher value of the index shows that the gap between the average expenditure of the poor and the poverty line is wider (Susilastuti, 2017). Alkire and Santos (2014) developed the Multidimensional Poverty Index (MPI) a direct approach having similarities with the Head Count Index. MPI aims to quantify acute poverty, understood as a person's inability to meet simultaneously minimum internationally comparable standards in indicators related to the Millenium Development Goals (MDG) and to core functionings. The dimensions and indicators of MPI of poverty are: health, education, and standard of living (Alkire and Santos, 2014).

Farmers' welfare is not only measured from the economic side but also measured from the social-spiritual side (Puspitasari, 2015). Marginalization of farmers is due to agricultural politics that are not pro-farmers such as land conversion regulations, policy provision of infrastructure, market mechanisms and unfair competition. Farmers' Term of Trade (FTT) is used to measure success level of agricultural businesses based on revenue received from the increase/decrease of agricultural production price compared to the increase/decrease of purchased good/services price for the household consumption and the agricultural production process. FTT indices can be classified into two parts, that are indices of prices received by farmers and indices of prices paid by farmers. Indices of prices received by farmers consist of food crops indices (paddy and secondary crops), horticulture, small holders estate crops, animal husbandry, and fishery indices. While indices of prices paid by farmers consist of household consumption indices (food stuff, prepared food, housing, clothing, health, education, recreation and sport, transportation, and communication), and indices of production cost and capital formation.

The method used in calculating prices received and prices paid is the modified Laspeyres formula. FTT may reflect the ability of farmers production and household

consumption. If FTT is greater than 100, it indicates that the level of success of agricultural businesses in such period is better than it in the base year period, and conversely (Central Bureau Statistics of Indonesia, 2016).

Population growth is a major challenge for agriculture that is how to meet the needs of food. Food availability is the dominant factor to food security, to reduce poverty need to strengthen food security (Susilastuti, 2017). Another factor to be considered as a challenge in agricultural development are rising income per capita, rapid urbanization, increasing use of food crops for the production of bio-fuels as well as for other industrial purposes, and uncertainties associated with climate change and the environment. If people go hungry today it is not because the world is not producing enough food but because such food is not produced by the 70% of the world's poor whose main livelihood is agriculture and who cannot afford to eat their fill (FAO, 2009; Dibden *et al.,* 2013; FAO, 2013).

Sustainability agriculture is defined not just in terms of its long-term economic productivity but also in terms of environmental and social benefit and cost that can enhance the quality of life for farmers and society as a whole (Robertson and Harwood, 2013). Broad-based agricultural growth is more pro-poor than is export-led growth (Diao *et al.,* 2010). A small share of agriculture does not imply that the agricultural sector is less important for generating pro-poor growth. The model simulation for Zambia shows that growth in the non-agricultural sector, even including the non-mining industrial sector, is less effective at reducing poverty than an agricultural led growth strategy (Diao *et al.,* 2010). Agricultural development is based on evidence showing that is an effective strategy for economic growth and poverty reduction in many countries. Small farms are also considered more efficient than large farms in countries with a surplus of labor but a scarcity of agricultural land area and capital. The policy implication is for governments to stand back and let market forces hold away in driving agriculture and small farm development.

The primary role of policy interventions should be to provide an enabling economic environment for market-led development, which typically involves providing stable and undistorted economic incentives including price stability and inflation, and essential public goods and services (Diao *et al.,* 2010; Global Panel on Agriculture and Food Systems for Nutrition, 2014; Dorosh and Thurlow, 2016). There is a long term relationship between rate of inflation, economic growth, and government expenditure meaning that the government expenditures yield positive externalities and linkages. In the short run, the rate of inflation does not affect the economic growth while government expenditure does so (Attari and Javed, 2013).

While the effectiveness of agricultural growth in reducing poverty is well established, the effectiveness of public investment and government investment in inducing agricultural growth is still incomplete and conditional on context (Janvry and Sadoulet, 2009). The new paradigm of agriculture is urban agriculture. Agriculture currently faces major economic, cultural and ecological challenges.

Urban agriculture is expected to open new opportunities for the sector. Urban agriculture is conducted on narrow land with high technology inputs to increase productivity (Moschitz *et al.,* 2016). Urban agriculture is divided into two distinct positions. Urban agriculture is a viable and effective pro-poor development strategy and it has demonstrated limited positive outcomes on either food security or poverty (Frayne *et al.,* 2014).

3. Hypothesis Development

The growth rate of agriculture is influenced by many factors both out-farm and on farm. Inflation as an out-farm factor influences input prices e.g. fertilizer, pesticide, and other prices, as well as outputs such as agricultural product prices, and consumption households' prices. High inflation raises prices. Farmers' Term of Trade (FTT) describes the ability of farmers to fulfill of household needs and their agricultural production processes. Wetland area is an in-farm factor, the wider the area of rice, then it has the potential to increase agricultural production. Land productivity is the ratio of agricultural inputs, illustrating the results of any quantity and quality of technology of agricultural cultivation. Increased productivity will affect the agricultural yield.

Regionally and nationally, agricultural production contributes to the gross product (GRP/GNP). GNP is government revenue that is used for various government expenditures including poverty reduction. In Indonesia, the poor are predominantly in rural areas with livelihoods in the agricultural sector of food crops, especially paddy. The growth of the agricultural sector will increase farmers' income, reduce unemployment and improve welfare.

From the above description, the decrease of inflation, the increase of FTT, wetland area, and productivity of agricultural land can increase agricultural production. Increased agricultural production will increase GRP (Gross Regional Product) growth rate and reduce poverty, in this case, increase the poverty line. The increase of GRP growth will reduce poverty.

3.1 Theoretical Methodology

In this research, the magnitude of influence is tested with Path analysis. Path analysis is one method of multivariate analysis to evaluate hypothesized causal relationship among the traits represented in a study. The analytical procedure of Path analysis is described in terms of its use in non experimental settings in the social science. Path analysis can show the dominant factor through the magnitude of beta standardized coefficients. Relationships among variables were analyzed by partial correlation.

4. Research Methodology

The research is quantitative with simultaneous equations model building using secondary panel data of time series during the period of ten years 2007-2016 in six provinces, n = 60. The sample is determined purposively by the province of paddy production center namely North of Sumatra, South of Sumatra, West of Java, Center of Java, East of Java, and South of Sulawesi.

The model consists of four structural equation models that are:
  (1)   The influence of inflation (I), wetland area (WA) of paddy;
  (2)   The productivity of agricultural land of paddy (PAL);
  (3)   The farmers' term of trade (FTT) of crops plant toward agricultural production (AP) of paddy;
  (4)   The influence of agricultural production on GRP growth rate;
  (5)   The influence of agricultural production on poverty (P);
  (6)   The influence of GRP growth rate on Poverty.

The exogenous variables are: inflation, WA, PAL and FTT.
The endogenous variables are: AP, GRP, and poverty. The equations are:

$$\text{Agricultural production}: AP = \rho\, I + \rho\, WA + \rho\, PAL + \rho\, FTT + \mu_1 \tag{1}$$

$$\text{GRP}: \quad GRP = \rho\, AP + \mu_2 \tag{2}$$

$$\text{Poverty}: \quad P = \rho\, AP + \mu_3 \tag{3}$$

$$P = \rho\, GRP + \mu_4 \tag{4}$$

The research uses Path analysis to know the magnitude influence in each dependent variable. Relationships among variables were analyzed by partial correlation. Therefore, to estimate the parameters of the structural equation the research used the method of two stage least squares (2SLS). To determine the autocorrelation the research used the Durbin Watson test.

5. Result and Discussion

Descriptive analysis data (n = 60) is presented in Table 1. Trends data show that inflation and GRP growth rate having negative coefficients, while others are positive.

Table 1. *Descriptive Statistics.*

Variables	Mean	Units	Trends
Inflation	4.777	%	Negative
Wetland Area	823010.767	ha	Positive
Productivity of Agricultural Land	52.729	q/ha	Positive
Farmers' Terms of Trade	103.093	-	Positive
Agricultural Production	7417360.96	ton	Positive
GRP Growth Rate	5.716	%	Negative

Poverty	231466.717	IDR/cap/m	Positive

Source: Data processed.

The response of agricultural production is presented in Table 2. Coefficient determination (adjusted R square) is 85.8%, showing the magnitude of contribution of the effect of exogenous variables toward agriculture. The productivity of agricultural land of paddy (r = 0.92) and the wetland area of paddy (r = 0.64) has a very strong relationship with the agricultural production of paddy, while inflation (r = 0.21) and farmers' Terms of Trade of crops plant (r = 0.03) has a weak relationship with agricultural production. The magnitude influence indicated by beta standardized coefficients i.e. for productivity of agricultural land is 85.6%, and for Wetland Area 10.2%. This show that Productivity of Agricultural Land is the dominant factor to Agricultural Production ($\beta \geq 50\%$).

The productivity of agricultural land of paddy has significant effect on agricultural production. Therefore, inflation, wetland area of paddy and farmers' Terms of Trade of crops plant have non-significant effect on agricultural production. Based on the above, agricultural production improvement can be done intensively to increase the productivity of agricultural land and extent by increasing agricultural land area.

Table 2. The Magnitude Influence of Exogenous Variables toward Agricultural Production

Variables	Beta Standardized Coefficients	P value	ndard Dev.
Inflation	0.077	0.152	3.16
Wetland Area	0.102	0.146	370552.65
Productivity of Agricultural Land	0.856	0.000	6.22
Farmers' Terms of Trade	-0.089	0.108	4.47
DW= 1.446			

Source: Data processed.

The influence of agricultural production toward Gross Regional growth rate model is presented in Table 3. Agricultural production has non-significant effect toward GRP growth rate. The coefficient of determination (R squared) 0.93%, shows the magnitude of the effect of agricultural production toward GRP growth rate. Agricultural production of paddy contributes little to the formation of GRP. The GNP in Indonesia is dominated by industry and service sectors, while the role of the agricultural sector continues to decline. The role of the agricultural sector is enhanced through the improvement of agriculture-based industries while increasing the demand for agricultural products will also add value to agricultural products.

Table 3. The Magnitude Influence of Agricultural Production toward GRP Growth.

Variable	Beta Standardized Coefficients	P value	Standard Dev.

Agricultural Production	-0.093	0.479	3638280.317

Source*: Data processed.*

The influence of agricultural production toward poverty model is presented in Table 4. Agricultural production has non-significant effect toward poverty. The coefficient of determination (R squared) 0.7, shows the magnitude of the effect of agricultural production toward poverty. The low influence of agricultural production on the results of this study shows that the agricultural sector, although the primary source of livelihood for rural communities, has not been able to raise the people above the poverty line. This is understandable because of the narrow land ownership. People are only agricultural laborers, not landowners. Poverty is not only in the countryside but also in urban areas. In this study, the poverty line is a combination of poverty in rural and urban areas.

Table 4. *The Magnitude Influence of Agricultural Production toward Poverty.*

Variable	Beta Standardized Coefficients	P value	Standard Dev.
Agricultural Production	0.017	0.895	3638280.317

Source: *Data processed.*

The influence of GRP growth toward poverty model is presented in Table 5. GRP growth has significant effect toward poverty. The coefficient of determination (R squared) 0.6, shows the magnitude of the effect of GRP growth toward poverty. The trend of GRP data is negative while poverty is positive. The research results show that the decrease in GRP will decrease the poverty line, whereas if the GRP rate increases, it is expected to increase the poverty line and reduce poverty. The magnitude of the beta coefficient is -0.501 indicating that GRP is the dominant factor in poverty reduction.

Table 5. *The Magnitude Influence of GRP Growth toward Poverty.*

Variable	Beta Standardized Coefficients	P value	Standard Dev.
GRP Growth	-0.501	0.000	1.285

Source: *Data processed.*

Based on the results, government policy programs for poverty reduction in rural areas can be done by improving agricultural cultivation technology, the extent of wetland area, increasing of agriculture-based industries and the provision of poverty reduction programs budget. Farmer's economy is enhanced by maintaining price stability, inflation and value added of agricultural products.

6. Conclusion

The result of this research is productivity of agricultural land of paddy and wetland area of paddy have a very strong relationship with agricultural production of paddy.

The productivity of agricultural land of paddy has significant effect on the agricultural production of paddy. Therefore, inflation, wetland area of paddy and farmers' Terms of Trade of plant crops have no significant effect on agricultural production of paddy. The productivity of agricultural land of paddy is the dominant factor for agricultural production of paddy.

Agricultural production has no significant effect on Gross Regional Product growth rate. Agricultural production has not been able to reduce poverty. Gross Regional Product growth rate has significant effect and is the dominant factor for poverty reduction. The research findings are that poverty reduction is influenced by government revenues to finance poverty reduction programs in both rural and urban areas. Increased agricultural production is done by intensification (increasing productivity of agricultural land) and extent of the agricultural land.

Acknowledgements:

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