Global Forum on Agriculture
29-30 November 2010
Policies for Agricultural Development, Poverty Reduction and Food Security
OECD Headquarters, Paris

Economic Importance of Agriculture for Sustainable Development and Poverty Reduction: Findings from a Case Study of Indonesia

Dalila Cervantes-Godoy, OECD Secretariat, dalila.cervantes@oecd.org; Joe Dewbre, OECD Secretariat, joe.dewbre@oecd.org
TABLE OF CONTENTS

Introduction ....................................................................................................................................... 4
Economy-wide context ..................................................................................................................... 5
Agriculture policy and productivity ............................................................................................... 7
  Input subsidies .............................................................................................................................. 7
  Price support ............................................................................................................................... 8
Sector-wide distortions due to government interventions in agricultural markets ..................... 10
Agricultural research and total factor productivity .................................................................... 11
Agriculture and poverty .................................................................................................................. 13
  Measuring poverty incidence and trends .................................................................................... 15
  Other indicators of poverty ......................................................................................................... 19
Agriculture’s contribution to poverty reduction in Indonesia ....................................................... 21
  Previous studies ......................................................................................................................... 22
  Method ....................................................................................................................................... 23
  Data ........................................................................................................................................... 24
Summary and conclusions ............................................................................................................. 29
References ..................................................................................................................................... 31

Tables

Table 1. Macroeconomic indicators ............................................................................................... 6
Table 2. Number and percentage of poor people by urban-rural areas, 1996-2009 ...................... 17
Table 3. Poverty gaps, Gini coefficients and food expenditure shares, 1996-2009 ..................... 20
Table 4. OLS regression results .................................................................................................... 27
Table 5. Contribution to poverty reduction by sector in Indonesia, 1999-2008 ......................... 29

Figures

Figure 1. Poverty rates in Indonesia 2009 ...................................................................................... 4
Figure 2. Agriculture’s share of GDP and employment ................................................................. 6
Figure 3. NRA’s for exportable, import-competitng and for total agriculture, 1970-2004 ............ 11
Figure 4. Annual growth rates in spending on agricultural research (real PPP adjusted dollars) ........ 12
Figure 5. Total factor productivity in agriculture, annual growth rates, 1991 to 2006 .................. 13
Figure 6. Poverty head count rates nationally, 1976 to 2009 ....................................................... 16
Figure 7. Rural poverty rates by province, 2009 ......................................................................... 18
Figure 8. Urban poverty rates by province, 2009 ....................................................................... 19
Figure 9. Lorenz Curve of income distribution .............................................................................. 21
Figure 10. Poverty rates and GDP per worker from various sources ............................................. 25
Figure 11. Estimated impacts of GDP per worker on urban and rural poverty rates compared on a per rupiah basis .............................................................................................................. 28
Figure 12. Evolution of real agriculture, industry and services GDP per worker, 1996-2008 .......... 28
Introduction

1. In 1996 Indonesia seemed on track to vanquish extreme poverty. From 1976 to 1996 the country’s GDP grew at between 7% and 8% per year. Agricultural GDP grew as well, albeit at a somewhat slower pace, as is typical in countries undergoing successful economic transformation. A more telling indicator of agriculture’s potential contribution to poverty reduction is agricultural GDP per worker. This indicator trended upward over those two decades at a faster rate than GDP per worker in other sectors of Indonesia’s economy during that time. Those two decades of steady economic progress had sharply reduced both the total number and the estimated proportion of the national population living below the official poverty line (approximately USD 1.55 per day in constant purchasing power terms).

2. The Asian economic crisis that struck the country in mid-1997 stymied economic growth and temporarily reversed the downward trend in poverty. From 1996 to 1999 the number of people in poverty rose by 13.5 million and the head count rate from 17.6% to 23.4%. Poverty rates subsequently resumed their downward trends and are now running well below pre-crisis levels. However, until recently, the total number of people in poverty was still above the pre-crisis level. Moreover the pace of poverty reduction since the crisis has slowed to less than one half that experienced in the quarter century before the onset of the crisis.

3. Past analyses of the relationship between poverty and economic growth show that both the overall rate and the sectoral composition of economic growth matter. A general conclusion emerging from that literature is that agricultural growth is typically more important for poverty reduction than growth in other economic sectors. Despite ongoing declines in its GDP and employment shares agriculture remains an important sector of Indonesia’s economy. Moreover, though also declining, more than half the population is still defined as rural and a large proportion of rural people, especially the poorest of them, still depend on farming for a living.
4. The post-crisis rebound of Indonesia’s economy has been slower for agriculture than for other sectors. For example, in sharp contrast with the situation pre-crisis, GDP per worker in agriculture has been growing much more slowly than GDP per worker in other sectors – trends that are contrary to the usual pattern in growing economies. What makes this apparent low level of agricultural productivity worrisome is that there has been no shortage of government policies, as well as substantial increases in budgetary expenditures to support various parts of the agricultural sector. From 2001 to 2008 real national government expenditures on agriculture rose by 11% per year. This resulted in agriculture doubling its share of total government spending (including by sub-national governments) from 3% to 6% by 2008 (Barichello, 2010).

5. What is the connection between agricultural sector performance and poverty in Indonesia? And, what role does or could government policy play in fostering better agricultural performance for poverty reduction? These questions motivated the analysis discussed in this case study report. We start by placing agriculture in the economy-wide context that largely determines sectoral growth outcomes. A brief review of agricultural policy developments follows to set the stage for a discussion of selected agricultural performance indicators. In the subsequent section we discuss trends in poverty and findings from analysis aimed at measuring the impact of agricultural growth on poverty.

**Economy-wide context**

6. Agriculture currently accounts for 14% of national GDP, having declined from 24% in 1980 (Figure 2). The sector share of employment currently stands at 40%, having declined from a 1980 share of 56%. Such declines are characteristic of developing countries and, indeed, it is generally considered a worrying sign if agriculture’s share of economy-wide GDP and employment start to increase – often the consequence of urban to rural migration ‘back to the farm’ during episodes of severe economic crisis. That the employment share still considerably exceeds the GDP share is indicative of the much lower productivity per worker in agriculture as compared to other sectors of the economy considered collectively – a subject to which we will return below.

7. Agricultural trade is increasingly important for Indonesia. It is the world’s largest exporter of palm oil, the second largest producer, and frequently a large importer, of rice. Its share of the country’s merchandise exports has grown from 4% in 2000 to 6% in 2008 (from 13 to 24% when processed food exports are included). Nonetheless, variation in supply, demand and prices for agricultural products, as in most large developing countries, reflect mainly the macroeconomic situation in the country rather more than what is happening on world markets. Domestic consumption demand for agricultural products depends largely on per capita income growth. And, apart from weather, variation in supply of agricultural products is greatly affected by trends in domestic price inflation, interest and exchange rates – all variables subject to the influence of government monetary and fiscal policies. This explains the widespread belief that a stable macro-economic environment is an essential pre-condition to good agricultural performance. Table 1 compares Indonesia and other countries in the region using selected indicators of macro-economic performance for the period 1985 to 2007.
First in the list is growth in GDP/capita. Although lagging somewhat behind other growth powerhouses in the region, China and Vietnam especially, income growth in Indonesia was a respectable 3.2% per year from 1985-2007 – an average brought down significantly by economic difficulties experienced during the Asian financial crisis. The three middle columns of the Table show the evolution of an indicator of macroeconomic performance based on data from the International Country Risk Guide (PRS-Group, 2009) and used as a barometer of overall economic health of a country. A country’s score on this indicator is based on the average of three measures: the budget balance score, inflation score, and exchange rate stability score. Macroeconomic conditions in Indonesia improved significantly from the mid-1980s to present times. However, the pace of improvement in the country was somewhat slower than in any of the other countries in the list and, again, especially that of Vietnam and China.

The final columns of the table compare for each of the selected countries the evolution from 1980 to 2005 of an index of trade openness - the sum of exports and imports expressed as a percentage of national GDP. The higher the value of this percentage, the less restrictive trade policy is seen to be.
Interpreted in this way, Indonesia has improved its trade performance (became more trade friendly) during the period. However the degree of trade openness suggested by this indicator and the rate of growth in that openness is much less than that characterizing other countries in the region.

The overall picture emerging from the comparisons in Table 1 is of a country characterized by an improving macroeconomic situation but one which, by all the indicators, is not improving nearly as rapidly as other countries in the region.

**Agriculture policy and productivity**

Historically, agriculture policy in Indonesia focused largely on achieving food self-sufficiency and price stability, especially and mainly in rice. The government has used a wide variety of policy instruments in pursuing those goals. Subsidies to purchased inputs have long featured prominently in the policy package. Perhaps the most striking example has been a large subsidy for fertilizer, but water (irrigation systems), fuel, credit, tree planting materials, and pesticides have also been subsidized. Though not usually considered a subsidy in the same sense, substantial sums of public monies have been spent financing investments in agricultural research, innovation and dissemination.

Where input subsidies benefit a wide range of commodities, most of the support for individual commodities has been through or has required complementary interventions through trade or border policy. The most important example is the price support afforded rice producers by government financed purchases of rice at prices above what would have prevailed in the market place. Other commodities, prominently sugar, have benefited from high tariff protection.

**Input subsidies**

Indonesia’s largest farm input subsidy was for many years a fertilizer subsidy. Over the seven year period from 1984 to 1990 this subsidy alone averaged 9% of the total development budget. (The development budget, largely financed through development assistance, refers to non-salary expenditures made to promote economic development.) Fertilizer subsidies fell beginning in the early 1990’s, and had been entirely eliminated by 2000. Across the eight years from 1991/92 to 1998/99 the average subsidy was Rp. 552 billion, but excluding the very high subsidy paid out in the last year, the first year after the financial crisis, the average subsidy actually paid was down to Rp. 357 billion amounting to about 2% of the development budget. Fertilizer subsidies have since been reinstituted and in 2009 had risen to Rp. 16 trillion (Rp. 1 trillion is equivalent to almost USD 100 million at current exchange rates), representing 30% of the entire agriculture budget in that year (Barichello, 2010).

Another input benefiting from subsidies from time to time in Indonesia is agricultural credit. Early efforts to encourage farmers to shift to high yielding rice varieties featured credit subsidies as one means of helping farmers finance their seed purchases. Subsequently, there have been many smaller programs to offer farmers credit at rates lower than were available through traditional lenders such as input sellers, money lenders, and more recently formal bank sources such as the state owned bank, Bank Rakyat Indonesia (BRI) lending at the village level.

Over the years many other development projects have included some kind of interest subsidy including, to encourage adoption of higher yielding varieties, better planting material for tree crops, as well as better farm practices. Most of these programs have provided for limited quantities of subsidized credit, so that not all farmers had access to this credit each year and most farmers who did could not obtain all the financing they wished to obtain with subsidy. Policy efforts in the farm credit area in Indonesia since the mid-1980s have included the improved provision of formal sector credit through BRI. This relatively unsubsidized source of credit has been successful and now accounts for a larger share of credit provided to
the agriculture sector. Further, it appears that there has been a decline in the amount of subsidized credit being offered.

**Price support**

**Rice**

16. Given the pre-eminence of rice in Indonesia, not only as the largest crop in agricultural production, but also in consumption as the staple food commodity, it has been centrally in agricultural commodity policy since at least the beginning of the Suharto (New Order) government. Government policy for this commodity began in the 1970s with a focus on stabilizing its price, a task charged to the food logistics agency, BULOG (State Logistics Board) a state-owned enterprise. Subsequently, public policy has been focused, more often than not, on raising the domestic price and attempting to increase the degree of self-sufficiency.

17. BULOG’s task was undertaken with the use of trade policy, domestic market purchases, and stockholding to set and enforce floor and ceiling prices. When prices threatened to fall below the floor, BULOG would purchase domestic rice in order to keep prices at or above the floor. When prices rose and were likely to exceed the ceiling, BULOG would sell stocks or purchase imports in order to keep domestic prices beneath the ceiling. Examination of these efforts prior to 1997 suggested strongly that BULOG seriously attempted to stabilize rice prices, as opposed to having tried to protect rice producers by systematically raising them (Barichello 1998). BULOG’s monopoly on rice trade was removed in 1998/99, and their domestic procurement efforts fell considerably after 1997.

18. Along with the end of BULOG’s monopoly and the opening up of trade to private importers, a specific tariff on rice imports was introduced - amounting to Rp. 430/kg, roughly equivalent to a 30% ad valorem tariff. The estimated nominal rate of protection for rice (as measured by the ratio of the domestic wholesale price to the c.i.f. import parity price) has fluctuated considerably over the years. During the 1990’s protection was positive in all years except for 1998 the year of the Asian financial crisis when domestic rice prices hardly changed despite the 75% depreciation of the exchange. Ignoring that one unusual year, the average nominal protection rate was 17% from 1990 to 2000, rising to 36 percent in 1999-2000. Rice imports were banned in 2004 and measured rates of rice trade protection have remained high since the beginning of the century, except at the height of the 2008 price spikes in international food commodity markets (Barichello, 2010).

**Sugar**

19. Although sugar is a lower priority crop than rice, it shares the features of being an import-competing crop with a policy goal of self-sufficiency which, as for rice, has largely not been realized. Its policy was always arcane but has undergone major changes since the financial crisis. Sugar policy in the early years of the New Order involved restricted imports through BULOG as the monopoly importer. BULOG also had a full monopoly over all purchases of domestic production. The government set the purchase price that sugar mills were required to pay farmers. The distribution chain was also regulated. Most prices were regulated and wholesalers received quotas for what they could buy from BULOG, with the result that margins in the sugar marketing chain were above competitive levels. BULOG chose who would receive the “purchase” quotas, giving them control over who would receive the economic rents in this distribution system. Regulations in the distribution chain were important because they usually accounted for more than 20% of the wholesale price.

20. At the farm level, regulation took the form of price setting as well as a form of quantity setting, under the Sugarcane Smallholder Intensification (TRI) program. Selected farmers were required by the
regional government head to grow sugar for its 2-3 year rotation, and these “required duties” were rotated within the village. This policy of forced sugar plantings was controversial because on irrigated land it was normally (not always) the case that rice was more profitable. It was estimated that these required sugar plantings came at a cost of about 1 million tonnes of rice per year which, for the most part, was privately and socially more profitable.

21. The result of this policy was that selected farmers would grow certain amounts of sugar and were paid regulated prices that were reportedly close to but somewhat above world prices. But prices were high enough that some farmers in East Java chose voluntarily to grow sugar in 2000, even though they were no longer forced to do so. This effectively subsidized sugar mills via assured domestic raw cane supplies at regulated relatively low prices. More importantly, the mills were paid for processed sugar at domestic prices considerably higher than world prices, made possible by the restricted imports and the regulated distribution system.

22. Since 1998, one of the biggest changes is that farmers are now free to grow sugar on their own. A second major change was that BULOG’s monopoly on purchasing local and imported sugar was removed. Although this could have led to a substantial increase in imports, more competition in processing, and a fall in consumer prices, there was a re-regulation of imports in early 1999, with import licenses given to the Java-based sugar millers. Then, in January 2000, under the conditions of the Letter of Intent between the Government of Indonesia and the IMF, the trade restriction was removed, replaced with a 25% tariff, and trade was opened to all importers. The tariff was to be phased down over three years and other adjustments were planned.

23. However, in September 2002, sugar policy was “reformed” again. The tariff has remained, although there have been calls to increase it to as high as 110%, but two other changes were significant. Import licenses were re-introduced and were given to the five largest sugar mills, and a floor price was introduced at a level above the existing market price, financed by a government subsidy commitment. It was acknowledged by the Commission for the Supervision of Business Competition (KPPU) in 2003 that this policy change had the potential to trigger cartel activities, but the politics of protecting sugar farmers and sugar mills dominated the policy choice.

Other food crops

24. Although there has been a history of government support for some food crops other than rice and sugar, notably for soybeans and corn, they were never as important and have virtually disappeared in recent years. Formerly, there was a complex policy regarding soybeans and their crushing, which hinged around BULOG control of imports as the sole importer. This involved importation at world prices and selling into the domestic market at relatively high prices. This was an inducement to produce for domestic farmers growing soybeans, while it simultaneously generated high import rents to BULOG as they could arbitrage these large margins. Beginning in the later 1980s these rents were largely passed on from BULOG to a private monopoly soybean crushing firm which operated until 1996. And then, in the post-financial crisis reforms, the monopoly import rights held by BULOG were removed and trade was opened to all importers.

25. There is now a bound tariff on some food crops where BULOG non-tariff barriers existed previously. The bound rate for soybean meal was 45% in 1995, declining to 40% in 2004. The comparable rates for both wheat and wheat flour are 30% and 27%, in 1995 and 2004, respectively. However, as is the case for many agricultural commodities in Indonesia, actual rates are considerably lower. Moreover, wheat and wheat flour tariffs have no direct effect on domestic production, given there is no commercial production of that cereal in Indonesia.
26. During the decade of the 1980s, trade in corn was controlled by BULOG but since the beginning of the 1990s, there has been no control over imports and the tariff has been zero. So although Indonesia has been a net importer of corn, the domestic corn industry has been competing freely with imports. This has been to the advantage of the livestock sector, particularly the growing poultry sector which has been the major user of corn as a primary ingredient in animal feed.

Tree crops

27. This category includes three major export crops: oil palm, coffee and rubber, where the export value, although quite variable from year to year, is in the range of at least several hundred millions of dollars in each case. Over the past decade, oil palm and palm oil products have been subject to export bans and export taxes. No export taxes or bans have been applied to coffee but, until 1988, coffee exports were limited by an export quota scheme through the International Coffee Agreement. Rubber has not had any export restrictions although a rubber export tax has been proposed on several occasions.

28. An export ban on crude palm oil (CPO) was in place following the rapid depreciation of the Rupiah during the financial crisis in order to limit increases in the domestic price of cooking oil. The export ban was replaced by an export tax of 40% on crude palm oil in 1999, a rate that subsequently declined to 10%. Currently palm exports are subject to a variable export levy, beginning when CPO prices exceed USD 700/mt. The rate increases by 1.5% for each $50 increase in the international CPO price to USD 950/mt, then by 2.5% for each $50 increase, to a ceiling of 25% for prices in excess of USD 1250/mt.

29. An important recent development in the tree crops sector is the encouragement of biofuel production. The objective is to convert 6 million hectares of land to biofuel production, based on increased oil palm production (Basri, and Patunru, 2006). The expectation is that this would generate increased production of 22.5 million kilolitres of biofuel and create 3–5 million jobs. Additional biofuel initiatives have been proposed: banning crude palm oil exports and diverting this production to biodiesel production, and banning sugarcane molasses exports to use them instead for bioethanol production. Estimates of the 2007 budget cost ranged from Rp. 1 to 13 trillion for these initiatives. In late 2008 mixing regulations for gasoline were introduced to require the addition of biofuels.

30. The stated policy objective is to absorb more crude palm oil produced in Indonesia and increase its value-added instead of exporting the currently large and growing volume. In addition the program is aimed at increasing the supply of green fuels produced in Indonesia to combat global warming, and, it is argued, reducing unemployment. So far, only about 10%-15% of domestic production of CPO is being used to produce biofuels.

Sector-wide distortions due to government interventions in agricultural markets

31. It is difficult to discern from the discussion above whether, when viewed from a sector-wide perspective, government policies have generally favoured or disfavoured agriculture. Producers of some commodities have benefited some of the time from government interventions but the occasional ban or tax on exports have had negative impacts on producer returns. One indicator of the overall effects of government interventions is the Nominal Rate of Assistance (NRA), an estimate of the percentage by which government subsidy and price policies have raised/lowered gross returns to farmers above/below what they would be without the government intervention (Anderson and Valenzuela, 2008). The NRA is higher the greater are input and output price subsidies and the greater is trade protection. Correspondingly, export taxes and bans result in negative NRA’s.

32. Fane and Warr (2007) report estimates of sector-wide NRA’s for Indonesia, separately for an aggregate of exportable commodities (coffee, tea, coconuts, rubber and palm oil) and for importables (rice,
maize, soybeans, sugar and poultry). They also report a sector-wide or overall NRA. They used data covering the period 1970 to 2004. Figure 3 traces the time path of their estimates (displayed as five year averages to smooth out sometimes extreme year to year fluctuations).

**Figure 3. NRA’s for exportable, import-competing and for total agriculture, 1970-2004**

![Graph showing trends in NRA for exportable, import-competing, and total agriculture, 1970-2004](image)

*Source: Fane and Warr (2007).*

33. The trends in assistance rates displayed in Figure are heavily dominated by developments in rice, sugar and palm oil sectors discussed above. In particular, the trough in apparent protection (increase in disprotection for exportables) in the 1990’s is largely the consequence of exchange rate trends during the Asian financial crisis. Nonetheless, the overall story told in Figure 3 is typical of the nature of government involvement in agriculture for many developing countries during the 1980s and 1990s. Producers of import competing agricultural commodities benefitted from positive trade protection and government support (positive NRA) while producers of exportable commodities were, in effect, taxed by government policy (negative NRA). The NRA for all of the crops covered taken together was positive in more years than not, i.e. the positive NRA’s for importables generally more than offset the negative NRA’s for exportables.

**Agricultural research and total factor productivity**

34. Public investment in agricultural research and development is widely considered essential to achieving productivity growth in the agricultural sector. Lacking direct estimates of Indonesia’s budgetary expenditure on this category it is difficult to judge either the size of spending or the degree to which such spending has increased or decreased. Part of this measurement problem arises because one major element of research/extension spending is for salaries of government-employed researchers and these salaries often fall under the routine budget. Given that spending on the routine budget for agriculture has declined, this may be an indication that this component of spending on research also fell. The World Bank (2010) suggests that the apparent slowdown in agriculture recently is the consequence of a long run downturn in public investment in the sector.
35. Data from IFPRI’s Agricultural Science and Technology Indicators (ASTI) database may provide some insights. That database contains estimates of total public spending on agricultural research for a large number of developing countries. We have data for Indonesia from this source covering the years from 1994 to 2003. A worrying conclusion emerging from that data is that Indonesia may be seriously under-investing in agricultural research. Figure 4 shows annual average growth rates of public spending on agricultural research in Indonesia and some other countries in the region. They show a significant decline in Indonesia’s investments in agricultural research, a decline that stands in stark contrast to the significant increases in such spending posted by the other countries as well as for the Southeast Asian region overall.

36. Another indicator reported in the ASTI database is the intensity of public investment in agricultural research - the ratio of spending to agricultural GDP. During 1994 to 2002 that ratio averaged just over 0.2%, less than half the Asia-Pacific region average of 0.6% and was declining over most of that period. Caution is in order however as all these comparisons are based on data covering only ten years of data. This topic must be given closer examination before definitive conclusions would be possible.

Figure 4. Annual growth rates in spending on agricultural research (real PPP adjusted dollars), 1994-2003

37. The payoff from investments in agricultural research, development, extension and education comes from increased agricultural productivity. Comparisons of agricultural performance among countries and over time are frequently made using partial productivity indicators such as output, e.g. per unit of land, or head of livestock or agricultural worker. However these indicate only the trends in output relative to one input and can be misleading in cases where the input mix is changing or, especially, where there are technical advances allowing increases in output for a given level of input use.

38. A superior measure, frequently used to overcome these problems is total factor productivity (TFP). Thistle, Lin and Piesse (2003) examine the impact of total factor productivity growth on the incidence of poverty in the LDCs, as measured by the percentage of the population living on less
than USD 1.00 per day. Employing regression analysis their empirical analysis shows that agricultural productivity growth has a substantial impact on poverty reduction, whereas productivity growth in industry and services does not. They use their empirical findings to show that investment in agricultural R&D has had a substantial impact on poverty reduction in Africa and Asia, as well as paying for itself by being an extremely profitable investment.

39. Fuglie (2008) reports findings from a comprehensive study of trends in total factor productivity covering 173 countries. His analysis includes Indonesia, which has, relatively speaking, better than average data on the variables: production, factor use and cost shares, needed to make TFP calculations. Figure 5 uses estimates taken from that analysis to compare Indonesia’s estimated TFP performance with that of neighbouring countries in the region for the years 1991 to 2006.

**Figure 5. Total factor productivity in agriculture, annual growth rates, 1991 to 2006**

![Figure 5](image)

Source: Fuglie, 2008.

40. Indonesia posted an estimated TFP growth rate of just less than 1.5% per year on average 1991 to 2006. Fuglie also reports estimates of TFP growth rates for earlier epochs going all the way back to the 1960’s. Indonesia is remarkable in that the estimated rate of TFP growth has been steady around that 1.5% per year mark for virtually the entire period. Nonetheless, this was considerably below the performance of other individual countries and the regional average for 1991 to 2006 as shown in Figure 5.

**Agriculture and poverty**

41. In principle, good agricultural performance operates to reduce measured poverty through both food price and farm income channels. Because food constitutes such a high share of consumer expenditures by the poor, currently around 50% in Indonesia, lower food prices, would tend to reduce poverty. This is because poverty calculations are based on real, inflation adjusted consumer expenditures. Thus, if in the intervening years between cost of living surveys, consumer food prices go down the purchasing power of a given level of nominal income and thus real expenditure goes up.

42. However, there is no guarantee that just because food commodity prices go down so will poverty. An ambiguity arises because many poor people also depend on farming for their income. Thus, depending
on what causes prices to fall, how much they fall and whether the majority of the poor are net buyers or sellers of food a decline in food prices might simultaneously reduce the real incomes and expenditures of some poor farmers while increasing those of some poor consumers. The ‘net’ poverty impact nationally could go either way. In a recent paper, Warr and Usuf (2010), use a general equilibrium model to trace through the effects of the spikes in international food prices occurring during 2007 to 2008. They conclude that the net effect of those higher prices on poverty was negative but quantitatively quite small.

43. The link between agriculture and poverty through the income channel has received a great deal more attention in the literature than has the link through the price channel. In Indonesia, as elsewhere in the developing world, most people who depend on agriculture for their incomes are poor and, nationally, most of those who are poor depend on agriculture for a living. Explaining why this is so and what ought to be done about it is an enduring theme in development economics. Although measurement difficulties abound there is general consensus that farmers and their families are poorer than other people because average worker productivity and thus earnings per worker in agriculture are lower than for workers employed in other sectors of the economy. The debate centres not on this basic fact but on the causes and the appropriate policy responses.

44. There are two polar views. One, inspired by Nobel Prize winning economist Sir Arthur Lewis and still popular among some prominent development economists (see, e.g., Dercon, Hill and Zeitlin, 2009), holds that average productivity per worker in agriculture is low because, relative to the optimal, there are simply too many workers in the sector. Lewis’s seminal contribution was entitled ‘Economic Development with Unlimited Supply of Labour’, Lewis (1955).

45. According to the Lewis explanation, the productivity gap between agricultural and non-agricultural sectors of the economy will be restored only when a sufficiently large number of agricultural workers find jobs off the farm. It is by this process of transferring low productivity and poor workers to higher paying jobs in non-farm occupations that the twin objectives of reducing poverty and enhancing economic growth are to be achieved.

46. In the Lewis model economic growth occurs because the output gain in the sectors receiving workers migrating from jobs in agriculture is greater than is the output loss in agriculture. A strong view of the Lewis theory holds that, in the initial phases of the adjustment process, there may be no reduction whatsoever of agricultural output because the surplus of labour in that sector is so great as to yield a zero marginal productivity of labour. Many economists who subscribe to the Lewis model favour government actions that favour non-agricultural sectors, typically manufacturing and industry, over agriculture.

47. In the alternative view, the problem of low agricultural productivity per worker is seen not to be the consequence of an excess of labour in the sector but of a deficit of capital – a less than optimal level of investment. Agricultural workers cannot earn incomes comparable to workers in other sectors because of a lack of complementary capital. Agricultural investment is less than optimal because of the public goods nature of the payoff to some categories of investment such as agricultural research or infrastructure and because of widespread market failures. A famous contemporary advocate of this view is Jeffrey Sachs (Sachs, 2005). Government action is required to close this investment gap, both by direct public investments in the sector and by interventions to resolve market failures discouraging private investment.

48. The range of public actions justified by this approach include budgetary financing of subsidies to encourage use of modern inputs; increased public investments in agricultural research, extension and education; expanding the network of public roads and marketing infrastructure. This approach achieves growth and poverty objectives, not by reducing the number of workers in agriculture, but by increasing their productivity within the sector. Further support for the idea that government actions should favour agriculture over other productive sectors comes from economists who believe that agricultural growth
exhibits greater economy-wide multiplier effects than growth in other sectors, i.e., that agriculture, at least in the early stages of development, is the engine of economy-wide growth.

49. In reality, these polar extremes serve merely to help establish the scope of the policy challenge faced by developing country governments. Neither serves well all on its own. In some countries, more emphasis will need to be put on policies that promote investment in agriculture. In others the emphasis may be more appropriately on policies that promote off-farm job opportunities the sector. The difficulty is in finding the best middle ground – a position that will be different for different countries depending on resource endowments, comparative advantage and stage of development. The analysis described in this chapter aimed to contribute to that search, focusing on the special case of Indonesia.

Measuring poverty incidence and trends

50. The Copenhagen Declaration issued at the UN’s World Summit on Social Development in 1995, described poverty as “…a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information”. While evocative as a description of the human condition of those suffering from poverty, such definitions do not provide a quantitative basis for tracking progress in reducing it (World Bank, 2005).

51. Working definitions of poverty are based on the notion of a poverty line. Generally, each country defines its own national poverty line based on the cost of a basket of goods necessary to cover basic needs. Basic needs typically mean enough food for adequate nutrition plus other essentials such as clothing and shelter. A person is considered poor if his or her actual consumption expenditure falls below that which is necessary to cover the cost of that basket of essentials. However, the definition of what is necessary to satisfy basic needs varies across time and societies. Therefore, poverty lines vary in time and place as each country uses lines which are appropriate to its level of development, societal norms and values (World Bank 2005).

52. In Indonesia the poor are defined as those whose monthly expenditures are less than a poverty threshold defined as “…the amount of money needed to purchase minimum basic essentials to sustain life.” (Maksum, 2004). The list of basic essentials incorporated in the computation of the poverty line comprises separate food and non-food bundles. The composition of these two bundles is obtained from observations of consumption of items in the respective bundles of essential goods by a non-poor reference group, i.e., a group of people whose total expenditures on essential goods exceed the poverty line. The level of food expenditure incorporated in the poverty line is that necessary to attain a target 2100 kcal per capita per day. The corresponding level of non-food expenditure is determined based on consumption by a reference group. Poverty lines differ between rural and urban areas, among provinces and over time. Although still dominant, food expenditures constitute a decreasingly important share of the total.

53. The main source of data for estimating poverty Indonesia is the National Socio-Economic Survey (SUSENAS) collected by Statistics Indonesia (BPS). There is a core survey every year soliciting information on prices and expenditures on main categories of consumption. Then, every three years, there is an in-depth survey called the consumption module soliciting the detailed information needed to construct poverty lines. Consumption estimates needed to estimate poverty rates for the in-between years of the consumption module are inferred from the corresponding aggregate data collected in the core survey. The BPS has published official annual poverty estimates for those in-between years since 2003. The SUSENAS has been conducted since 1984. In 1993 representation increased from the national to the provincial level. The current sample size is 225 000 for the core annual survey and is 66 000 for the tri-annual consumption module (Marksum, 2004).
54. In 1998, the consumption basket used to calculate expenditures for poverty measurement was revised to reflect greater expenditure on non-food items such as electricity and housing. Applying the revised method to data for 1996 resulted in an upward revision of national poverty rate from 11.3% to 17.6%. However 1996 was the only previous year to which the revised method was applied. That rendered problematic any comparisons of pre- and post 1996 figures. Figure 6 plots estimated poverty rates using the old method for 1976 to 1996 and then the 1996 to 2009 estimates based on the revised method.

55. The data in Figure 6 shows the impressive decline in poverty that occurred prior to the Asian financial crisis. In 1976, after considerable economic growth from the late 1960s, poverty was still at 40% of the population. Yet by 1980, after 6%–8% annual growth rates throughout the 1970s, it had fallen to 29%, falling further to 15% by 1990 and to only 11% by 1996 (old method). Indonesia’s achievement in poverty reduction during that period rivals that of the best performing economies of the developing world, including regional neighbours Thailand and Vietnam (Warr, 2006; World Bank, 2006).

56. The post 1996 data tell a different story. Not only is the estimated poverty rate for 1996 six percentage points higher using the new as compared to the old method but that rate increased sharply between the 1996 and 1999 surveys revealing the seriousness of the 1997/1998 economic crisis. Since then poverty declined but at a disappointingly slow pace. Note that the rate of decline in the poverty headcount index for the period 1976 to 1996 averaged around two percentage points per year. That average fell to less than half that, to less than one percentage point per year for the years from 1999 through 2009.

57. What explains the apparent slowdown in progress against poverty following the crisis? Part of the explanation may be technical, relating to the 1996 switch to a different method for measuring poverty. Another technical factor at play is the normal dampening that occurs as the percentage rate asymptotically approaches its lower bound – theoretically zero, realistically probably 2%–3%. Finally, progress in reducing poverty may have slowed following the crisis because neither economy-wide growth nor agricultural sector growth has been as great post-crisis as before. It is evidently more difficult to achieve rapid declines in poverty when the national economy is growing at only 4%–5% per year, as it has for most of the first decade of the 2000s, than with the 7%–9% growth rates, pre-crisis.

Figure 6. Poverty head count rates nationally, 1976 to 2009

Source: BPS several years.

16
Table 2 contains data comparing urban and rural poverty rates for the period 1996 to 2009. In Indonesia as is typical in developing countries rural poverty is greater, both in total numbers and in percentage rates, than urban poverty. In 2009 nearly twice as many rural as urban people were in poverty. The corresponding poverty rate in urban areas had decreased to just less than 11% by 2009 but in rural areas was nearer 17.5%. Nonetheless, the post-crisis fall in the absolute number of poor people in the country (between 1999 and 2009) was due entirely to a reduction in the total number of rural poor. Indeed, because of the up-surge during the crisis, the number of urban poor was still substantially greater in 2009 than in 1996.

Table 2. Number and percentage of poor people by urban-rural areas, 1996-2009

<table>
<thead>
<tr>
<th>Year</th>
<th>% Poor people (Headcount Index)</th>
<th>Number of poor people (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Rural</td>
</tr>
<tr>
<td>1996</td>
<td>13.6</td>
<td>19.9</td>
</tr>
<tr>
<td>1999</td>
<td>19.4</td>
<td>26.0</td>
</tr>
<tr>
<td>2002</td>
<td>14.5</td>
<td>21.1</td>
</tr>
<tr>
<td>2003</td>
<td>13.6</td>
<td>20.2</td>
</tr>
<tr>
<td>2004</td>
<td>12.1</td>
<td>20.1</td>
</tr>
<tr>
<td>2007</td>
<td>12.5</td>
<td>20.1</td>
</tr>
<tr>
<td>2008</td>
<td>11.7</td>
<td>18.9</td>
</tr>
<tr>
<td>2009</td>
<td>10.7</td>
<td>17.4</td>
</tr>
</tbody>
</table>

Source: BPS several years.
59. Poverty varies substantially across provinces in Indonesia (Figures 7 and 8). The island of Java accounts for both the majority of the population and the majority of the poor. However the incidence of poverty is much higher in outlying regions. For example, in 2009, the estimated rural poverty headcount rate nationally was just over 17% but the four poorest provinces: Gorontalo, Maluku, Papua Barat and Papua registered head count poverty rates ranging from 33% to 47% while in the four richest ones: Kalimantan Selatan, Bali, Jambi and Kalimantan Tengah those rates averaged under 8%. Urban poverty rates not only average lower than rural ones but are also less disperse. For example, in 2009, apart from in one province - Nusa Tenggara Barat, urban poverty rates were in all other provinces less than 20% in 2009 and in the majority of them less than.

**Figure 7. Rural poverty rates by province, 2009**

*Source: OECD calculations based on BPS statistics.*
**Other indicators of poverty**

60. Though simple to construct and easy to understand, the poverty headcount index does have some shortcomings. It does not, for example, take into account the intensity or the depth of poverty. In other words, it does not indicate how poor the poor are, and hence does not change if people living below the poverty line become richer or poorer. During periods of economic prosperity, many poor people might increase their expenditures but not by enough to clear the poverty threshold. Likewise, during periods of economic downturn many people already living below the poverty line might be spending less but that would not show up as an increase in the poverty rate. An indicator which overcomes some of these problems is the Poverty Gap Index (PGI). In effect, the PGI indicates how far expenditures by the poor fall short of the established poverty line (World Bank, 2005).

61. The PGI indicates how great is the difference between poor households’ expenditures and the poverty threshold. The gap is considered to be zero for the non-poor, i.e. those whose expenditures are greater than the poverty line. As the gap closes (tends to zero) it means that expenditures by the poor population are progressively closer to the poverty line i.e., that poor people are becoming progressively less poor – a development that would not show up by looking only at the poverty head count. The PGI for Indonesia (Table 3) was at 3.3 in 1996 and substantially lower in urban (2.6) than in rural areas (3.6). During the crisis years this index both rose sharply nationally, and increased more in rural than in urban
areas. Since then poverty intensity as measured by this index has declined steadily and is now well below even its pre-crisis levels.

Table 3. Poverty gaps, Gini coefficients and food expenditure shares, 1996-2009

<table>
<thead>
<tr>
<th></th>
<th>Poverty gap urban</th>
<th>Poverty gap rural</th>
<th>Poverty gap national</th>
<th>Gini coefficient</th>
<th>Percentage household expenditure for food</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>2.58</td>
<td>3.62</td>
<td>3.25</td>
<td>0.33</td>
<td>n.a.</td>
</tr>
<tr>
<td>1999</td>
<td>3.52</td>
<td>4.84</td>
<td>4.18</td>
<td>0.31</td>
<td>62.94</td>
</tr>
<tr>
<td>2002</td>
<td>2.59</td>
<td>3.34</td>
<td>3.01</td>
<td>0.33</td>
<td>58.47</td>
</tr>
<tr>
<td>2003</td>
<td>2.55</td>
<td>3.53</td>
<td>3.13</td>
<td>0.32</td>
<td>56.89</td>
</tr>
<tr>
<td>2004</td>
<td>2.18</td>
<td>3.43</td>
<td>2.89</td>
<td>0.32</td>
<td>54.59</td>
</tr>
<tr>
<td>2005</td>
<td>n.a.</td>
<td>n.a.</td>
<td>2.94</td>
<td>0.36</td>
<td>51.37</td>
</tr>
<tr>
<td>2006</td>
<td>n.a.</td>
<td>n.a.</td>
<td>3.43</td>
<td>0.33</td>
<td>53.01</td>
</tr>
<tr>
<td>2007</td>
<td>2.15</td>
<td>3.78</td>
<td>2.99</td>
<td>0.36</td>
<td>49.24</td>
</tr>
<tr>
<td>2008</td>
<td>2.07</td>
<td>3.42</td>
<td>3.37</td>
<td>0.35</td>
<td>50.17</td>
</tr>
<tr>
<td>2009</td>
<td>1.91</td>
<td>3.05</td>
<td>2.51</td>
<td>0.37</td>
<td>50.62</td>
</tr>
</tbody>
</table>

Source: BPS several years.

62. Trends in the PGI provide insights into developments within the population of poor people. But it is interesting as well to know what has happened to the distribution of income within the population at large. Did, for example, the spending of the relatively well-off – those whose spending levels that place them in the top 10% or 20% of the population, increase more rapidly than those in the bottom 10% or 20%? An indicator that helps to answer income distributional questions is the Gini coefficient - probably the most commonly used measure of income or wealth inequality. The Gini coefficient indicates how evenly the income (or wealth) is distributed throughout a country (World Bank, 2005).

63. The Gini coefficient is obtained by comparing the actual distribution of income within a population to a hypothetically equal distribution. In Figure 9 below, the straight line depicts the cumulative distribution of income in a situation where each decile of the population receives exactly 10% of total income. The curved line (called a Lorenz curve) represents the income distribution in Indonesia in 2009. The Lorenz curve plots the proportion of the total income of the population (y axis) that is cumulatively earned by the bottom x% of the population (x axis). Figure 9 shows, for example, that the bottom 40% of the Indonesian population earns less than 20% of total income.

64. Area A in the Figure thus shows how much the actual distribution departs from a hypothetically equal one. Numerically, the Gini coefficient is equal the ratio of area A divided by the sum of areas A + B, thus varying between 0 and 1. Notice that the closer the Lorenz curve is to the Line of Equality, the smaller is area A and the closer is the Gini coefficient to zero, indicating a very even distribution of income. Correspondingly, if area A is very large (making B very small), then the Gini Coefficient tends toward unity indicating a very uneven distribution of income.
Developing countries have Gini coefficients that fall over a quite wide range, from e.g., 0.30 for Ethiopia to 0.74 for Namibia (UNDP, 2010). Developed countries typically have relatively low Gini coefficients, averaging around 0.25 in, e.g., Denmark, Japan and Sweden and around 0.40 in, e.g., Portugal and the United States. It is common in many developing countries that as incomes grow, the income gap between the rich and poor widens and the Gini coefficient increases. In fast growing China for example the Gini coefficient increased from 0.30 in 1993 to 0.42 in 2007 (UNDP, 2010).

The Gini coefficients estimated from the survey data for Indonesia (next to last column of Table 3) show that in 1996 the income distribution in Indonesia was relatively even. Since then the index has varied considerably from a low of 0.31 in 1999, the year worst hit by the Asian financial crisis, to a high of 0.37 in 2009. That incomes became more evenly distributed in 1999, suggests that the incomes of the rich were pushed down relatively more by the economic crisis than were those of the poor. Since then, the Gini has been on a generally rising trend. Nevertheless, even in 2009, the estimated Gini coefficient was, at 0.37, well within the range observed for developed countries.

The final column of Table 3 contains estimates of the share of income spent on food in Indonesia for 1996-2009. Though not an indicator of poverty per se trends in this indicator do correspond to the stage of development of a country. As incomes grow the share of consumer expenditures on food tends to decline. (Technically, the income elasticity of demand for food is less that unity and therefore less than the income elasticity of demand for non-food items in the aggregate.) Though still much higher than in developed countries, the food share of consumer expenditures in Indonesia has been declining steadily, indicative of a country undergoing rapid economic development.

Agriculture’s contribution to poverty reduction in Indonesia

This section examines directly the main research question motivating our study of Indonesia – how important is agricultural growth versus growth in other sectors for poverty reduction. It is generally accepted that the only sustainable cure for poverty is economic growth and most empirical studies indeed find that poverty tends to fall with growth. But some kinds of growth reduce poverty more than others and many studies document that a given rate of growth can deliver diverse outcomes for the poor, suggesting
that the pattern of growth (sectoral and/or geographical) matters independently of the overall growth. Different sources of growth affect poverty differently because they impact factor returns differently and the distribution of factor ownership is different as between the poor and non-poor.

**Previous studies**

69. Montalvo and Ravallion (2009) explain that if economic growth is very intense in sectors that do not benefit poor people then inequality will rise, holding back the gains to the poor. For example, if the poor live mostly in rural areas and depend mainly on agriculture for living, a booming high-tech sector in major metropolitan areas may not have much of an impact on poverty. Additionally, the initial distribution of income is known to be important for the subsequent effect of economic growth on poverty (Ravallion 1997; Bourguignon, 2003). When the poor have a low initial share of total income they will consequently have a lower share of the gains in aggregate income during the growth process.

70. Christiaensen and Demery (2007) emphasize the importance of the geographic pattern of growth. The contribution of economic growth to poverty reduction might differ across sectors because the benefits of growth might be easier for poor people to obtain if growth occurs where they are located. This reasoning implicitly assumes that transferring income generated in one economic sector or geographic location to another sector or location is difficult because of market segmentations or considerations of political economy. They find that growth originating in agriculture is on average significantly more poverty reducing than growth originating outside agriculture.

71. Montalvo and Ravallion (2009) find that the primary sector rather than the secondary or tertiary sectors was the real driving force in China’s spectacular success against absolute poverty. They conclude that the idea of a trade-off between these sectors in terms of overall progress against poverty in China is moot, given how little evidence they found of any poverty impact of non-primary sector growth.

72. Rural economic growth has been found to have more impact on poverty in India than urban economic growth. However, growth in the services sector has had more impact than the primary (agriculture) sector, while the secondary (manufacturing) sector appears to have brought little direct gain to India’s poor (Ravallion and Datt 1996, 2002; Datt and Ravallion, 2002).

73. While most empirical studies show that agricultural growth is relatively more important for poverty reduction than growth in other sectors, there are exceptions. This underscores the existence of potentially important differences in the sectoral GDP elasticities of poverty across countries depending on the structure and institutional organization of their economies (Loayza and Raddatz, 2006). A common finding is that the poverty reducing powers of agriculture declines as countries get richer (Christiaensen and Demery, 2007; Ligon and Sadoulet, 2008).

74. The story emerging from past analyses of the importance for poverty reduction of growth in agriculture versus other sectors for Indonesia in particular is also mixed. Suryahadi *et al.* (2009) investigate the relationship between economic growth and poverty reduction using econometric analysis of provincial data distinguishing between the sectoral poverty rates and sources of growth. They find that while agricultural growth strongly reduces rural poverty urban services growth has the largest effect on poverty in both urban and rural locations. Contrastingly, their results indicate that industrial sector growth has almost no impact at all on poverty in either rural or urban populations.

75. McCulloch, Weisbrod and Timmer (2007) utilise cross-section data in an attempt to determine whether productivity growth in agriculture, productivity growth in non-agriculture activities or migration from rural to urban areas was most successful in reducing rural poverty reduction in Indonesia from 19993 to 2002. They find that while increased engagement of farmers in rural non-farm enterprises is an
important pathway out of poverty, most of the rural agricultural poor that escape poverty still do so while remaining in rural areas, employed in agriculture. Interestingly, they conclude that rural to urban migration seems not to have been an important route out of poverty. This leads them to conclude that changes in agricultural prices, earnings and productivity still play a critical role in reducing poverty.

76. Fane and Warr (2007) arrive at quite different conclusions after investigating the growth-poverty relationship for Indonesia by doing simulations with a computable general equilibrium model. They compare the poverty impacts of technical progress in industry, services and agriculture concluding that “Contrary to the implicit assumptions of many commentators, the poor do much better if a given amount of GDP growth is produced by technical progress in services, or manufacturing, than if it is due to technical progress in agriculture.” (p.12)

77. Warr (2006) merges poverty and growth data for four Southeast Asia countries: Indonesia, Thailand, Malaysia and the Philippines to study econometrically the relative contribution to poverty reduction of past growth in the industrial, services and agricultural sector growth. He concludes that in the specific case of Indonesia both agriculture and services sector growth were important explanators of poverty reduction with agricultural growth being slightly more important. He found that industrial sector growth had actually increased rather than reduced poverty in the country.

Method

78. We estimate the relationship between poverty and agriculture by regression analysis of provincial data measuring headcount poverty rates and GDP per worker by sector for the period 1996 to 2008. Our method follows closely that used by Montalvo and Ravallion (2009) in their analysis of the sectoral and geographic pattern of economic growth and poverty in China using. However, our approach differs in one important respect from that study and many other past attempts to econometrically estimate the relationship between poverty and sector incomes.

79. The research question motivating the Montalvo and Ravallion (2009) study and much prior analysis of the link between economic growth and poverty is whether the sectoral or regional pattern as distinct from the economy-wide rate of growth matters. The associated regression analyses featured two broad types of estimating equations, differing according to the choice of right hand side variables, but with many variations on the theme. In one of those two general categories, the right hand side variables comprise per capita income and GDP sector shares. In the other, the right hand side variables comprise simply per capita GDP separately for each economic sector, i.e., sector GDP divided by population.

80. We chose instead to use as right hand side variables sector GDP per worker, i.e., total sector GDP for each province divided, not by population, but by associated number of workers in the sector. Our choice was motivated by two considerations. First, sector GDP per worker corresponds most closely to earnings or income per worker. In the particular case of agriculture, GDP per worker aggregates returns to factors of production (especially own labour and land) owned by poor people. The second reason relates to the dynamics of the role of agriculture in development process. Two contrasting trends characterize countries undergoing economic development: 1) agricultural GDP in total grows more slowly than GDP in other sectors but 2) agricultural GDP per worker grows faster than in other sectors. And, it is the latter rather than the former that explains why poverty rates among those who depend on agriculture for a living decline sharply with economic growth. (There is of course more to the story. Importantly, agricultural households also tend to increase the diversity of their income sources as economies prosper.)
81. The time series dimension of the dataset we created for regression analysis corresponds to the years between 1996 and 2008 for which there are data available from the SUSENAS surveys. Although data are available for earlier years we chose to focus only on the poverty estimates created using the revised method (Figure 2) to ensure comparability of the poverty estimates from between survey years. The cross-section dimension of the dataset corresponds to data available for all survey years for twenty-six regional ‘entities’. Twenty-one of these are provinces whose geographical definition is the same in the most recent survey year as it was in 1996. In the other five cases, there were changes in the geographical definition occurring when some provinces were split into two. In those cases, following SUSENAS procedures, we created data using the 1996 provincial definitions again in order to retain comparability of the data over all survey years.

82. The dataset distinguishes poverty headcounts between rural and urban populations and GDP per worker by sector: agriculture, industry and services. We took the poverty headcount rates, measured using the official poverty line, directly from published SUSENAS results. We constructed the GDP per worker data using published estimates of sector GDP, measured in real (inflation adjusted) terms, and estimates of the number of workers by province provided by BPS. Thus, for each variable in the urban poverty dataset we have 7 years by 26 regions or 182 observations. Because the province of Jakarta does not report estimates of rural poverty, we have in the rural poverty dataset 7 years by 25 regions or 175 observations. (A link to an electronic version of the complete dataset will be added to the next version of the report). Note that in creating the income variables we counted only GDP per worker in each of sectors respectively. This excludes other potential sources of incomes that could also help to reduce poverty such as rents, remittances, subsidies and other kinds of financial transfers to households.

83. The three panels on the left of Figure 10 exhibit plots of the time-series, cross-section observations for rural poverty (vertical axes) against the three sector GDP per worker variables respectively (horizontal axes). The three panels on the left do the same job for urban poverty. Each dot in these figures pairs a year by province observation for the poverty rate and the associated sector GDP variable. These plots hint at negative relationships between poverty and GDP per worker in both services and agriculture. However, the connection between poverty and GDP per worker in industry is not so evident. Notice in this connection (by comparing the scales of the horizontal axes of the panels of Figure 10 or by looking at Figure 12 below) that GDP per worker in industry is several times higher than of either the services sector or agriculture.
Figure 10. Poverty rates and GDP per worker from various sources

Source: OECD calculations based on BPS statistics.
The data plots in Figure 10 are indicative of the underlying relationships between poverty and sector GDP trends; however more precise attribution requires regression analysis. We estimated separate regression equations for rural and urban poverty respectively. Following some experimentation with various alternatives we chose the following specification of the regression equation.

\[ P_u = \pi_{0i} + \sum_{j=1}^{3} \pi_j \ln Y_{ijt} + \varepsilon_{it} \]

Where \( P_u \) is headcount rate of poverty for province \( i \) at the time \( t \); \( Y_{ijt} \) is GDP per worker in sector \( j \) of province \( i \) at time \( t \). Results are in Table 4.

We estimated the coefficients using OLS regression. Because economic time series tend to trend together and thus be highly correlated, there is frequently a problem in obtaining efficient coefficient estimates using OLS due to multicollinearity. We tested for this problem using the variance inflation factors (VIF) test. A VIF greater than 10.0 is generally seen as indicative of severe multicollinearity. In our case the VIF mean value of the three explanatory variables is 2.49, suggesting an absence of this problem.

Considering the high degree of cross-sectional and time series variability in the data, the regression equations explain respectively high percentages of statistical variation in poverty rates. The \( R^2 \) for the urban poverty equation is 0.36 and that for the rural poverty 0.22, a difference possibly reflecting the greater cross-sectional variability of rural versus urban poverty rates noted earlier. While indicative of the importance of sector GDP per worker as a source of poverty reduction, the \( R^2 \) estimates also reveal there must be other factors that vary across provinces and over time in ways that affect estimated poverty rates. The estimated coefficients linking poverty rates and GDP per worker in services sector and in agriculture are both negative and statistically significant. Unsurprisingly, the estimated coefficient for agricultural GDP per worker has a greater influence on rural than on urban poverty. The coefficient linking urban poverty to GDP per worker in industry is negative but not significant while the corresponding coefficient for rural poverty is positive, and statistically significant.

The finding that growth in industrial GDP per worker might have only a small impact on urban poverty and perhaps even a slightly positive impact on rural poverty is surprising. The industrial sector in Indonesia is large, accounting for over 40% of national GDP in 2008 and, as noted earlier, average labour productivity in the sector is several times higher than that in either services or agriculture. However, both Suryahadi et al. (2009, 2006, 2003) and Warr (2006) also found that growth in industry GDP in Indonesia had only a small influence on poverty. Suryahadi et al. speculated this was because: a) the industrial sector in Indonesia is much less labour intensive than either services or agriculture and b) most of the poor in the country are employed either in agriculture or in services. Warr (2006) blames protection of the industrial sector that encouraged expansion of capital intensive manufacturing, driving down the demand for labour.

There are other similarities between our results and those obtained in the Suryahadi et al., study - despite differences in the way the regression equations were specified (e.g., they used a first difference version) and the time period covered (theirs was 1984 to 2002; ours 1996 to 2008). They too found that growth in both services and agricultural GDP had significant negative impacts on poverty rates. Moreover, the numerical magnitudes of their estimates of the impact of sector growth on poverty are broadly similar to those we found. One notable difference however is that where we find agricultural GDP growth to be relatively more pro-poor than services GDP growth, they find the opposite.
### Table 4. OLS regression results

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Urban poverty (headcount rates)</th>
<th>Rural poverty (headcount rates)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log agriculture income per worker</td>
<td>-0.0331*** (0.0105)</td>
<td>-0.1178*** (0.0266)</td>
</tr>
<tr>
<td>Log industry income per worker</td>
<td>-0.0065 (0.0051)</td>
<td>0.0487*** (0.0139)</td>
</tr>
<tr>
<td>Log services income per worker</td>
<td>-0.0606*** (0.0119)</td>
<td>-0.0656* (0.0262)</td>
</tr>
<tr>
<td>Constant</td>
<td>1.77*** (0.1685)</td>
<td>2.29*** (0.3684)</td>
</tr>
</tbody>
</table>

Observations: 182, 175; R-squared: 0.3620, 0.2203

Robust standard errors in brackets * significant at 10%; ** significant at 5%; *** significant at 1%.

*Source: OECD calculations based on BPS statistics.*

90. The estimated regression coefficients directly provide answers to the question ‘how much does the poverty rate change for a hypothetical 1% increase in GDP per worker in each of the sectors respectively?’ However, we can use the estimated results to answer a closely related question – ‘How much does the predicted poverty rate change for a given increase in sector GDP per worker, measured in real rupiah than percentage terms?’ In other words, what is the derivative of the poverty rate with respect to changes in real sector GDP rates? The answer to this latter question provides a better basis for comparison since a 1% increase in, say, agricultural GDP per worker constitutes a much smaller amount in real money terms than does a 1% increase in industry GDP per worker. Figure 11 displays the results of these calculations (done using sample averages of the GDP data for each province and then taking the average across all provinces to arrive at a national figure).

91. Comparisons displayed in Figure 11 put in sharp contrast the differences in their impacts on poverty of the three GDP per worker variables. A hypothetical one rupiah increase in agricultural GDP per worker has a greater impact on poverty than does a hypothetical one rupiah increase in either services or industry, a difference that is more pronounced when looking at rural as opposed to urban poverty. Displaying the results in this way also illuminates further the finding that, whether negative (urban) or positive (rural), the estimated poverty impacts of growth in industry GDP per worker are trivially small.

92. The basis for interpreting the regression coefficients in Table 4 and the associated derivatives is an imaginary or hypothetical change in sector GDP per worker. But those results are also useful in addressing another important, more concrete, question frequently posed in analyses of the economic growth and poverty. That question is, ‘How important was past growth in agriculture versus other sectors as a source of poverty reduction?’ This was the question posed in the Montalvo and Ravallion (2009) analysis of sources of poverty reduction in China. As noted above, they concluded that neither industry nor services growth made no measurable contribution at all the remarkable progress China made in cutting poverty rates from 1980 to 2000; it was all due to agriculture.
Figure 11. Estimated impacts of GDP per worker on urban and rural poverty rates compared on a per rupiah basis

Source: OECD calculations based on BPS statistics.

93. To make judgements about the relative historical importance of agricultural versus non-agricultural growth requires both the estimated coefficients linking sector growth rates to poverty and knowledge of the historical rates of growth. Figure 12 displays trend lines of GDP per worker in each of the three sectors for the years 1986 to 2008, all measured at the national level. We chose to focus on this period both because it includes most of the years of data used to estimate the regression and because this was a period of reasonably steady progress against poverty.

Figure 12. Evolution of real agriculture, industry and services GDP per worker, 1996-2008

Source: OECD calculations based on BPS statistics.

94. The patterns of growth in sector GDP per worker provide already the key insights needed to explain whether growth in agriculture or in the other sectors was most important. During the period 1998-2008, the trend agriculture GDP per worker was flat; there was hardly any growth so there could not...
have been much of a contribution to poverty reduction. There was though some growth in services GDP per worker over that period and, when taking into account the estimated *per rupiah* impacts of services GDP on poverty, leads us to suspect that such growth might have contributed significantly to reduction in poverty reduction achieved.

95. To gain some precision on these observations we used the estimated regression equation to, in effect, simulate this period of historical data in order to attribute reductions in predicted poverty rates to the three variables. There were three steps. In the first step we generated a baseline of predicted poverty rates by plugging into the regression equations observed values for each of the three independent variables for each year of the entire study period 1996-2008. In the second step, we created three alternatives to that baseline by replacing actual observations for one or another of the three income variables by its initial year value. In the final step we compared, one by one, the predicted values obtained in the three alternative scenarios to those from the baseline.

96. These comparisons allowed us to calculate how much of the predicted change in poverty could be attributed to each sector, *i.e.* to calculate percentage contributions of each. It is important to emphasize here that we are talking about the allocation of *predicted* effects on poverty only of observed growth in the three GDP per worker variables. As revealed by the regression results reported above variation in these variables explain only a fraction of total variation in poverty rate data.

| Table 5. Contribution to poverty reduction by sector in Indonesia, 1999-2008 |
|---------------------------------|-------------------|
| **Sector** | **Contribution** |
| Rural  |  |
| Agriculture | 16.1% |
| Industry | -4.6% |
| Services | 88.5% |
| Urban |  |
| Agriculture | 5.2% |
| Industry | 0.7% |
| Services | 94.1% |
| National |  |
| Agriculture | 12.5% |
| Industry | -2.8% |
| Services | 90.4% |

*Source: OECD calculations based on BPS statistics.*

97. Table 5 contains the results showing clearly that indeed growth in services GDP per worker was the dominant source of reduction in predicted poverty rates, explaining near 90% of the reduction in predicted rural poverty and near 95% of the reduction in predicted urban poverty. Although less important, agricultural GDP per worker growth, still contributed significantly to poverty reduction. Growth in agricultural GDP per worker can be credited with 16% of the predicted reduction in rural poverty and 5% of the predicted reduction in urban poverty. The contrast between results displayed in Figure 11 and the results tabulated in Table 5 provides the basis for an important insight into the role of agriculture in poverty reduction. The finding revealed in Figure 11 refers to the potential of agriculture as a source of pro-poor growth – shown there to be relatively large, somewhat larger than the effect of services growth. The findings tabulated in Table 5 refers to the degree to which that potential was realized in the post-crisis period in Indonesia.

**Summary and conclusions**

98. Indonesia’s achievements in reducing poverty were substantial in the period leading up to the Asian financial crisis. The economic difficulties incurred with that crisis temporarily reversed the
downward trend in poverty and the pace of poverty reduction subsequent to the crisis has been slower than before it. This slower pace coincides with a less robust recovery in economic growth and macroeconomic performance after the crisis, as compared to other countries in the region. Agricultural growth performance has been especially weak.

99. Agricultural policy in Indonesia has been narrowly focused, both in terms of the commodities usually favoured by interventions, mainly rice, sugar and palm oil and the policy instruments deployed, principally trade interventions and input subsidies. Input subsidies and trade protection have repeatedly been shown highly inefficient and equitable means for supporting incomes. Export taxes and bans such as have been applied to palm oil have deleterious impacts on farm incomes.

100. The policy objectives underlying the interventions have been to achieve self-sufficiency and price stability for these import competing commodities. Palm oil, a major source of export earnings for the country has frequently suffered from negative protection due to export taxes and occasional quantitative limitations on exports. Moreover, estimated levels of protection have varied considerably over time largely reflecting Indonesia’s isolation from world markets.

101. Though based on a limited number of time series observations, there are signs that Indonesia is under-investing in policies that exhibit both high social rates of return and reductions in poverty. Especially alarming is that Indonesia is the only country in the region to have experienced negative growth in real spending on agricultural research. Moreover, the intensity of that spending as measured by expenditures as a share of agricultural GDP is well under the average for the region and has also been declining.

102. Analysis of the relationship between agriculture and poverty illustrates a critical difference between the potential for agricultural growth to reduce poverty and the realization of that potential. Estimated results suggest that growth in agricultural GDP per worker has a significant negative effect on poverty. The estimated impact of growth in services GDP per worker is also negative and only slightly less than that obtained for agricultural GDP per worker. Surprisingly, but consistent with results obtained in other studies, industry GDP per worker seems not to have any influence whatever on poverty rates. This would seem to imply that government efforts to promote industrial led growth might be difficult to defend as a way to promote poverty reduction.

103. Of course, if the potential for growth in GDP per worker is to be realized there must be some growth. There was rapid growth in GDP per worker in agriculture in the years leading up to the Asian financial crisis. Indeed, during those years agricultural GDP per worker grew faster than per worker gains in other sectors. And, it was during those years that Indonesia made the most rapid progress in reducing poverty.

104. However, estimated agricultural GDP per worker was basically flat from 1996 to 2008, the most recent year for which data are available. There was however growth in services GDP per worker, implying that the actual achievements in poverty reduction in recent years was due almost entirely to growth in the services sector. These latter trends are worrying in that they run counter to usual pattern for successfully developing countries. Normally agricultural labour productivity grows faster (from a lower base).
REFERENCES


ASTI-IFPRI (2010), Database on Agricultural Science and Technology Indicators, IFPRI.


BPS-Statistics Indonesia (2009), Poverty Data, Based on National Socioeconomic Survey (SUSENAS Survey).

BPS-Statistics Indonesia (2008), Poverty Data, Based on National Socioeconomic Survey (SUSENAS Survey).

BPS-Statistics Indonesia (2004), Poverty Data, Based on National Socioeconomic Survey (SUSENAS Survey).

BPS-Statistics Indonesia (2003), Poverty Data, Based on National Socioeconomic Survey (SUSENAS Survey).

BPS-Statistics Indonesia (2002), Poverty Data, Based on National Socioeconomic Survey (SUSENAS Survey).

BPS-Statistics Indonesia (1999), Poverty Data, Based on National Socioeconomic Survey (SUSENAS Survey).

BPS-Statistics Indonesia (1998), Poverty Data, Based on National Socioeconomic Survey (SUSENAS Survey).


FAOSTAT (2010), FAO Online Database, FAO.


ILO (2010), ILO online Database. ILO.


UN Comtrade (2010), UN-Comtrade database.


WDI (2010), World Bank Database.


