The Assessment of the Importance of Agricultural Growth for Poverty Reduction in Indonesia

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Although poverty is generally recognized as a highly multidimensional phenomenon, in the Indonesian context, poverty has been mainly an agricultural or a rural phenomenon. This has of course an important policy implication for poverty reduction in Indonesia. This paper examines the importance of agricultural growth for poverty reduction in Indonesia. It shows that: (i) agriculture is still the biggest employment-generating sector; (ii) the vast majority of poor families are in agriculture, consisting mainly of the marginal farmers and agricultural laborers; (iii) poverty in agriculture is caused by many factors, including lack or unequal distribution of land, and lack of capital; (iv) growth in gross domestic product (GDP) has an impact on poverty reduction; and (v) the decomposition of changes in poverty by sector shows that the output growth in agriculture appears to have the greater effect on the change in poverty than that in manufacturing, though it is lower than that in services.

Keywords: Green revolution, Agricultural growth, Poverty reduction, Poor households

JEL Classification: I32, O13

I. Introduction

In the beginning of the 'new order' (NO) regime in 1966, the average Indonesian earned only roughly U.S.$50 a year; about 60% of adult Indonesian could not read or write; and close to 65% of the country's

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population lived in absolute poverty (Tambunan 2006). Facing this condition, the new order government launched five-year economic development plans, with the first plan started in 1969, and made several crucial economic policies in the 1970s and 1980s, including liberalization in investment, capital account, banking and trade.

During this NO era (1966-1998), agriculture and manufacturing were two priority sectors; although agriculture was promoted first in the 1970s mainly because of four reasons (Booth 1992). First, it was related to the national food self-sufficient policy, especially in rice. Second, agriculture constitutes largest share of country's employment though the share has declined from about 67% in 1971 to almost 44% by early 2007. Third, it also ever constituted the largest share in GDP before the NO era and then it started to decline steadily as industrialization process begun gradually by late 1970s. In 1965 the share was 55% and fell to 12.9% in 2006 (Tambunan 2006). Fourth, growth of other sectors and overall economy depends on performance of agriculture to a considerable extent. Besides, agriculture has special significance for low income, poor and vulnerable sections of rural society. Because of these reasons agriculture is at the core of socio economic development and progress of Indonesian society, and so the NO government adopted agricultural growth as the national strategy for poverty alleviation.

The implementation of this agricultural growth-led poverty reduction policy accompanied with other special designed poverty alleviation measures, including labour intensive (particularly for unskilled workers) projects (such as construction of village roads and technical irrigations); more access to primary education and health care facilities for the poor families with government subsidies; and development of backward villages through *Inpres Desa Tertinggal* (IDT) program introduced in 1993 under the Presidential Instruction No. 5 for development of isolated/under-developed villages; and development of micro and small sized enterprises.

Rapid output growth in agriculture and manufacturing together had resulted in rapid and sustained economic growth during the 1980s up to 1997, just before the Asian financial crisis occurred, and accompanied with the above mentioned special designed measures, the poverty rate (people living under current official poverty line as a percentage of total population) also declined substantially. Based on recent revised estimated figures by BPS, the rate fell from 40.1% of total population in 1976 to 17.5% in 1996 (Table 1).

The key objective of this study is to examine the importance of

agricultural growth for poverty reduction in Indonesia. It addresses a simple but very important policy-question: does the output growth in agriculture really matter for poverty reduction in Indonesia? This study has an important implication for poverty alleviation policy. As shown in this study, although shifting population outside agriculture continues to take place, the majority of workforce in Indonesia still finds employment in rural areas, and the largest part of rural workers is found in the agricultural sector. Even, data on poverty show that the majority of poor households have incomes from agriculture, either as self-employed or agricultural labour. It means obviously that agricultural growth should be the main focus of national poverty alleviation policy. Since many people shifted out from agriculture are found in rural small non-farm enterprises in industry, transportation, trade and services or in urban informal sector, attacking poverty in agriculture will generate a "trickle down" effect on poverty in non-agricultural sectors through consumption linkage effects.

To answer the above research question, methodologically, the study is conducted in the following stages. First, it starts with a brief survey of literature on the importance of agriculture in poverty reduction in less developed countries (LDCs). Second, it analyses recent data on poverty related aspects of agricultural development in Indonesia such as the importance of the sector for employment creation and household incomes. Third, it analyses statistically the impact of the growth in GDP on poverty. Fourth, it decomposes changes in total poverty into changes in output in three big sectors, namely agriculture, manufacturing, and services (including trade) and by region.

The analysis uses secondary data from a variety of sources. Data on poverty are from the National Social and Economic Survey (SUSENAS), which is an annual cross-sectional survey of households by the Central Agency of Statistics (BPS). Poverty rate is measured by the head-count index, which is the percentage of the population for whom consumption expenditure is less than the national poverty line. The line is constructed with the cost-of-basic-needs approach. Data for other items such as gross domestic product (GDP), output/value added and labor force/employment by sector are from Statistical Year Book of Indonesia (SI), the National Agricultural Census (NAC), and the National Labour Survey (NLS). SI and NLS are published annually and NCA per 10 years, all by BPS. This study also uses data from the Food and Agricultural Organisation (FAO) of the United Nations.

II. Agricultural Growth-Poverty Reduction Thesis

There are some who suggest that poverty can be fought indirectly but effectively through policies that support the trickle down mechanism of economic growth. The assumption here is that by investing in urban areas and the manufacturing sector, benefits will eventually filter down to the rural areas and therefore reach most of the poor. Evidence in many LDCs, however, does not seem to support this notion. Benefits of urban-led development do not appear to have trickled down to the rural areas. For instance, a study by Ravallion and Datt (1996a, 1996b) shows that while urban income growth translates into urban poverty reduction, it does not contribute to rural poverty reduction, so at the national level, the impact is relatively small.

This implies that in countries dominated by rural economy or agriculture such as Indonesia, India and China, the growth center must be in the rural areas or started from agriculture. The assumption here is that rural development, including development of agriculture, has important positive effects on overall development. Improving income in agriculture and hence in rural areas in general necessarily spills over to improvement of income in urban areas. Many studies[1] indeed show that in many LDCs, the largest growth in poverty reduction has occurred as a result of agricultural growth. The implication of this evidence is that agricultural growth is generally pro-poor. In addition, studies show that improving farm production helps spur non-farm activities in the rural areas. Such non-farm activities are very crucial to insulating rural families from poverty. This implies that the role of agricultural growth on poverty reduction is not only in the form of its direct effects on employment creation or income increases in the sector, but also through its indirect (or linkages) effects on output growth in labor-intensive non-farm activities such as food and beverages manufacturing industries.[2]

Many factors have been said to be very important in determining the effects of agricultural growth on poverty reduction. Three of these

[1] See *e.g.,* Rangarajan (1982), Saith (1990), Singh (1990), Matsuyama (1992), Binswanger and Von Brown (1993), Lipton and Ravallion (1995), Ravallion and Datt (1996a, 1996b, 1999), Timmer (1988, 2004), Wichmann (1997), Kanwar (2000), Irz and Roe (2000), Thirtle and Irz (2001), and Bourguignon and Morrison (1998).

[2] See for instance, Johnston and Mellor (1961), Mellor (1995, 2000), and Sarris (2001).

factors are the availability of land or land reform, technology reflected by the use of fabricated fertilizers, modern seed, and tractor, infrastructure development, and human resource development reflected by farmers' education level (Fan and Hazell 1999). Many studies on the supply response to price changes in agriculture suggest that farmers are quite responsive to price incentives, but only when they have access to these mentioned factors and other necessary complementary inputs.[3]

There are, however, some authors who have different conclusions. The question of how much do poor people share in the gains from higher growth of output or productivity in agriculture has been the subject of debates. In contrast to such as Saith's (1981) and Singh (1990) who claims that rapid agricultural growth has benefited the poor, many others including Gaiha (1995) who concludes that acceleration in agricultural growth by itself is unlikely to make a dent in rural poverty. Even, recently, some authors started to doubt on whether development of agriculture is still crucial as a policy instrument to fight poverty. Dorward (2001) and Dorward *et al.* (2002) for instance, argue that reliance on pro-poor agricultural growth as the main weapon against rural poverty today faces more difficult challenges than those faced in the green revolution areas in the latter part of the 20th century, due to a number of features that together increase risk and uncertainty and raise costs and/or lower returns to agricultural investment. Many of these difficulties are endogenous to today's poor rural areas, others result from broader processes of global change, but some are the direct result of policies supporting world trade liberalization and withdrawal of the state. A review of literature on the green revolutions suggests that state interventions in agricultural markets were widely used and important in supporting sometimes short periods of critical market and technological development in the process of rural growth. But, such interventions now in the era of globalization and world trade liberalization have become unpopular.[4]

[3] See *e.g.*, Bond (1983), Schiff and Montenegro (1997) and McKay *et al.* (1997).

[4] The green revolution in developing countries has received much attention in the literature. From the 1970s and 1980s, see Lipton and Longhurst (1989) for a valuable review of the literature. For 1990s onwards, see for instance Hazell and Ramasamy (1991), Singh (2001), Kuhnen (1996), Howard and Kelly (1999), Mittal and Rosset (2000), Borlaug (2000a, 2000b), Shah and Strong (2000), Sharma (2000), Shiva (1991), and Niazi (2004).

III. Green Revolution in Indonesia

Recognizing the importance of development and growth in agriculture for food security (or self-sufficiency in food production) and poverty alleviation, in early 1970s the NO government started a big program to intensify or to modernize the agricultural sector, known as the green revolution. The process was marked by the introduction of new, often called 'modern' inputs (*e.g.,* manufactured fertilizers, seeds, and pesticides), new/high-yield technologies, and new methods of production/farming, and massive public investments in rural areas.

It is generally believed that among many factors, massive public investments in rural areas during the green revolution period in many fields such as improvement in human capital, development of market centers and grain storages, expansion of modern irrigations system in crop land, adoption of new technologies, mechanized production process and improved modern inputs in agriculture, and development/improvement of basic infrastructure such as roads, bridges, transport and telecommunication facilities that links rural households, farmers and non-agricultural producers to wider market opportunities, had played a substantial role in generating output growth in agriculture, and, hence in the large reduction of rural poverty in Indonesia.

Irrigated crop land, modern inputs used, and level or growth in agricultural output are often used as success indicators of the green revolution. It is generally expected that the green revolution will result, from the input side, in the expansion of (technical) irrigated crop land and the increase in the use of modern inputs, and, from the output side, in the increase in agricultural output or productivity.

A. Input-Side

Historical data from BPS on cropped agricultural land and the use of fertilizers and other inputs in Indonesia are generally unreliable. BPS data from the 1970s and earlier are not fully comparable with more recent data.[5] But, this is not only the Indonesian problem. Also in many other parts of Asia and Africa, national agricultural statistics are being constantly revised and improved, which creates the comparability

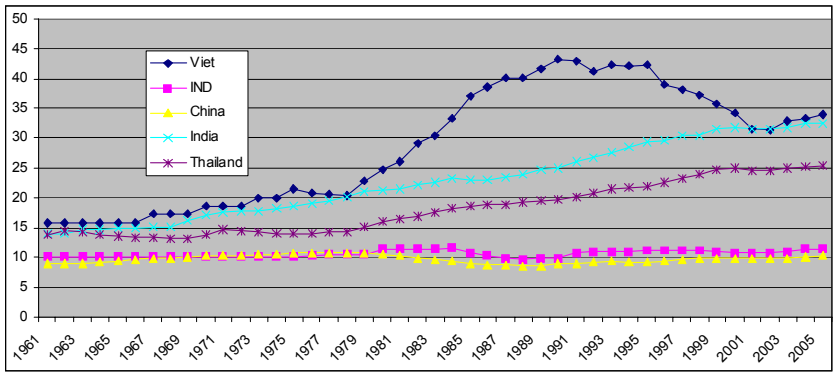
[5] Only since the 1980s, BPS has published reasonably good estimates of land use for agriculture, divided in irrigated and non-irrigated. See further Booth (1993) and Fuglie (2004) for a more detail discussion of agricultural land use statistics in Indonesia.

problem. Therefore, many previous studies also use data from FAO.[6] But, the FAO figures are also problematic since they are derived, partly, from national statistics, and party, own estimations. FAO *database* on land use in agriculture in Indonesia differs markedly from the BPS estimates. The BPS data show that agricultural crop land in Indonesia expanded from 17 million hectares (ha) before the green revolution to more than 37 million ha in the 1990s. The FAO data, on the other hand, show that total agricultural land use increased from 38.4 million ha in 1970 to 44.88 million ha in 2002, or arable land from about 18 million ha in 1970 to 20.5 million ha in 2002. The gross irrigated land in Indonesia in the period 1960s-70s on average per year was 10%, and ever reached 11% of total agricultural land in the 1980s.

Using data from BPS and FAO (FAOSTAT), Fuglie (2004) has analysed land and modern inputs used for agriculture in Indonesia in three periods: before the green revolution in the 1960s, during the green revolution in the 1970s and 1980s and after in the 1990s up to 2000. It shows that in the 1960s, crop land expanded annually, and during the green revolution period the growth rate increased to 2.3% per year, and after that in the period 1992-2000 about 2.1% per year. Before the green revolution started, irrigated land expanded by 1.4% per year and during the green revolution period it increased by more than half to 2.3% per year, but after that it fell significantly to 0.3 per year. The use of modern inputs was also very intensive during the green revolution. The average annual growth rate in the use of fabricated fertilizer measured in kg/ha increased markedly from 1.7% in the 1960s to 16% in the 1970s-1980s, leading to the increase of fertilizer use per crop land from 1.3% to 13.6% on average per year during the same period, respectively. The use of machinery, measured in terms of horsepower available from tractors, and threshers used in agriculture, also increased from 7.5% per year before to 14.3% per year during the green revolution.

To get some insights about the relative position of Indonesia in this matter, by using FAO data on gross irrigated land from 1961 up to 2005 (most recent), this study compares Indonesia with other important agricultural based economies in the region, namely China, India, Thailand, and Vietnam. As illustrated in Figure 1, agricultural land in

[6] See for instance Fuglie (2004), Arnade (1998), Suhariyanto (2001), and Mundlak *et al.* (2002).



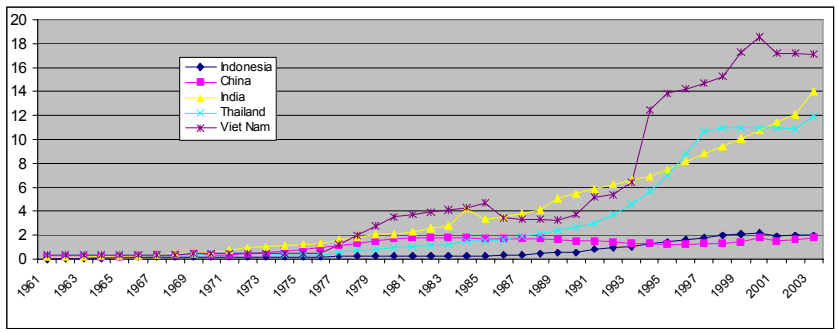
Source: FAO *database* (FAOSTAT).

FIGURE 1
GROSS IRRIGATED LAND AS A PERCENTAGE OF AGRICULTURAL LAND IN SELECTED ASIAN COUNTRIES, 1961-2005

Indonesia is slightly more irrigated than in China, but much less than in other three countries. In Vietnam, in the 1960s, the ratio was between 15-17% in the 1960s and increased markedly to over 40% in the first half of 1990s.

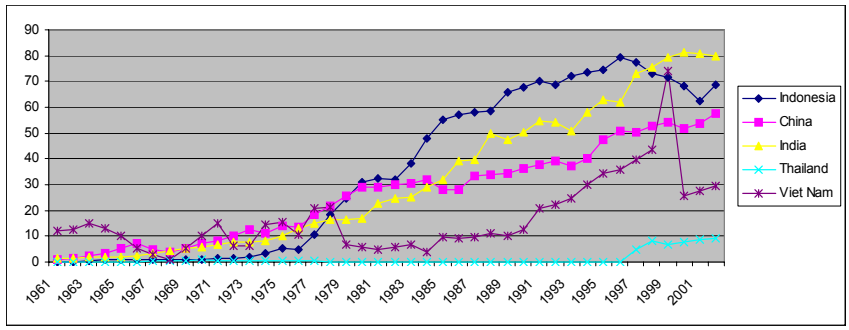
Growth in fabricated inputs used in Indonesian agriculture, namely fertilizer and tractor, was very rapid, averaging more than 10% p.a. between 1961 and 2003 (most recent FAO data). However, use of these inputs started from a very small base, and tractor (two- and four-wheel in all sizes) use per hectare in Indonesia remained small by Asian standards (Figure 2). This may suggest that agriculture in Indonesia is much less mechanized, despite government's efforts to make that happen during the green revolution period.

Use of fabricated fertilizer, on the other hand, is quite high compared with other Asian countries (Figure 3). But, from mid 1990s, there was virtually no growth in fertilizer use, and per hectare application actually declined. The slowdown in fertilizer use can be attributed in part to farmer's rising real costs. The level of fertilizer subsidy was as high as 50% from the mid 1970s to the mid 1980s, but then declined gradually (Fuglie 2004). The subsidy finally ended in 1999 as a result of the agreement between the Indonesian government and the International Monetary Fund in the crisis recovery programs.



Source: FAO (FAOSTAT).

FIGURE 2
USE OF TRACTORS PER HA OF AGRICULTURAL LAND
IN SELECTED ASIAN COUNTRIES (PER HA), 1961-2003

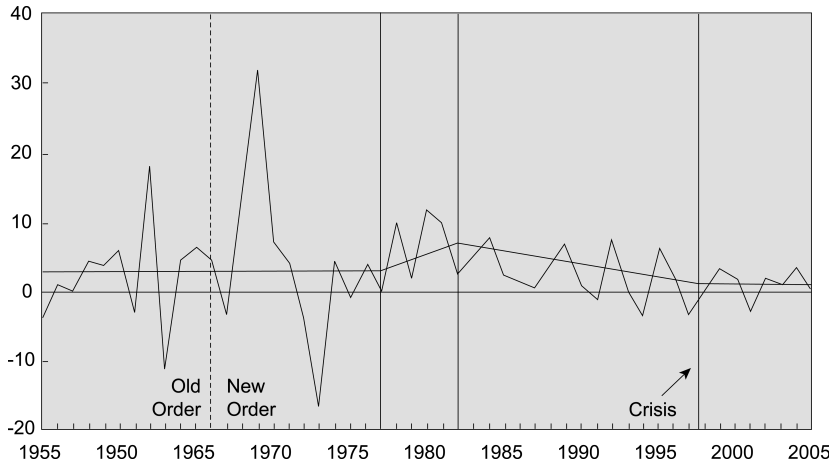


Source: FAO *database*.

FIGURE 3
USE OF FABRICATED FERTILIZER IN AGRICULTURE
IN SELECTED ASIAN COUNTRIES, 1961-2002 (KG PER HA)

B. Output-Side

The green revolution policy emphasized maximizing productivity for the two scarcest factors of production, namely land and capital. To this end, labor-intensive cropping patterns using high-yield technologies were introduced, especially in regions where land was the scarce resource relative to labor, as on Java. So, there was no trade-off between the achieved output growth and employment generation in

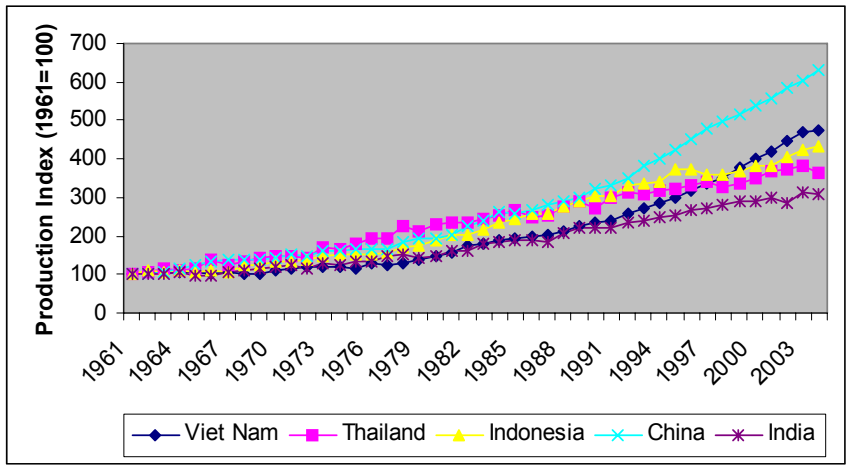


Source: Adopted from Figure 1 in Simatupang and Timmer (2008).

FIGURE 4
ANNUAL GROWTH RATE OF RICE PRODUCTION (%)

agriculture. Obviously, the technologies used or the adopted cropping patterns were poverty reducing. In regions where land was abundant relative to labor, as in many parts of the Outer Islands, with the help of new technologies and methods of production and management, plantation crops yielded better incomes than in labor surplus regions (particularly Java and Sumatra) for both laborers and smallholders. Also, during that period varieties of rice were introduced, and they responded dramatically to greater fertilizer applications, good irrigation systems and careful agronomic management. As a result of high output growth/productivity in agriculture, the gap between rural and urban productivity did not widen too rapidly for labor migration to keep wages closely linked (Timmer 2004).

Based on a study made by Simatupang and Timmer (2008), growth of rice production in Indonesia over five decades is shown in Figure 4. Due to such a volatile series, they break this period into four separate growth phases, based simply on visual inspection of the data. These phases are 1955-77, when annual growth was constant (but highly variance) and of the order of 3.1%; 1977-82, when trend growth accelerated rapidly to about 7.0%; 1982-98, when the trend growth rate declined steadily (but with much lower variance); and 1998-2005,



Source: FAO *database.*

FIGURE 5
LONG-TERM DEVELOPMENTS OF AGRICULTURAL OUTPUT INDICES IN SELECTED ASIAN COUNTRIES, 1961-2004

when the growth rate established at around 1.2%.

As a comparison, based on FAO *database*, Figure 5 shows long-term developments of quantity-based indices of agricultural output (which includes rice and other food crops) in Indonesia and other countries mentioned in the previous figures. It shows that agricultural production in Indonesia started to increase significantly since the beginning of the 1970s up to the mid 1990s; especially the years of 1980s up to 1995 were exceptionally good for Indonesian agriculture, with annual growth averaging 4.6-5.2%. Only in the last few years of the 1990s, the rate of output growth in Indonesian agriculture slowed significantly, partly caused by the crisis in 1997/98.

IV. Agricultural Growth and Poverty Reduction in Indonesia

The crucial question here is does agricultural growth matter for poverty reduction in Indonesia? Or did green revolution in the 1970s give a significant contribution to the poverty reduction through its effect on agricultural growth? In India, for example, the green revolution since the 1960s has not contributed much to the poverty reduction (Kurosaki

1999, 2002, 2004). Although the rapid increase in land productivity of wheat and rice thanks to the Green Revolution is well documented,[7] its implementation in India has been criticized for being environmentally unsustainable and apolitical as it never addressed the issues of land and tenancy reforms, and other related institutional reforms. Green revolution did not take into account the needed change in rural and social institutions. Since green revolution offered a high-valued package, so it helped only the rich farmers (owning large landholdings) from assured irrigated areas. Areas where rain-fed irrigations take place could not gain much from the green revolution. It only promoted production of certain crops which are agro-climatically suitable for certain regions, which some say have affected biodiversity. It relied excessively on major irrigations (instead of minor irrigation and rainwater harvesting), chemical fertilizers and pesticides, in which without huge subsidies from government, the entire effort is not sustainable fully at the hand of farmers, especially the marginal ones (Kurosaki 1999, 2002, 2004).

However, the Indonesian case may provide a different story. By the end of 1960s, the average Indonesian earned only roughly U.S.$50 a year, and over 80% of the country's population lived on tiny, fragmented and scattered farms. They had little or no access either to rudimentary health care or to basic amenities of life such as safe drinking water or adequate shelter. About 60% of adult Indonesian could not read or write and close to 65% of the country's population lived in absolute poverty. However, with a sustained rapid economic growth during the NO era, the income per capita has increased significantly, from 126.3 U.S.$ in 1973 to 1,120 U.S.$ in 1997 (Tambunan 2006), and the percentage of population deemed as poor has declined dramatically. In 1976 the national poverty rate was 40.1% and steadily declined to 17.5% in 1996. When the crisis occurred in 1997 and reached its climax in 1998, the poverty rate increased to 24.2% in 1998. The rebound of the country's economy in 2000 has led to a drop again in poverty incidence which continued up to 2005 (Table 1).

Table 1 shows that in the pre-crisis period, the poverty rate in rural

[7] As emphasized by Kurosaki (1999, 2002), however, a substantial increase in aggregate land productivity occurred before the introduction of high-yielding varieties of rice and wheat, mainly through crop shift effects as the result of farmers' attempts to diversify farming activities towards non-traditional, high value-added crops such as fruits and vegetables and towards livestock activities. See also Chand (1999, 2004a, 2004b) and Kurosaki (2004).

TABLE 1
POVERTY IN INDONESIA: 1976-2007

Year	Poor People (%)		
	Urban*	Rural**	National***
1976	38.8	40.4	40.1
1978	30.8	33.4	33.3
1980	29.0	28.4	28.6
1981	28.1	26.5	26.9
1984	23.1	21.2	21.6
1987	20.1	16.1	17.4
1990	16.8	14.3	15.1
1993	13.4	13.8	13.7
1996	13.4	19.8	17.5
1998	21.9	25.7	24.2
1999	19.4	26.0	23.4
2000	14.6	22.4	19.1
2001	9.8	24.8	18.4
2002	14.5	21.1	18.2
2003	13.6	20.2	17.4
2004	12.1	20.1	16.7
2005	11.7	19.98	15.97
2006	13.5	21.8	17.8
2007	12.5	20.4	16.6
2008	...	...	15.4

Note: * = % of urban population; ** = % of rural population; *** = % of total population.
Source: BPS (SUSENAS).

areas declined faster than that in urban areas. There were at least three causes: (i) agricultural output growth that led employment in the sector and farm income to increase; (ii) employment increased in rural non-farm activities like agro-industries, trade, services, and rural transportations as a result of improved rural infrastructure and rural-urban connections; and (iii) many unskilled labor, unabsorbed by the growth in agriculture and rural non-farm activities, migrated to urban areas and worked in labor intensive manufacturing industries such as food and beverages, textile and garments, leather products, electronics and footwear, construction, transportation and services. These were boomed industries and sectors during the NO era, especially since the successive deregulation measures and trade reforms after the end of the second oil boom era in the early 1980s.

The increase of rural poverty during the crisis period was partly a

result of returning unemployed people from urban areas. During the crisis, many laid-off workers particularly from manufacturing industries and construction (the two sectors that mostly hit by the crisis) were reportedly leaving urban centers to return to their villages where subsistence could at least meet their basic needs. However, in the crisis situation in which poverty in both urban and rural settings was on the increase, many rural originated people who became unemployed stayed in cities and considered self-employment or do any kind of low-paid works in urban informal sector as an option (Amin 1998; Hugo 1998). So no doubt that during the crisis agriculture together with urban informal sector had played an important role as the last resort for the laid off workers from the formal sector.[8]

From a comparative perspective, Indonesia has better experience than some other countries in the region (Table 2). In 1970, based on national poverty lines, Indonesia had more poor people than, for instance, India had, but in 2005, Indonesia has only about 15.97% of its total population as poor, or 19.5% and 11.4% in rural and urban areas, respectively; compared to India in 2004 at 27.5% of its total population, or 28.3% and 25.7% in respectively rural and urban areas.

The key factor that made significant effect of economic growth on poverty reduction during the NO era was indeed the growth of output in agriculture. Although the role of non-agricultural sectors especially manufacturing, trade, banking, and services in the Indonesian economy continues to increase as the consequence of ongoing structural transformation, agriculture remains central to poverty reduction in Indonesia for two main reasons. First, although continuously declining, it remains the largest sector in terms of employment. The National Labour Survey (SAKERNAS) data show that in 1971, about 67% of Indonesian total working population worked in the sector. By February 2007, around 43.67% of the working population still worked in agriculture (Table 3). In fact, during the crisis many workers who were laid off in modern sectors returned to agriculture, so between 1997 and 1998 the employment share of agriculture in Indonesia increased from 40.8% to 45% (Feridhanusetyawan 1999). The pattern of change in employment distribution by sector in Indonesia is also observable in other important agricultural based economies in Southeast Asia such as China, India, Vietnam, and Thailand, where other sectors particularly

[8] See *e.g.*, Amin (1998), Hugo (1998), Suryahadi *et al.* (2000), and Skoufias *et al.* (2000).

TABLE 2

TRENDS IN POVERTY IN SELECTED ASIAN COUNTRIES, BASED ON NATIONAL AND INTERNATIONAL POVERTY LINES, 1990 AND LATEST YEAR

Country	Population below the national poverty line (%)					Below U.S.$1 (PPP) a day (%)
	1970	1980	1990	2000	2005	
China	33.0	28.0	10.1	4.6	2.5	33.0 (1990) - 10.8 (2004)
Indonesia	60.0	28.6	15.1	19.1	16.6 (2007)	20.6 (1990) - 4.0 (2005)
Malaysia	18.0	9.0	6.1 (1989)	8.1 (1999)	5.1 (2002)	<2.0 (1990) - <2.0 (2004)
Philippines	61.6 (1971)	59.7 (1985)	45.2 (1991)	40.0	30.0 (2003)	20.2 (1990) - 13.6 (2006)
Thailand	26.0	17.0	18.0	14.2	9.8 (2002)	10.2 (1990) - <2.0 (2002)
Viet Nam	...	75.0 (1988)	58.0 (1993)	37.0 (1998)	19.5 (2004)	50.8 (1990) - 8.4 (2004)
Bangladesh	71.0 (1973/74)	52.3 (1983/84)	49.7 (1991/92)	39.8	40.0	34.4 (1990) - 36.3 (2005)
India	55.6	48.4 (1978)	40.9 (1992)	26.1 (1999/2000)	27.5 (2004)	44.3 (1990) - 35.1 (2004)
Nepal	...	41.4 (1984/85)	...	44.6 (1995/96)	30.9 (2004)	45.7 (1990) - 24.7 (2003)
Pakistan	54.0 (1961)	29.1 (1986/87)	26.1 (1990/91)	32.6	23.9 (2004)	47.8 (1990) - 9.8 (2004)
Sri Lanka	37.0 (1963)	27.3 (1985/86)	22.4 (1990/91)	22.9 (1995/96)	22.7 (2002)	3.8 (1990) - 4.8 (2002)

Source: ADB (Key Indicators of Developing Asian and Pacific Countries).

TABLE 3

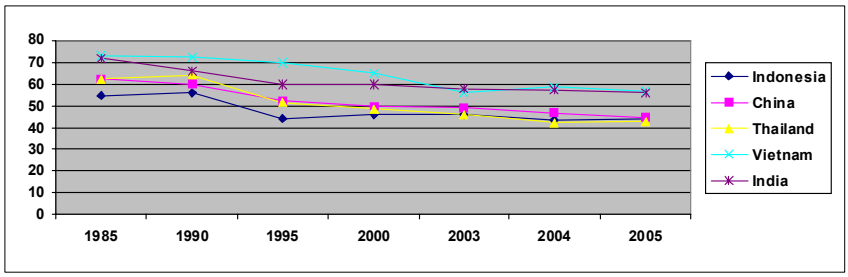
EMPLOYMENT BY SECTOR IN INDONESIA, 1990-2007 (%)

Sector	1971	1980	1985	1990	1995	2000	2003	2004	2005	2006	2007*
Agriculture	67.04	56.30	54.66	55.87	43.98	45.28	46.26	43.33	44.04	42.05	43.67
Manufacturing	6.92	9.14	9.28	10.14	12.64	12.96	12.04	11.81	12.27	12.46	12.39
Mining	0.21	0.76	0.67	0.70	0.80	0.58	0.98	1.10	0.85	0.96	1.05
Others	25.83	33.80	35.39	33.29	42.58	41.18	40.72	43.76	42.84	44.53	42.89

Note: *February.
Source: BPS (*SAKERNAS*) and ADB *database*.

manufacturing, construction and services become increasingly important for employment generation (Figure 6).

Distribution of employment by region in Indonesia also confirms the importance of agriculture. First, the majority of workforce in Indonesia still finds employment in rural areas, although the proportion declined from 75% in 1990 to 59% in 2005 (Table 4). Second, the largest part



Source: BPS (SI) and ADB *database*.

FIGURE 6

SHARES OF TOTAL EMPLOYED WORKERS IN AGRICULTURE IN SELECTED SOUTHEAST ASIAN COUNTRIES, 1985-2005 (%)

TABLE 4

EMPLOYMENT DISTRIBUTION BY RURAL AND URBAN AREAS IN INDONESIA, 1990-2005 (%)

Sector	1990	1995	2000	2003	2005
Rural	75	67	62	60	59
Urban	25	33	38	40	41

Source: BPS (*SAKERNAS*) and ADB *database*.

TABLE 5

RURAL EMPLOYMENT BY SECTOR IN INDONESIA, 1990-2003 (%)

Sector	1990	1995	2000	2003
Agriculture	70	60	66	68
Manufacturing	9	11	10	9
Service	22	29	24	24

Source: BPS (*SAKERNAS*).

of rural workers was found in the agricultural sector, although the proportion also declined from 75% in 1990 to 68% in 2003 (Table 5).

Second, the agricultural sector has the highest poverty incidence compared to other sectors and contributes the largest proportion of the poor in the country (Table 6). Further, Table 7 shows that almost 70% of the Indonesian poor in rural areas work in agriculture. Even for urban poor, agriculture is very important as their main source of income.[9] Semi-subsistence urban farming is widely believed to make

TABLE 6
DISTRIBUTION OF POOR HOUSEHOLDS BY MAIN OCCUPATIONS/INCOME SOURCES IN INDONESIA AND INDIA

Sector	Indonesia (% of total poor households)					
	1996	1998	1999	2000	2001	2002
Agriculture	68.5	56.7	58.4	51.7	63.0	67.4
Manufacturing	6.7	7.4	8.7	13.8	11.9	10.3
Others	24.8	35.9	32.9	34.5	25.1	22.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Indonesia, BPS (SUSENAS).

TABLE 7
DISTRIBUTION OF POOR FAMILIES BY SECTOR AND AREA: 2002 (%)

Sector	Urban	Rural
Agriculture	31.11	69.09
Forestry	0.23	1.34
Fishery	1.48	2.23
Mining	1.25	0.49
Manufacturing	12.17	4.98
Electricity	0.10	0.02
Construction	9.67	3.63
Trade	14.06	5.00
Transportation	8.94	2.73
Finance	0.69	0.08
Services	8.14	2.40
Others	0.04	0.06

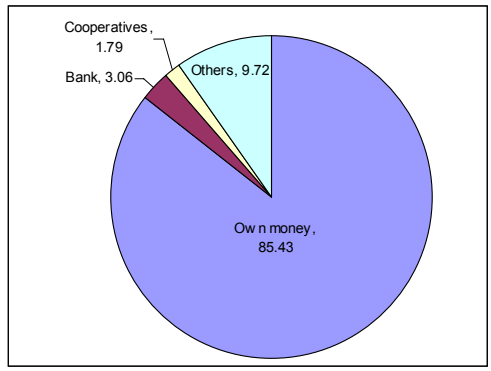
Source: BPS (SUSENAS).

an important contribution to the livelihoods of the urban poor in many developing countries.[10]

The highest poverty rate in agriculture has been caused mainly by the massive structural transformation that the Indonesian economy

[9] Urban agriculture can encompass aquaculture in tanks, ponds, rivers, and coastal bays; livestock (particularly micro-livestock) raised in backyards, along roadsides, in poultry sheds and piggeries; orchards, street trees, and backyard trees; and vegetable and other crop production on roof tops, in backyards, in vacant tracts of land on industrial estates, along canals, on the grounds of institutions, on roadsides and in many peri-urban and urban farms (Gordon *et al.* 2000).

[10] See *e.g.,* UNDP (1996), Sanyal (1985), and Freeman (1991).

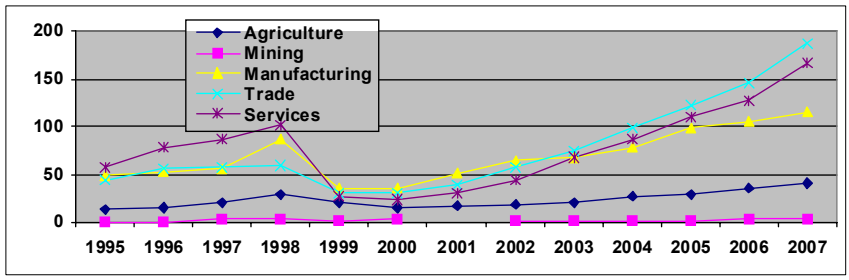


Note: Others include money from relatives and friends.
Source: NAC 2003.

FIGURE 7
PERCENTAGE OF FARMERS BY SOURCE OF FINANCE, 2003

has undergone from an economy where the agricultural sector played a dominant role in the country's GDP to an economy where the sector's contribution becomes much less important. The GDP contribution of agriculture has declined from 45% in 1971 to 15% in 2003. Meanwhile, the process of structural change in the labor market has been much slower due to labour absorption limitations in non-agricultural sectors relatively to the annual growth rates of new workforce. Over the same period, the proportion of agricultural employment has declined from around 67% in 1971 to slightly less than 50% in 2003.

In addition, there are other four interrelated issues why people who have a living in agriculture tend strongly to be poorer than those in other sectors. First, the quality of human resources in agriculture is very low compared to those in other sectors. Second, generally, they have low access to formal capital. As shown by NAC 2003 data, the majority of farmers used their own money to finance their farming activities; only about 3% of total farmers ever used bank credit (Figure 7); or from the other side: agriculture has never been one among important sectors receiving bank credits (Figure 8) Third, their land holding size is small. As discussed in Section II, distribution of land is very important in determining the pro-poor agricultural growth effect (Fan and Hazell 1999). The higher is the proportion of small size or marginal farmers, the lesser is the effect of output growth in agriculture on poverty reduction. Based on NAC data, Table 8 indicates that



Source: BPS.

FIGURE 8

BANK CREDITS BY SECTOR, 1995-2007 (TRILLION RUPIAH)

TABLE 8

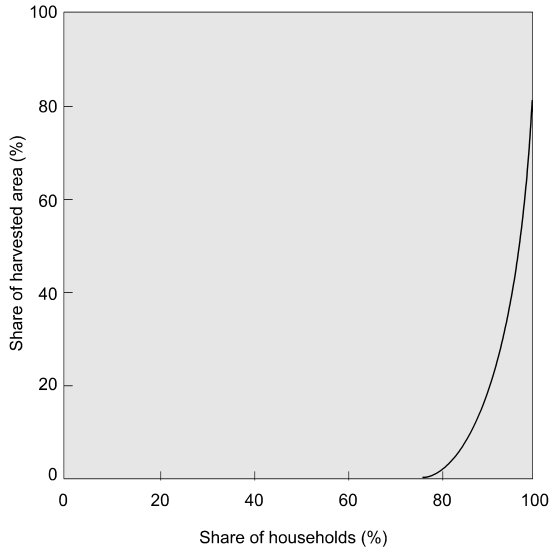
DISTRIBUTION OF AGRICULTURAL HOUSEHOLDS BY CULTIVATED LAND HOLDING SIZE: 1983, 1993, 2003 (%)

Size (ha)	1983	1993	2003
<0.1	8.5	7.0	17.2
0.1-0.49	37.7	40.7	39.2
0.50-0.99	24.1	22.4	18.4
≥1.0	29.7	29.9	25.2

Source: BPS (NAC 1983, 1993, 2003).

Indonesian agriculture is dominated by small or marginal farmers. Figure 9a shows the household distribution of control over Indonesia's rice harvested area,[11] and Figure 9b shows the estimated distribution of total *sawah* (rice harvested area) holdings by landholding category. Strikingly, more than 75% of all households in Indonesia do not control any *sawah*, and 75% of those households controlling *sawah* hold less than 0.5 hectares individually. Between the 1983-2003 period, the proportion of marginal farmers who owned land with sizes less than 0.1 hectare has increased substantially from 7% in 1993 to 17% in 2003. In Java, the total number of marginal farmers is much higher than in outside Java, namely about 68.04% versus 26.48%. These marginal farmers and agricultural laborers with the lowest income among all agricultural household groups (Table 9) have been identified as containing the majority of poor in rural areas in Indonesia (Mason and Baptist 1996).

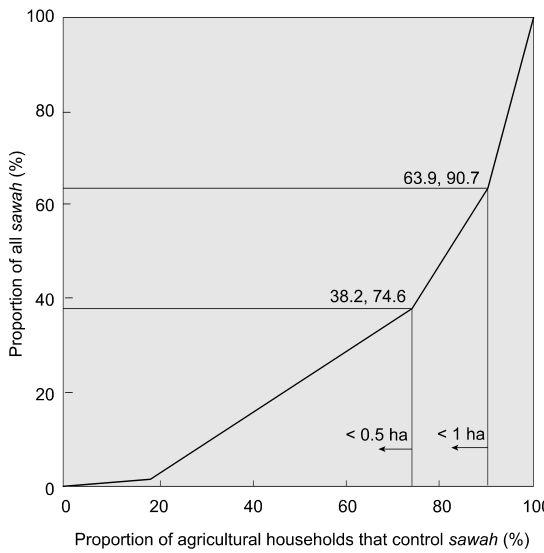
[11] Controlled land is land that is owned plus land obtained from *e.g.*, rented-in land minus land that is being used by other parties (*e.g.*, rented-out land).



Source: Adopted from Figure 5a in McCulloch (2008).

FIGURE 9A

HOUSEHOLD DISTRIBUTION OF CONTROL OVER RICE HARVESTED AREA



Source: Adopted from Figure 5b in McCulloch (2008).

FIGURE 9B

DISTRIBUTION OF TOTAL *SAWAH* CONTROLLED BY LANDHOLDING CATEGORY

TABLE 9
PER CAPITA NET INCOME BY CATEGORY OF AGRICULTURAL HOUSEHOLD (000 RUPIAH), 1975-1999

Category	1975	1980	1985	1990	1993	1995	1999
Agricultural worker	40.1	102.2	238.1	415.3	468.2	616.7	1629.7
Farmer with 0.5 ha or less	43.3	133.9	228.7	548.9	757.6	934.5	1676.9
Farmer with 0.501−1.0 ha	57.7	154.8	342.0	656.5	901.9	1200.2	2650.5
Farmer with >1.0 ha	84.4	198.9	553.7	1035.3	1471.8	1758.8	3422.3

Source: BPS.

No doubt that rapid and sustained conversion of agricultural land, especially in areas surrounding big cities like Jakarta, Bandung, Tangerang, Bekasi, and Bogor in West Java, Semarang and Yogyakarta in Central Java, Surabaya in East Java, Medan in North Sumatera, Palembang in South Sumatera, Padang in West Sumatera, Makassar in South Sulawesi, and Menado in North Sulawesi in the last 30 years as a consequence of population growth, rapid urbanization, and industrialization has been the most responsible for the declining average size of land per farmer in Indonesia. Whereas, at the same time, total number of farm households increased at about 16% during the period 1983-2003. Although no specific information is available, no doubt that difficulties in finding jobs in formal non-agricultural sectors are also attributed to this increase. Despite every year new land is available for agriculture the rate of land conversion is higher than the rate of new added land. Recent data from the Department of Agriculture show that in the period 1999-2002 about 563,159 hectares of rice field, or on average 187,720 hectares per year, has been converted to other purposes (Table 10). This has been aggravated further by no any action from the government to prevent rich urban households from buying, sometimes with force, land from farmers, while the farmers become agricultural workers for these new owners.

From the above evidence, although poverty is generally recognized as a highly multidimensional phenomenon, which, by implication, obtains from an array of factors,[12] in the Indonesian context, poverty is mainly a rural phenomenon, and it strongly linked with the performance of agriculture. There are two main channels through which the performance of agriculture affects poverty, namely output (or productivity) growth

[12] The World Development Report 2000 identifies institutional, social, economic, and human factors as the major causes of poverty.

TABLE 10

CHANGES IN RICE FIELD IN INDONESIA, 1999-2003

Region	Size of fixed land for rice in 1999 (million ha)	Size of disappeared land (000 ha)	Size of added new land (000 ha)	Size of land conversion (000 ha)	% of conversion
Java	3.38	167.2	18.1	-149.1	4.42
Outside Java	4.73	396.0	121.3	-274.7	5.81
Indonesia	8.11	563.2	139.3	-423.9	5.23

Source: BPS (NAC, 2003).

TABLE 11

LINES OF DEVELOPMENT OF GDP SHARES OF AGRICULTURE AND INDUSTRY IN INDONESIA, INDIA AND CHINA (%)

Year	Indonesia		India		China	
	Agriculture	Industry	Agriculture	Industry	Agriculture	Industry
1981*	23.6	12.2	36.8	17.6	31.8	42.1**
1985*	23.2	15.98	33.03	17.9	28.4	38.5**
1990	19.4	39.1	29.3	26.9	26.9	41.3
2000	15.6	45.9	23.4	26.2	14.8	45.9
2006	12.9	47.0	17.5	27.9	11.8	48.9

Note: *industry only manufacturing; **industry in China includes electricity, gas and water.

Source: ADB (*Key Development Indicators*).

and wage increases in the sector. With respect to the first channel, Timmer (2004), who has done a number of studies on agriculture in Indonesia in the last few years, concludes that there have been several major sources of economic growth in Indonesia since the end of 1960s, including rapid output growth in agriculture. The dominant contribution of agricultural growth, however, ended by the late 1980s and manufacturing industry took off rapidly. This was also the period when workers from agriculture (rural areas) began to move to the manufacturing sector (urban areas). By the mid 1980s the GDP share of agriculture started to decline rapidly from 23.2% to 19.4% in 1990. In 1998 there was some improvement in agriculture's GDP share, mainly because output in the sector grew, though slightly, while output in other sectors declined. In 2006, the GDP share of agriculture is about 12.9, much lower than that in India at 17.5% and slightly higher than that in China at 11.8% (Table 11).

V. An Econometric Analysis

To obtain empirical insights into the issue being studied (*i.e.,* does output growth in agriculture matter for poverty reduction in Indonesia?), two simple equations were used for the analysis using secondary data (as explained in the Introduction). Equation 1 estimates the effect of economic growth on changes in poverty (total, rural, and urban), with the percentage changes in poverty rate as the dependent variable, and the percentage changes in real GDP as the only explanatory variable:

$$\%\Delta P_L = a_0 + a_1 \%\Delta y + \varepsilon \quad (1)$$

where P_L is poverty with L for location: total (national), rural, and urban, and y is real GDP. This equation is to measure the effect of output growth in agriculture on poverty changes indirectly through GDP growth, since the latter is also contributed by the output growth in agriculture.

Equation 2 estimates the effect of output growth in agriculture relatively to output growth in two other main sectors, *i.e.,* manufacturing and services, on changes in poverty (total, rural, and urban):

$$\%\Delta P_L = b_0 + b_1 x_1 \%\Delta y_1 + b_2 x_2 \%\Delta y_2 + b_3 x_3 \%\Delta y_3 + \varepsilon \quad (2)$$

where $\%\Delta y_1$, $\%\Delta y_2$, and $\%\Delta y_3$ are percentage changes in real output in respectively, agriculture, manufacturing, and services, and x_1, x_2, and x_3 are output shares in GDP of the three sectors, respectively.

The findings show that one percentage increase in GDP lead to less than one percentage reduction in total poverty level. This may suggest that although Indonesia had experienced a significant reduction in poverty, especially during the pre-1997 crisis with the rapid economic growth, the growth cannot be considered as "pro-poor" since the poverty elasticity is much less than one. However, the impact is greater in rural than in urban areas. Further the decomposition of changes in poverty into three big sectors, *i.e.,* manufacturing, agriculture and services (including trade), shows that the output growth in agriculture has the greater effect on the change in poverty than the output growth in manufacturing, but, it is less than that in services (Table 12).

Specifically with respect to industry, the result does not mean, however, that the manufacturing sector is not important for the poverty

TABLE 12
IMPACT OF ONE PERCENTAGE GROWTH ON PERCENTAGE POINT OF GROWTH IN POVERTY LEVEL

Growth in	Change in		
	Total Poverty	Urban Poverty	Rural Poverty
GDP	-0.40	-0.28	-0.44
Output in Manufacturing	-0.02	-0.01	-0.02
Output in Agriculture	-0.05	-0.03	-0.05
Output in Services	-0.15	-0.13	-0.16

reduction. It has already been demonstrated elsewhere that it was the rapid output growth in manufacturing, resulting a similarly rapid growth in the demand for relatively unskilled labor (which is generally recognized as crucial for poverty reduction), that resulted in a tendency for labor to move out of agriculture and into manufacturing, while labor earnings in the latter sector increased. However, as shown before, the employment share of agriculture is much larger than that of manufacturing, and this gap does make a significant difference in sectoral growth effects on poverty reduction.

Previously, several studies from the SMERU research institute support the view that agriculture is still very important for poverty reduction in Indonesia. For instant, Sumarto and Suryahadi (2004) find that more than half of the reduction in the overall poverty headcount index achieved at the provincial level in the period 1984-1996 attributes to output growth in agriculture. Manufacturing growth was only marginally significant in reducing urban poverty. A recent study from the institute by Suryahadi *et al.* (2006) finds that the growth of the agricultural sector is very important for poverty reduction not only directly but also indirectly since it strongly induces the growth in non-agricultural sectors in rural areas. Although it has been fluctuating over time, it is estimated that, on average, 1% growth in the agricultural sector will induce 1.2% growth in the non-agricultural sectors in rural areas. Booth (2000, 2002) also finds the importance of agriculture for poverty reduction, especially in rural areas, not only directly but also indirectly through strong linkages between on-farm and off-farm activities. Based on her examined evidence on the determinants of rural poverty in Indonesia, she concludes that if rural poverty is to be further reduced in futures years, sustainability in output growth in agriculture as well as in rural non-farm sectors is the

pre-condition, and to have a sufficient condition, this should be accompanied with rural development programs targeted to the specific needs of rural poor people.

The above findings get support from studies in other countries with large agricultural sector. For instance, Ravallion and Chen's (2004) finding in China showing that about three-quarters of the overall reduction in poverty in the 1980s and 1990s in this country came from gains to the rural poor, stemming mainly from growth within rural areas. Growth in agriculture did much more to reduce poverty than growth in other sectors.

Many authors also emphasize the obvious importance of agriculture and the rural economy in the process of pro-poor growth in Indonesia. Even, Timmer (2004) concludes that *if labour-intensive manufacturing had not taken off rapidly in the mid 1980s, agriculture on the Outer Islands would probably have contributed more to pro-poor growth by offering migration opportunities from Java* (page 192).

With respect to services, this sector includes trade, and the latter consists not only of large and modern trade, but also small trade activities which are mainly found in the informal sector. Such activities are not only huge in terms of employment created, which are mainly conducted by poor households, but in many rural areas where agriculture is small or does not well developed (especially in rather isolated regions/islands) due to lack of transportation infrastructure, trade plus such as construction and local transportations are the only source of income that most people in the regions depend on. It is then generally expected, therefore, that the growth of these activities will have a significant impact on poverty reduction.

VI. Conclusions

This article attempts to answer one simple but very important policy-question: how important is the growth in agriculture for poverty reduction in Indonesia. This article also reviews briefly the Indonesian experience with the green revolution, since it has no doubt played an important role in development of agriculture in Indonesia particularly in the 1970s and 1980s. The following paragraphs summarize the main findings:

First, the resulting rapid economic growth during the new order government was significant on poverty reduction in the country, and

this was attributed to the combination of the labor-intensive oriented growth strategy and poverty alleviation measures. This experience emphasizes that although economic growth is not the only determinant factor of poverty reduction, in combination with poverty alleviation measures, the growth would have greater impact than without such policies directed towards poverty reduction.

Second, agriculture remains central to the Indonesian economy for two main reasons: (i) agriculture is still the biggest employment-generating sector in Indonesia; and (ii) the vast majority of poor families in Indonesia are in agriculture, consisting mainly of the marginal farmers and agricultural laborers. This evidence suggests that in the Indonesian context, poverty is mainly a rural phenomenon, and it strongly linked with the performance of agriculture. The decomposition of changes in poverty suggests that there is a cause-effect relationship between the trend in agricultural performance and poverty reduction in Indonesia.

Third, the green revolution in Indonesia had led the expansion of irrigated land to accelerate, and the use of modern inputs was also very intensive. All these have resulted in rapid output growth in agriculture, particularly in the 1980s up to early 1990s, suggesting that the green revolution did contribute to the reduction in poverty in Indonesia, particularly in rural areas during the new order government.

Overall, the above findings emphasize the importance of agriculture for poverty reduction in Indonesia. This implies, not only for Indonesia but also for other agricultural-based developing countries, that promoting agricultural is crucial for pro-poor growth. However, in order to achieve that, it should be supported by policies in the following main important areas:

(1) Infrastructure development, especially in rural areas where agricultural production centers are located, such as roads, bridges, electrification, telecommunication, transportation means, pack houses, cold stores, management of water resources, centers for further processing, terminal market centers, refrigerated transportation system, and irrigation system. This latter can be improved through drip irrigation method.
(2) Well-functioning output as well as input markets. These can help farmers in selling their products at real market prices, and to get the best seeds and appropriate fertilizers and pesticides at appropriate prices. Well-functioning inputs market also secure

timely and qualitative supply of these inputs. With this, the farmers can improve the efficiency in their production process and quality of their products. Farmers must also be provided facilities to directly sell their produce to various retailers or aggregators subject to various laws and regulatory norms.

(3) Legal system. Clear rights to the use and control of property should be established. This should include improvement in land distribution (*i.e.,* land reform). As shown before, the land distribution in Indonesia is very unequal, and this has been one reason of poverty in rural areas. Moreover, if the poor or farmers could get more secure titles to their assets, they could use this as collateral for borrowing. In other words, duping of poor and marginalised farmers must be met with stringent legal provisions.

(4) Business friendly environment for attracting more investment in agriculture, both in primary production and in further or downstream processing activities. In other words, supply chain must be strengthened by suitable investment.

(5) Technology. Government and private agencies like university and R&D institutions should actively support the farmers with the best or the most appropriate technology that closely link to the current as well as future market demand requirements.

(6) Education. Knowledge and skills of farmers need to be enhanced with respect to such as appropriate technologies or methods of production, post-harvest management, and local or domestic as well as global marketing. Farmers must be empowered through "capacity development initiatives" to meet the domestic and export demands more efficiently. Also empowerment of farmers is crucial in order to protect them from being unfairly treated by traders because they do not have any knowledge about current market situation.

(7) Credit. Easy and efficient access to credit at low interest rates for farmers, especially those owning small land should be secured. This also will protect farmers from being exploited by traders, since many farmers in LDCs depend much on 'informal' credit provided by traders.

(8) Unplanned and increasing speed in land conversion should be prevented. A good master plan on land distribution among different economic activities should be in place, so land for agriculture can be secured in the long-run.

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