

**School of Economics and Finance  
Department of Economics**

**Revitalizing Indonesia's Agriculture: An Examination of the  
Economy-wide Effects of Policy Changes**

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**This thesis presented for the Degree of  
Doctor of Philosophy  
of  
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## **Declaration**

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgement has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.



.....  
Firmansyah

July 2013

*Dedicated to*

*My father and my late mother,*

*My wife and children*

*For their love and support*

## **Abstract**

Agriculture has played an important role in Indonesia's economy. The agricultural sector, which includes food crops, livestock, horticulture, estate crops, fisheries and forestry absorbed 41.2 per cent of the total work force, and accounted for 12.5 per cent of the total GDP in 2012. Agriculture is one of the main sources of livelihood of 62.1 per cent of Indonesian rural workers. While Indonesian agriculture has performed well historically and has contributed to significant growth, increased employment and poverty reduction, productivity gains in most crops have remained low with the majority of farmers operating in small pockets of land of less than one-half hectare. Revitalizing the agricultural sector is necessary to support efforts toward creating employment opportunities, especially in the rural areas, and underpinning robust growth in the economy. This is a key component of Indonesia's rural development strategy. The National Medium Term Development Plans of 2004-2009 and 2010-2014 point to revitalizing the agricultural sector through agricultural policies that will assist in rural development, poverty alleviation and alleviate food security issues (Ministry of Agriculture of Republic of Indonesia, 2004; 2010).

This thesis aims to examine and quantify the economy-wide effects on Indonesia's macro-economy, industries and households of policy changes embodied in its agricultural revitalization program. The thesis develops a 52-sector, recursive dynamic computable general equilibrium model of the Indonesian economy which decomposes the agricultural sector to 26 industries. Of particular interest to this thesis are the analyses of the potential impacts of various policy scenarios involving tariff and subsidy changes as instruments of protection, and an increase in agricultural productivity. The major contribution of this thesis is to inform public policy, particularly in Indonesia, of the potential effects on the economy of policy changes that aim to revitalize the country's agricultural sector. This thesis also makes a contribution to the empirical literature of gains from trade liberalization and increased agricultural productivity.

The findings in this thesis suggest that trade liberalization stimulates output demand, exports, and increases welfare, and in the long-run, increases the competitiveness of industries. Full tariff liberalization (with zero tariffs) stimulates those indicators higher than partial tariff liberalization. However, to support the agricultural sector and maintain output for the purposes of food security, it is necessary to provide input subsidies. The policy maker needs to be careful in easing tariffs on certain agricultural commodities which are critical to economic and social stability. Increase in agricultural productivity stimulates output, exports, and employment in industries, and affect real wages and household's welfare positively through direct and indirect impacts on real household incomes. Most households are projected to benefit from the improvement in agricultural productivity, except for a small percentage of rural households belonging to the lowest income bracket, which is worse off. This has implications for government policy to address issues in training and education to improve skills of unskilled labor.

**JEL classifications:** Q11, Q17, Q18, C68

**Keywords:** Agriculture, tariff, subsidy, productivity, CGE model



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## Abbreviations

ADB	Asian Development Bank
AFTA	ASEAN Free Trade Area
APEC	Asia Pacific Economic Cooperation
ASEAN	Association of South East Asian Nations
Bappenas	<i>Badan Perencanaan dan Pembangunan Nasional</i> or The National Economic Planning Agency
Bimas	<i>Bimbingan Massal</i> or Mass Guidance
BLT	<i>Bantuan Langsung Tunai</i> or Direct Cash Assistance
BPPN	<i>Badan Penyehatan Perbankan Nasional</i> or National Banking Restructuring Agency
BPS	<i>Badan Pusat Statistik</i> or Statistics Indonesia
BTO	Bank Take Over
CAR	Capital Adequacy Ratio
CES	Constant Elasticity of Substitution
CET	Constant Elasticity of Transformation
CEPT-AFTA	Common Effective Preferential Tariffs for the AFTA
CGE	Computable General Equilibrium
CGI	Consultative Group on Indonesia
CPO	Crude Palm Oil
FAO	Food and Agriculture Organization
GATT	General Agreement on Trade and Tariffs
GDP	Gross Domestic Product
GTAP	The Global Trade Analysis Project
HDI	Human Development Index
IDT	<i>Inpres Desa Tertinggal</i> or Under-developed Village Fund
IGGI	Inter-Governmental Group on Indonesia
IMF	International Monetary Fund
Indra	Indonesian Debt Structuring Agency
IO	Input-Output
JITF	Jakarta Initiative Task Force

Kapet	<i>Kawasan Pengembangan Ekonomi Terpadu</i> or Integrated Economic Development Area
KUR	<i>Kredit Usaha Rakyat</i> or People's Business Credit
KUT	<i>Kredit Usaha Tani</i> or Credit for Farm Enterprises
KPH	<i>Kesatuan Pemangkuan Hutan</i> or Forest Authority Unit
LES	Linear Expenditure System
LoI	Letter of Intent
MDGs	Millennium Development Goals
MSMEs	Micro, Small, and Medium Enterprises
NDA	Net Domestic Assets
NTP	<i>Nilai Tukar Petani</i> or Farmers' Exchange value
OECD	Organisation for Economic Co-operation and Development
OPEC	Organization of Petroleum Exporting Countries
Pelita	<i>Pembangunan Lima Tahun</i> or Five-Year Development
PIR	<i>Perkebunan Inti Rakyat</i> or Farmers Nucleus Smallholder
PJP	<i>Pembangunan Jangka Panjang</i> or Long Term Development (LTD)
PPF	Production Possibility Frontier
Raskin	<i>Beras Rakyat Miskin</i> or Rice for the Poor
R&D	Research and Development
RKP	<i>Rencana Kerja Pemerintah</i> or Government Work Plan
RPJMN	<i>Rencana Pembangunan Jangka Menengah Nasional</i> or The National Medium-Term Development Plan
RPJPN	<i>Rencana Pembangunan Jangka Panjang Nasional</i> or National Long-Term Development Plan
SAM	Social Accounting Matrix
SBI	<i>Sertifikat Bank Indonesia</i> or Certificates of Bank Indonesia
SBPU	<i>Surat Berharga Pasar Uang</i> or Money Market Securities
SNI	<i>Standar Nasional Indonesia</i> or Indonesian National Standard
SSN	Social Safety Net
TBS	<i>Tandan Buah Segar</i> or Fresh Fruit Bunches
TFP	Total Factor Productivity
TOT	Terms of Trade
UN	United Nations
UNDP	United Nations Development Programme

WB            World Bank  
WTO          World Trade Organization

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# Chapter 1

## Introduction

### 1.1 Brief background of the study

Agriculture plays an important role in the Indonesian economy. The sector, which consists of food crops, livestock, horticulture, estate crops, fisheries, and forestry sub-sectors, has contributed significantly to Indonesia's national output. Its share reached 12.5 percent of the national Gross Domestic Product (GDP) in 2012 (Badan Pusat Statistik or BPS, 2013a). The role of this sector in Indonesia's exports is also important accounting for 39.5 percent of Indonesia's total non-oil and gas exports in 2012 (Bank Indonesia, 2013b). In 2012, the agricultural sector employed 35.1 percent of the national workforce: it is the largest employment provider in Indonesia (BPS, 2013b). According to the National Population Inter-Census 2005, 57 percent of the total population of Indonesia lived in rural areas (BPS, 2009d). Of the rural workforce, 62.1 percent worked in the agricultural sector. Therefore, agriculture supports rural economic development through employment it creates and is the most strategic sector for reducing rural poverty.

Despite agriculture's significant economic contribution in recent times, historical trends of its performance have been unsatisfactory. Based on BPS (2009b, 2013a), between 2000 and 2012, the contribution of agriculture to national output declined from 15.6 percent in 2000 to 12.5 percent in 2012. The average annual growth of agricultural output during this period was lower than other sectors' growth. The relative decline in the agricultural sector was exacerbated by the large share of Indonesia's poor, who represent the majority of agricultural workers. The distribution of income between farmers' households has widened from year to year.

To address this, starting in 2004 the government formulated and issued "agricultural revitalization" policies that were enacted in *Rencana Pembangunan Jangka Menengah Nasional* (RPJMN) or The Medium-Term Development Plan 2004–2009. These policies were components of a development strategy which was pro-growth, pro-employment, and pro-poor (Republik Indonesia, 2005a). The agricultural revitalization policies were intended to improve agricultural performance to reduce poverty and unemployment, and improve national economic

competitiveness. As a result of these policies, the agricultural sector became central to economic development. Agricultural revitalization then continued in RPJMN 2010–2014<sup>1</sup>. These medium-term plans have been defined each year by the *Rencana Kerja Pemerintah* (RKP) or Government Work Plan. Some of the specific measures of agricultural revitalization included agricultural protection policies and policies that targeted an increase in agricultural productivity. RPJMN 2004–2009 and RPJMN 2010–2014 point out that one of the government’s agricultural policies is protecting farmers from unfair competition and unjust trading practices. According to Kementerian Pertanian Republik Indonesia or Ministry of Agriculture of Republic of Indonesia (2005; 2010), protection is implemented through the imposition of import duties and the granting of subsidies, mostly for commodities that mostly relate to rural development, poverty alleviation, and food security issues. In addition, other obstacles that need to be overcome in order to revitalize the agricultural sector include poor productivity and business efficiency, the conversion of farming land to industrial use and public housing, the lack of infrastructure, and limited credit and investment (Republik Indonesia, 2005a).

In terms of implementing protection policies, however, Indonesia as a member of World Trade Organization (WTO) is committed to complying with WTO rules and terms of accession. Consequently, Indonesia’s commitments on tariff must take into account various international agreements levels and market access for goods and services.

Indonesian agricultural productivity is still lower than other countries in South East Asia and China (Fuglie, 2008). The low output of Indonesia’s agricultural sector has been caused by reduced investment from government and private sectors (The World Bank, 2010b; Warr, 2012). The relatively low government agricultural research and development (R&D) spending has also been a significant constraint to productivity growth.

This thesis attempts to measure and analyze the effects of the Agricultural Revitalization program, which is focused on protection policies (tariffs and subsidies) and programs to increase agricultural productivity to aid economic development.

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<sup>1</sup>RPJMN 2004–2009 and 2010–2014, refers to the national development plan document for the five (5) years period, from 2004 to 2009 and from 2010 to 2014.

## **1.2 Objective of the study**

The main objective of this thesis is to evaluate the welfare effects of agricultural revitalization policies on national economic outcomes, industries and households. To evaluate these welfare effects, this thesis develops a recursive dynamic computable general equilibrium model of Indonesia (referred to as PERTANINDO-F). PERTANINDO-F consists of 52 industries which decomposes the agricultural sector to 26 industries.

In particular, the thesis will address the following issues:

- Why is agriculture important to development in Indonesia? How does agriculture contribute in the development of Indonesia?
- Are the Agricultural Revitalization programs consistent with the goals of poverty reduction, increased welfare, and improvement in agricultural performance?
- How effective are trade and productivity policy instruments in supporting agricultural development?

This thesis contributes to the empirical literatures on agriculture policy modelling, trade liberalization, and agricultural productivity in Indonesian agriculture. PERTANINDO-F employs the 2005 Indonesian I-O and 2005 Indonesian SAM tables as database, which were the most recent tables with the details industries classification. With the specific disaggregated agricultural industries, households, and labor, and develop specific policy changes which have been identified in the Agricultural Revitalization Program, this thesis distinguishes itself from previously developed Indonesian CGE models.

## **1.3 Thesis organization**

Chapter 2 provides a background on the development of Indonesia's macro-economy and policy regimes. It starts with discussion of trends on Indonesia's economic indicators and provides a comparison with other South East Asia countries. Subsequently, the structural transformation, from agriculture to the manufacturing, is reviewed. The development of economic policies since Indonesia's independence to the present gives a comprehensive overview of the strategy and implementation of government policy.

Chapter 3 highlights the important role of agriculture in economic development and its strong link with the incidence of poverty in rural areas. Indonesia's agricultural policies are also reviewed, with a particular focus on the agricultural revitalization policy.

Chapter 4 develops a recursive dynamic CGE model for the Indonesian economy with a detailed specification on agricultural industries. Computable general equilibrium modeling of agricultural policies for developing countries and the current state of CGE modeling in Indonesia are briefly discussed. This is followed by a discussion on the structure of PERTANINDO-F and its theoretical foundations, closures and database.

Utilizing PERTANINDO-F, Chapter 5 analyzes using various policy scenarios, the impact of liberalizing tariffs and providing subsidies on Indonesian agricultural commodities in particular, but more generally on national output, employment, and household income. It describes in detail how the agricultural protection policy scenario is developed. The Chapter also provides a brief overview of the literature related to the effects of agricultural trade liberalization on the economy. Issues faced by Indonesia in relation to the determination of tariff rates especially on agricultural products as a consequence of trade liberalization and agricultural subsidies are reviewed and considered.

Chapter 6 analyzes the impact of agricultural productivity increase on the Indonesian economy and more specifically on agricultural industries in terms of output, trade, employment, and household welfare. It generates the policy scenarios which are then used to undertake simulations using PERTANINDO-F. It also reviews the literature relating to effects of agricultural productivity on the economy, discusses the trends in Indonesia's agricultural productivity and reviews policies that affect agricultural productivity.

The final chapter presents the conclusion of the study, including its findings, some policy implications, the limitations of the study, and recommendations for further research.

## Chapter 2

### Economic performance and policy regimes in Indonesia

#### 2.1 Introduction

Indonesia is a country with the largest area and highest population in South East Asia. Its population which, reached more than 242 million people in 2011, is accompanied by an economy which is the largest in the region. The average annual growth of Gross of Domestic Product (GDP) has been 7 per cent in the last 3 decades (1967–1997). Indonesia, together with several other East Asian countries, has been recognized by most analysts as a newly industrialized economy and an emerging market.

The Indonesian economy began to develop significantly in 1966, when the government introduced more liberal economic policies, aiming to increase agricultural as well as manufacturing output. Since the independence of Indonesia in August 17, 1945 until 1966, the Indonesian economy did not show any significant changes. During this period, production and investment stagnated and real per capita income was low, even lower than prior to Indonesia's independence (Booth and McCawley, 1981). The destruction of economic infrastructure during the Japanese occupation of World War II (1942–1945), followed by the confrontation with the Dutch (1945–1949), created political and security chaos. These, along with poor macro-economic management, created a terrible economic situation in Indonesia.

Commencing in 1969, the government ran *Pembangunan Lima Tahun* (Pelita) or Five-Year Development Programs, which brought about dramatic improvements in economic indicators and rapid economic growth—until the economy was hit by Asian crisis in late 1997. During 1969–1997, high economic growth increased the income per capita more than 10 times from USD\$70 in 1969 to USD\$1,100 in 1997 (Tambunan, 2009). Through strict financial and monetary policies, the government kept the inflation rate at a moderate level of 5–10 per cent, and stabilized the exchange rate of the rupiah.

Unfortunately, the strong economic development was accompanied by decreases in social welfare, regional development disparities, and fragile industries. While the number of poor people decreased, the income distribution increasingly

widened. Regional development was unbalanced, with most of the development centered in the island of Java. Various industries were not well-established ('footloose' industries) and there was a continued high dependence on imports, combined with imprudent banking practices and an economy dependent on foreign loans. The cumulative effect was that the Indonesian economy plummeted during the Asian economic crisis in 1997.

By the mid-1980s, the Indonesian government was paying more attention to manufacturing industries. In the industrial sector it was implementing a range of systematic protection policies. In line with this, structural transformation in the agricultural and industrial sectors started in the 1990s. Unfortunately, this structural change was not matched by changes in the structure of labor, so that most workers were still employed in the agricultural sector. In relative terms, this caused labor productivity in the agricultural sector to be lower than it was before the structural transformation. Low levels of farmers' income and high poverty were also problems in the agricultural sector. After the period of the 1997–1998 crisis, beginning in 2004, the agricultural sector became the object of more attention in government policies. In relation to this, the government developed and announced its Agricultural Revitalization program.

This chapter focuses on analyzing Indonesian economic performance, and reviews the general economic policies adopted by the government. The purpose of Chapter 2 is to provide some background to the more detailed examination of the development of Indonesia's macro-economy and policy regimes in subsequent chapters. More specifically, Chapter 2 discusses the performance of Indonesia's macro-economy in Section 2.2. This section discusses the development of several major macro-economic indicators, and compares them with similar indicators in selected South East Asian countries. This section is followed by a discussion in Section 2.3 of the structural transformation in the Indonesian economy. The section explains how the shift of the main sectoral contribution to the Indonesian economy, from agriculture to the manufacturing sector came about. Next, in Section 2.4, the development of Indonesian aggregate demand components is proposed. Section 2.5 identifies in detail the development of population, employment and poverty in Indonesia, including the distribution of the poor in each economic sector and the achievement of the Millennium Development Goals (MDGs). Section 2.6 sketches out the economic policies from Indonesia's independence in 1945 to the present. This

section gives a comprehensive overview of the strategies and implementation of government policy towards economic development. Finally, Section 2.7 concludes.

## **2.2 Macro-economic performance of Indonesia**

The performance of the Indonesian economy is highlighted by comparing a set of its key macro-economic indicators with those in several other developing countries in South East Asia. The latter countries have shown similarities to Indonesia in economic development, as well as displaying some ethnic and cultural likeness. These countries are Malaysia, Philippines, Thailand and Vietnam.

### **2.2.1 Gross Domestic Product (GDP)**

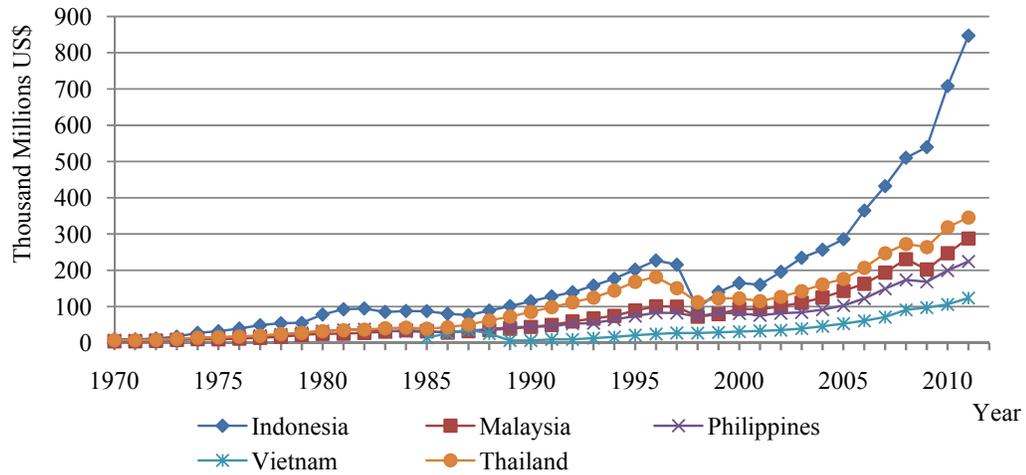
From the GDP data during 1970–2011, it is known that the economies of South East Asian countries displayed positive trends, even though several economic shocks occurred during this period (Figure 2.1). Overall, the pattern of these countries' economic growth during 1970–2010 was similar (Figure 2.2). The drop in growth in 1972–1975 was mainly caused by a food crisis and its associated increase in the price of food such as rice and wheat. These shocks were influenced by energy and raw material crises in the United States (U.S.). The increase of the Organization of Petroleum Exporting Countries' (OPEC) oil prices and the Vietnam War led to stagflation in the U.S. The energy crisis and strict policies in developed countries affected the world economy and led to a decline in growth during 1980–1985. The decline of economic growth of Indonesia in 1985 was less severe than the decline in economic growth in other countries. Malaysia and the Philippines experienced negative economic growth in 1985.

During 1985–1997, the Indonesian economy grew on average by 7 per cent per year, higher than other countries' rates of growth (over 5 per cent per year). Most of East Asian countries were also hit by the crisis in 1998, sparked by the collapse exchange rate of the Thai Baht. Compared to other countries in the region, the Indonesian economy contracted the most in 1998, by about -13.1 per cent, while Thailand's contracted by -10.5 per cent. Almost all other South East Asian economies experienced a contraction due to the crisis, except for Vietnam.

Indonesia put substantial measures in place to recover from the crisis. Although its process of recovery was slower than that of other South East Asian

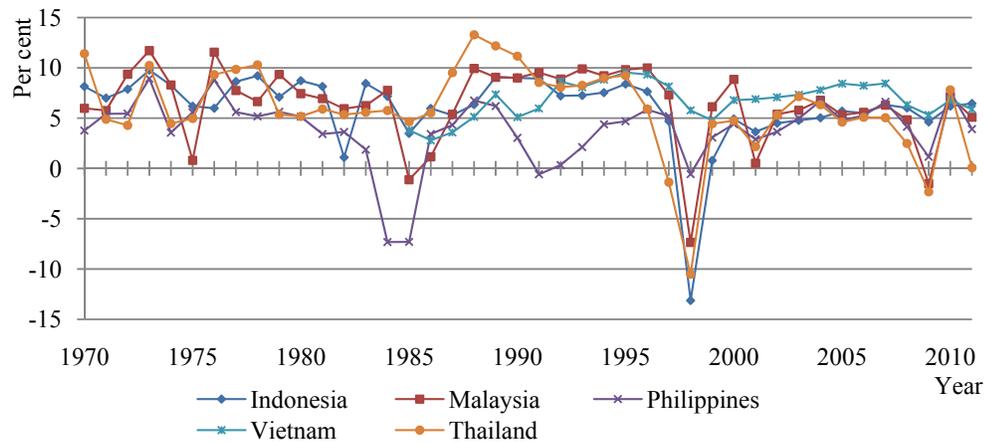
countries – due to its worse economic fundamentals than other countries – in the post-crisis period (2000–2011), Indonesia's economy grew more than 5 per cent per year (see Figure 2.2). This rate of growth was lower than those of Malaysia and Vietnam (over 6 per cent per year), but higher than that of Thailand.

Figure 2.1 Gross Domestic Product of South East Asian countries, 1970–2011 at current prices (US\$)



Source: The World Bank (2010a, 2013)

Figure 2.2 Annual growth of Gross Domestic Product of South East Asian countries, 1970–2011 at constant prices (%)



Source: The World Bank (2010a, 2013)

The 2007 global financial crisis, originating in the United States, was begun to affect the world economy in 2008-2009. Indonesia was the one of the countries that survived from the crisis with its economy relatively intact. In 2008, the

economies of Indonesia and Vietnam grew at over 6 per cent, higher than those of other countries in South East Asia. The declining trend of growth continued in 2009 and several South East Asian countries experienced negative growth such as Malaysia, and Thailand. Despite experienced a decrease in 2009 growth, Indonesia's GDP grew by 4.6 per cent and this is the highest growth compared to other South Asian countries. In 2010, all of South East Asian countries experienced significant growth. In 2011, the growths of GDP in all South East countries are lower than the growth of GDP in 2010. In this year, GDP of Indonesia grew highest by 6.5 per cent, followed by Vietnam at 5.9 per cent.

### ***2.2.2 Inflation***

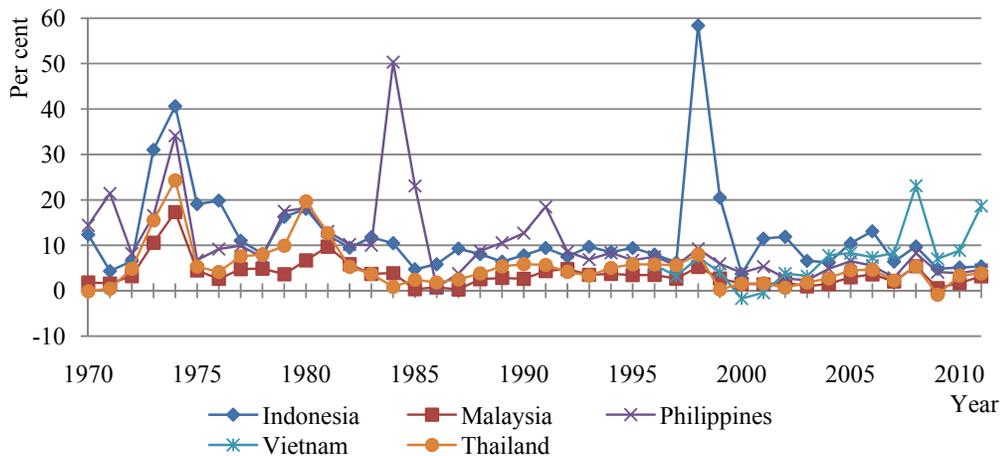
Indonesian economic development during 1958–1968 was marked by hyperinflation, and the skyrocketing prices peaked in 1965–1966. The World Bank (2010a) suggests that Indonesian inflation soared from around 40 per cent in the early 1960s, to 100 per cent in 1962–1963, 300 per cent in 1965 and more than 1,000 per cent in 1966. This increase was directly caused by the growing budget deficit, which was financed by simply printing new money (Hill, 2000). Commencing in 1968, the government oversaw a quick economic recovery: economic growth increased and inflation declined sharply.

Figure 2.3 displays the development of inflation during 1970–2011. During the period, other South East Asian countries did not experience significant price volatility. In the period 1970–1997, inflation was under control. Strict fiscal and exchange rate policies restored the competitiveness of the non-oil trade sector in the mid-1980s end, these combined with the balance of public spending between physical infrastructure, education, agriculture and industry contributed to the stability of aggregate prices (Hill, 2000). Indonesia's achievements in agriculture as a domestic food provider also contributed significantly to maintaining the stability of prices – especially food prices.

The 1997–1998 economic crisis was followed by political riots and the worst drought in Indonesia's history. These led to economic fundamentals declining, and the government was unable to control the prices of goods and services. Prices soared and the inflation rate reached 58.4 per cent in 1998. Other South East Asian countries also experienced inflation rises, but these were below two-digit level.

In the wake of the crisis, the inflation rate of Indonesia was also higher than other South East Asian countries, especially in 2005 and 2008. The reduction of fuel subsidies in late October 2005, due to rising fuel prices on the world market, led to an increase in domestic fuel prices by over 100 per cent. The weakening of the rupiah's exchange rate also contributed to the rise in prices. In 2008, the Indonesian government raised the fuel price again which led to an inflation rate that reached the two-digit level.

Figure 2.3 Annual inflation rate of South East Asian countries, 1970–2011 (%)



Source: The World Bank (2010a, 2013)

Inflation rate in South East Asian countries during 2009-2011 was in moderate level, except for Vietnam. In 2011, the growth of prices in Vietnam reached 18.7 per cent, driven by higher food and fuel costs.

### 2.2.3 International trade and Foreign Direct Investment

An important factor that has affected Indonesian economic growth since 1966 was the re-opening of international trade and the re-integration of the Indonesian economy with the world economy (Hill, 2000). The government issued a series of liberalization reforms during 1966–1969. Hill (2000) notes that Indonesia have experienced a rapid improvement in its terms of trade since the early 1970s. Table 2.1 shows that the value of Indonesian exports and imports increased over the years 1960–2011. Compared to 1960, Indonesia's export value in 2011 had increased by approximately 16 times, while the value of imports had increased by approximately 48 times in the same period (in 2000 US\$ constant prices).

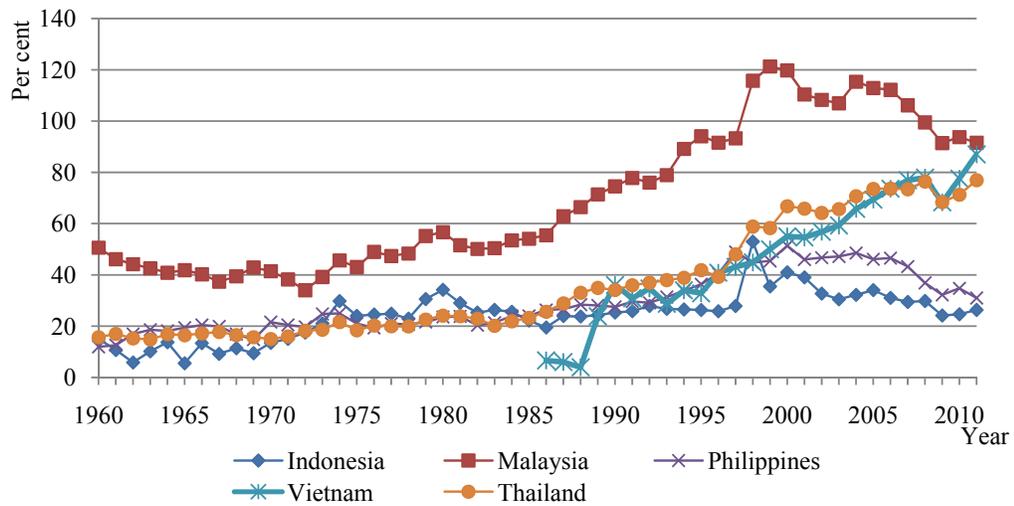
Table 2.1 Indonesia's export and import 1960–2011 in 2000 US\$ constant prices (millions US\$)

Year	Export	Import	Year	Export	Import
1960	9,165.35	2,332.25	1986	28,039.34	26,681.19
1961	9,964.66	3,143.99	1987	32,138.99	27,207.94
1962	9,129.83	3,083.41	1988	32,477.25	22,121.29
1963	8,561.43	2,259.55	1989	34,665.71	24,680.80
1964	9,573.89	2,459.46	1990	35,829.01	30,396.85
1965	9,229.74	2,259.54	1991	42,556.87	35,177.29
1966	9,113.50	2,162.61	1992	48,391.87	38,234.39
1967	9,146.73	2,774.45	1993	51,347.52	39,830.49
1968	10,059.70	2,968.29	1994	56,452.26	47,914.18
1969	11,553.77	3,592.24	1995	60,811.04	57,946.93
1970	13,529.20	4,022.34	1996	65,408.37	61,924.85
1971	15,654.04	5,276.30	1997	70,510.20	71,037.69
1972	18,974.06	6,015.35	1998	78,395.48	67,279.71
1973	22,509.90	8,062.85	1999	53,461.82	39,913.52
1974	23,987.29	10,655.60	2000	67,621.17	50,264.69
1975	23,406.20	11,897.42	2001	68,057.31	52,365.68
1976	27,390.33	13,890.39	2002	67,229.10	50,140.43
1977	29,979.91	14,508.30	2003	71,186.46	50,924.49
1978	30,278.79	16,343.80	2004	80,816.80	64,497.54
1979	30,972.22	18,157.29	2005	94,233.45	75,958.08
1980	32,684.52	19,925.26	2006	103,096.61	82,477.31
1981	26,785.64	26,659.85	2007	111,904.13	89,953.26
1982	24,373.05	27,035.83	2008	122,572.46	98,950.90
1983	24,774.87	26,304.55	2009	110,695.02	84,130.57
1984	26,396.51	24,328.85	2010	127,594.08	98,722.45
1985	24,336.75	25,612.90	2011	144,913.42	111,877.63

Source: The World Bank (2010a, 2013)

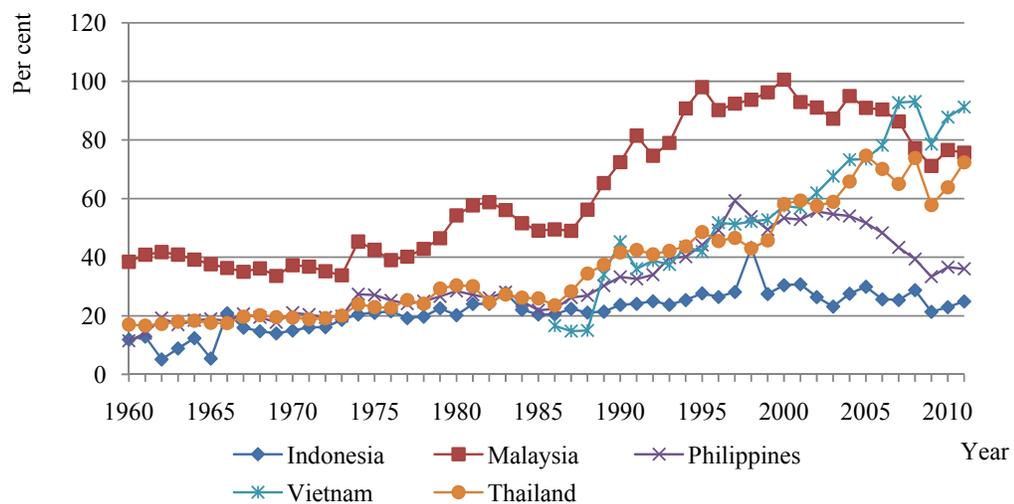
The fluctuations in exports were caused by the export boom of wood, the use of a realistic exchange rate between 1969 and 1972 (Manning, 1971) and the oil boom during 1973–1978 (BPS, 2005). In the middle of the 1980s, the government started to intensify exports of non-oil and gas commodities, particularly the commodities of the manufacturing industry, which was accompanied by a deregulation of the management system of exports (BPS, 2005). The contribution of international trade to the GDP of Indonesia was lower than in other South East Asian countries, particularly Malaysia. Figures 2.4 and 2.5 show the ratio of each South East Asian country's exports to GDP and imports to GDP respectively.

Figure 2.4 Ratio of export to GDP of South East Asian countries, 1960–2011 (%)



Source: The World Bank (2010a, 2013)

Figure 2.5 Ratio of import to GDP of South East Asian countries, 1960–2011 (%)

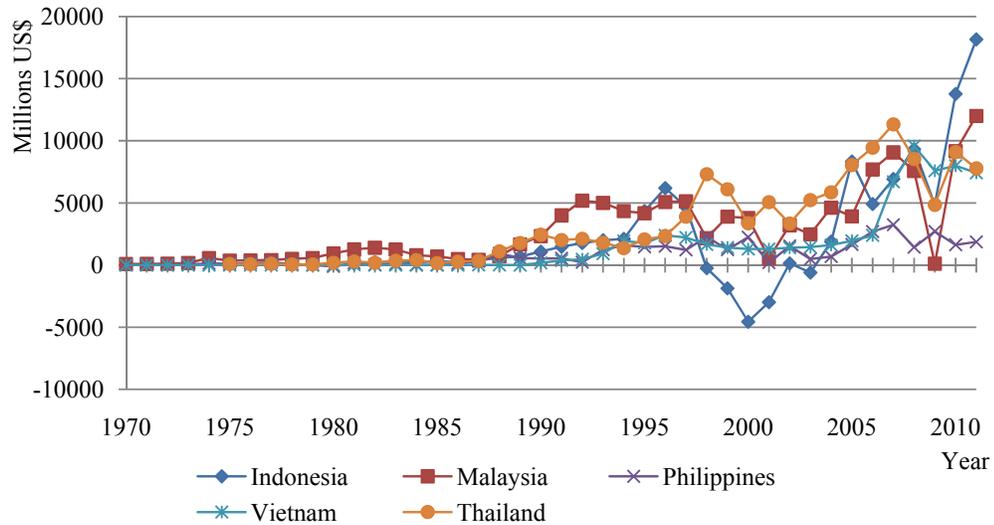


Source: The World Bank (2010a, 2013)

In addition to liberalizing trade, since 1967, Indonesia also opened up to foreign investment. After the issuance of Law No. 1/1967 on Foreign Investment (which was amended by Law No. 25/2007 on Investment) which was a milestone in Indonesia’s economic integration into the world economy, foreign investment started to rise. During the 1970s, the increase was triggered by a series of liberal policies and new regulations, the prospect of import substitution projects, and rising oil prices. Starting in 1990 through to 1997–1998 economic crisis, foreign investment increased rapidly. This growth of foreign investment in Indonesia during 1969–1997 was

driven by political and social stability, as well as economic policies conducive to domestic business activity.

Figure 2.6 Foreign Direct Investment of South East Asian countries, 1970–2011 (million US\$)



Source: The World Bank (2010a, 2013)

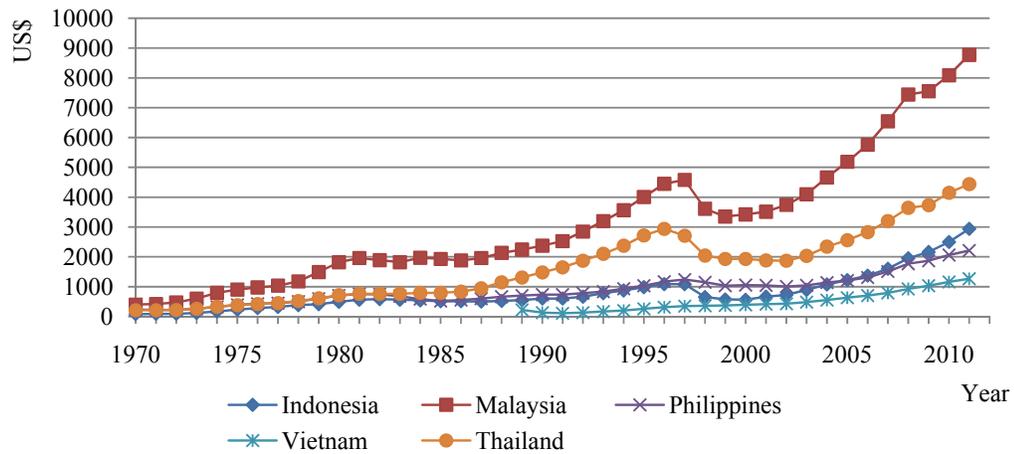
In contrast to other South East Asian countries that were also affected by the crisis, such as Thailand and Malaysia, the net inflow of foreign investment to Indonesia was negative during 1998–2000, and did return to positive until 2001. This was caused by a number of foreign investors who withdrew or moved the location of their investment into neighboring countries, such as Thailand and Vietnam.

#### 2.2.4 Per capita income

Indonesia's income per capita increased from 1970–2011, but during the 1997–1998 crisis, it fell to USD\$680 (1998) from USD\$1,020 (1995) (see Figure 2.7). In the same period, the income per capita of other South East Asian countries declined, except for the Philippines and Vietnam. After the crisis, Indonesia's income per capita increased to USD\$1,880 in 2008.

Despite significant increases during 1970–2011, the income per capita of Indonesia was lower than that of other South East Asian countries, except for Vietnam. Hill (2000) cites that the reason for Indonesia's lagging per capita income level, were the problems inherited from the 1960s, and the government's priorities in particular economic sectors, and the physical infrastructure during first 10 to 15 years starting from 1967.

Figure 2.7 Gross National Income per capita of South East Asian countries, 1970–2011 at current US\$



Source: The World Bank (2010a, 2013)

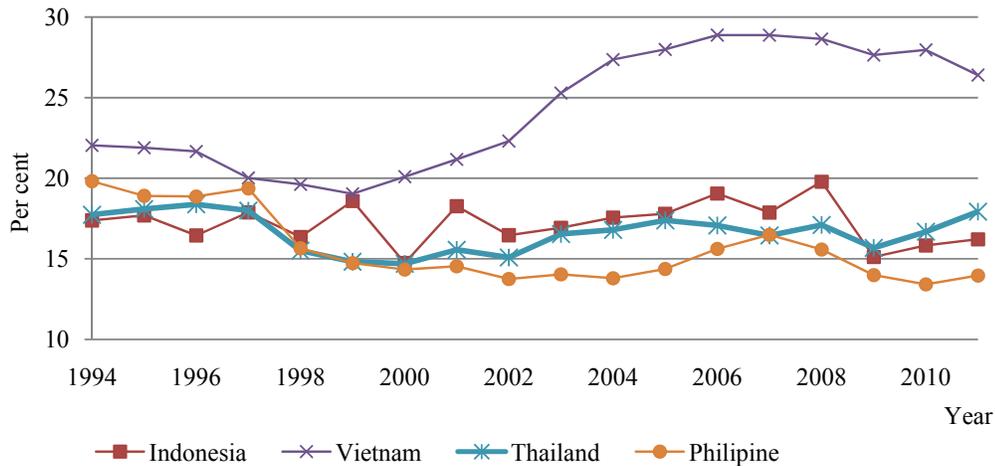
### 2.2.5 Government finance

An indicator to measure the government’s role in the economy through fiscal policy is the long-term trend of the ratio of government expenditure to GDP (or expenditure/GDP). As can be seen in Figure 2.8, during 1994–2011 the expenditure/GDP ratio of Indonesia had a rising trend, which indicated an improvement in the government’s role in economic development throughout those years. During 1994–2000, the expenditure/GDP ratio of Indonesia was lower than that of other South East Asian countries. During 2000–2011, Indonesia’s expenditure/GDP ratio increased to intermediate levels when compared to all South East Asian countries’ ratios.

Indonesia’s expenditure/GDP ratio increased significantly during the 1998 crisis – though it was lower than other countries’ ratio – as the government of Indonesia implemented an expansionary fiscal policy to stimulate the economy, while at the same time, investments weakened. Thailand’s government also ran an expansionary fiscal policy, which likewise resulted in an increase of the expenditure/GDP ratio. Generally, other countries did not increase their expenditure/GDP ratio during crisis. Between 1998–2000, the expenditure/GDP ratio of Indonesia declined and then increased again during 2000–2011. The government of Indonesia once again applied an expansionary fiscal policy in 2007–2008, in reaction to the global economic crisis in 2007.

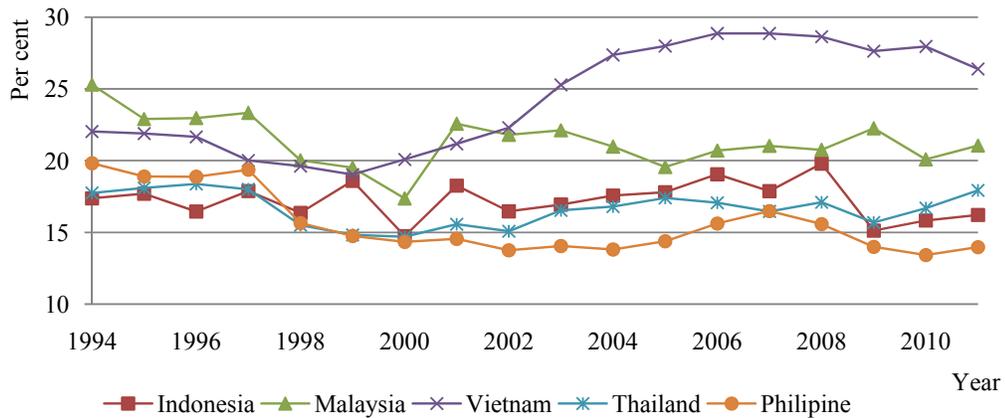
On the revenue side, the ratio of government revenue to GDP of Indonesia declined throughout 1994–2000, and increased during 2000–2011 (Figure 2.9). These ratios, on average, were higher than Thailand’s and that of the Philippines.

Figure 2.8 Ratio of government expenditure to GDP of South East Asian countries, 1994–2011 (%)



Source: Asian Development Bank (2012)

Figure 2.9 Ratio of government revenue to GDP of South East Asian countries, 1994–2011 (%)



Source: Asian Development Bank (2012)

### 2.3 Structural transformation in Indonesian economy

Since the early 1990s, structural transformation has taken place in the Indonesian economy. From initially been dominated by the agricultural sector, Indonesia’s economic output has come to be dominated by the manufacturing sector, which has a

high level of exports. The transformation from agriculture to manufacturing was smooth in Indonesia, as it received strong political support from the government.

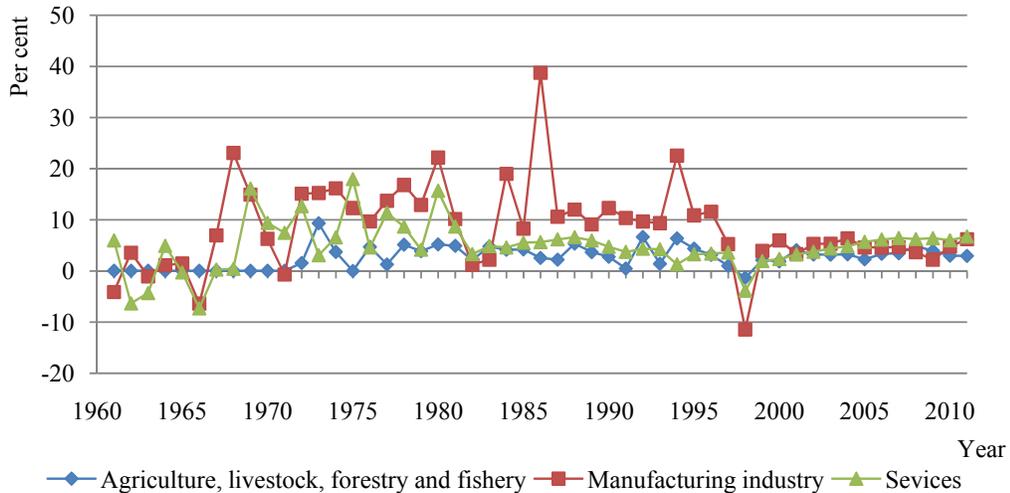
From Independence Day in 1945 until 1966, the Indonesian economy tended to stagnate and there was no structural change process. Wie (2005) notes that in the mid-1960s, the manufacturing sector was not much different from its condition near the end of Dutch colonialism in 1941. During 1950–1965, there were several large industries to be built; one of them was Sriwijaya Fertilizer Plant, the first fertilizer plant in Indonesia. However, due to the unstable political situation, the business climate was less conducive to private enterprises, and due to a lack of funds, many large industrial projects that had been planned could not be implemented.

In 1960, the agricultural sector (agriculture, livestock, forestry, and fisheries) contributed 53.9 per cent to GDP. However, this fell to 18.4 per cent in 1991 and continued to diminish to only 12.7 per cent in 2011 (Figure 2.11). For the same period, the manufacturing sector initially contributed 8.4 per cent to the total GDP, grew to 20 per cent in 1991, and continued to increase to 25.8 per cent in 2011. Despite its declining contribution to GDP, the annual growth of agricultural output remained positive throughout 1961–2011 (Figure 2.10). The decline of the agricultural contribution was due to its relatively lower growth than that of the manufacturing industries. The services sector also displayed an upward trend in output during the period. Hill (2000) states that rapid growth in the services sector especially from the 1970s to 1980s, was primarily driven by infrastructure development which was financed by oil revenues and foreign aid. He concludes that there was a clear positive correlation between increased government spending and growth in the services sector in that era.

The manufacturing sector started to grow in 1967, though relatively slowly. One of the reasons for this was the scarcity of foreign exchange which subsequently led to limited imports, while almost all types of machinery had to be imported. As a result, development in the industrial sector became obstructed (Tambunan, 2006). However, in subsequent years, industrial output grew rapidly (Figure 2.10), except in the early 1980's when the growth of the manufacturing industry's output fell during the economic recession (which was caused by the falling oil prices in world markets). Wie (2005), states that the rapid growth of Indonesia's manufacturing sector almost occurred entirely in modern industries, which generally consisted of

large-scale (which had 100 workers or more) and medium-scale production units (employing 20–99 workers).

Figure 2.10 Annual growth of Gross Domestic Product at constant prices by industrial origin 1961–2011 (%)



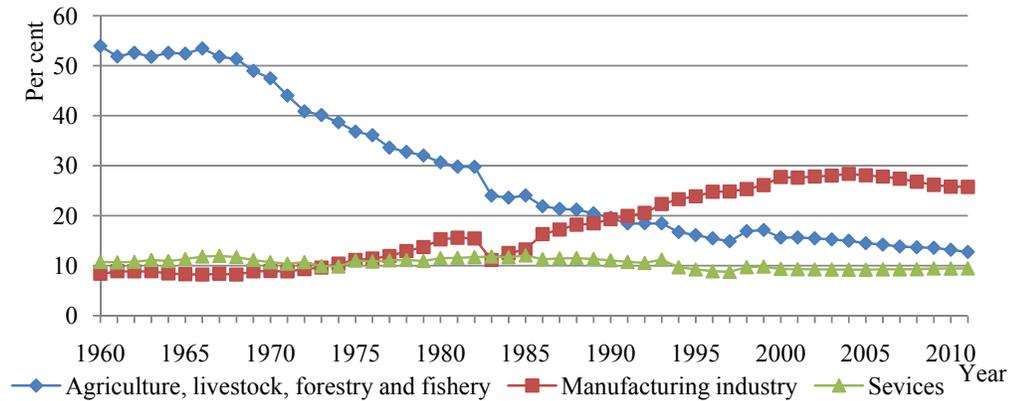
Source: BPS (2005, 2013a) and Bank Indonesia (2010b)

Unfortunately, the rapid transformation of Indonesia’s manufacturing sector during 1969–1997 did not create efficient and internationally competitive industries. Wie (2005) argues that from the beginning, the Indonesian government did not focus on industrial policies for efficiency and competitiveness, and just before the Asian economic crisis 1997, Indonesia’s industrial structure was very vulnerable to external shocks.

The 1997–1998 Asian economic crisis contributed to Indonesia’s GDP falling by 13.13 per cent in 1998, while the manufacturing sector’s output fell by 11.44 per cent and the services sector fell by 15.33 per cent. The output of the agricultural sector contracted by 3.76 per cent. This 1998 economic contraction was much greater than that which occurred during 1960s crisis (a -3.0 per cent drop in GDP).

In 1999, the Indonesian economy began to grow, by a rate of 0.79 per cent (Figure 2.10). The manufacturing sector’s output grew by 3.92 per cent in 1999, and its growth rate reached 6 per cent in 2000. During the period 2001 to 2011, the growth of manufacturing output remained positive, at about 4.63 per cent per annum. The agricultural sector grew by 2.16 per cent in 1999, and declined to only 1.88 per cent in 2000. The agricultural sector’s growth then increased to an average of 3.42 per cent per annum during 2001–2011.

Figure 2.11 Distribution of Gross Domestic Product at constant prices by three main industries, 1960–2011(%)



Source: BPS (2005, 2013a) and Bank Indonesia (2010b)

The contributions of the oil and gas sub-sector fell after the 1982 oil boom era ended in 1982, and the low growth of manufacturing output since 2000 was largely due to the similarly minimal output of oil and gas industry, a sub-sector of manufacturing, this output was caused by the lower production of oil refineries (Wie, 2005).

During the 1998 economic crisis, labor-intensive industries, including textiles, garments, and footwear, benefited from the large depreciation of the rupiah against the U.S. dollar. However, the growth in exports of these industries has slowed since 2000. These industries' outputs have been unable to compete with those of China, Vietnam, and other competitor countries which have lower production costs (Aswicahyono and Hill, 2004).

#### 2.4 Structure of Indonesia's aggregate demand

Overall, the components of Indonesia's aggregate demand showed positive trend during 1961–2011 (Figure 2.12). Between 1960s–1968, all components experienced positive growth on average, even though some components, such as investment, exports, and imports, had several years of negative growth. During 1969–1997, all of the components grew positively. At the peak of the Asian economic crisis of 1998, all of the aggregate demand components contracted except for export. The main reason exports could withstand the effects of the crisis was the presence of international competitive advantage, due to the depreciation of the rupiah against the

U.S. dollar. This benefited some agricultural commodities and some manufactured products that used local raw materials, such as handicrafts.

Gross fixed capital formation (investment) decreased the most during 1998, falling by 33 per cent (Figure 2.12). Tambunan (2009) explained that the initial cause of the decline in investment was the large losses suffered by some private companies due to the rupiah's depreciation as most of their foreign debt was in U.S. dollars, which were not protected from certain rates in forward market). Some causes of the slowing of investments were the collapse of stock prices, the drastic increase of capital flight; and the risk premium. The last two factors were the result of political upheaval, public protests, security and law enforcement.

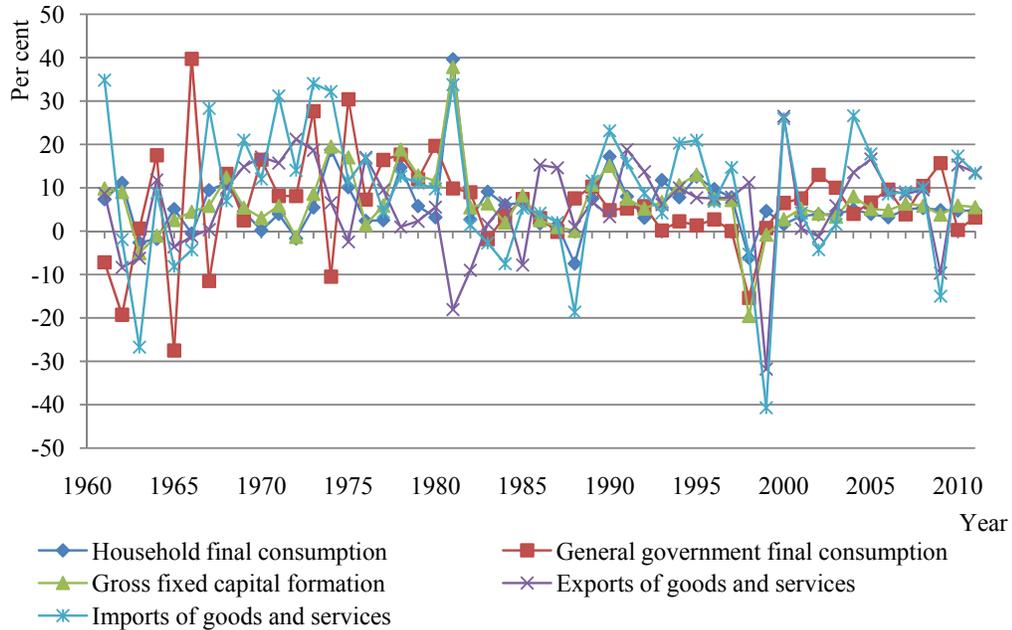
Household and government consumption decreased by 6.2 and 15.4 per cent respectively in 1998. The reduction of people's purchasing power as a result of the crisis caused this decline in household consumption levels. However, the contributions of consumption to total aggregate demand still increased (Figure 2.13). Besides exports and consumption, imports share in aggregate demand also increased, due to the dramatic rise in the value of imports, as a result of the high depreciation of the rupiah against U.S. dollar in 1998.

In 2000, Indonesia's economy started to grow by 4.7 per cent. In terms of demand, this growth was initially supported by household consumption, exports, and investment growth. Unfortunately, consumer confidence declined due to political uncertainty and the high level of exports could not be maintained, due to the declining economy of the United States of America –the largest market for Indonesian non-oil exports– and Japan's prolonged economic stagnation. The growth of Indonesia's economy slowed to 3.8 per cent in 2001 (Bank Indonesia, 2010c).

In 2009, the economic growth was slower than in 2008. The global economy's contraction, as an effect of the global financial crisis was an unavoidable influence on the Indonesian economy, and led to a decline in exports (Figure 2.12). The Bank Indonesia (2010c) explained that the domestic economy slowed down due to the contraction in exports, while high interest rates had caused investment growth to slow to 15 per cent. Household consumption still grew by 4.9 per cent in 2009, although this was lower than its growth in the previous year (Figure 2.13). Due to its high growth and high contribution to GDP (57 per cent), household consumption became the main driver of economic growth in 2009. This high household

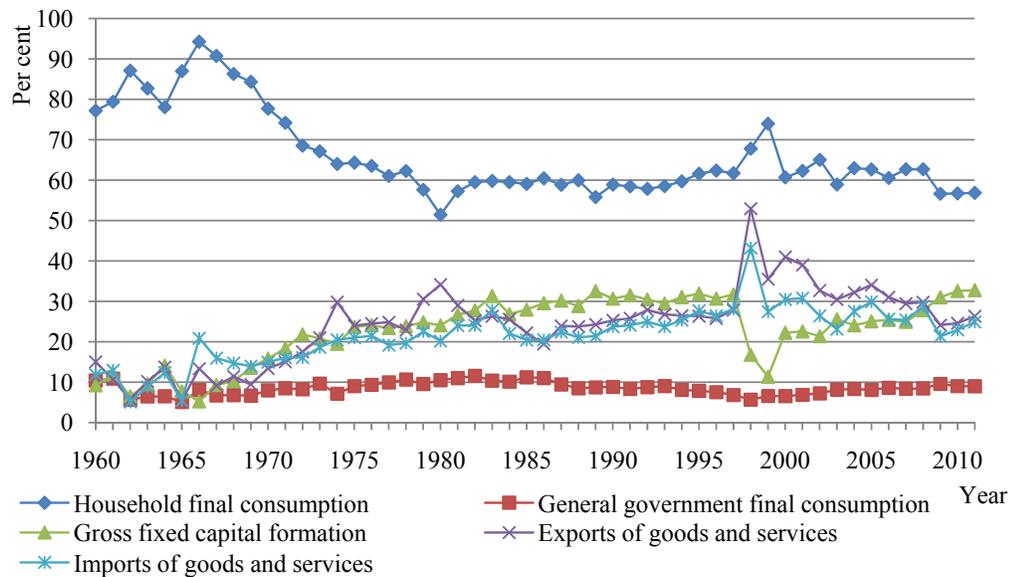
consumption growth was stimulated by, among others things, the 2009 election and the increase of consumer confidence and income (Bank Indonesia, 2010c).

Figure 2.12 Annual growth of aggregate demand, 1961–2011 at constant prices



Source: BPS (2005) and Bank Indonesia (2010b)

Figure 2.13 Contribution of aggregate domestic demand components 1960–2011 at constant prices (%)



Source: BPS (2005) and Bank Indonesia (2010b)

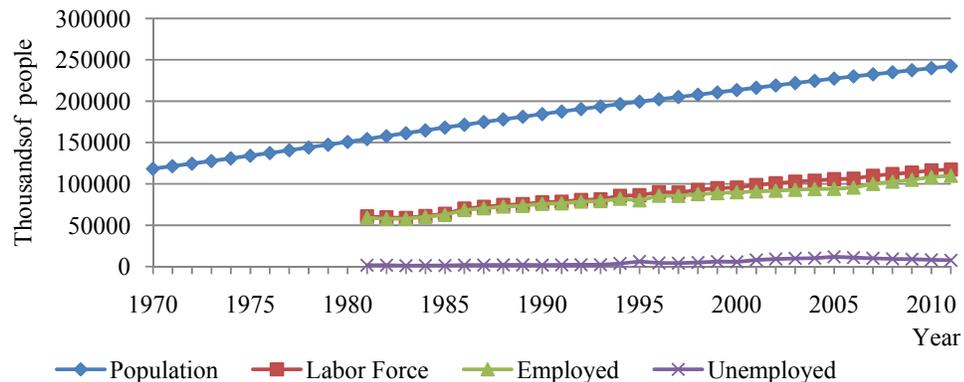
## 2.5 Employment, income distribution, and poverty

### 2.5.1 Employment

As Indonesia's population increase between 1970-2011, so did its labor force. In 1981, the total of labor force was 60.76 million people: 59.12 million people were employed and 1.64 million people were unemployed, resulting in an unemployment rate of 2.69 per cent) (Figure 2.14). In 2011, the total labor force increased to 117.37 million people, with 109.67 million people classified as employed and 7.7 million (6.56 per cent) as unemployed. The economic crisis in 1997–1998 led the increase in unemployment of 20.63 per cent, from 4.19 million people in 1997 to 5.1 million people in 1998. After 1998, the figures for both employment and unemployment demonstrated positive trends.

Ahmed and Dhanani (1999) establish that a notable increase in the labor force came from female workers who had been occupied in housekeeping activities prior to the 1998 crisis. These women entered the workforce to support their families. However, faced with difficulties in finding jobs, many workers, male and female, became discouraged. Furthermore, the crisis caused a movement of people back into informal and rural employment.

Figure 2.14 Population, labor force and unemployment (thousands)



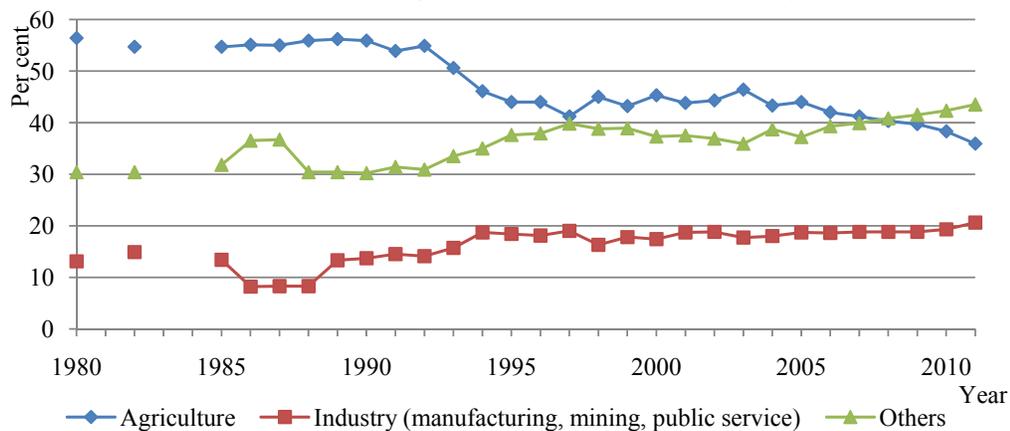
Source: The World Bank (2010a, 2013)

In the last 30 years, as the percentages of the working population in the key sectors of the economy shifted, employment was still been concentrated in the agriculture –although the manufacturing sector is now the greatest contributor to Indonesia's economy. In 2011, agriculture employed 35.9 per cent of the total labor force, down from 56.4 per cent in 1980, while employment in manufacturing,

mining, and public sector increased from 13.1 per cent in 1980 to 20.6 per cent in 2011 (Figure 2.15).

The 1998 crisis led to labor decreases in almost all economic sectors, except for agriculture. Employment in the manufacturing, mining, and public sector fell to 16.3 per cent from 19 per cent in 1997, whereas agriculture's share of the labor force increased by 3.8 per cent, from 41.2 per cent in 1997 to 45 per cent in 1998. These facts demonstrated that the agricultural sector could provide employment in times of crisis.

Figure 2.15 Distribution of labor by main industries, 1980–2011 (%)



Source: The World Bank (2010a, 2013)

From Figure 2.15 and Figure 2.11, it can be observed that the shift in Indonesia's economic structure was not concurrent with the changes in employment in Indonesia; sectoral output shifter faster than sectoral employment. In other words, an economic turning point was reached earlier than a labor turning point, a phenomenon that may caused the exploitation of human resources in the primary sector.

### 2.5.2 Income distribution

Statistics of population income distribution, indicated that the inequality of income distribution in Indonesia was low during 1976–2011; however the income inequality of the urban population was higher than it was in rural areas (Table 2.2).

The Gini Index Coefficient (Table 2.3) demonstrates that income inequality in Indonesia tended to decline throughout 1976–1990, increased during 1990–1998, tended to be constant between 1998–2004, and again increased during 2005–2011.

Over the period of time observed, urban income inequality levels were similar to national averages and income inequality in rural areas was lower than in urban areas. Rural income inequality trended downwards between 1976–2006 and then increased during 2007–2011.

Table 2.2 Income distribution by percentage groups 1976–2011

Year	Urban			Rural			Urban and rural		
	40 % lowest	40 % middle	20 % highest	40 % lowest	40 % middle	20 % highest	40 % lowest	40 % middle	20 % highest
1976	19.6	37.5	43.0	21.2	38.8	40.0	19.6	38.0	42.5
1980	18.7	37.8	43.5	21.2	39.0	39.8	19.6	38.2	42.3
1987	21.5	38.0	40.5	24.3	39.3	36.5	20.9	37.5	41.7
1990	19.7	37.7	42.7	24.4	39.2	36.4	21.3	36.8	41.9
1996	19.0	36.9	44.0	23.2	39.0	37.8	20.3	35.1	44.7
1998	20.6	36.8	42.5	24.4	39.4	36.2	21.5	36.9	41.5
2002	20.3	38.3	41.4	25.8	38.0	36.2	20.9	36.9	42.2
2005	21.2	37.2	41.6	23.4	40.0	36.6	20.2	37.7	42.1
2008	18.6	37.0	44.5	22.1	38.6	39.4	18.7	36.4	44.9
2009	18.5	36.6	44.9	22.4	38.4	39.1	19.0	36.1	44.9
2010	17.6	37.0	35.4	21.0	38.8	40.2	18.1	36.5	45.5
2011	16.1	34.8	49.1	20.0	37.5	42.6	16.9	34.7	48.4

Source: BPS (2005, 2007b, 2009f, 2012)

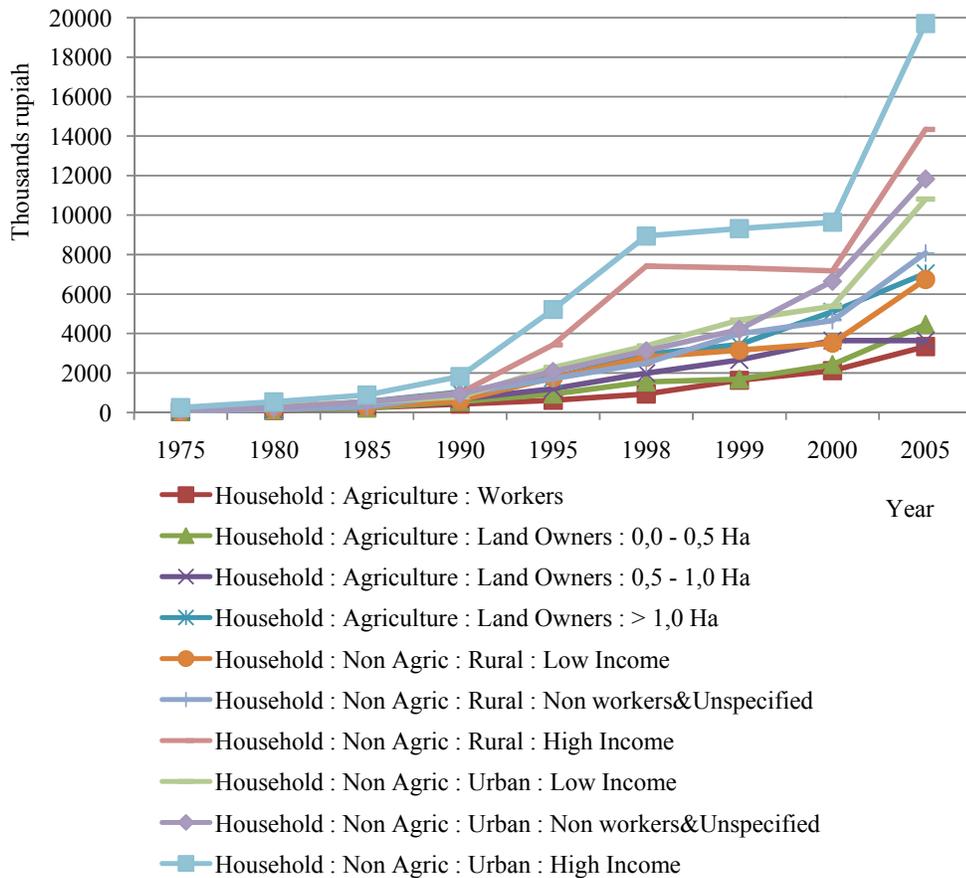
Table 2.3 Gini Index 1976–2011

Year	Urban	Rural	Urban and rural
1976	0.35	0.31	0.34
1980	0.36	0.31	0.34
1987	0.32	0.26	0.32
1990	0.34	0.25	0.32
1996	0.36	0.27	0.35
1998	0.33	0.26	0.32
2002	0.33	0.25	0.32
2005	0.32	0.27	0.33
2008	0.37	0.30	0.37
2009	0.37	0.29	0.37
2010	0.38	0.32	0.38
2011	0.42	0.34	0.41

Source: BPS (2005, 2007b, 2009f, 2012)

The income per capita levels of all household groups had an ascending trend during 1975–2005 (Figure 2.16). Unfortunately, along with this increase, the distribution of household income widened over this period, with a greater increase in non-agricultural households than in the agricultural households.

Figure 2.16 Income per capita of household groups 1975–2005 (thousands rupiah)



Source: BPS (2007a)

### 2.5.3 Poverty

The total population of the poor in Indonesia declined during 1976–2011 (Table 2.4). The number of poor in urban areas increased even as the share to total poverty declined, while the poor in rural areas decreased both in number and in share. An effect of the 1998 crisis, was the increased in the number of the poor from 34.01 million people in 1996 to 49.50 million in 1998, with this increased population concentrated in rural areas.

In 2011, about 63.2 per cent of Indonesia’s poor resided in rural areas (Table 2.4), while 57.8 per cent of the poor earned their livelihood in the agricultural sector in 2010 (Table 2.5).

Table 2.4 Number and percentage of poor people in Indonesia 1976–2011

Year	Urban		Rural		Urban + Rural	
	Total (million)	Percentage	Total (million)	Percentage	Total (million)	Percentage
1976	10.00	38.80	44.20	40.40	54.20	40.10
1980	9.50	29.00	32.80	28.40	42.30	28.60
1987	9.70	20.10	20.30	16.10	30.00	17.40
1990	9.40	16.80	17.80	14.30	27.20	15.10
1996	9.42	13.39	24.59	19.78	34.01	17.47
1998	17.60	21.92	31.90	25.72	49.50	24.23
2000	12.30	14.60	26.40	22.38	38.70	19.14
2005	12.40	11.68	22.70	19.98	35.10	15.97
2008	12.77	11.65	22.19	18.93	34.96	15.42
2009	11.91	10.72	20.62	17.53	32.53	14.15
2010	11.10	9.87	19.93	16.56	31.02	13.33
2011	11.05	9.23	18.97	15.72	30.02	12.49

Note: 1. A new standard to measure poverty has been adopted since December 1998. Data from 1976–1996 is based on the old standard; the 1996–2008 figures are based on the revised standard.

2. The month of measurement for all data is February, except for 1998 (December) and 2006–2009 (March). Starting in 1999, the data presented excluded East Timor.

Source: BPS (2009f, 2012)

Table 2.5 Distribution of the poor\* in Indonesia by sector, 2000–2010 (%)

Year	Agriculture	Industry	Other**
2000	51.7	13.8	34.5
2001	63.0	11.9	25.1
2002	57.7	12.5	29.8
2003	59.6	5.8	34.7
2004	58.8	5.6	35.6
2005	54.5	6.3	39.2
2006	54.7	6.9	38.4
2007	59.2	5.4	35.4
2008	52.3	6.2	41.4
2009	63.6	5.8	20.9
2010	57.8	8.8	25.0

Note: \*Based on Central Bureau of Statistics of Indonesia, the population of poor people who have an average expenditure per capita per month under the Poverty Line. The poverty line which consists of two components, namely the Food Poverty Line (2,100 kcal, minimum requirement per capita per day) and the Non-Food Poverty Line (the minimum requirements for housing, clothing, education, and health),

\*\* Total includes the poor in other sectors and the unemployed poor.

Source: BPS (2009f, 2012)

#### ***2.5.4 Achievement of Millennium Development Goals for poverty reduction***

Table 2.6 presents the targets of Goal 1 of the Millennium Development Goals (MDGs) regarding poverty which is eradicate extreme poverty and hunger between 1990–2015, and Indonesia’s achievements in meeting these targets until 2008. According to the standard of national poverty lines that are used by the *Badan Pusat Statistik* (BPS) or Statistics Indonesia, the number of the poor in Indonesia was about 12.49 per cent of the total population in 2011, which increased from 15.1 per cent in 1990 (BPS, 2009f, 2013a). Based on this indicator, the poverty rate of Indonesia was lower than the MDGs’ corresponding target. According to the figures of the population living below \$1 per day, Indonesia had achieved the MDGs’ target by 2008, as the number of poor in Indonesia was 20.6 per cent in 1990, a figure that had dropped dramatically to 7.5 per cent in 2008, below the MDGs’ target of 10 per cent in 2015. However, the population of those living below \$2 per day was still very high, having reached 49 per cent in 2008. The poverty gap ratio, which measures the difference between the average incomes of the poor and those below the poverty line, was relatively constant during 1990–2008 at 2.70 per cent in 1990 and 2.77 per cent in 2008.

Indonesia also had success in meeting the MDGs’ Goal 1 target for the productivity of workers, which increase by about 3.4 per cent annually during 2000–2007. Indonesia is also on track to achieve the target for the population of people who consume the minimum dietary requirement. Unfortunately, the prevalence of underweight and undernourished children 28.7 per cent of the population and expected to increase. It was not anticipated that this MDG target would be met.

Table 2.6 Targets and achievements of Goal 1 of the Millennium Development Goals: Eradicate extreme poverty and hunger

Indicator	1990	2008	Target
Goal 1. Eradicate extreme poverty and hunger			
Target 1A. Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day			
1.1 Population below \$ 1 a day (%)	20.60	7.50	10
1.1a Poverty head count ratio (population below national poverty line) (%)	15.10	15.40	7.50
1.1b Population below \$ 2 a day (%)		49.00	
1.2 Poverty gap ratio (incidence x depth of poverty) (%)	2.70	2.77	
1.2a Poverty Depth Index		0.76	
1.3 Share of poorest quintile in national consumption (%)	9.30	9.70	
Target 1B. Achieve full and productive employment and decent work for all, including women and young people			
1.4 Growth rate of GDP per person employed (%)		4.30	
1.5 Employment-to-population ratio		67.30	
1.6 Proportion of employed people living below \$1 (PPP or purchasing power parity) per day (%)		8.20	
1.7 Proportion of own-account and contributing family workers in total employment (%)		62.00	
Target 1C. Halve, between 1990 and 2015, the proportion of people who suffer from hunger			
1.8 Prevalence of underweight/undernourished children (under 5 years) (%)	35.50	28.70	18.0
1.9 Proportion of population below minimum level of dietary energy consumption (%)	9.00	6.00	5.00

Source : Badan Perencanaan dan Pembangunan Nasional and United Nations Development Programme (2007), p. vi

## 2.6 Economic policies 1945–now

### 2.6.1 Economic policy during 1945–1966 (*Old Order era*)

During 1945–1966, also known as the Old Order era, the Indonesian economy faced several obstacles to its development. Contribution to GDP was still dominated by the large companies of Dutch heritage. These companies were export-oriented and were mostly owned by foreigners. The unstable socio-political condition and poor security in Indonesia made these companies stagnate. Boeke (1954) explains that economic structures such as dual societies, which are one of the main characteristics of a developing country such as Indonesia, are a legacy of colonization. Hill (2000)

asserts that the economy did not grow during 1961–1964; even though slight growth occurred in the agricultural sector in 1965, this was caused solely by a good season. Since there was little need of funds and less dependence on imported raw materials, the agricultural sector managed to survive better than other sectors in the face of economic ruin. Indonesia's economic failure culminated in the economic crisis in 1966, which was marked by skyrocketing inflation to 1000 per cent in 1966 (The World Bank, 2010a). The main causes of the poor Indonesian economy during the Old Order era were the destruction of economic infrastructure due to war, both physical and non-physical infrastructure, and poor macro-economic management.

The government's economic policy during the Old Order era are grouped into three periods, namely the national revolution (1945-1950), parliamentary democracy or liberal democracy (1950-1957) and guided democracy (1957-1965). Several key government policies during each period of Old Order era were as follows:

- 1) The economic policy for agriculture during the national revolution was the Kasimo Plan, a plan of agricultural production during 1948–1950 to regulate food self-sufficiency. During this period, the government imported rice in large quantities, despite the fact that Indonesia had experienced self-sufficiency in rice before the war of independence (Dick, 2002).
- 2) Policies during the liberal democracy period included: i) the national currency devaluation and the 50 per cent cut rate exchange rate; ii) the issuance of the foreign exchange certificate policies to encourage exports and decrease imports, the reduction of the rate of inflation, and the extending of government revenue sources to cover the budget deficit (Bank Indonesia, 2010c); iii) the instigation of the multiple exchange rate system to protect farmers who produced most of the exported goods, iv) the nationalization of the De Javasche Bank to become the Bank Indonesia in December 1951 which was to function as the central bank and the circulation bank; v) the cancellation of the debt to the Dutch government and the receiving assistances from the IMF; vi) the imposing of the anti-strike law and law against illegal-owned land. Law against illegal-owned land was an effort to protect the plantations which were mostly owned and operated by foreigners; and vii) the nationalization of foreign companies which were mainly owned by the Dutch. This nationalization process began in 1951, but occurred on a large scale in 1958 due to the implementation of the Law No. 78/1958 concerning Foreign Investment, an anti-foreign investment policy (Dumairy, 2001). An

immediate effect of this law was the closure of the Djakarta Stock Exchange in 1958, as companies listed on the stock market were mostly foreign companies, and as a result there was substantial capital flight.

- 3) Government policies which were implemented during the period of guided democracy included: i) the formation of *Badan Perencanaan dan Pembangunan Nasional* (Bappenas) or The National Economic Planning Agency; and ii) the passing of a package of land reform legislation to replace the old rules that were still using the basic laws of the Dutch and Japanese colonial administrations.

In the last years of the Old Order Regime, Indonesia's banking system was a fund for government projects financed through the printing of money, particularly for the president's special projects, and also for financing the confrontation with Malaysia and other western countries (Dumairy, 2001).

In the trade sector, foreign trade did not develop in the late 1950s and early 1960s because of the government, especially during the period of guided democracy, "inward-looking policies" were enacted (Wie, 2005). These policies were characterized by the implementation of import substitution protectionist policies, the strict regulation of the domestic economy, and restrictions on foreign investment. However, Myint (1984) states that the Indonesian government's policies during this period could not be described as completely inward-looking policies because in fact the government still relied on foreign aid, including aid from western countries. Foreign aid was primarily used to finance the import substitution projects put in place by the Indonesian government.

### ***2.6.2 Economic policy during 1966–1998 (New Order era)***

In March 1966 the Old Order government was replaced with a new administration and this period became known as the New Order era. Facing with a bad economy inherited from the Old Order, the New Order government prioritized economic recovery by employing more pragmatic and non-ideological policies (Wie, 2005). Fundamentally, the new order government implemented outward-looking economic policies indirect contrast to the Old Order. Early in the New Order era Indonesia began to re-integrate into the world economy, pursuing a broader relationship with other countries, particularly developed countries. Indonesia once again became a

member of the United Nations (UN) and other global institutions such as the World Bank and the International Monetary Fund (IMF).

The government issued several laws to regulate foreign and domestic investment between 1967–1968, which were supported by a series of more specific policies for deregulation and de-bureaucratization. Additionally, the government restored the nationalized companies of the Old Order era back to their previous owners (Tambunan, 2009). In 1967, as a result of the return to the UN, World Bank, and IMF, and with the cooperation of these international institutions, a consortium called the Inter-Governmental Group on Indonesia (IGGI), was formed with a number of developed countries as members. The IGGI aimed to coordinate multilateral financing for economic development in Indonesia. Besides the Netherlands as chair, the other members of IGGI were the Asian Development Bank (ADB), the IMF, the United Nations Development Programme (UNDP), the World Bank, Australia, Belgium, Great Britain, Canada, France, Germany, Italy, Japan, New Zealand, Switzerland, and the United States.

Starting on 1 April 1969, the government set a development program of a five-year term which was called *Pembangunan Lima Tahun* (Pelita) or Five-Year Development. Pelita was part of a long-term development policy of 30 years, which was called first phase of Long Term Development (LTD I). LTD I had three targets to be achieved in each Pelita; there were called the trilogy of development. The three targets were economic stability, economic growth, and equitable development outcomes. The orders of priority of the targets were tailored to the problems and conditions that were faced in each Pelita's term. In Pelita I the order of the targeted priorities was the maintenance of economic stability, economic growth, and equitable development outcomes. In Pelita II, the target priorities were prioritized as economic growth, equity, and stability. From Pelita III until Pelita VI, the order of the priorities has been equality, growth, and then stability.

In Pelita I (1969–1974) the government directed economic development primarily the agricultural sector and industries related to agriculture (agro-industries). In this Pelita, economic policies were focused on the development of the industries that could generate foreign exchange through export and import substitution, industries that processed domestic raw materials, labor-intensive industries, and industries that produces fertilizer, cement, chemicals, pulp and paper, and textiles. In this period there was a severe shortage of rice due to the poor harvests

in Indonesia and around the world in 1972, and the result soaring prices for rice (Hill, 2000). In late 1973 oil prices rose four-fold and generated huge revenues for the government. These circumstances caused a large increase in inflation.

In Pelita II (1974–1979), government policies were aimed at increasing the availability of food, clothing, housing, infrastructure, public welfare, and employment. In this period economic growth increased by 7 per cent per year, which was supported by the oil prices boom in late 1973. Output industries increased significantly and the government also invested a lot in the development and rehabilitation of roads, bridges, and irrigations systems. In the monetary sector, the government ran a stabilization program in 1974 to reduce inflation, lower interest rates on time deposits and short-term loans (mainly for export and domestic trade), and to devalue the rupiah (Bank Indonesia, 2010c).

During Pelita III (1979–1984), the decrease of world oil prices and the recession that hit developed countries in 1982–1983, lowered the net value of Indonesia's exports. Consequently, current account surpluses in 1980–1981 turned into deficits in 1981–1982 and 1982–1983. The effect on economic growth was dramatic: the GDP grew only 2.24 per cent in 1982, whereas during the previous decade the GDP grew an average of 7–8 per cent per annum (Dumairy, 2001). To deal with this the government implemented a budget reduction, increased foreign loans, promoted the export of non-oil and gas commodities, limited the import of luxury goods, reduced the trips to abroad, promoted the use of domestic products, and rescheduled or canceled about 50 public sector projects that were capital and import intensive. In 1984 the government reduced various subsidies on fuel, fertilizers and pesticides, while subsidies on certain food ingredients were granted. A series of new laws on taxation were enacted in January 1984. In the monetary sector, the government issued a policy that directed the Indonesian economy towards greater exposure to the mechanisms of the free market. Collectively, these laws were known as Policy Package 1 June 1983 (Pakjun 83), and they aimed to promote the independence of the banking system. As a result, in addition to increasing the level of public deposits in banks, Pakjun 83 also contributed positively to monetary stability.

The Pelita IV (1984–1989) focused on developing the agricultural sector so that Indonesia could achieve food self-sufficiency and improving those industries

that could generate their own industrial machines. Early in Pelita IV, Indonesia managed to become self-sufficient in rice, an accomplishment for which the Indonesian government was awarded by the Food and Agriculture Organization (FAO). During this Pelita, the government continued to issue deregulation and de-bureaucratization policies, which liberalized more aspects of the economy. In response to the uncertainty of the oil market price, the falling prices of traditional export commodities, and some acts of speculation in the foreign exchange market, in June 1987 the government, together with Bank Indonesia, enacted a drastic monetary tightening measure, which was known as *Gebrakan Sumarlin I* (the Sumarlin Breakthrough, named for the finance minister of the time). The government and Bank Indonesia raised the interest rate of the *Sertifikat Bank Indonesia* (SBI) or Certificates of Bank Indonesia, the rate of discount facility, and the level of re-discount of the *Surat Berharga Pasar Uang* (SPBU) or Money Market Securities. The government issued a Policy Package on 27 October 1988 (Pakto 88), that became the turning point of the various regulating policies of banking in the period 1971 to 1972. Pakto 88 was the most liberal set of rules in the banking history of Indonesia. Business licensing for new banks, which had been discharged since 1971, was reopened by Pakto 88. In this period, the government also implemented a family planning program and home for the family. Family planning programs aimed to improve the welfare of families with birth control.

In Pelita V (1989–1994), the government focused on the development of agriculture and industry to establish food self-sufficiency, the increase of other agricultural productions, and the manufacture of goods for export. In this Pelita, deregulation and de-bureaucratization were continued, which included efforts of to reduce the high-cost economy and increase national efficiency. Some regulations that were initiated in Pelita V were the Law on Cooperatives in 1990, the Law of Banking in 1992, and the Law on Taxation in 1994.

On 25 March 1992, the government disbanded the IGGI, arguing that this institution interfered with Indonesian non-economic affairs. The dissolution of this institution raised public expectations about the reduction of the dependence of Indonesia on debt, but in the same year the IGGI was replaced by the Consultative Group on Indonesia (CGI), which was also a consortium to continue the management of new debts to finance development in Indonesia.

To optimize domestic financial resources by increasing non-oil and gas exports, the government controlled inflation and strengthened the credit structure through policy package in March 1989 and January 1990. Pakto 88 has resulted in the number of banks and other financial institutions increasing significantly during 1988–1994, which led to a greater role for private banks in mobilizing public funds, from about 35–40 per cent in 1988, to about 55–60 per cent in 1994 (Dumairy, 2001). In an effort to prevent the impact of excessive expansion and unselective bank credit due to Pakto 88, in March 1988 the government conducted a monetary tightening policy which was known as *Gebrakan Sumarlin II*. In 1993, to eradicate poverty the government began to run the program *Inpres Desa Tertinggal* (IDT) or the under developed village fund, which provided funds directly to villages that were classified as underdeveloped. In industry, the government further developed the export-producing industries and small industries to create jobs.

The developments in Pelita VI (1994–1998) were still focused on the economic sectors related to agriculture and industry. To meet the increasing domestic demand and strengthen the non-oil and gas exports, in June 1996 the government issued a package of deregulation policies that included increasing of production sector efficiency, increasing non-oil exports, and securing the foreign loans. To reduce poverty, besides continuing the IDT program, the government also implemented sectoral and regional programs for combating poverty. Governments at the local level participated in these programs, and managed a portion of these funds. To improve the quality of industrial products the government established the standardization and normalization of industrial products through the *Standar Nasional Indonesia* (SNI) or Indonesian National Standard by Government Regulation No. 15/1994 and ISO 9000 standards. To encourage small business development, including small-scale industries, Law No. 9/1995 on Small Business was issued and the government released the Government Regulation No. 44/1997 concerning the Partnerships. Pelita VI was meant to have officially ended in 1999 but the terrible political crisis, which followed the 1998 economic crisis, resulted in a new government. In 1998 the New Order era came to a close and the five-year development systems, Pelitas, also ended.

During the new administration era, the government ran agricultural policies which adopted ‘green revolution’ ideas from western countries. At the beginning of

this period agricultural policies were intended to spur the production of food, mainly rice, to meet the needs of the people and to reduce the high dependency on rice imports. Narrowly, the green revolution could be interpreted as a pattern of intensive agriculture programs with a modern technology package which was characterized by: 1) the substantial use of external inputs, such as inorganic fertilizers, chemical pesticides, and hybrid seeds; 2) the use of supporting infrastructure, such as irrigation and capitalization systems on a large scale; and 3) the application of agricultural mechanization in land preparation and post-harvest handling.

Despite the various successes achieved in macro-economic indicators, there were also many criticisms of the economic performance under the New Order administration. The poverty rate was still high, even though it declined during this era, and there was a widening income gap. The uneven development and the emergence of the development gap between central and local regions, was partly because most of the local resources had been drawn into the central government region.

Rapid economic transformation and high growth were achieved at a high cost and with fragile economic fundamental. High economic costs and in-efficiency occurred, along with sharp increase in the levels of corruption, collusion, and nepotism. Fragile fundamentals were indicated by the condition of the less prudent banking sector, foot loosing of the national industries and the significant increase in Indonesian dependence on foreign capital, foreign loans and imports. This situation was evidenced by the crash of the Indonesian economy during the Asian economic crisis of 1997–1998.

### ***2.6.3 Economic policy during 1999–2004 (Transition of Reformation era)***

Within a period of six years after the 1998 crisis, which can be called the transition of reformation era, Indonesia experienced three different administrations: 1998–1999, President Bacharuddin Jusuf Habibie's administration; 1999–2001, President Abdurrahman Wahid administration; 2001–2004, President Megawati Soekarnoputri administration.

President Habibie's administration was marked by the commencement of government cooperation with the IMF to assist the process of economic recovery. Other important policies which were issued by the government in this period

included the stabilization of the exchange rate, the granting of independence of Bank Indonesia, the application of a Social Safety Net (SSN) program, infrastructure development, a basic needs fulfillment program, stabilization of the basic needs prices, budget policy, agriculture regulations, special market operations for the poor, the provision of subsidies, private debt restructuring, and real sector deregulation.

The Habibie government imposed tight monetary policy, coupled with the rescheduling of private and public foreign debt, to stabilize the rupiah. Base money and net domestic assets (NDA) were programmed as zero per cent growth, while the floating exchange rate system and free traffic system were maintained. In this period, Bank Indonesia, became an independent central bank with the passing of Law No. 23/1999 and achieve and maintain stability in the exchange rate. To rescue the collapsed banks the government established the *Badan Penyehatan Perbankan Nasional* (BPPN) or National Banking Restructuring Agency. To specifically address the private foreign debt during the crisis, the government launched the Indonesian Debt Structuring Agency (Indra) program. This program provided foreign exchange to pay foreign creditors.

Regarding food security and agriculture, the government implemented the SSN program, which was aimed to reduce the impact of the economic crisis on the poor. In order to combat and prevent food insecurity, the government established the Food Crisis Centre and provided subsidized food aid through special market operations for rice, as one way of helping the most vulnerable household groups of the crisis. To support farmers, especially rice farmers, the government guaranteed benefits through a system of basic prices.

In the agricultural sector the government rehabilitated irrigation systems and swamps, increased paddy fields areas, constructed new irrigation networks, and protected production areas from the threat of flooding. Overall, the agricultural planting area reached 8.38 million ha.

The government ran an expansionary fiscal policy and budget deficits were financed by foreign sector in the form of soft loans. Instead of providing subsidized goods, subsidies were targeted at groups, such as the special market operation program, with direct sales of basic foodstuffs to poor households. Also, the government removed subsidies for basic commodities such as flour and sugar, while subsidies for energy were maintained. To support fair competition in industries, Law No. 5/1999 regarding the Prohibition of Monopoly Practices and Unhealthy

Competition was issued, and commitment to protect consumers was increased in the form of Law No. 8/1999 concerning Consumer Protection.

Throughout the brief government period, post-crisis economic recovery efforts moved in the right direction; i.e. general economic conditions showed improvement. The economy grew by 0.8 per cent in 1999, although the level of income per capita continued to decline from U.S. \$680 in 1998 to U.S. \$590 in 1999. The inflation rate began to decrease, although it was still at double-digit levels, and the poverty rates were slightly lower than at the peak of the crisis in 1998. As stated by Tambunan (2009), during 1998–1999 the government had not been able to do much to settle the issues of corruption, collusion, and nepotism, which had increased rapidly since the New Order era.

At the beginning of the second period administration, entrepreneurs, investors, and domestic and foreign investors looked forward to the rise of the national economy and the solution of all of the problems of the New Order, such as corruption, collusion, and nepotism, the rule of law, improved human rights, alleviation of the problem of disintegration, and advances to overcome various other problems.

Economic policies responding to 1997–1998 crisis were still the focus of the new government. Broadly speaking, the policies which were issued during 1999–2000, aimed to create a conducive climate for economic recovery by creating stable macro-economic conditions for business activities, increasing trade and investment, financing the budget deficit with prioritized foreign aid (to avoid inflationary pressures), enacting policies on decentralization to improve the effectiveness of state financial management, implementing monetary policy which was focused on the stability of exchange rates, restructuring banking, and applying poverty reduction policies.

In the fiscal sector the government made a gradual transition from policies that gave priority to fiscal stimulus to those aimed at fiscal sustainability. The policies that supported the transition included revamping tax administration, providing tax incentives and adjusting tax rates, increasing transparency in tax collection, and reducing off-budget funds. To broaden the tax base, the government replaced the tax holiday that had been in place since January 1999 with investment tax allowances; it also eliminated various taxations on the *kawasan pengembangan*

*ekonomi terpadu* (Kapet) or economic development areas. The government adjusted tax rates for customs and excise duties as an incentive for investment, and reduce the tariffs entry of capital goods. The government also simplified the structure of tobacco excises.

In the monetary sector, policy was focused on achieving the single goal of price stabilization. This policy was consistently applied by controlling the base money. The control of monetary indicators was mainly done through SBI auctions and direct intervention into the money market. The banking restructuring program included the recapitalization of four state banks to achieve a capital adequacy ratio (CAR) of 4 per cent, the recapitalization of the Bank Take Over (BTO), and the first step towards privatization of the BTO. For poverty reduction in the fiscal year 1999–2000, the government continued the social safety net and poverty alleviation programs.

During this short-lived government, economic performance did not improve significantly. According to Tambunan (2009), the government did solve many existing problems, including the Indonesian government's poor relationship with the IMF, which was resolved with the amendment of Law No. 23/1999 concerning the Bank Indonesia, implementation of regional autonomy, which freed local governments to borrow money from abroad, and the revised government budget 2001 for which was continually delayed. In addition, the Paris Club, the donor countries for Indonesian foreign debt, threatened to declare the bankruptcy of Indonesia. The Paris Club argued that Indonesia's economic condition had worsened and the government deficit continued to swell, so that Indonesia was considered unable to pay back its debts, which were getting bigger and would fall due in 2002.

Increasingly considered a risk, foreign investors became reluctant to conduct business activities or invest in Indonesia. Especially in 2001, before the fall of President Wahid's administration, several economic indicators and businesses displayed unfavorable developments, such as the stock price index and the rupiah exchange rate in the first half of the year.

Prior to this, during 1999–2000 some macro-economic indicators had improved, such as the annual inflation rate in 2000, which was only 3.7 per cent, far lower than inflation in 1999, which reached 20.5 per cent. The economic growth in 2000 was 4.9 per cent, far higher than in 1999, which was only about 0.8 per cent. Growth continued to improve in 2001 and 2002 under the next administration. The

poverty rate also declined from 23.43 per cent or 47.97 million poor in 1999, became 19.14 per cent or 38.7 million poor, in 2000 (BPS, 2009e).

Under President Soekarnoputri's administration, economic development programs included poverty reduction, the fulfillment of basic needs, the empowerment of the micro, small, and medium enterprises (MSMEs) and cooperatives, the stabilization of the financial sector and the economy, the improvement of the competitiveness of industries, the increase in investment, the provision of facilities and infrastructure supporting economic activities, and the utilization of natural resources.

To reduce poverty the government issued a food security policy through tariff protection setting customs duties for the import of rice and direct restrictions on imports of sugar. In the employment sector the government opened a new transmigration settlement area and an improved delivery mechanism for overseas labor.

To accelerate economic recovery, the government restructured private debt through the Jakarta Initiative Task Force (JITF) and the BPPN. To increase investment, the government sought to establish greater legal certainty, simplified licensing and investment procedures, enhanced institutional capacity, and improved international cooperation in the field of investment. In 2001, regarding these policies, the government issued regulations that helped foreign investors to buy stocks in domestic companies, evaluated and canceled a number of local regulations that did not support investment, and imposed regulations on a one-stop investment service.

In this reformation period Indonesia's economic performance showed many improvements. GDP grew by 4.03 per cent in 2002, higher than growth of the previous year of 3.8 per cent. This growth continued to increase until 2004, the final year of the Soekarnoputri's government, by about 5.1 per cent. Income per capita increased rapidly from U.S. \$697 in 2001 to U.S. \$1191 in 2004. Export performance improved during the period 2001–2004 despite, in relative terms, the contribution of net exports to GDP declining.

The increase of economic growth and income per capita were also followed by a reduction in the number of poor people during the era of Soekarnoputri's administration. Although it was not a significant drop, the number and percentage of poor people decreased during 2001–2004, from 37.9 million people, or about 18.41

per cent of the population in 2001, to 36.2 million people or about 16.66 per cent in 2004.

#### **2.6.4 Economic policies 2004–onwards**

Starting in 2004 the Indonesian government oversaw development policy programs for five year period which were contained in *Rencana Pembangunan Jangka Menengah Nasional* (RPJMN) or National Medium Term Development Plan 2004–2009 and 2005–2010. These two five-year development programs from part of four phases of the *Rencana Pembangunan Jangka Panjang Nasional* (RPJPN) or National Long Term Development Plan 2005–2025.

The government's agenda for economic development in RPJMN 2004–2009 was improving the people's welfare with fundamental targets including decreasing percentage of the poor to 8.2 per cent in 2009, the creation of job opportunities that could reduce unemployment to 5.1 per cent in 2009, the reduction of economic disparities between regions, making the rural areas the basis of economic growth, the promotion of the development of underdeveloped and disadvantaged areas, increasing the competitiveness of regions and regional competitive products, the improvement of the quality of life of people and a better rating on the Human Development Index (HDI), the improvement of environment and natural resource management, and the improvement of infrastructure.

The government ran several programs of economic development in a 'triple track' strategy which were of 'pro-growth', 'pro-employment', and 'pro-poor'. The aims were: 1) increase the economic growth above 6.5 per cent per year through the acceleration of investment and exports, 2) improve the real sector to be able to absorb the additional workforce and create new jobs, and 3) revitalize the agricultural sector and rural areas to contribute to the alleviation of poverty.

The government issued and implemented poverty alleviation policies with the provision of *bantuan langsung tunai* (BLT) or direct cash assistance, a compensation program for fuel price increases in 2005 and 2008, the subsidy of rice through *beras rakyat miskin* (Raskin) or rice for the poor, tenure and land ownership: land certification programs, provision of the *Kredit Usaha Rakyat* (KUR) or People's Business Credit: a low-interest loan program for the poor, and providing health and education subsidies.

To improve the competitiveness of national industries, the government put in place various measures such as applying the SNI to outstanding products in the domestic market, management development, encouraging export-oriented industries, and restructuring machinery in the textiles, sugar, and footwear industries.

In agriculture the government implemented various policies which were intended to improve the welfare of rural communities, especially farmers. The regulatory framework aimed to increase agricultural production, and productivity and to enable communities to achieve self-sufficiency and food independence. In the forestry sub-sector the government issued various regulations governing the use of production forests and for monitoring the circulation of the products of timber forests. To empower the cooperatives and MSMEs, Law No. 25/1992 concerning the cooperatives and Law No. 20/2008 regarding MSMEs are issued.

To overcome the problem of unemployment, the government issued a policy package to expand employment opportunities through the improvement of the investment climate, and policies to accelerate the real sector development, and to empower MSMEs. The government also issued regulations regarding the prevention of mass layoffs, taxation, customs, legal certainty, local government regulations, and infrastructure. The government ran various programs to create new employment opportunities, such as infrastructure development (particularly rural infrastructure), urban poverty reduction programs, and various other similar programs. Likewise, revitalizing agriculture, fisheries, forestry, and rural areas to increase agricultural productivity and create new employment opportunities for the community were also undertaken by the government.

At the macro-level the government tried to maintain macro-economic stability to support sustainable economic growth. In the monetary field, to realize a healthy and efficient financial sector and to improve banking intermediation, especially to support real sector growth, the government established a long-term program, known as the Indonesian Banking Architecture. To face the external pressure of the global financial crisis of 2008, the government issued several policies to strengthen the financial sector, such as aid from the government budget (a bail out) for banks that had financial difficulties (which could have had a systemic effect and potentially caused a crisis), raised the guarantee of public deposits in banks, and prepared legal instruments for the Financial Sector Safety Net program.

On the fiscal side the government increased the amount of revenue it raised from taxes and improved the effectiveness and efficiency of public spending through the implementation of a performance-based budget. To deal with external conditions, in 2005 and 2008, the government raised fuel prices due to the pressure of the international oil price increases. At the same time the government disbursed a direct subsidy to the poor to maintain their purchasing power due to the increase of the fuel prices; they did this through BLT. In 2008 and 2009 the government lowered fuel prices, following the decrease of the world oil price. Facing the global recession during 2008–2009, the government adopted an expansionary budget policy with a fiscal stimulus disbursed throughout the economy. This policy aimed to maintain the purchasing power of the community and the endurance of the business sector, especially in coping with layoffs.

During this administration era, the Indonesian economy experienced a great deal of progress. GDP grew an average of 5.5 per cent per year over the period 2004–2009. The inflation rate was stable, within the single-digit range and the average annual rate was 3.9 per cent during 2004–2008. The number of poor declined from 11.4 million people, or 12.1 per cent, in 2004 to 12.77 million, or 11.1 per cent, in 2008. The unemployment rate also declined from 9.9 per cent of the total workforce in 2004 to 8.39 per cent in 2008. The government's commitment to reducing the dependence on foreign aid was demonstrated by the settlement of all remaining debt to the IMF around \$3.2 billion U.S. dollars in mid-October 2006. Furthermore, on 24 January 2007 the government dissolved the CGI.

However, the government did not achieve all of the development targets set out in RPJMN for 2004–2009. The economic growth rate target of 6.5 per cent per annum set for the period 2004–2009 (Republik Indonesia, 2005a), could not be achieved by the government. Based on BPS (2009f), the rate of economic growth over that period was only 5.5 per cent per year. The rise of oil prices in 2005 and 2008 and the contraction of the world economy due to the global financial economic crisis in 2008 were two significant reasons for not achieving the target rate of economic growth. The decrease of the percentage of the poor, which was targeted by the government for 8.2 per cent, and the decline of the unemployment rate to 5.1 per cent by the year 2009, also could not be met by the government.

## **2.7 Conclusion**

The objective of this chapter is to analyze Indonesian economic performance, and reviews the general economic policies adopted by the government. The purpose of Chapter 2 is to provide some background to the more detailed examination of the development of Indonesia's macro-economy and policy regimes. In detail, this chapter gives the description of the performance of several major macro-economic indicators of Indonesia, and compares them with similar indicators in selected South East Asian countries; the analysis of the shift of the main sectoral contribution to the Indonesian economy, from agriculture to the manufacturing sector, the development of Indonesian aggregate demand components, the identification of the development of population, employment and poverty in Indonesia, including the distribution of the poor in each economic sector and the achievement of the MDGs, and the comprehensive overview of the economic policies from Indonesia's independence in 1945 until now.

The slow development of Indonesia's economy since 1970s can be attributed to the effects of the war for independence and the political conflicts between 1945 and 1969. Starting in 1969 economic development was planned and implemented consistently and brought about rapid economic growth and placed Indonesia as one of the largest and most significant economies in South East Asia. However, economic stability was disrupted by the 1997–1998 Asian economic crisis, during which Indonesia's GDP contracted by 13 per cent in 1998.

At the time of the crisis, as a result of the large contraction in economic growth, prices soared to 58.4 per cent, the net inflow of foreign investment was negative, and the value of the rupiah against the U.S. dollar fell, the level of population welfare was on average in decline, marked by the falling of income per capita which reached 50 per cent in 1998 compared to 1995. Unemployment levels rose to 20 per cent in 1997–1998. All of these indicators suggest that Indonesian economic fundamentals were fragile and in a worse position than the economies of other South East Asian countries. The rapid transformation of Indonesia's manufacturing between 1969–1997 did not create efficient and internationally competitive industries, so the overall structure of Indonesian industry was very vulnerable to external shocks.

After the 1998 crisis Indonesia's economy gradually recovered, though more slowly than other South East Asian countries. Economic foundations were soared up with the implementation of appropriate fiscal and monetary policies. The improvement of economy had allowed Indonesia to survive from the impact of 2008 global financial crisis. In 2011, the economy of Indonesia grew by over 6.5 per cent, higher than the growth of most South East Asian countries' economies. Overall, macro-economic indicators showed an improvement post-crisis.

Between 1970–2011, welfare and poverty indicators also demonstrated a trend of improvement. Per capita income exhibited an increasing trend during the period. Post–1998 crisis, Indonesia's per capita income was U.S. \$2,940 in 2008, increasing from U.S. \$650 at the time of the 1998 crisis (in 1995 it was U.S. \$980). Although unemployment has increased an average since 1990, between 2005–2011 it demonstrated a decline. The poverty rate decreased during 1976–2011, and the achievement of the MDGs is still feasible.

Starting in the 1990s, the manufacturing industry became the largest contributor to GDP, replacing agriculture. The economy was initially supported by minimal exports which were predominantly agricultural commodities, but become an high exporter of manufacturing products. This transformation occurred as a result of comprehensive government attention in the form of a series of policies applicable to manufacturing industries, in place since the mid–1980s. The transformation was primarily driven by infrastructure developments that were financed by oil revenues and foreign aid.

Nevertheless, the agricultural sector was an important sector for the economy and the development of Indonesia. Besides playing a significant role in maintaining food security, the agricultural sector employed over 36 per cent of the total work force in 2011, and accounting for 12.7 per cent of the national GDP (in 2011).Agriculture underpinned the Indonesian economy during the 1997–1998 crisis. This crisis caused the number of workers to decrease in almost all economic sectors in Indonesia– except agriculture, which grew by 11 per cent in 1998. Thus, the agricultural sector could be a basis for the provision of employment in times of crisis. However, the problem of poverty also accompanied the development of the agricultural sector during the period being considered, most of the poor in Indonesia lived in rural areas and about 57.8 per cent of the poor earned their livelihood from

the agricultural sector. Additionally, the low level of income in the agricultural sector was accompanied by the unequal distribution of income between agricultural households and non-agricultural households.

During 1945–1966, the economic policies and economic activities did not have the results that had been hoped for. Economic policies began to implement effectively in 1970 and they were supported by increased security and political stability. The government prioritized economic recovery and employed more pragmatic and non-ideological policies. Fundamentally, the government implemented outward-looking economic policies. In early 1970s Indonesia started to re-integrate the world economy, seeking a broader relationship with other countries, particularly developed nations.

In the agricultural sector, starting in the early 1970s, the government pushed for prompt increase in the production of food (mainly rice), to meet the food needs of the people and to reduce the high dependency on rice imports. To achieve these objectives, the government adopted from western countries a green revolution policy, the main goals of this being to achieve the food self-sufficiency through the increase of agricultural productivity, to increase the real per capita income in the agricultural sector and especially in rural areas, and to reduce poverty. Agricultural modernization through the green revolution policy also aimed at supporting national industrial development, especially in the industries that used agricultural materials as primary inputs, such as the food and beverage industries.

After the 1998 crisis, government policies were concentrated on counteracting of the economic decline. Starting in 2004, the government oversaw several programs in economic development through a ‘triple track’ strategy, which had the principles of ‘pro-growth’, ‘pro-employment’, and ‘pro-poor’, one program sought to revitalize the agricultural sector and rural areas to contribute to the poverty alleviation.

Following this chapters discussion, Chapter 3 will further examine in detail the agricultural sector’s development, employment, household welfare, and poverty in agriculture up to present. Chapter 3 also identifies agricultural policies in specific agricultural sectors.

## **Chapter 3**

### **Agriculture in Indonesia: Performance and policies**

#### **3.1 Introduction**

Chapter 2 discussed the development of Indonesia's macro-economy, trade, employment, income distribution and poverty, as well as the structural transformation in the Indonesian economy and in the broader economic policies of the government. In addition to an overall picture of the Indonesian economy, Chapter 2 stressed the importance of the agricultural sector in Indonesia and described how a growing agricultural sector in Indonesia contributes to economic growth, employment, food security and poverty alleviation. Thus, improving the production capacity of agriculture is an important policy goal for Indonesia's economic growth.

The importance of the agricultural sector's development, particularly in relation to issues of poverty alleviation, is emphasized by The World Bank (2007). According to The World Bank, agriculture is a vital development tool for achieving the MDGs by 2015. Furthermore, The World Bank confirms that agriculture can be a primary source of growth and, as such, can reduce poverty. This can be accomplished by: 1) enhancing the asset holdings of poor rural people; 2) increasing the competitiveness and sustainability of smallholder farmers; 3) increasing the range of income sources of rural labor markets and the number of non-agricultural economic activities; and 4) enabling the rural poor to move outside the agricultural area. The World Bank states that the standard of living of subsistence farmers can be increased by improving the productivity of their staple crops, particularly those that grow in unproductive areas. Such improvements will require substantial investments in soil and water management as well as agricultural research (The World Bank, 2007).

In the first Rome Declaration on World Food Security in 1996, the Food and Agricultural Organization (2009) emphasized the importance of agriculture and rural development with respect to alleviating hunger and poverty. The declaration states that food insecurity is caused mainly by poverty and that the sustainable progress of poverty reduction efforts is significantly important to improving people's access to food. This declaration also states that the revitalization of rural areas is a priority for

enhancing social stability and reducing excessive levels of rural–urban migration in many countries. Furthermore, it stresses the importance of food security and sustainable agriculture, fisheries, forestry, and rural development in higher- and lower-yield areas.

This chapter observes the important role of agriculture in economic development, the development of poverty in agriculture and in rural areas, and the agricultural policies implemented in Indonesia for the period under study. The following section, 3.2, emphasises some of the economic indicators of agricultural development, including output growth, trade, labor productivity, the welfare of farmers and subsidies. Section 3.3 specifically discusses policy developments in agriculture, including industrial-, employment- and welfare-related policies. Agricultural policy discussions are divided into general agricultural policy prior to 2004, the Agricultural Revitalization Policy in 2004 and beyond. This division has been made because by 2004 (after the 1998 reforms), the revitalization of agriculture was central to the government's development program. Finally, Section 3.4 concludes this chapter.

## **3.2 The development of the agricultural sector in Indonesia**

### ***3.2.1 Output and trade***

Beginning in the 1990s, the agricultural sector ceased being the main contributor to the GDP; notwithstanding, the role of this sector in the Indonesian economy remains very significant. As well as being the provider of the staple food for more than 242 million people in Indonesia in 2011, the sector is a provider of the raw materials for the agro-industry sectors, which are the leading contributors to national exports. In addition, the agricultural sector provides jobs for 39 per cent of the Indonesian population – more than that provided by any other sector – in 2011.

The importance of the agricultural role in Indonesian economic is consistent with Meier's assessment (1995). Meier claims that the strong role of the agricultural sector in economic development is due to four main reasons: 1) it supplies primary food and raw materials for other sectors in developing economies; 2) it provides a surplus from savings and taxes that can be invested in other developing sectors; 3) it involves buying other consumable products from other sectors, thereby increasing rural residents' demands for developing sectors' products; and 4) it leads to the

obliteration of foreign exchange reserve constraints through either export or import substitution.

As discussed in Chapter 2, until the early 1990s, the agricultural sector was the major contributor to the GDP of Indonesia, until it was replaced by the manufacturing sector. Both sectors' outputs increased, but the manufacturing sector, which was the modern and capital-intensive sector, grew faster than the agricultural sector, which was the traditional labor-intensive sector. The transformation of the Indonesian economy is natural and consistent with the hypothesis of Chenery (1979), and changes in economic structure were consistent with the increases in national income.

The agricultural sector is comprised mostly of the food crop sub-sector (Table 3.1). The food crop sub-sector, in addition to being a provider of food needs, is also a major provider of raw materials for food processing industries. However, the food crop sub-sector's contribution to the total agricultural output declined between 1970 and 2011. Table 3.2 indicates that the output of the livestock sub-sector, on average, grew less than that of the food and non-food sub-sectors during 1970–2011, and the output of the livestock sub-sector was smaller than the output of the other two sectors.

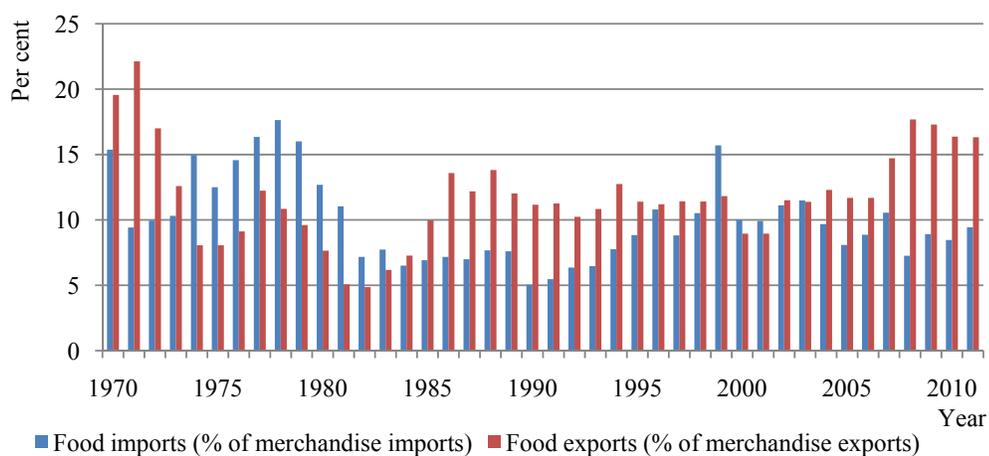
The dynamics of agricultural development in Indonesia can not be separated from the international trade environment. Moreover, the effect of international trade on Indonesia's food self-sufficiency increases consistently with increases in imports. With respect to trade, Figure 3.1 shows the exports and imports of food as percentages of merchandise exports and imports for the period 1970 to 2011. The contribution of food exports fluctuated during this period and has displayed an increasing trend since 2000. During the same period, there has been a downward trend in imports since 1998. In 2011, the total value of exports of goods and services reached \$144.9 billion U.S., while the total value of imports of goods and services was \$111.9 billion U.S. (The World Bank, 2013). In Tables 3.3 and 3.4, the development of Indonesia's ten food exports and imports between 2005 and 2011 are presented.

Table 3.1 Percentage distribution of agricultural output by sub-sectors, 1970–2011, at constant price (%)

Year	Farm food crops	Non-food crops	Livestock and its product	Forestry	Fishery
1970	64.94	18.45	8.12	3.69	4.80
1975	60.33	17.62	7.20	9.74	5.10
1980	60.54	18.96	6.20	8.98	5.32
1985	61.92	16.07	10.60	4.43	6.98
1990	60.15	17.11	10.77	4.48	7.49
1995	53.25	16.02	10.97	10.19	9.58
1996	52.72	16.22	11.18	10.10	9.79
1997	50.71	16.28	11.61	11.15	10.25
1998	51.26	16.60	10.70	10.86	10.59
1999	51.61	17.02	10.63	9.91	10.82
2000	51.34	14.63	11.82	7.94	14.27
2001	50.08	15.44	12.30	7.80	14.37
2002	49.76	15.71	12.62	7.71	14.20
2003	49.57	16.10	12.75	7.16	14.42
2004	49.61	15.72	12.81	7.05	14.81
2005	49.55	15.68	12.74	6.77	15.26
2006	49.37	15.75	12.74	6.36	15.78
2007	49.31	15.91	12.60	6.09	16.08
2008	49.89	15.73	12.45	5.81	16.11
2009	50.38	15.40	12.39	5.69	16.15
2010	49.71	15.47	12.54	5.66	16.62
2011	48.93	15.64	12.71	5.52	17.20

Source: BPS (2005, 2007b, 2009f, 2013a)

Figure 3.1 Food exports and imports, 1970–2011



Source: The World Bank (2010a, 2013)

Table 3.2 Production index of three main agricultural sub-sectors, 1970–2011, (2004–2006=100)

Year	Food production index	Crop production index	Livestock production index
1970	28.25	27.05	21.67
1975	31.94	31.19	26.07
1980	40.03	38.96	32.72
1985	50.14	49.87	46.56
1990	61.66	62.26	62.80
1995	76.07	77.75	79.52
1996	76.06	78.02	83.34
1997	73.10	75.25	83.05
1998	74.57	75.11	72.77
1999	76.03	75.53	68.65
2000	78.61	78.28	74.36
2001	80.85	80.88	80.44
2002	85.34	86.07	89.80
2003	90.95	91.80	94.51
2004	94.91	95.68	99.41
2005	98.49	98.05	95.37
2006	106.6	106.27	105.22
2007	109.76	108.78	104.4
2008	114.10	113.02	105.61
2009	120.27	120.38	110.28
2010	120.55	120.71	118.98
2011	124.56	124.55	124.21

Source: The World Bank (2010a, 2013)

The developments in the export and import of the ten major agricultural commodities during 2005–2011 are shown in Tables 3.5 and 3.6. From Table 3.5, it is clear that plantation commodities dominated the exports. These commodities, which include palm oil, rubber, cocoa, coffee, and coconut, are traditionally the major foreign exchange earners. Plantation commodities earned a large amount of foreign income during the 1997–1998 economic crisis due to the depreciation of the rupiah against the U.S. dollar.

In terms of imports, the ten major agricultural commodities were dominated by food commodities, such as wheat, soybeans, processed soybean, processed wheat, and rice (Table 3.6). The livestock products that belong to the main group of major imported agricultural products are milk and milk products and cattle, while the plantation products include rubber and tobacco.

Table 3.3 Food exports by commodity, 2005–2011 (million US\$)

No.	Commodities	2005	2006	2007	2008	2009	2010	2011	Average Growth 2005–2011 (%)
1.	Wheat Processing	174.9	184.5	190.2	234.1	234.7	363.9	447.1	16.7
2.	Fresh Cassava	25.4	14.8	6.2	20.8	29.0	31.7	27.0	27.7
3.	Cassava Processing	15.6	1.8	8	15.1	3.4	13.7	52.0	113.3
4.	Corn	9	4.3	18.5	28.9	18.8	2.3	6.4	56.2
5.	Wheat	3	3.3	13.7	17.8	5.8	18.7	0.0	57.5
6.	Soybean Processing	6.1	5.5	6.1	6.7	7.5	9.6	11.0	9.1
7.	Fresh Sweet Potatoes	4.6	6.3	6.2	6.6	6.1	5.3	6.3	4.2
8.	Peanut Processing	7.5	8.2	5	5.1	5.7	3.9	10.0	47.6
9.	Fresh Peanuts	3.3	2.6	4.6	9	5.3	9.7	5.4	15.7
10.	Rice	8.7	0.5	0.5	0.9	1.96	0.42	0.84	252.2
11.	Other Food Crops	28.7	32.3	30.1	4	4.03	28.68	31.69	82.4
	Total	286.7	264.2	289	348.9	322.3	488.0	597.9	13.3

Source: Kementerian Pertanian Republik Indonesia (2009, 2011)

Table 3.4 Food imports by commodity, 2005–2011 (million US\$)

No.	Commodities	2005	2006	2007	2008	2009	2010	2011	Average Growth 2005–2011 (%)
1.	Wheat Processing	192.4	222.4	259.6	389.9	321.1	1,525.6	444.7	56.8
2.	Fresh Cassava	0.1	0.0	0.0	0.0	0.3	0.0	0.0	185.5
3.	Cassava Processing	24.6	70.2	77.8	57.9	49.6	120.8	211.3	74.2
4.	Corn	30.9	277.5	151.6	87.4	77.8	3.7	6.2	84.7
5.	Wheat	802.0	819.0	1,185.2	1,981.8	1,320.2	301.8	2,211.4	90.2
6.	Soybean Processing	493.8	509.5	18.0	34.2	22.7	31.1	44.1	4.5
7.	Fresh Sweet Potatoes	0.0	0.1	0.1	0.0	0.1	0.0	0.0	211.6
8.	Peanut Processing	4.5	5.4	2.3	2.9	2.4	2.7	5.5	1.9
9.	Fresh Peanuts	39.6	54.2	62.2	99.6	176.7	222.8	256.9	38.2
10.	Rice	51.5	132.6	464.4	123.8	107.9	360.7	1,509.1	122.5
11.	Other Food Crops	475.8	477.6	507.9	749.4	659.0	1,324.7	2,334.7	28.7
	Total	2,115.1	2,568.5	2,729.1	3,527.0	2,737.9	3,893.8	7,023.9	20.6

Source: Kementerian Pertanian Republik Indonesia (2009, 2011)

Table 3.5 Exports of ten main agricultural commodities, 2005–2011 (million US\$)

No.	Commodities	2005	2006	2007	2008	2009	2010	2011	Average Growth 2005–2011(%)
1.	Palm oil	4,030.8	4,430.9	5,551.2	9,078.3	14,110.2	11,728.8	15,413.6	25.5
2.	Rubber	2,164.6	2,584.1	4,322.5	4,986.6	6,152.2	3,450.5	7,470.1	36.8
3.	Cocoa	549.3	668.0	855.0	924.2	1,269.0	1,459.3	1,643.8	14.9
4.	Coffee	294.1	504.4	588.5	636.4	991.5	829.3	814.3	23.0
5.	Coconut	329.7	513.7	363.1	695.9	900.9	489.9	703.2	30.7
6.	Tobacco	90.6	107.3	102.5	424.7	508.8	595.8	672.6	54.8
7.	Processed wheat	163.8	174.9	184.5	190.2	234.1	234.7	363.9	16.7
8.	Green tea	116.0	121.5	134.5	126.6	159.0	170.4	178.5	5.8
9.	Veterinary Medicine-raw material	198.5	139.0	121.7	61.9	4.8	0.3	5.3	265.5
10.	Pepper	55.6	58.4	77.3	132.5	185.7	130.3	245.9	27.9

Source: Kementerian Pertanian Republik Indonesia (2009, 2011)

Table 3.6 Imports of ten main agricultural commodities, 2005-2011 (million US\$)

No.	Commodities	2005	2006	2007	2008	2009	2010	2011	Average Growth 2005–2011(%)
1.	Wheat	802.0	819.0	1,185.2	1,981.8	1,320.2	301.8	2,211.4	90.2
2.	Milk & milk product	399.2	416.2	617.4	640.6	460.1	815.5	778.5	17.4
3.	Sugar cane	376.1	355.4	1,101.9	437.7	689.3	1,227.1	1,869.3	74.6
4.	Soybean	308.0	299.6	482.9	698.5	625.0	840.0	1,246.0	21.3
5.	Processed soybean	493.8	509.5	18.0	34.2	22.7	31.1	44.1	4.5
6.	Processed wheat	192.4	222.4	259.6	389.9	321.1	1,525.6	444.7	56.8
7.	Rubber	26.2	29.1	372.7	743.0	542.9	864.7	128.9	177.7
8.	Tobacco	142.2	150.2	267.8	401.9	365.8	470.5	591.7	28.1
9.	Cattle	107.7	108.6	218.4	376.1	428.6	445.1	-	35.5
10.	Rice	51.5	132.6	464.4	123.8	107.9	360.7	1,509.1	122.5

Source: Kementerian Pertanian Republik Indonesia (2009, 2011)

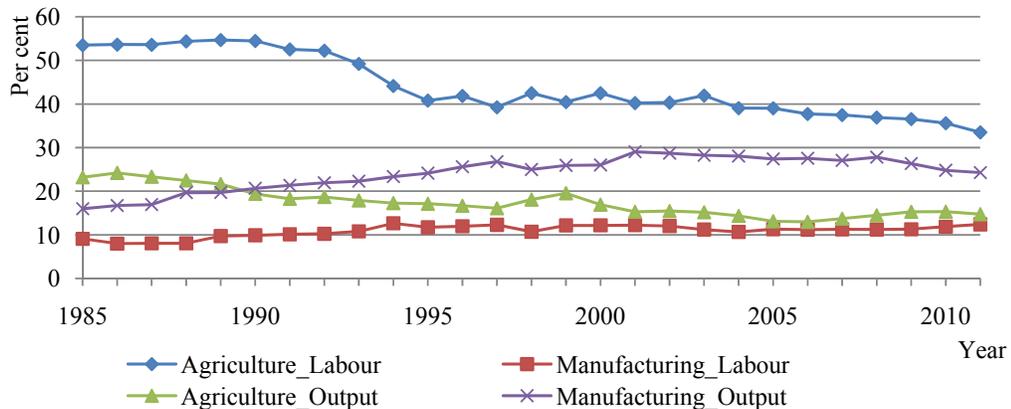
### 3.2.2 Labor productivity

The contribution of agricultural output to the total GDP decreased during the period 1970 to 2008 (Figure 3.2), and since the beginning of the 1990s, the role of agriculture as the biggest contributor to output shifted to the manufacturing sector.

However, this transformation in output was not followed by a transformation in labor. Although the share of agricultural labor to national labor decreased from year to year, the share of labor in the agricultural sector is still greater than it is in the manufacturing sector. The decrease of agricultural labor share is due to the shift of labor from agriculture to other sectors and to the new labor force entering non-agricultural sectors. The percentage of agricultural labor to national labor was approximately 35.9 per cent in 2011, a decrease from 56.4 per cent in 1980, and the percentage of workers in the manufacturing sector was only 20.6 per cent in 2011, which was an increase from 13.1 per cent in 1980 (Figure 2.15).

The imbalance between the share of output and employment in agriculture and manufacturing can be observed in Figure 3.2. The gap in the share of output and the share of employment between the two sectors widened during the period 1985 to 2011. These figures indicate that labor productivity in agriculture was lower than in the manufacturing industry (Figure 3.3).

Figure 3.2 Share of output and share of labor in the agricultural sector and manufacturing industry at constant prices, 1985–2011 (%)

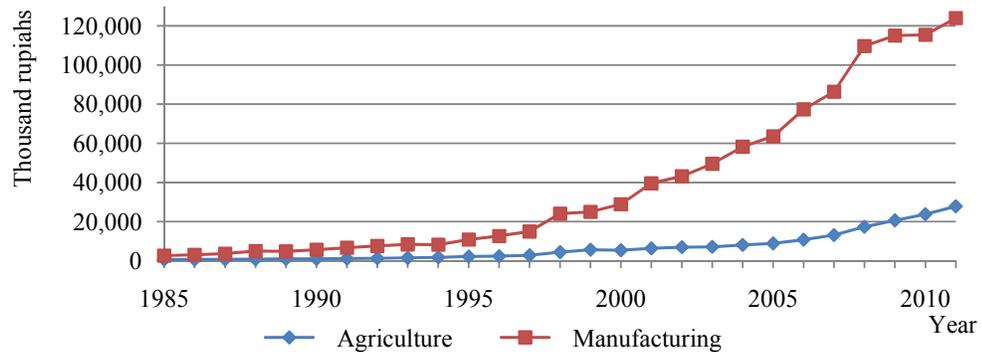


Source: Asian Development Bank (2010a, 2010b, 2012)

The common belief is that a different rate of productivity growth across sectors has important implications for government policies (Krueger et al., 1992). Krueger et al. identifies examples in many developing countries that demonstrate how the public’s strong belief that the growth of the total factor productivity (TFP) in the industrial sector is higher than that in the agricultural sector is one of the causes of the anti-agriculture and pro-industry policies. This occurred in Indonesia, especially during the New Order Era (1966–1998), during which time the

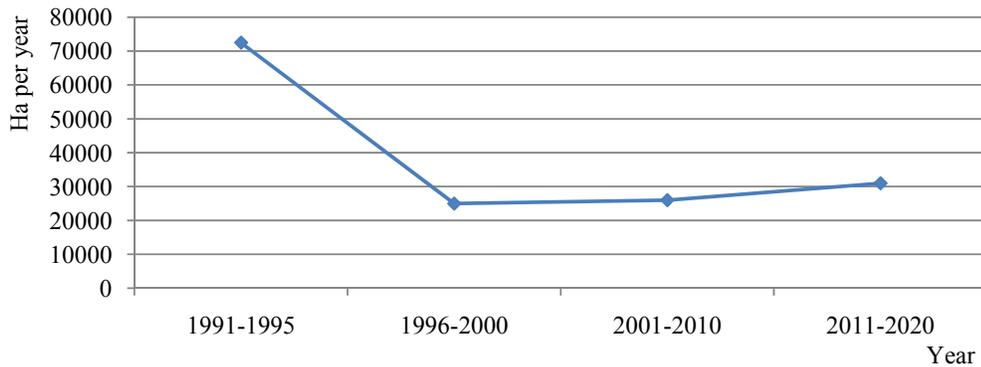
government paid much greater attention to the development of modern industries than it did to the modernization of the agricultural sector (Tambunan, 2003).

Figure 3.3 Output per labor of agricultural and manufacturing industry sectors, 1985–2011 (thousands rupiah)



Source: Asian Development Bank (2010a, 2010b)

Figure 3.4 Projection of irrigated land conversion (Ha/year)



Source: Soetrisno (2002)

Before the 1997–1998 Asian economic crisis, the level of industrialization in Indonesia had increased rapidly. This rapid increase, especially in Java, was extremely influential in the development of the agricultural sector, as land that had previously been used for agriculture was converted to industry use. Figure 3.4 demonstrates the irrigated agricultural land converted into industrial land based on projections from the Japan International Cooperation Agency (Soetrisno, 2002).

### 3.2.3 Welfare of farmers, access to capital, and government subsidies

Despite the general welfare of farmers improving along with the increasing prosperity of the Indonesian people, the welfare of farmers was still at a low level. The number of poor in agriculture was larger than in other sectors. As mentioned in Chapter 2, in 2011, approximately 63.2 per cent of Indonesia's poor resided in rural areas (Table 2.4), while 57.8 per cent of the poor earned their livelihood from agriculture in 2010 (Table 2.5).

According to the agricultural censuses conducted every ten years, the number of farm households in Indonesia increased from 20.8 million in 1993 to 25.8 million in 2003, a growth of 2.2 per cent per year (Table 3.7). The numbers of *gurem* farmers, i.e., farmers whose land area was less than 0.5 hectares, increased from approximately 10.8 million households, or 52.7 per cent of the total number of farming households in 1993, to 13.7 million households in 2003, or 56.5 per cent of the total. During this period, the increase in the number of *gurem* reached 2.6 per cent per year, which was greater than the increase in the number of farmers. Such a growing number of *gurem* suggests a rising poverty level in Indonesia during this period (Krisnamurthi, 2006).

Table 3.7 The development of farm households based on the 2003 Agricultural Census

Households	1993	2003	Growth
Number of farm households (million)	20.8	25.4	2.2% per year
Number of <i>gurem</i> farming households (million)	10.8	13.7	2.6% per year
Share of <i>gurem</i> farmer households	52.7%	56.5%	

Source: Krisnamurthi (2006)

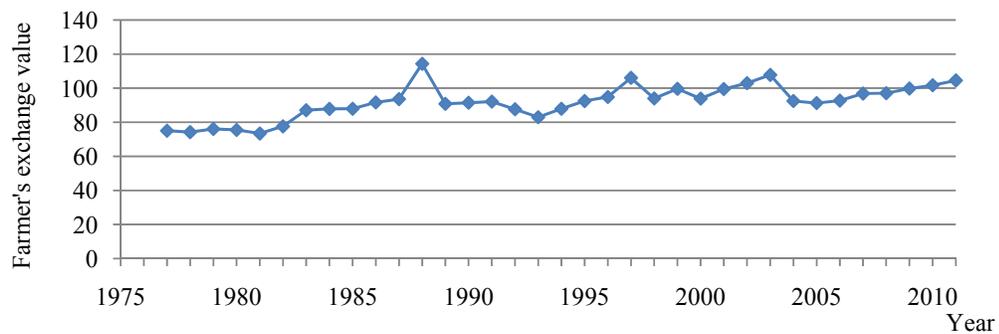
Farmers' income levels are an important factor in determining farmers' welfare. Based on the type of household, as described in Chapter 2, the income per capita levels of all household groups exhibited an ascending trend during the period 1975 to 2005 (Figure 2.16). Along with this increase, the distribution of household income widened over the period, with income distributions widening more rapidly in non-agricultural households than in agricultural households.

Poverty in agriculture is closely related to changes in farmers' exchange value (*nilai tukar petani* or NTP). Farmers' exchange value is the difference between the prices of agricultural output and the prices of agricultural input. Alternatively

stated, the value is the ratio between the prices received by farmers, as measured by the output price index, to the index of prices paid to farmers, i.e., the input price index or inputs used for farming, such as fertilizer. A higher farmers' exchange value results in farmers receiving greater profit and, subsequently, higher incomes.

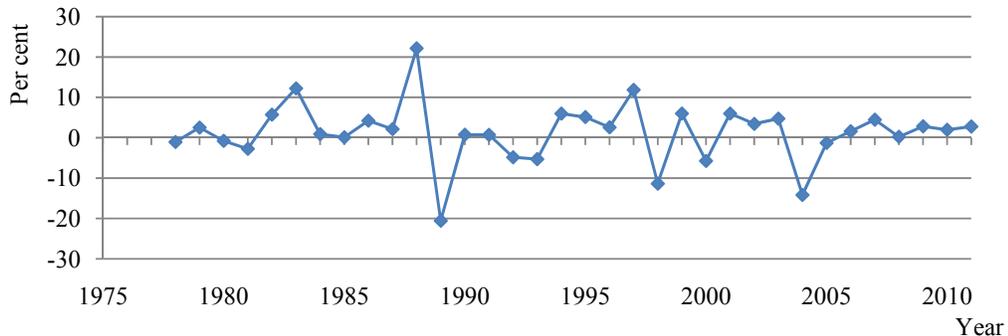
Figures 3.5 and 3.6, respectively, present the farmers' exchange values during 1978–2011 and their annual growth during 1978–2011. This value decreased from year to year, resulting in a decrease in farmers' income. In the beginning of the economic crisis in 1997, the farmers' exchange value increased significantly to 11.9 per cent. This large increase caused the agricultural output value to increase due to the large depreciation of the rupiah against the U.S. dollar; the farmers received agricultural export commodity price increases in terms of the rupiah, and the demand for agricultural output surged consistent with the falling prices of export commodities in the international market.

Figure 3.5 Farmers' exchange value, 1977–2011



Source: BPS (2005, 2007b, 2009f, 2012)

Figure 3.6 Growth of farmers' exchange value, 1978-2011 (%)



Source: BPS (2005, 2007b, 2009f, 2012)

In addition to the decrease in the farmers' exchange value, investments in the agricultural sector also declined. Based on the value of sectoral domestic investment

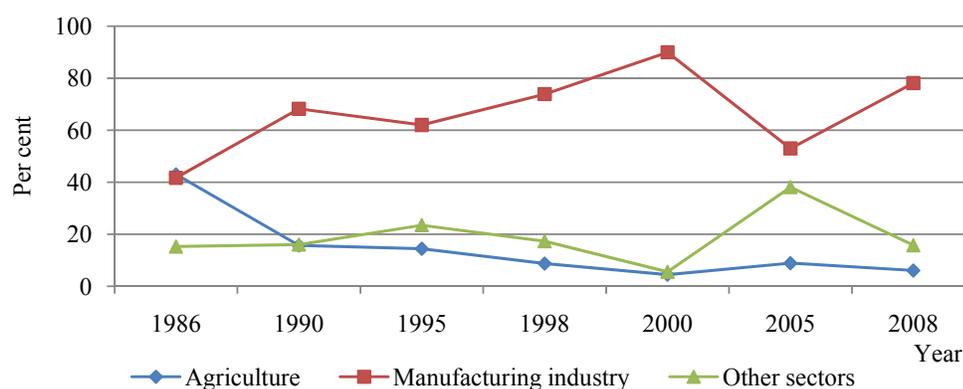
approvals during 1986–2008, as shown in Table 3.8, as the agricultural sector was the least attractive sector to investors, the investment plans in this sector declined annually (Figure 3.7). The food crop and plantation sub-sectors contributed the most to the total investment in the agricultural sector (Figure 3.8).

Table 3.8 Domestic investment planning approvals by sectors, 1986–2008 (billions of rupiah)

Year	Agriculture	Manufacturing industry	Other sectors
1986	1900.1	1842.3	674.3
1990	9403.9	40863.4	9611
1995	10096.9	43341.9	16414.2
1998	5315.1	44908	10526.2
2000	4137.8	83059.5	5130.4
2005	4494.1	26807.9	19275.4
2008	1238.5	15914.9	3210

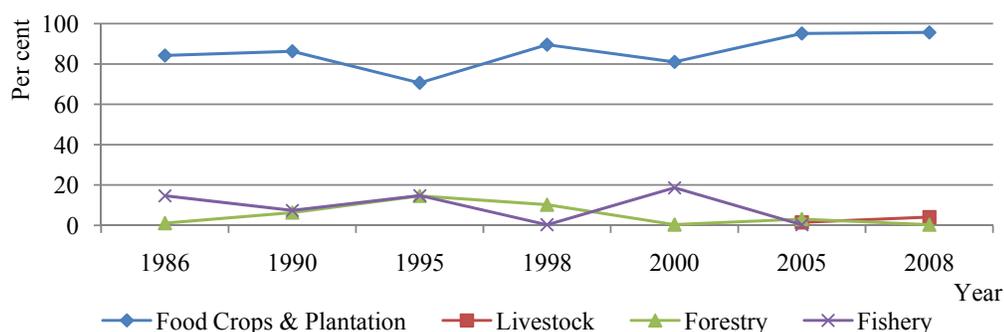
Source: Bank Indonesia (2000, 2004, 2010b)

Figure 3.7 Share of domestic investment planning approvals by sectors, 1986–2008 (%)



Source: Bank Indonesia (2000, 2004, 2010)

Figure 3.8 Share of domestic investment planning approvals by agricultural sub-sectors, 1986–2008 (%)



Source: Bank Indonesia (2000, 2004, 2010)

The lack of financial support for agriculture is indicated by the low value of investments in this sector and by the farmers' lack of access to loans from commercial banks. Although the number of loans had increased annually, this number remained much lower than the total number of loans received by the manufacturing sector (Table 3.9 and Figure 3.9).

The farmers' lack of access to commercial bank loans was important. Despite the process of industrialization being relatively advanced in Indonesia, most of the labor force in Indonesia relied on the agricultural sector. Accordingly, improving access to funding would have been – and would still be – a significant way to increase farmers' income and welfare. As stated by Soetrisno (2002), the difficulties in obtaining loans may have reduced the interest in developing the agricultural sub-system in Indonesia into a modern agricultural sector, i.e., agribusiness.

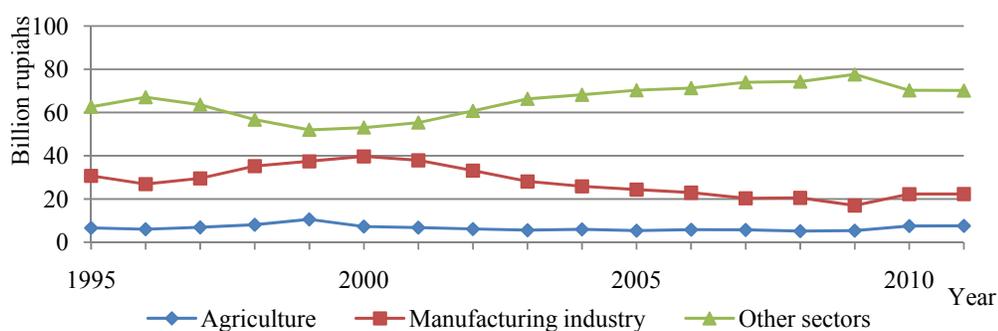
Table 3.9 Loan approval in rupiah and foreign currency of commercial banks by sectors, 1995–2011 (billions of rupiah)

Year	Agriculture	Manufacturing industry	Other sectors
1995	15,525	72,088	146,998
1996	17,630	78,850	196,441
1997	26,002	111,679	240,453
1998	39,308	171,668	276,450
1999	23,777	84,259	117,097
2000	19,503	106,782	142,715
2001	20,863	116,525	170,206
2002	22,332	121,035	222,043
2003	24,307	123,125	290,510
2004	32,997	143,492	378,747
2005	37,564	169,917	491,214
2006	45,999	182,689	568,079
2007	57,203	204,141	742,834
2008	67,828	269,578	976,467
2009	77,394	246,188	1,123,226
2010	92,525	274,330	865,833
2011	116,210	343,002	1,079,185

Source: Bank Indonesia (2000, 2004, 2010, 2013a)

Based on the data for small-scale enterprise bank loans, the agricultural sector, which is dominated by small-scale enterprises, received a greater total value of loans than the manufacturing sector (Table 3.10), though agriculture received smaller total bank loans than those received by manufacturing.

Figure 3.9 Share of loan approval of commercial banks by sectors, 1995–2011 (%)



Source: Bank Indonesia (2000, 2004, 2010, 2013a)

Table 3.10. Outstanding loans in rupiah and foreign currency made by commercial banks to small scale-enterprises by sector, 2003–2011 (billions of rupiah)

Year	Agriculture	Manufacturing industry	Other sectors
2003	13,949	2,751	67,710
2004	18,509	4,642	84,465
2005	17,907	4,825	98,523
2006	252,142	70,826	1,268,843
2007	20,115	6,940	118,246
2008	20,469	5,512	117,005
2009	21,417	4,335.00	130,609
2010	n/a	n/a	n/a
2011	29,794	52,231	376,139

Source: Bank Indonesia (2000, 2004, 2010, 2013a)

Another factor that is important for improving the welfare of farmers in Indonesia is subsidies. Specifically, for the agricultural sector, there are subsidies to reduce the price of fertiliser and seeds. With respect to the fertilizer subsidy, the goal is to improve the ability of farmers to buy the amount of fertilizer they require based on the recommended dosage. The development of government subsidies during the period 2005 to 2011 is shown in Table 3.11.

Table 3.11. Government subsidies for fertilizer and seed, 2005–2011 (billions of rupiah)

	2005	2006	2007	2008	2009	2010	2011
	Audited	Audited	Audited	Audited	Audited	Revised budget	Proposed budget
Fertilizer	2,527.3	3,165.7	6,260.5	15,181.5	18,329.0	18,411.5	16,377.0
Seed	147.7	131.1	479	985.2	1,597.20	2,263.50	120.3

Source: Ministry of Finance Republic of Indonesia (2011), p. 12

### **3.3 Agricultural revitalization policy in Indonesia**

#### ***3.3.1 Review of major agricultural policies prior to 2004***

Since the early 1970s, consistent with the progress of the Indonesian economy, the government has prioritized agriculture and rural development through programs to ensure agricultural land expansion, irrigation investment and technology, and infrastructure development. As a consequence of these policies, Indonesia achieved self-sufficiency in rice production in 1984.

However, the promotion of agriculture has declined since the 1980s, when the government started to pay greater attention to the manufacturing industry and when international oil prices began falling. Export activities, which had previously focused on oil and gas commodities, started to shift to the non-oil and gas commodities, and efforts to attract foreign investment and to strengthen the private sector's role in the economy increased. These efforts emphasized efficiency, competition, and an export orientation. Significant policy changes in agriculture included reducing pesticide subsidies, prohibiting the importation of a wide range of pesticides, and increasing the attention given to non-rice products, particularly the crop commodities that supported industries such as rubber, palm oil, cocoa, and fishery products for export and poultry for domestic consumption.

Tambunan (2003) states that, from 1969 until the 1998 economic crisis, bank credit flowed more to the manufacturing and service sectors than to agriculture. To address this situation, the government provided a special loan scheme for farmers, known as *kredit usaha tani* (KUT) or credit for farm enterprises. Unfortunately, the realization of KUT until 1998 was below the government target. According to Tambunan, this condition was caused by the distortion in distribution channels, which, in turn, was due to corruption and the lack of effective distribution.

While the major concern was the food crops sub-sector, the government also issued policies in other agricultural sub-sectors. The most important policy was the prohibition of palm oil exports to maintain the availability of domestic cooking oil. The policy was known as the Minister of Industry and Trade Decision No. 350/MPP/Kep/7/1998, and it regulated a 60 per cent increase in the export tax of crude palm oil (CPO). Soetrisno (2002) states that, this regulation may have led to the demise of small-scale palm oil plantations. This policy also lowered the income of the *perkebunan inti rakyat* (PIR), or farmer's nucleus smallholder, because the

price of fresh fruit bunches (*tandan buah segar*, TBS) had been suppressed because most of palm oil plantations in Indonesia were small-scale enterprises. In short, small-scale farmers had subsidized urban communities' cooking oil consumption.

The plantation crops' price increases were mainly due to an agreement between the Indonesian government and the IMF, which aimed to eliminate the poor trade regulations that were believed to be the source of various distortions in some exported commodities. Because the rice trade system remained regulated by the government to maintain food prices, this policy led to the low levels of rice farmers' welfare.

After the 1998 crisis and after 2004, the government introduced a range of policies related to agriculture. In 2009, the government issued the subsidized credit scheme for farmers in food production, but this scheme was not successful due to the farmers' repayment defaults. Indonesia implemented a decentralization system in economic development in 2001 that was consistent with the implementation of the law of local government and with fiscal decentralization. In the context of the role of agriculture, the positive result from this decentralization was that almost all local governments prioritized the development of agriculture.

In relation to trade policy and protection in agriculture, from 1985 to 1998, Indonesia introduced a series of trade reforms. Regarding domestic trade, these reforms included bilateral cooperation, participation in a number of international agreements and bodies such as the General Agreement on Trade and Tariffs or GATT, World Trade Organization or WTO, Asia Pacific Economic Cooperation or APEC, among others, and cooperation with international institutions, including the government's agreement with the IMF, particularly with the letter of intent or LoI regarding the management of the economic crisis of 1997–1998 (Thomas and Orden, 2004). In fact, long before the GATT agreement, the Indonesian government had committed to deregulating the economy and trade (Suryana and Erwidodo, 1996). During the 1997–1998 economic crisis, in accordance with the recommendations of the IMF, Indonesia reduced import tariffs for agricultural commodities. Previously, on 7 July 1997, the government announced a package of deregulation that contained 1,600 tariff cuts in import duties on various agriculture, trade, and health products (Tempo, 1997).

As a consequence of the GATT, WTO, the ASEAN Free Trade Area (AFTA), and APEC, Indonesia had to ratify various trade agreements. The

agreement framework provided an opportunity for Indonesia, but it also resulted in competition between Indonesia's agricultural commodities and the commodities of other countries.

The impact of globalization on Indonesia's agricultural sector is reflected in the terms of trade of its agricultural commodities. Bappenas and Institut Pertanian Bogor (2003) states that in the development of trade in agricultural commodities during 1995–2002, after the approval of the WTO agreement in 1994, almost all Indonesian agricultural commodities became net importers, except for plantation commodities, whose surplus declined.

#### *Review of the Green Revolution policy*

The government of Indonesia oversaw agricultural policies under a program known as the Green Revolution from the beginning of the 1970s. In farming communities, these policies were known as *bimbingan massal* (Bimas), or mass guidance. Tambunan (2009) states that, the main goals of the Green Revolution were to achieve food self-sufficiency (especially in rice) through the increase of agricultural sector productivity, to increase the real per capita income in the agricultural sector, especially in rural areas, and to reduce poverty. Agricultural modernization through the policies of the Green Revolution also aimed to support national industrial development, especially in the industries that used agricultural materials as primary inputs, such as the food and beverage industries.

To increase productivity in agriculture, especially in the food crops sub-sector, the government implemented a modern agricultural technology package that consisted of the use of non-organic fertilizers, plant protective drugs (pesticides), irrigation systems, and superior rice seeds. In addition, the government provided loan facilities to farmers and other supporting infrastructure, such as the rehabilitation of the irrigation infrastructure.

The Green Revolution was a long-term program (approximately 20 years), and its duration contributed to its success in changing farmers' practices, especially food crops farmers, from adhering to traditional farming methods to endorsing modern technology in farming. The changes in farmers' attitudes and practices contributed greatly to the increase in productivity of the food crops sub-sector such

that Indonesia achieved food self-sufficiency, at least with respect to rice (Soetrisno, 2002).

Other positive effects of the Green Revolution included the increase in employment opportunities in the agricultural sector, the improvement of local production, the overcoming of food shortages, and the strengthening of the agricultural sector as a buffer for the Indonesian economy in times of crisis.

However, the Green Revolution policy also had several negative effects, such as the commercialization of agricultural production, the rapid decrease of land productivity due to the use of chemical fertilizers, the changing of social structures in rural communities, the increase in economic inequality due to the transfer of property rights, and the increase in land prices, which meant that low-income farmers could not afford land.

Soetrisno (2002) argues that apart from the increased productivity of food crops, the Green Revolution resulted in susceptible agricultural crops being harmed by various pests due to the uniformity of the seedlings. According to Soetrisno, the Green Revolution also led to the gap in production levels between the rice and non-rice areas. The concentration of agricultural development on food crops impeded the development of horticultural crops. Adiningsih (1992) emphasizes that during the implementation of the Green Revolution, the rapid decline of land productivity was caused by the excessive use of chemical fertilizers. Esje and Daniel (1998) note that farmers no longer had the autonomy to determine which technologies they used in the production process. Under these conditions, many resources and local technologies, which were owned by farmers, were not exploited. The technology of the Green Revolution also created other issues, including the dependence of farmers on external inputs that were made by factories, such as chemical fertilizers, pesticides, and other synthetic materials. While this dependence was not necessarily bad because the exchange of food products in Indonesia was very low, this dependence of farmers on external inputs tended to be economically burdensome.

The implementation of the Green Revolution program led to agriculture being the sector with the most government interference, especially the sub-sector of food crops, with rice being the key. The government intervened in the process of planting, the use of inputs, seed selection, pricing, and product marketing. The government eventually realised that its interference in the process of agricultural production was contrary to the objectives of agricultural development, e.g., increasing the farmers'

income. Based on these considerations, the government issued a law in 1992: Law No. 12/1992 on Plant Cultivation System. This law asserted that farmers had the freedom to make choices about the types of crops they planted and the cultivation method they employed. Unfortunately, because farmers lacked awareness about this law, it was inadequately enforced (Soetrisno, 2002).

### **3.3.2 Agricultural Revitalization Policy 2005–onwards**

#### *The meaning of agricultural revitalization*

During the period 2004 to 2009, the government of Indonesia issued programs of economic development with a triple track strategy based on the principles of pro-growth, pro-employment, and pro-poor. The goals were 1) to improve macroeconomic stability by increasing economic growth above 6.5 per cent per year through the acceleration of investments and exports; 2) to improve the real sector through infrastructure development and empowerment of micro and small enterprises to absorb the additional workforce and create new jobs; and 3) to alleviate poverty by revitalising agriculture and the rural sector. In the period of administration between 2010 and 2014, the government continued and strengthened the triple track strategy.

The government's development plans for the medium terms, i.e., RPJMN 2004–2009 and RPJMN 2010–2014, include the revitalization of food crops, plantation crops, livestock, fisheries, and forestry. Bakrie (2005) states that, the agricultural revitalisation is an integrated policy and strategy that seeks to achieve an understanding and awareness of the importance of the multifunctional role of agriculture, to expand agricultural activities today and in the future, and to ensure that the agriculture industry is independent, competitive, productive, and sustainable. Additionally, agricultural revitalization is meant to improve the welfare of farmers, fishermen, forest farmers, and agricultural businesses in general. According to Bakrie, agricultural revitalization must begin with the understanding that the scope of agriculture, fisheries, and forestry incorporates the whole system of production, distribution, and consumption, starting from resources and lasting until the final product is in the hands of consumers.

Krisnamurthi (2006) confirms that agricultural revitalization can raise people's awareness of the importance of the agricultural sector proportionally and contextually, thereby empowering and improving the performance of agriculture in

national development without ignoring the other sectors. Krishnamurti further states that agricultural revitalization activities include all upstream-downstream activities, including land, water, seeds, financing, equipment and machinery, cultivation, industry, distribution, and retail, and all actors, including farmers, fishermen, plantation farmers, fish farmers, forest farmers, entrepreneurs and agribusiness companies, state enterprises, cooperatives, banks, universities, and related associations.

In RPJMN 2004–2009, the government stated that the objectives of agricultural revitalization would be achieved successfully if it overcame obstacles in agriculture, such as productivity, business efficiency, conversion of farming land, lack of infrastructure, and limited loans and investments (Republik Indonesia, 2005a). According to RPJMN 2004–2009, development in the agricultural sector was (and is) vulnerable to environmental changes, such as acid deposition due to air pollution and land degradation due to the excessive use of chemical fertilizers. Several constraints and other problems faced by the agricultural sector include 1) the low prosperity and high poverty levels of farmers and fishermen; 2) the decline in the agricultural land; 3) the limited access to productive resources, especially access to capital sources and high quality human resources; 4) the low mastery of technology; 5) the sub-standard management of fishery resources; 6) the decreased quantity of natural forest and the sub-optimal use of forest products and the products of non-timber plants; and 7) the poor infrastructure (physical and non-physical) in the agricultural sector and in rural areas.

The agricultural revitalization policy was continued in RPJMN 2010–2014 (Republik Indonesia, 2010a). RPJMN 2010–2014 stresses several issues regarding food self-sufficiency that could lead to a reduced capacity for food production: the limitations of natural resources to support the increase of food production, the decrease in the quantity and quality of land resources, the rate of agriculture land conversion to non-agricultural use, the degradation of agricultural land and fishpond land, facilities and infrastructure limitations on agricultural production and fisheries, and the negative impacts of climate change phenomena.

Agricultural revitalization in 2010–2014 guarantees the provision and accessibility of production inputs (feed, fertilizer, and seed) for the agricultural community, fishing, and forestry, manages problems related to deforestation, forest

land and degradation, and unsustainable utilization of potential resources (such as over-fishing in some areas of fisheries management), and optimizes the utilization of resources to increase production and productivity.

*The agricultural revitalization policy targets and programs in RPJMN 2004-2009*

The ultimate objective of agricultural revitalization was a growth rate of 3.52 per cent per annum in the agricultural sector over the period 2004 to 2009, along with increasing farmers' income and welfare. The intermediate targets are described in Table 3.12 (Republik Indonesia, 2005a).

Agricultural revitalization has been and is being pursued through four main steps: 1) increasing the abilities of farmers and strengthening their support institutions; 2) improving food security; 3) increasing productivity, production, competitiveness, and value-added agricultural and fisheries products; and 4) using forests to diversify business and support food production with due regard to gender equality and the interests of sustainable development (Republik Indonesia, 2005a). The policy direction of agricultural revitalization and its four basic steps are detailed in Appendix 3.1.

Table 3.12 The intermediate targets of agricultural revitalization, 2004–2009

No.	Target
1.	Increase the capability of farmers to produce highly competitive commodities
2.	Maintain the domestic rice production at a minimum of 90 per cent of domestic demand to safeguard food self-reliance
3.	Diversify production, supply, and consumption of food to reduce high dependence on rice
4.	Increase the availability of food from livestock and fish from domestic production
5.	Increase the domestic consumption of animal protein that originates from livestock and fish
6.	Increase the competitiveness and value-added of agricultural and fishery products
7.	Increase the production and export of agricultural and fishery products
8.	Increase the capability of farmers and fishermen in managing natural resources in a sustainable and responsible manner
9.	Realise optimal value-added and benefits from timber forest products
10.	Increase non-timber forest products by 30 per cent from the 2004 production
11.	Increase planted forests by at least 5 million hectares and the consistent use of the <i>Kesatuan Pemangkuan Hutan</i> (Forest Authority Unit), as the reference for managing production forests

Source: Republik Indonesia (2005a)

The agricultural revitalization policy in RPJMN 2004–2009 is divided into yearly programs that are called *rencana kerja pemerintah* (RKP), or government working plans. The details of the RKP within the framework of agricultural revitalization are listed in Appendix 3.3.

Agricultural revitalization entails the political commitment of the government, which is undertaken operationally by all related government agencies. At the ministerial level, the policy was translated into the Agricultural Development Plan 2005–2009 and considered the national development priorities and the vision and direction of long-term agricultural development.

As stated in the Agricultural Development Plan 2005–2009, the three main target groups for agricultural development are the increases in 1) national food security, including the increase of the agricultural production capacity and the decrease in the dependence on food imports by 5 to 10 per cent of domestic production; 2) the value-added and the competitiveness of agricultural commodities, which include increasing the quality of the primary agricultural products, the diversity of processed agricultural products and exports, and the trade surplus of agricultural commodities; and 3) farmers' welfare, including the increase of labor productivity in the agricultural sector and the decrease of poverty incidence (Kementerian Pertanian Republik Indonesia, 2005). This plan was formulated and divided into three programs: 1) the improvement of food security program, 2) the agribusiness development program, and 3) the improvement of farmers' welfare program.

Food security is defined as the fulfilment of food needs by maintaining sufficient levels of availability at all times and in all areas and ensuring that food is easily obtainable by households at affordable prices and is safe to eat. *Kementerian Pertanian Republik Indonesia* or the Ministry of Agriculture Republic of Indonesia (2005) states that, the agricultural development program includes upstream agribusiness, farming activities, downstream agribusiness, and supporting services. The agribusiness development approach is intended to increase farmers' income, which expands the coverage of farmers' productive economic activities and enhances their efficiency and competitiveness.

The development of agribusiness includes the leading commodities of food crops, horticulture, plantation crops, and livestock. Although the commodities that

must be developed vary among regions based on each region’s national potential, priority was given to 31 commodities (Table 3.13). The Ministry of Agriculture (2005) stated that these commodities make large enough contributions and have potential contributions with respect to compliance with food security, provisions of industrial raw materials, increased export or import substitutions, and the expansion of employment opportunities and poverty reduction.

The program for improving farmers’ welfare aimed to facilitate the empowerment of farmers by increasing their income, improving their access to agricultural resources, improving institutional development, and protecting farmers.

Table 3.13 Commodities focus in agricultural revitalization, 2004–2009

Agricultural sectors	Commodities
1. Food Crops	Paddy, Corn, Soybean, Groundnut, Cassava
2. Horticulture	Potato, Chillie, Shallot, Mango, Mangosteen, Banana, Durian, Orange, Orchid, <i>Rimpang</i>
3. Estate Crops	Rubber, Coconut, Palm oil, Coffee, Cacao, Cashew Nut, Pepper, Sugarcane, Fiber, Tobacco
4. Livestock	Cattle, Goat, Sheep, Native Chicken, Duck, Pig

Source: Kementerian Pertanian Republik Indonesia, 2005 (2005).

*The agricultural revitalization policy targets and programs in RPJMN 2010–2014*

In RPJNM 2010–2014, the agricultural revitalization policy is referred to as “food security improvement and revitalization of agriculture, fisheries, and forestry” (Republik Indonesia, 2010a). The main goals of this policy are to 1) maintain the availability of rice and increase the availability of other staple foods from domestic production; 2) achieve a GDP growth rate in agriculture, fishery, and forestry that is, on average, 3.7 to 3.9 per cent per year; 3) increase access to food for poor and food-insecure households; 4) maintain the stability of the prices of food commodities, including fish, at a level that is affordable for lower middle-income households; 5) increase the availability and consumption of fish as a necessary source of animal protein; 6) increase the value-added and competitiveness of agricultural products, fisheries, and forestry in Asia and throughout the world; and 7) improve farmers’ welfare, which is indicated by an increase in the farmers’ exchange value indices to between 115 and 120 and the fishermen’s exchange value to between 115 and 120.

Table 3.14 presents the intermediate targets of the RPJNM 2010–2014 (Republik Indonesia, 2010a). The program and policy activities of agricultural revitalization are detailed in Appendix 3.2.

### **3.4. Conclusion**

This chapter aims to observe in detail the role of agriculture in Indonesian economy, the development of poverty in agriculture and in rural areas, and the implementation of policies in agriculture in Indonesia, include the development of agricultural economic indicator, such as output growth, trade, labor productivity, the welfare of farmers and subsidies; and the discussion of policy developments in agriculture, including industrial-, employment- and welfare-related policies.

Starting in the 1990s, the manufacturing sector surpassed agriculture as the largest output contributor to Indonesia's GDP. However, the significant role of the agricultural sector in providing raw materials for manufacturing industries demonstrates the importance of agricultural support for manufacturing, and as a result, the agro-industrial sector is currently one of the leading sectors in national exports.

The transformation in the major output contribution to the national GDP shifting from the agriculture industry to the manufacturing industry was not, however, followed by a transformation in labor in the two sectors. This finding indicates that labor productivity in the agriculture industry is lower than it is in manufacturing industry. The greater attention paid by the government in the 1980s to the development of modern industries over the development and enhancement of the agricultural sector was one of the causes of the lower productivity of labor in agriculture. This low productivity of agricultural labor corresponded to the low income levels among the agricultural workers.

Several other problems accompanied the development of the agricultural sector, such as the low income of farmers and poverty-related issues. In general, farmers' incomes increased, as did their corresponding general welfare. While this was consistent with the increasing prosperity of the Indonesian population, the farmers' welfare was still at its lowest level. In addition, there were more poor farmers than poor workers in other sectors.

Table 3.14 The intermediate targets of the agricultural revitalization policy, 2010–2014

No.	Target
1.	<p>Increase the production and productivity of food, agriculture, fisheries, and forestry, particularly increase the availability of food and raw materials from domestic sources by</p> <ul style="list-style-type: none"> <li>(i) maintaining self-sufficiency in rice and increasing self-sufficiency of other foods (maize, soybean, sugar, beef, and dairy) from domestic production, with an increasingly efficient production system</li> <li>(ii) ensuring the availability of inputs for food production, agriculture, fisheries, and forestry, including seeds, fertilisers, medicines, equipment, and machinery</li> <li>(iii) increasing fisheries' production to 22.39 million tons by 2014</li> <li>(iv) maintaining and/or increasing the quantity and quality of land and water resources for agricultural activities, fisheries, and forestry</li> <li>(v) establishing adequate facilities and infrastructure support for agricultural development, fisheries, forestry, and rural areas, especially in centres of production</li> <li>(vi) developing science and technology that supports the development of agriculture, fisheries, and forestry</li> <li>(vii) controlling for pests in agricultural commodities, fisheries, and forestry</li> <li>(viii) developing 250,000 ha of community forests, 500,000 ha of forest villages, and 2 million ha of community forests for industrial raw materials for carpentry</li> <li>(ix) planting an additional area of 3 million ha for HTI and HTR</li> <li>(x) Increasing production of wood forest products, forest products, and environmental services by 5 per cent,</li> <li>(xi) managing the logged-over area (LOA) controlled by the holder of a permit for utilisation to result in restoration of timber forest cover to 2.5 million ha</li> </ul>
2.	<p>Achieve efficiency of the distribution system and domestic food price stabilisation by</p> <ul style="list-style-type: none"> <li>(i) increasing and guaranteeing the amount of food reserves of the national and local governments to stabilise food prices</li> <li>(ii) establishing a trade policy regarding food exports and imports that support the interests of national food security</li> <li>(iii) establishing facilities and distribution infrastructure, marketing, and logistics of food in the country</li> <li>(iv) controlling food price fluctuations between regions and over time</li> </ul>
3.	<p>Meeting the needs of community food consumption will be realised by</p> <ul style="list-style-type: none"> <li>(i) increasing the quality and diversity of food consumption, using the scores of 95 food patterns</li> <li>(ii) increasing the availability of fish to be consumed to 38.67 kg per capita per year</li> <li>(iii) developing agro-based processing of local food</li> <li>(iv) decreasing the number and percentage of the population and areas experiencing food insecurity</li> <li>(v) ensuring food reserves at the national and local government levels for food aid</li> <li>(vi) establishing quality control systems, security, and halal food</li> <li>(vii) increasing people's knowledge regarding a nutritious and balanced diet and a healthy lifestyle</li> <li>(viii) establishing coordinated and integrated institutional food and nutrition networks</li> </ul>
4.	<p>Increase the value-added, competitiveness, and marketing of agricultural products, fisheries, and forestry by</p> <ul style="list-style-type: none"> <li>(i) decreasing the number of cases of export denial of agricultural products, fishery, and forestry in the international market</li> </ul>

Table 3.14 The intermediate targets of the agricultural revitalization policy, 2010–2014 (continued)

No.	Target
(ii)	increasing the support for marketing facilities and infrastructure of agricultural products, fisheries, and forestry in the country
(iii)	increasing the quarantine system for agriculture, fisheries, and forestry
(iv)	increasing the quantity and quality of processed products from agriculture, fisheries, and forestry
(v)	expanding domestic and international market access for fishery products
(vi)	increasing utilisation of wood forest products industry (IPHHK) with small-diameter wood raw material from plantation forests
(vii)	offering sustainable forest management certificates to 50 unit forest management plantation units and certify as sustainable 50 per cent of the licenses for unit timber forest products management
(viii)	implementing the Certified Wood Legality Verification System to certify 50 per cent of the industry
(ix)	using efficiently raw materials at the industry average
5.	Increase capacity of farmers, fishermen, and fish farmers by
(i)	increasing the quantity, quality, and coverage extension of agriculture, fisheries, and forestry
(ii)	adhering to the ‘harmonisation’ rules for agriculture, fisheries, and forestry from the centre to the regions in the country
(iii)	increasing the knowledge and skills of communities in agriculture, fisheries, and forestry, including those related to processing
(iv)	increasing the support for science, technology, and research that can be used by communities in agriculture, fisheries, and forestry

Source: Republik Indonesia (2010a)

The government of Indonesia has implemented many policies that were intended for the agricultural sector, with the aim of these policies being to increase farmers’ income. The policies included input subsidies for the farmers, of which the most prominent was the subsidy for fertiliser prices. The fertiliser subsidy was aimed at improving the ability of farmers to buy fertiliser in accordance with the specific recommended dosage for food production.

Though policies that had agriculture as their focus had been issued since Indonesia’s independence in 1945, the implementation of the new agricultural policy has only been effective since the 1970s. Starting in the early 1970s, priority was given to agriculture and rural development through agricultural land expansion, increased investments in irrigation and technology, and infrastructure development. The implementation of policies related to agriculture was known as the Green Revolution. The greatest effect of this policy was Indonesia’s achievement of self-sufficiency in rice production in 1984. The Green Revolution policy also had several negative impacts, including the commercialisation of agricultural production, the

rapid decrease in land productivity due to the use of chemical fertilisers, the changing social structure in rural communities, and the dependence of farmers on external inputs that were made by factories, such as chemical fertilisers, pesticides and other synthetic materials. The consequence was the widening of the production gap between rice and non-rice commodities.

After 1984, the support for agriculture began to decline. The government's attention shifted to the manufacturing industry sector and the fall of oil prices in international markets. As a consequence of the attention, the manufacturing sector grew rapidly in the 1990s and has since become the biggest contributor to Indonesia's GDP.

In its development programs for 2004 to 2014, the government issued policies to revitalise agriculture and the rural sectors in an effort to contribute to the alleviation of poverty. The government stressed that agricultural and rural economic revitalisation programs were related to the economic and welfare programs, policies to improve and create jobs, and policy measures for poverty eradication.

In their implementation, the policy changes embodied in Indonesia's agricultural revitalization program aimed to improve people's welfare. Such improvements were envisaged as resulting from direct and indirect economic effects. Accordingly, the remainder of this study will examine the economy-wide impact of the agricultural policy that was planned and implemented by the government. In particular, the welfare effects of these changes on Indonesia's macro-economy, industries, and households will be examined.

Based on the discussion of policies and agricultural indicators in previous chapters, Chapter 4 will construct a model of the Indonesian economy and thereby enable the agricultural sector to be analyzed in detail. In accordance with the objectives of this research, the model that will be constructed is a recursive dynamic computable general equilibrium model that enables broader economic impacts to be assessed. Using this model, the size and effectiveness of the influence of certain government policies on the macro-economic variables of national and sectoral output, trade, employment, and household income will be estimated.

## **Chapter 4**

### **PERTANINDO-F: a general equilibrium model of the Indonesian economy**

#### **4.1 Introduction**

The previous chapters have described the development of the Indonesian economy and its economic policies (Chapter 2), with a specific look at the evolution of the agricultural sector (Chapter 3). This chapter builds on this background to analyze the welfare effects and quantify the impact of policies identified in Indonesia's Agricultural Revitalization Program through the development of a recursive dynamic Computable General Equilibrium (CGE) model referred to as PERTANINDO-F.

In this chapter, computable general equilibrium modeling of agricultural policies for developing countries and the current state of CGE modeling in Indonesia are briefly discussed in Section 4.2. Section 4.3 discusses the structure of PERTANINDO-F and its theoretical foundations, closures and database. Section 4.4 concludes this chapter.

#### **4.2 CGE modeling in agricultural sector analysis**

Computable general equilibrium is held to be the most powerful tool in analyzing economy-wide policy impact, that is, those policies that have been heavily determined by market or sectoral interdependence (Mitra-Kahn, 2008). In several general equilibrium modeling, markets are interdependent: the change in supply and demand in one market affects supply and demand in other markets. Thus, it has been applied to empirically analyze economic-wide impact of various economic policies. For instance, an economy-wide, multi-sectoral framework is needed to analyze macro-economic influences, particularly the various inter-relationships that affect agricultural development (Byerlee and Halter, 1974). CGE modeling has been used widely to analyze the impact of many economic policies around the world, including Indonesia. Studies using CGE models analyzing agricultural policies in Indonesia include Cabalu et al. (1997), Erwidodo, Stringer, and Wittwer (1999), Abimanyu (2000), Oktaviani and Drynan (2000), and Haryono (2008). Some have also used CGE to analyze agricultural policies of other countries, such as Salma (1992) for

Bangladesh, Dogruel, Dogruel and Yeldan (2003) for Turkey, Valenzuela et al. (2007) for 17 world country regions, and Zhai and Zhuang (2009) for South East Asian countries (See Appendix table 4.1 for summary).

Cabalu et al. (1997) used the MEGABARE model to make a projection of the performance of the Indonesian agricultural sector to the year 2020. They developed and modeled four future scenarios for the Indonesian economy, namely: 1) an increase in productivity in grain and non-grain sectors; 2) an increase in world trade liberalization; 3) a trade liberalization backlash, which leads to increased trade barriers in agricultural products; and 4) a reaction to global warming through greenhouse gas emission by the imposition of carbon taxes. The welfare analysis of each scenario focused on Indonesia despite the fact that MEGABARE is a multi-country, multi-sector CGE model. The findings from the first three simulations were net welfare-increasing compared with baseline levels. The simulation of the 'greenhouse' scenario was modeled as a two-stage cooperative response to global warming: stage one by OECD (Organization for Economic Co-operation and Development) countries and stage two by non-OECD countries. As a result of the initial stage, Indonesia's GDP and investment increased substantially. However, the impact on agriculture and food was negative, with large reductions in production evident everywhere, with the notable exception of forestry, which increased by 20 per cent above baseline levels. In the second stage, Indonesian economic activity and investment displayed a large negative response.

A number of applied CGE models have been developed for Indonesia involving collaborations of Indonesian and international institutions. For instance, INDORANI was developed by Gadjah Mada University in collaboration with the Centre of Policy Studies (COPS) in Monash University; WAYANG and WAYANG02 were developed by the Center for Strategic International Studies in collaboration with COPS; INDOCEEM was developed by the Indonesian Ministry of Energy and Mineral Resources and *Lembaga Penyelidikan Ekonomi dan Masyarakat* or Institute for Economic and Social Research, University of Indonesia; and INDOF and AGRINDO were developed by Bogor Institute of Agriculture. These models were based on the framework of the Australian economy CGE models such as ORANI (Dixon, et al., 1982; Powell, 1991), ORANI-F (Horridge Horridge, Parmenter, and Pearson, 1993), and ORANIGRD (Horridge, 2002).

Erwidodo, Stringer, and Wittwer (1999) provide insights into how Indonesian agriculture can contribute best to overcoming the negative consequences of a crisis in the medium-term. A single country CGE model for Indonesia, WAYANG, is utilized to model the consequences of a real devaluation, a decline in productivity, and a loss of the country's endowment factors. WAYANG is a single country, 65 sectors CGE model of the Indonesian economy. Erwidodo, Stringer, and Wittwer find that with a 25 per cent real devaluation of the rupiah, productivity declines in agriculture due to a decrease in the growth of knowledge, and with a 5 per cent run down in primary factor endowments (excluding land), all industries suffer a loss of output compared with a base case. Most agricultural products designated as export-oriented within the model increase exports.

Abimanyu (2000) utilized a static single country CGE model, named INDORANI, to analyze the impacts of agriculture trade liberalization and subsidy policy on the macro-economy, income distribution and environment in Indonesia. Abimanyu examined several scenarios, including a decline in agricultural input tariffs, increases in the fertilizer subsidy, and a combination of input tariff reductions and increase in government transfers to the poor. His research used Indonesia's 1993 Input-Output (IO) and Social Accounting Matrices (SAM) tables as baseline data. In accommodating the Asian economic crisis scenario, the database was updated to 1999-2000 and included 49 industries. His research shows that the three shocks lead to an increase in GDP. Trade liberalization, by reducing import tariffs on agriculture inputs, has only a small effect on the distribution of nominal household income and provides more benefits to middle-income farmers. On the other hand, providing a direct subsidy will assist poor people in rural regions who do not have permanent jobs. Generally, the implementation of import tariffs to agriculture inputs does not impact the environment. However, the increasing use of domestic fertilizer is not efficient and is not environment-friendly.

Other researchers, Oktaviani and Drynan (2000), have analyzed the impact of APEC trade liberalization on the Indonesian macro-economy and agricultural sector by using the CGE INDOF model. This model was developed based on ORANI-F, a CGE model of the Australian economy and adapted to suit the Indonesian economy.

Haryono (2008) analyzed the impact of agricultural industrialization on agricultural sector performance and rural poverty. He used Indonesia's 2003 IO and SAM tables and employed a CGE recursive dynamic model, AGRINDO. The results

of policy simulation showed that productivity improvement in agro-industries has a strong impact on total outputs in industry and increases labor absorption. Productivity improvement also affects rural and urban household incomes with both incomes going down.

Salma (1992) used a CGE model to analyze the impact of agricultural policies in Bangladesh. She used 25 sectors and 35 commodities in her research and simulated scenarios, that were related to technological growth, the increase of infrastructure investment in rural areas, resource transfer to agriculture (as the constraining effect of unsuitable indirect policies), trade reforms, and currency depreciation. Her research findings confirm that the short-run simulation of these government policies resulted in lower levels of growth than the long-run simulation. Indirect policies have a bigger impact on agricultural productivity and output than do direct policies. In the short-run, the implementation of direct and indirect policies increased public investment in agricultural infrastructure. The government's expenditure on agricultural subsidies could be used as public investment. In the long run, increased agricultural profitability would attract private investment to the sector.

Dogrueel, Dogrueel, and Yeldan (2003) investigated feasible options for a proposed agricultural-cum-fiscal reform and analyzed the formal links between the public sector fiscal balances, accumulation patterns, dynamic resource allocation, and consumer welfare under a medium-long-term horizon. They utilized a six sector dynamic general equilibrium model, using Turkey's 1990 IO table as baseline data. The model results suggest that even though there were expected normal welfare gains in consumers' inter-temporal efficiency, the consequences of these policies on the rural economy and aggregate gross domestic product were likely to be deflationary.

Valenzuela et al. (2007) validated simulation models, on a sector-by-sector basis, with particular emphasis on the agricultural market. In particular, they focus on the world wheat market and used the GTAP model with price volatility as policy shocks. Using 17 world country regions, Valenzuela et al. concluded that the inadequate representation of government policies for wheat, including the presence of state trading corporations, is a significant limitation of the GTAP model. They suggest the representativeness of such models should be improved, which would increase such model validity, and their usefulness in policy analysis.

Zhai and Zhuang (2009) assessed the economic effects of climate change for South East Asian countries through 2080. This study used a dynamic multi-country CGE model that was built on the LINKAGE model developed by the World Bank. The model was recursive dynamic, beginning with the base year of 2004 and being solved annually through 2080, using 21 countries/regions and 19 sectors. Six South East Asian countries were explicitly modeled as individual regions. The results suggest that the aggregate impacts of agricultural damage caused by climate change on the global economy are moderate. The expected increase of crop import dependence in the coming decades would make most South East Asian economies suffer greater welfare losses as a result of deteriorated terms of trade. Based on these countries' economic structures, however, the negative effects are expected to be less for Singapore and Malaysia but to be greater for the Philippines, Indonesia, Thailand, and Vietnam. They also stated that South East Asia must concentrate on reversing its current trend of declining agricultural productivity to manage the potential agricultural damages arising from the expected changes in climate in the region.

#### **4.3 Development of PERTANINDO-F**

The key objective of this thesis is to develop a CGE model of the Indonesian economy (referred to as PERTANINDO-F) to assess the likely effects of policies identified in the Agricultural Revitalization Program on Indonesia's national and industry outputs, employment, households' income, trade, and other economic parameters. PERTANINDO-F is a recursive dynamic model largely based on ORANI-G (Horridge, 2000), and ORANI-F (Horridge, Parmenter, and Pearson, 1993), INDOF (Oktaviani, 2000), ORANIGRD (Horridge, 2002), and AGRINDO (Haryono, 2008). PERTANINDO-F represents the Indonesian economy with 52 industries producing 52 commodities (26 of which are in agriculture), which can be produced domestically or imported from abroad. There are four labor groups classified by occupation, and ten representative households.

PERTANINDO-F distinguishes itself from previously developed Indonesian CGE models on several aspects. First, this model uses data based on Indonesia's (most recent) 2005 175-sector I-O table. This input-output data was then used to disaggregate the Indonesian 2005 SAM data which originally had 23 sectors only. The disaggregated SAM data was then used to derive the data on households (10

types) and labor (4 types) used in this model. The data for 175 sectors in the I-O table were also aggregated to derive PERTANINDO-F's 52 sectors classifying them as 26 agricultural sectors and 26 non-agricultural sectors. Second, of all CGE models for Indonesia, PERTANINDO-F has the most disaggregated agricultural sector having identified 26 agricultural industries. Third, PERTANINDO-F is the most disaggregated model, being the only model with the most number of labor types employed and representative households identified. Finally, this model is unique in the policy simulations it undertook as it simulates numerous policy scenarios which have been identified in the Agricultural Revitalization Program.

#### **4.3.1 Model specifications**

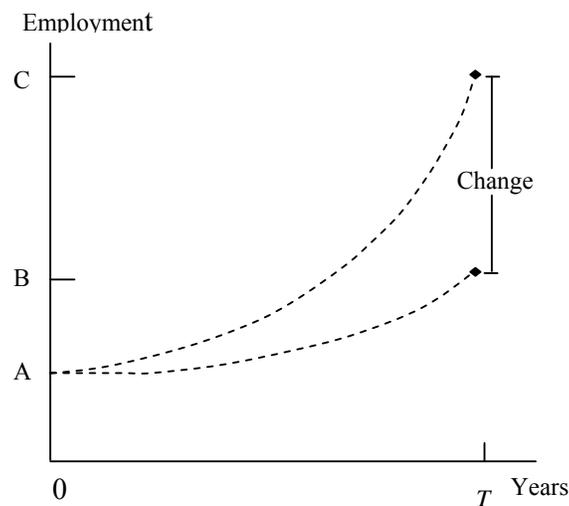
The majority of CGE models developed for the Indonesian economy were originally designed for comparative-static simulations. Their equations and variables all refer implicitly to the economy in some future time period. The interpretation of comparative-static simulations is illustrated in Figure 4.4, which depicts the value of some variable, such as employment, against time.  $A$  is the level of employment in the base period (period 0) and  $B$  is the level which it would attain in  $T$  years' time if some policy – possibly a tariff change – were *not* implemented. With the tariff change, employment would reach  $C$ , all other things being equal. In a comparative-static simulation, the CGE model might generate the percentage change in employment  $100(C - B)/B$ , showing how employment in period  $T$  would be affected by the tariff change alone.

Many comparative-static simulations have analyzed the short-term effects of policy changes. For these simulations, capital stocks have usually been held at their pre-shock levels. Econometric evidence suggests that a short-term equilibrium will be reached in about two years, that is  $T = 2$  (Cooper, McLaren, and Powell, 1985). Other simulations have adopted the long-term assumption according to which capital stocks will have adjusted to restore (exogenous) rates of return – this might take ten or twenty years, that is  $T = 10$  or  $20$ . In either case, only the choice of closure and the interpretation of the results affect the timing of changes: the model specifies the values of two dates only. Consequently, there is no information about adjustment paths, shown as dotted lines in Figure 4.1.

PERTANINDO-F is an annual recursive dynamic model. By ‘annual recursive dynamic model’ it is meant that each solution of the model represents the changes between one year and the next. The ‘initial’ data base that is the starting point of each computation represents the economy as it was both at the end of the previous period and at the beginning of the current period. Similarly, the updated data base produced by each computation represents the economy as it will be both at the end of the current period and at the beginning of the next. Changes in variables compare their values at the end of the current period with those at the beginning of the current period.

How to interpret the results from the CGE forecasting model has been explained by Horridge, Parmenter, and Pearson (1993) and is illustrated in Figure 4.2. In the forecasting model, the employment at time 0 is A. As a result of movements in all exogenous variables over the period to  $T$  and implied investment and capital accumulation, employment changes to D at time  $T$ . The change in exogenous variables cause a percentage change of  $100 (D-A)/A$  in employment.

Figure 4.1 Comparative-static interpretation of results

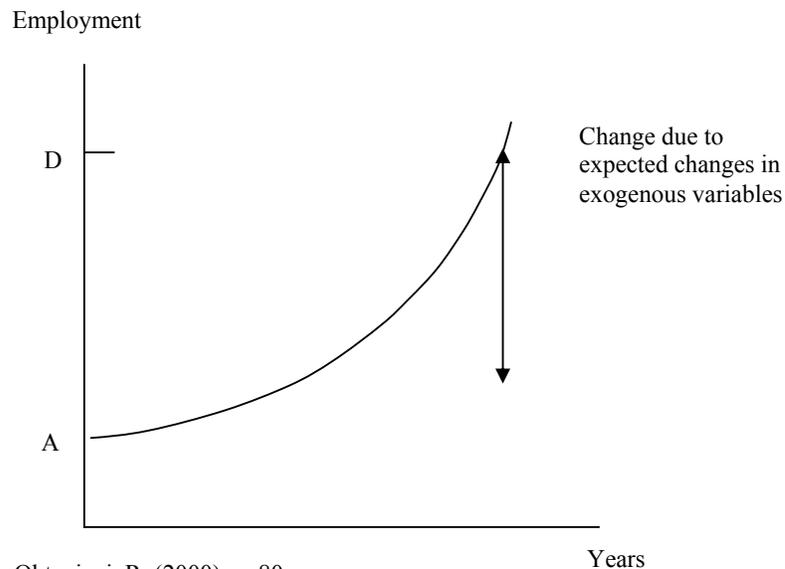


Source: Wittwer (1999), p.2

While CGE models can be used to forecast the future state of the economy conditional on exogenous variable settings, their primary use in policy analysis will be in providing better estimates of the long-run effect of policy changes. In essence, because of the long period of time involved in reaching long-run equilibrium

following a policy change, it is argued that it is important to recognize that the economy will have altered because of many exogenous changes, and that the particular policy of interest should be evaluated as an additional change. This is easy to do, using two runs of the model. The first run is used to forecast the economy at time  $T$ . Essentially this provides an updated data base for period  $T$ . From this equilibrium position, a policy change implemented in period  $T$  can be evaluated in the usual comparative-static analysis using the short-run static model, or if implemented in period 0, by doing the usual comparative-static analysis using an intermediate run static model. In the latter, the effect of the policy on investment and capital accumulation is taken into account, albeit with the assumed, likely unjustified, pattern of investment.

Figure 4.2 Interpretation of forecasting results



Source: Oktaviani, R. (2000), p. 80

According to Haryono (2008), the advantages of dynamic CGE over static CGE, is that in the former the inter-temporal impact from a certain policy can be separated into two phases: 1) short-term transitory effects, and 2) long-term permanent effects. Through the use of the dynamic CGE model, the choice of policy mix can be analyzed by comparing the short-term effect and long-term effect. A mixed policy is probably only effective in the short-term but not in the long-term. In other words, determining the policy mix involved the identification not only which policy should be implemented, but also the timing of this policy.

According to U.S. International Trade Commission (1997), the dynamic model which is based on periods of optimizing decisions could be either a single period 'sequential solution' or 'recursive' model, or a 'fully dynamic' or 'multi-period' model. PERTANINDO-F is a single period recursive model. The dynamic element in PERTANINDO-F is represented by capital accumulation and employment growth from year to year. In this study, the policy scenarios are simulated for the next fifteen years (2005-2020).

*Equation system.* The system of equations that forms the basis of the model are as follows:

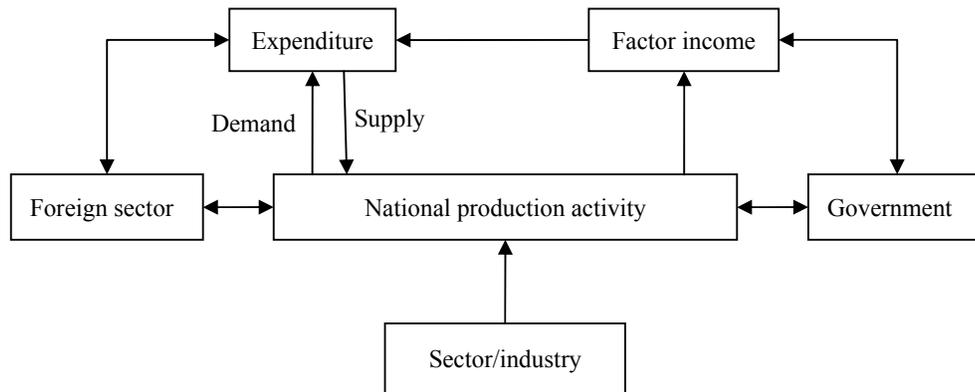
- 1) Demand for labor
- 2) Demand for primary factors
- 3) Demand for intermediate inputs
- 4) Demand for composite primary factors and intermediate inputs
- 5) Commodity composites of industry outputs
- 6) Demand for investment goods
- 7) Demand for margins
- 8) Household demands
- 9) Export and other final demands
- 10) Purchaser's prices
- 11) Market clearing conditions
- 12) Indirect taxes
- 13) GDP from the income and expenditure sides
- 14) Trade balance and other aggregates
- 15) Rates of return and indexing and other equations
- 16) Investment-capital accumulation
- 17) Real wage adjustment mechanism

PERTANINDO-F assumes that all producers (industries) operate in a perfectly competitive market, which prevents the earnings of pure profits, both in output and input markets. Thus, all agents are price-takers. Equations of demand and supply for private sector agents are derived from the solution of the optimization problems (cost-minimization, utility-maximization, etc.) which are assumed to

underlie the behavior of the agents in conventional neo-classical microeconomics. The model is solved by non-linear equations with a series of linear equations in percentage changes on model variables (Wittwer, 1999).

To understand the behavior of the relationship between variables in PERTANINDO-F, the economy can be simplified into several blocks of equations, as shown in Figure 4.3. Details of the equations and variables in PERTANINDO-F are in Appendix tables 4.3 and 4.4.

Figure 4.3 Model scheme



There are linkages between blocks of equations. In the national production activity block, producers/production sectors absorb inputs from the household sectors, that is, primary inputs: capital, land, and labor, while the production sector produces outputs as consumer goods to meet the needs of households, and as intermediate inputs, inventory or capital goods to meet the needs of the production sector itself. Any excess of domestic production will be exported, and conversely, lack of domestic production will be met from imports. The Walrasian neoclassical general equilibrium theory, in which there is equilibrium between demand and supply, is used as a basis for constructing the CGE model.

Households obtain income from producer expenditure on primary inputs. These revenue sources include transfers and subsidies from the government and the government also imposes taxes on households. Consequently, the government affects the level of household income; hence government policy can be used to influence the level of household income. In addition, household income level indicates patterns of household expenditure on goods produced by the production sector.

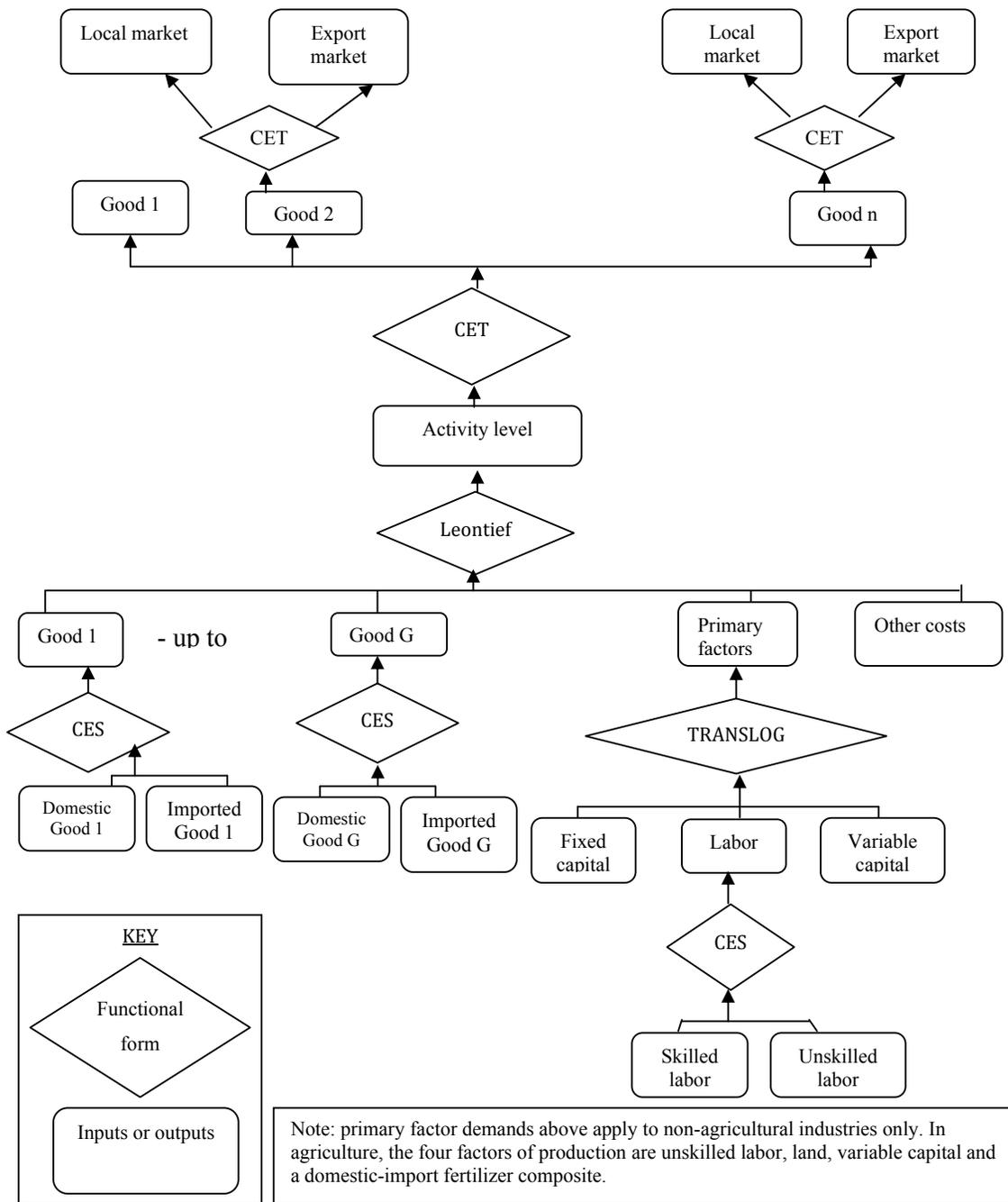
Production activity at the national level is an aggregate of national sector production activities. The national production activity box shows GDP from the production side, while the factor income box shows GDP from the income side, and the expenditure box shows GDP from the expenditure side.

*Structure of production.* In any production process, each industry may produce several commodities, using primary production factors: labor of several types, land, and capital. It also uses inputs, which are domestically produced or imported. In PERTANINDO-F, producers within each industry are assumed to be competitive and efficient. They are price takers in both input and output markets. Producers choose input and output levels in ways that minimize costs and maximize revenues, respectively. On the other hand, each industry can produce several commodities and a commodity can be produced by several industries. The multi-input, multi-output production specification can be managed by a series of separability assumptions (Figure 4.4).

First, the input-activity function exhibits constant returns to scale (CRS) and is a three-level nested form. At the top level, the Leontief production function is used which combines primary inputs, input delivery and other costs, and there is no substitution among these. At the second level, the demand for primary factors of production follows the CES (constant elasticity of substitution) production function. By following the CES production function, it allows for the substitution between primary factors of productions e.g. labor, capital, and land). At the third level, the CES function is applied to labor input, allowing for substitution among labor types by occupation. Intermediate input demands use the CES production function, employing the Armington model approach (1969).

Second, the output-activity function also exhibits CRS and is of two-level nested form. At the top level, the CET (constant elasticity of transformation) function describes transformation possibilities among composite commodities. At the second level, the composite commodities can be sold in the domestic market or export market. The CET aggregation function is identical with CES, except that the transformation parameter in the CET function has the opposite sign to the substitution parameter in the CES function.

Figure 4.4 Structure of production

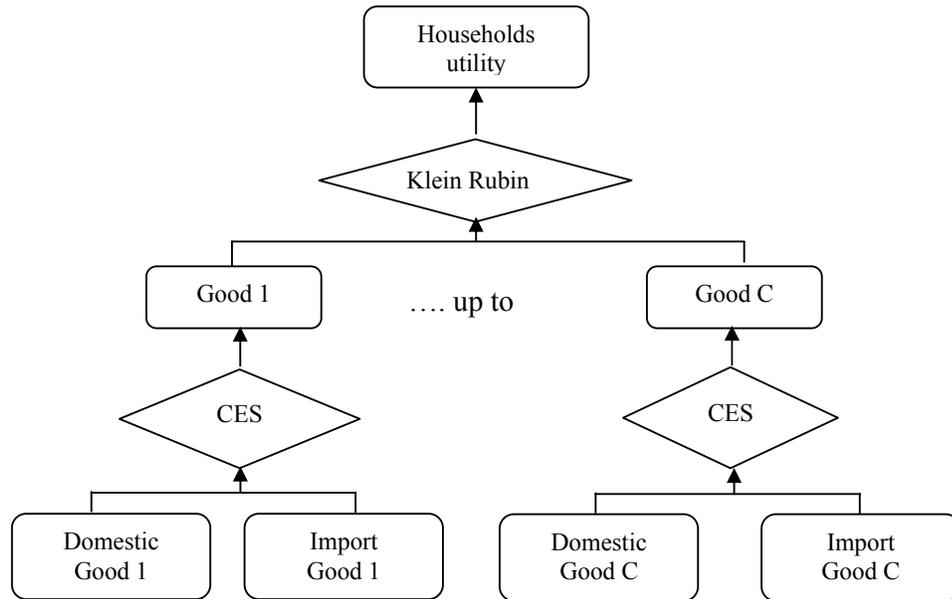


Source: Wittwer (1999), p.23

*Household utility and investment function.* The representative household is assumed to consume goods and services in ways that maximize its utility, subject to an aggregate budget constraint. In this case, the structure of household demand has two-

level nested form (Figure 4.5). At the first level, the composite commodities are aggregated by a Klein-Rubin utility function leading to a linear expenditure system (LES). At the second level, the CES functions allow these composite commodities to be substitutable between domestic and imported sources, in response to changes in relative price. Finally, the nested structure of investment follows a similar pattern as in Figure 4.5, except that the Klein-Rubin nesting is replaced by a Leontief function. Details of the equations and variables in PERTANINDO-F are in Appendix tables 4.3 and 4.4. Names for variables and coefficients followed the naming system in ORANI-G and conform to a system in which each name consists of two or more parts, as shown in Appendix table 4.2.

Figure 4.5 Specification of household consumption



Source: Wittwer (1999), p.36

#### 4.3.2 The database

PERTANINDO-F uses the Indonesian2005 Social Accounting Matrix (SAM) table as the main database (BPS, 2007a). SAM has the advantage of measuring the impact of policy or economic activities at the level of households, in detail. Decaluwé et al. (1999), claim that SAM is a comprehensive, consistent, and disaggregated data system, and that the SAM methodology can be used to analyze issues related to income distribution and, in a much more limited way, poverty.

The original 2005 SAM includes five aggregate agricultural sectors only: farm food crops, livestock and products, fisheries, other agricultural crops, and forestry and hunting sectors. Since this thesis focuses on agriculture, it needs to disaggregate the agricultural sectors, especially the food crops sector, and several sectors related to agriculture. Some sectors are aggregated, particularly the non-agricultural sectors. To aggregate and disaggregate the sectors, this thesis uses Indonesia's 2005 Input-Output table with 175 sectors and supporting data from various government sources. The Indonesian 2005 SAM table has a 23-production sector classification which is disaggregated to PERTANINDO-F's 52 sectors. These sectors and commodities are shown in Appendix table 4.6.

The basic structure of the data is represented schematically in Figure 4.6. The column headings (an absorption matrix) identify the following demanders (Wittwer, 1999):

- 1) domestic producers divided into  $i$  industries;
- 2) investors divided into  $i$  industries;
- 3) ten representative households;
- 4) an aggregate foreign purchaser of exports;
- 5) an 'other' demand category, broadly corresponding to government; and
- 6) changes in inventories of domestically produced goods.

The rows show the structure of the purchases made by each agent according to the column where the agent is. Each commodity  $c$  in the model is obtained locally or imported from abroad. These commodities are used by industries as inputs to production and as capital formation, as consumption by households and the government, and exports, all of which are part of the inventory. Only goods produced domestically are calculated on the export column. The  $m$  part of domestically produced goods is used as margin services (trade and transport from the seller to the user). Commodity taxes are payable on purchases. In addition to intermediate inputs, production also requires primary inputs that include labor (classified by  $o$  occupations), fixed capital and agricultural land. The 'other costs' category covers various miscellaneous industry expenses.

In principle, each industry is capable of producing any of the  $c$  commodity types. To show the value of output of each commodity by each industry, a MAKE

matrix is required, as shown at the bottom of Figure 4.6. Finally, import taxes are assumed to be levied at rates which vary by commodity but not by user. The revenue obtained is represented by the tariff vector V0TAR.

Labor is classified into four types: 1) Labor1 (Agriculture); 2) Labor2 (Production, Transport Equipment Operators, Manual and Unskilled laborers); 3) Labor3 (Administration, Sales, Service); and 4) Labor4 (Leadership, Management, Military, Professional, and Technician). Households are classified into 10 types, differentiated by income levels and sources of income. The composition of income and expenditure differs by group. Appendix table 4.7 shows details of this household classification.

Figure 4.6 The model flows database

		Absorption Matrix					
		Producers	Investors	Household	Export	Other	Change in Inventories
Size		$\leftarrow .i \rightarrow$	$\leftarrow .i \rightarrow$	$\leftarrow h \rightarrow$	$\leftarrow 1 \rightarrow$	$\leftarrow 1 \rightarrow$	$\leftarrow 1 \rightarrow$
Basic Flows	$\begin{matrix} \uparrow \\ c \times s \\ \downarrow \end{matrix}$	V1BAS	V2BAS	V3BAS	V4BAS	V5BAS	V6BAS
Margins	$\begin{matrix} \uparrow \\ c \times s \times m \\ \downarrow \end{matrix}$	V1MAR	V2MAR	V3MAR	V4MAR	V5MAR	n/a
Taxes	$\begin{matrix} \uparrow \\ c \times s \\ \downarrow \end{matrix}$	V1TAX	V2TAX	V3TAX	V4TAX	V5TAX	n/a
Labor	$\begin{matrix} \uparrow \\ o \\ \downarrow \end{matrix}$	V1LAB	<ul style="list-style-type: none"> <li>c = Number of commodities</li> <li>i = Number of industries</li> <li>s = 2: Domestic, imported,</li> <li>o = Number of occupation types</li> <li>m = Number of commodities used as margins</li> <li>h = Number of Households</li> </ul>				
Capital	$\begin{matrix} \uparrow \\ 1 \\ \downarrow \end{matrix}$	V1CAP					
Land	$\begin{matrix} \uparrow \\ 1 \\ \downarrow \end{matrix}$	V1LND					
Other Costs	$\begin{matrix} \uparrow \\ 1 \\ \downarrow \end{matrix}$	V1OCT					

		Joint Production Matrix
Size		$\leftarrow .i \rightarrow$
$\begin{matrix} \uparrow \\ c \\ \downarrow \end{matrix}$		MAKE

		Import Duty
Size		$\leftarrow 1 \rightarrow$
$\begin{matrix} \uparrow \\ c \\ \downarrow \end{matrix}$		V0TAR

Note: Each cell in the illustrative absorption matrix in Figure 4.6 contains the name of the corresponding data matrix. For example, V2MAR is a 4-dimensional array showing the cost of m margins services on the flows of C goods, both domestically produced and imported (s), to i investors.

Source: Wittwer (1999), p.8

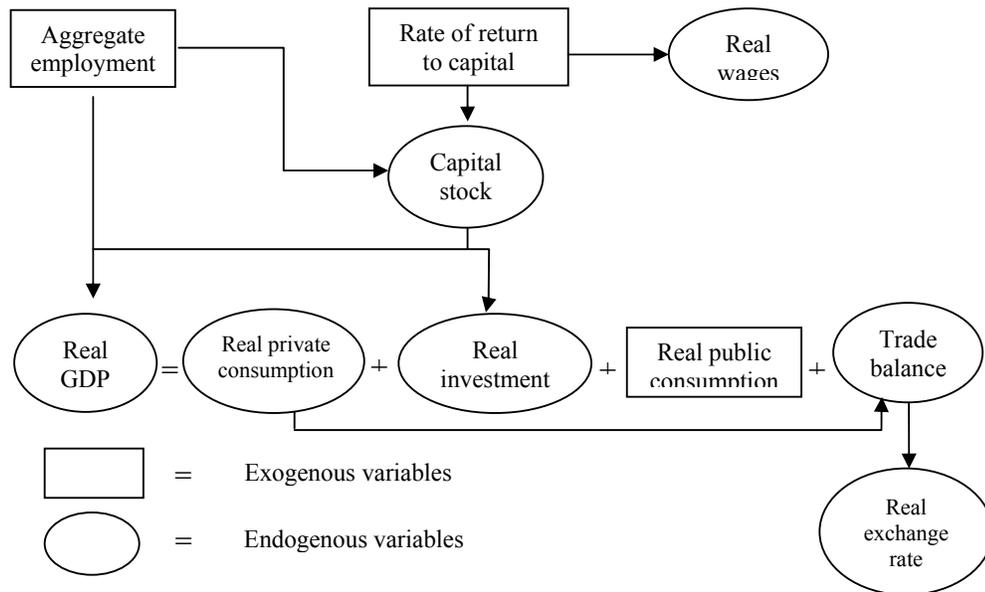
PERTANINDO-F requires elasticities and other behavioral parameters. The elasticity parameters used in this model are Armington elasticities, elasticity of substitution for primary factors, the elasticity of demand for exports and expenditure elasticities. Other necessary parameters are associated with investment. Armington (1969) assumed that imports and domestic goods are not perfect substitutes, and the elasticity between these two explains that the decrease in import prices of goods will increase its demand thus decrease the domestic demand of goods. The parameters used in this study are calculated based on the parameters used in previous models, such as WAYANG (Wittwer, 1999), INDOF (Oktaviani 2000), and AGRINDO (Haryono, 2008).

#### ***4.3.3 Model closure***

In a CGE model, the number of equations must be equal to the number of endogenous variables. In general, after the model is specified, the number of variables is more than the number of equations. Therefore, a CGE model needs to assign some variables as exogenous to ‘close’ the model.

The features of the macro-economic closures used in PERTANINDO-F are presented in Figure 4.7. These are a modification of the macro-economic closures used by Oktaviani (2000) and Horridge, Parmenter, and Pearson (1993). Government spending is an exogenous variable. Household consumption, investment, and the trade balance are endogenous variables. These variables affect the level of real GDP from the expenditure side. On the income side, the return on capital is set as an exogenous variable which is determined by the international capital market. In this study, the Indonesian economy is treated as a small country whose capital supply elasticity is relatively more elastic than the elasticity of capital in the international market. Furthermore, the real wage rate is an endogenous variable, which is influenced by the rate of return on capital and indirectly by the trend of aggregate labor. The other exogenous variable is aggregate labor. The aggregate labor variable affects the amount of capital stock and real GDP. A list of exogenous variables that are used for closure is presented in Appendix table 4.8.

Figure 4.7 Macro-economic closure



Source: Oktaviani (2000). p.329, modified

#### 4.4. Conclusion

PERTANINDO-F is a recursive dynamic CGE model which was developed in this chapter to encapsulate the Indonesian economy as a whole and agricultural sector in particular. PERTANINDO-F has 52 sectors that decompose the agricultural sector into 26 industries. This model also includes the flow of income and expenditure of 10 representative households and decomposes labor into four of types by occupation.

PERTANINDO-F is developed to address the objective of the study, which is to examine the welfare effects and quantify the main impact of policies of Indonesia's Agricultural Revitalization program on national and sectoral outputs, employment, households' income, trade, and other economic parameters. As this model has the agricultural sector constructed in greater detail, the policy shocks that are implemented and the impacts that are analyzed will be in the context of the agricultural sector. Chapter5 will examine the impact of tariff and subsidy policies, which are one of the major initiatives of the Agricultural Revitalization Program.

## **Chapter 5**

### **The impact of tariff and subsidy policies on the Indonesian economy using PERTANINDO-F**

#### **5.1 Introduction**

Implementing agricultural protection involves imposing tariffs and providing subsidies for agricultural commodities. As a country with an open economy, Indonesia has had to contend with the liberalization of the world market. Indonesia has been bound by various international trade agreements, both unilateral and bilateral. Consequently, the tariff policy in Indonesia has to be consistent with the implementation of various international agreements. In addition to tariffs and other import barriers, a subsidy for production was also regulated by the agreements, and this affected subsidy policy in Indonesia.

This chapter analyzes using various policy scenarios, the impact of liberalizing tariffs and providing subsidies on Indonesian agricultural commodities in particular, but more generally on national output, employment, and household income. Section 5.2 gives a brief overview of the literature related to the effects of agricultural trade liberalization on the economy. Section 5.3 describes in detail how the agricultural protection policy scenario is developed. Issues faced by Indonesia in relation to the determination of tariff rates especially on agricultural products as a consequence of trade liberalization and agricultural subsidies are reviewed and considered. Section 5.4 analyzes the results of simulations involving agricultural protection policies on national and sectoral outputs, trade, employment, and household income. Section 5.5 provides some concluding observations.

#### **5.2 The impact of agricultural trade liberalization on the economy: a brief overview**

The World Bank (2007) states that three-quarters of the poor in developing countries live in rural areas and most depend on agriculture for their livelihood. The Food and Agricultural Organization (2009) also emphasizes the importance of agriculture and rural development in reducing hunger and poverty. It is therefore believed that the

growth of the agricultural sector can improve the poor's welfare and reduce poverty. The World Bank also states that without improved demand for developing countries' agricultural products, agricultural growth needed to generate employment and reduce poverty in rural areas would not materialize.

Binswanger and Lutz (2000) assert that international trade has been one of the important engines for growth in industrial and developing countries. More so, trade in agricultural commodities can become an important source of growth for the agricultural sector, as it stimulates economic activity and employment particularly in rural economies. Scandizzo (1998) states that aggregate agricultural exports are a robust explanatory variable for agricultural growth. Using data of industrial and developing countries, Scandizzo finds that countries which implemented outward-looking policies and had minimal distortions in their agricultural incentive system benefited from international trade in agriculture.

Increased benefits from trade are realized by countries that conduct international trade in goods and services in which they are highly specialized. Countries which are involved in free trade are likely to enjoy increases in welfare as a result of increased trade volumes, especially in the short-term. However, gains from trade are highly dependent on the size of tariff reductions and whether these reductions or elimination of tariffs are made unilaterally or bilaterally with trading partners. As Ingo (1995) concludes, the benefits of the liberalization of world trade depend on the policies of trade reform for a country and its trading partners.

The following describes a theoretical review of the impact of trade liberalization on an economy based on Krugman and Obstfeld (2003). They show that for a sufficiently small tariff, the terms of trade (TOT) gain is always larger than the distortion loss, and there is always a positive optimal tariff. Using the case of linear demand and supply curves, the relationship between agricultural tariffs, agricultural price and welfare are explained below.

*Demand and supply of an agricultural good.* The demand of Indonesia, as the importing country, of an agricultural good is shown by the equation:

$$Q^D_{IA} = a - b\tilde{P}_{IA} \quad (5.1)$$

where  $\tilde{P}_{IA}$  is the domestic price of the agricultural good. The supply curve of the agricultural good is:

$$Q^S_{IA} = e + f\tilde{P}_{IA}. \quad (5.2)$$

Indonesia's import demand is equal to the difference between domestic demand and supply,

$$Q^D_{IA} - Q^S_{IA} = (a - e) - (b + f)\tilde{P}_{IA}. \quad (5.3)$$

Foreign export supply is shown by the equation:

$$(Q^{S*} - Q^{D*}) = g + hP_w \quad (5.4)$$

where  $P_w$  is the world price, and the domestic price in Indonesia is higher than the world price, is equal to the world price plus the tariff:

$$\tilde{P}_{IA} = P_w + t. \quad (5.5)$$

*Tariffs and prices of agricultural goods.* A tariff pushes a wedge between internal and world prices, steering the internal Indonesian price up and the world price down (Figure 5.1). The demand for the Indonesian import meets the supply of the foreign export in world equilibrium:

$$(a - e) - (b + f) \times (P_w + t) = g + hP_w. \quad (5.6)$$

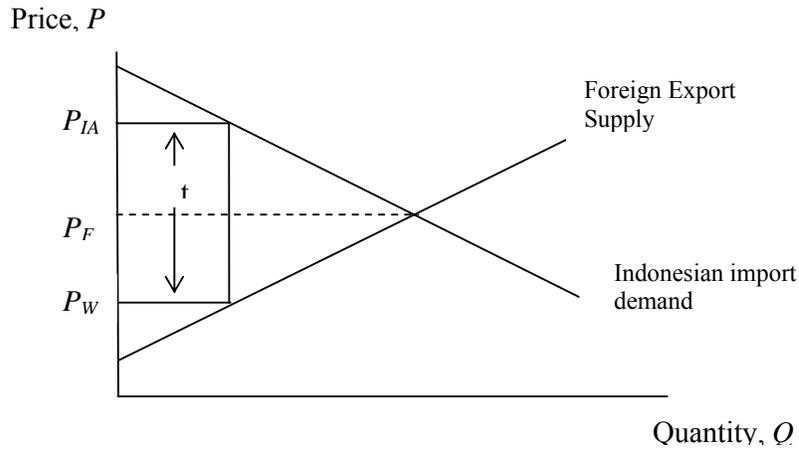
If  $P_F$  is the world price that would prevail if there were no tariff, then a tariff  $t$  will increase the domestic price to

$$\tilde{P}_{IA} = P_F + th/(b + f + h), \quad (5.7)$$

And, by derivation, the world price would be increased to,

$$P_w = P_F - t(b + f)/(b + f + h). \quad (5.8)$$

Figure 5.1 Effects of a tariff on prices of agricultural goods



Source: Krugman and Obstfeld (2003), p. 253, modified.

*The tariff and domestic welfare.* The following is the explanation of the effects of a tariff on Indonesia's welfare (Figure 5.2).  $Q^{S1}$  and  $Q^{D1}$  represent the free trade levels of consumption and production. The increase of domestic price due to a tariff imposition,  $Q^S$ , is to  $Q^{S2}$  and  $Q^D$  down to  $Q^{D1}$ , where

$$Q^{S2} = Q^{S1} + t/h(b + f + h) \quad (5.9)$$

and

$$Q^{D2} = Q^{D1} - t/b(b + f + h). \quad (5.10)$$

The gain from a lower world price is the area of the rectangle in Figure 5.2, the drop in the price multiplied by the level of imports after the tariff:

$$\begin{aligned} \text{Gain} &= (Q^{D2} - Q^{S2}) \times t(b + f)/(b + f + h) \\ &= t \times (Q^{D1} - Q^{S1}) \times (b + f)/(b + f + h) - (t)^2 \times h(b + f)^2/(b + f + h)^2. \end{aligned} \quad (5.11)$$

The loss from distorted consumption is the sum of the areas of the two triangles in Figure 5.2:

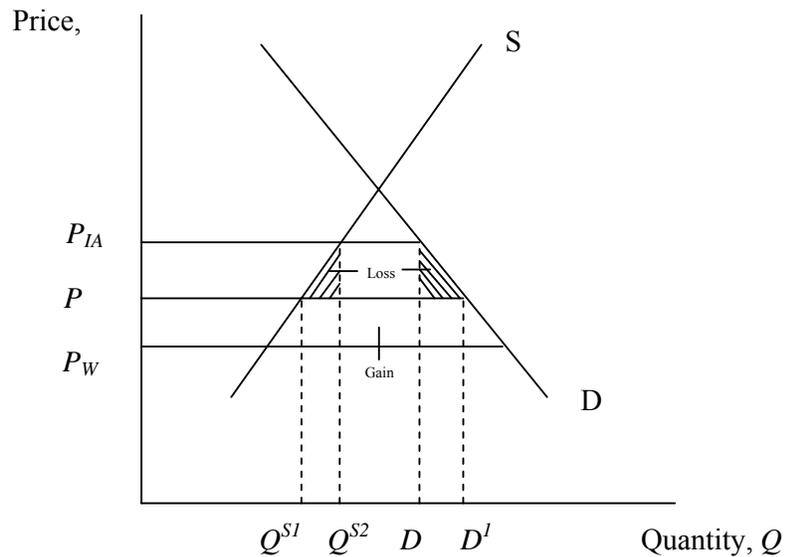
$$\begin{aligned} Loss &= (1/2) \times (Q^{S2} - Q^{S1}) \times (\tilde{P}_{IA} - P_F) + (1/2) \times (Q^{D1} - Q^{D2}) \times (\tilde{P}_{IA} - P_F) \\ &= (t)^2 \times (b + f) \times (h)^2 / 2(b + f + h)^2. \end{aligned} \quad (5.12)$$

The net effect on welfare is:

$$Gain - loss = t \times U - (t)^2 \times V, \quad (5.13)$$

where  $U$  and  $V$  are expressions that are independent of the level of the tariff and are positive. That is, the net effect is the sum of a positive number multiplied by the tariff rate and a negative number multiplied by the square of the tariff rate (Krugman and Obstfeld, 2003).

Figure 5.2 Welfare effects of a tariff on an agricultural good



Source: Krugman and Obstfeld (2003), p.254, modified.

### 5.3 Indonesian agricultural protection policy scenario

RPJMN 2004–2009 and RPJMN 2010–2014 feature agricultural policies protecting farmers from unfair competition and unjust trading practices. The protection policy was implemented in the form of import duties on commodities (eg., paddy, rice,

vegetables, and fruit, among others) that most related to rural development, poverty alleviation, and food security (Kementerian Pertanian Republik Indonesia, 2005; 2010; Ministry of Finance of Republic Indonesia, 2011). However, as a country with an open economy, the condition of the Indonesian agricultural market could not be segregated from a dynamic international trade environment. The government emphasized that the revitalization of Indonesian agriculture faced many challenges brought about by globalization namely: 1) the opening of markets and increase in competition; 2) the increasing demands on agriculture based on market mechanism or market-oriented policy; and 3) the enhanced role of consumer demand in determining activity in the agricultural sector (Republik Indonesia, 2005a).

Besides the impetus provided by regionalism that occurred in the late 1980s until the mid-1990s, such as the establishment of AFTA and APEC, the process of market liberalization was also attributed to the commitment to the Uruguay Round Agreement as part of a series of rounds of the World Trade Organization (WTO). The agreements in AFTA and WTO were binding, whereas the APEC agreement was voluntary. However, the spirit taken by the three institutions was relatively similar, that is liberalization through the reduction of trade barriers— tariff and non-tariff.

Trade agreements between countries, either unilateral or bilateral, that regulate international trade in agricultural commodities are more difficult and take longer time to formalize than do agreements for non-agricultural commodities. This is because agriculture is multidimensional, with possibly widespread political and social impacts for a country (Kartadjoemena, 1997). One very significant aspect of the Uruguay Round Agreement in agriculture during 1986–1994 was the change in the set of rules associated with market access, which in essence gradually reduced all kinds of distortions caused by protection, either by tariff or non-tariff.

Specifically, the agricultural agreement had three important components that were to be implemented by all WTO members, except in cases of “special treatment”<sup>2</sup>. Subsidies for food security, as well as for investment, input, transport, and marketing were exempt from reductions. Besides the expansion of market access

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<sup>2</sup>On 1 August 2004, a WTO General Council meeting approved the General Council Decision on the Doha Work Program, which is also often called the July Package. One of these decisions was about a paragraph of special products (SP), which are more general than previously, and no longer ensure the amount of a product that can be categorized as a sensitive product. Developing countries can determine the number of products that are categorized as special products based on criteria of food security, livelihood security, and rural development.

through tariff reductions, the other component was the provision of domestic support, by means of committing to a subsidy reduction policy for the production and transfer of funds to the producers. The third component was a commitment to export subsidy reduction, which was implemented in terms of the reduction of volume of commodity exported and the reduction in government budget for export subsidies.

The imperative of the reduction in subsidies is based on the idea that excessively granting subsidies to farmers – mainly in industrialized countries – will lead to distortions in the domestic market, where there is a large difference between domestic prices and international prices. This difference hinders imports despite the low level of tariffs imposed. However, a subsidy may be granted if it meets the criteria of minimal distortion effect on trade, and in consideration of the social and political aspects. The numerical targets of the reductions in agricultural subsidies and protection agreed in the Uruguay Round Agreement are in Table 5.1. Table 5.2 shows the tariff profile of Indonesia published by the WTO.

Associated with the commitment to the APEC forum, member countries, including Indonesia, were not bound as in the WTO. The APEC forum committed to reducing trade barriers and increasing investment without binding legal agreements; decisions were based only on consensus with all members. The first organizational meeting of APEC was held in Canberra, Australia, in 1989. APEC produced the “Bogor Declaration” at the 1994 summit in Bogor, which aimed to reduce import duties to zero and five per cent in the least developed Asia-Pacific countries by 2010, and for developing countries by no later than 2020.

In contrast, AFTA is binding. AFTA is the agreement of ASEAN countries to establish a free trade area in order to enhance the economic competitiveness of the ASEAN region, establishing ASEAN as a world production base and creating a regional market for about 500 million people.

Table 5.1 Tariff and non-tariff trade liberalization targets for agriculture in the Uruguay Round Agreement

	Developed countries 6 years: 1995–2000	Developing countries 10 years: 1995–2004
Tariffs		
average cut for all agricultural products	-36%	-24%
minimum cut per product	-15%	-10%
Domestic support		
total AMS cuts for sector (base period: 1986–88)	-20%	-13%
Exports		
value of subsidies	-36%	-24%
subsidized quantities (base period: 1986–90)	-21%	-14%

Notes:

1. AMS = Aggregate measurement of support
2. Least developed countries do not have to make commitments to reduce tariffs or subsidies.
3. The base level for tariff cuts was the bound rate before 1 January 1995; or, for unbound tariffs, the actual rate charged in September 1986 when the Uruguay Round began.

Source: World Trade Organization (2012a)

AFTA was formed at the 4th ASEAN Summit in 1992 in Singapore. Initially, the AFTA goal was to be achieved within 15 years (1993–2008), but later brought forward to 2003, and then again to 2002. AFTA agreed to the Common Effective Preferential Tariffs for the ASEAN Free Trade Area (CEPT-AFTA), which is a scheme to achieve AFTA's goal to reduce tariff rates up to 0–5 per cent, and remove quantitative restrictions and non-tariff barriers. Related to AFTA was an agreement to eliminate all import duties on goods in Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore, and Thailand (or ASEAN-6) in 2010 and in Cambodia, Laos, Myanmar, and Vietnam in 2015. The ASEAN-6 has eliminated tariff on 99 per cent of products in the inclusion list— products for tariff reduction or elimination—in 2013 (Ministry of International Trade and Industry of Malaysia, 2013). On average, the ASEAN-6 has 99.20 per cent of tariff lines in the inclusion list at 0 per cent and only 0.35 per cent of the tariff lines in the inclusion list which still imposed a tariff. For Cambodia, Laos, Myanmar and Vietnam, 68.88 per cent of the tariff lines in the inclusion list are already at 0 per cent. On average, ASEAN members have 87.81 per cent tariff lines at 0 per cent in 2013 schedule.

Table 5.2 Indonesian tariff profile(per cent)

<u>Part A.1 Agriculture Tariffs and imports: summary and duty ranges</u>									
Frequency distribution	Duty-free	0≤5	5≤10	10≤15	15≤25	25≤50	50≤100	>100	NAV
	Tariff lines and import values								
Final bound	0	0	0.6	0	0	87.5	8.7	3.2	0
MFN applied 2010	13.7	71.5	7.8	2.7	1.7	0.5	0.2	2.0	1.3
Imports 2009	65.8	19.5	10.6	1.6	2.5	0.0	0.0	0.0	10.2
<u>Part A.2 Tariffs and imports by product groups</u>									
Product groups	Final bound duties				MFN applied duties			Imports	
	AVG	Duty-free	Max	Binding	AVG	Duty-free	Max	Share	Duty-free
Animal products	43.8	0	50	100	4.4	16.2	25	0.4	66.3
Dairy products	74.0	0	210	100	5.5	0	10	0.3	0
Fruit, vegetables, plants	45.6	0	60	100	5.9	6.2	25	1.5	0.5
Coffee, tea	46.0	0	60	100	8.3	4.2	15	0.1	0.1
Cereals & preparations	44.8	0	160	100	5.8	6.8	150	7.0	83.2
Oilseeds, fats & oils	39.9	0	60	100	3.9	38.4	10	4.6	89.9
Sugars and confectionery	58.3	0	95	100	7.1	0	23	1.8	0
Beverages & tobacco	81.3	0	150	100	51.8	1.1	150	0.2	0.0
Cotton	37.4	0	40	100	4.0	20.0	5	0.6	99.2
Other agricultural products	40.7	0	60	100	4.2	23.1	15	1.2	65.5
Fish & fish products	40.0	0	40	100	5.8	5.0	15	0.3	27.1
Note	: NAV is non-ad valorem MFN is most favored nation AVG is aid for trade at a glance								
Source	: World Trade Organization (2012b)								

Indonesia, either alone, or jointly with other AFTA members, has taken part in various agreements with other countries. A summary of trade agreements involving Indonesia is shown in Table 5.3

Table 5.3 Free trade agreements involving Indonesia

Agreement	Implemented	Details
ASEAN	1992	The six most developed ASEAN members (Brunei Darussalam, Indonesia, Malaysia, the Philippines, Thailand, and Singapore) to cut all tariffs to 0–5 per cent, except for highly sensitive products by 2003. Same tariff cuts for Vietnam by 2006, Laos and Myanmar by 2008, and Cambodia by 2010. Non-tariff barriers to be reduced.
China–ASEAN	2004	Tariffs on 600 agricultural products cut to zero in 2004. By 2010, tariffs on over 7000 commodities, including agricultural, merchandise, and services, to be removed by the six most developed ASEAN members. Less developed members have until 2015. Non-tariff barriers to be reduced.
Korea–ASEAN 9	2007	Agreement covers merchandise, services and investment. Thailand rejected agreement because of lack of agricultural liberalization.
Japan–ASEAN	2008	Agreement on trade in goods, services and investment.
Japan–Indonesia	2008	Economic Partnership Agreement finalized in August 2007
India–ASEAN	2010	Agreement covers tariff reductions on agriculture products as the main sticking point.
EU–ASEAN	2010	Talks commenced in 2007.
Australia–New Zealand–ASEAN	2010	Talks commenced in 2005. Expected that the agreement will be fully implemented by 2015.

Source: Department of Agriculture, Fisheries and Forestry Australia (2012), p.539, edited.

Responding to trends and changes in global trade for goods to and from Indonesia, the Indonesian Government issued Customs Law No. 10 in 1995 and updated this with Customs Law No 17 in 2006. For the levels of tariffs imposed on imported commodities, the government issued a new policy, which is continually updated, the most recent version being Ministerial Regulation No. 213/PMK.011/2011, which covers 10,025 types of goods.

According to the framework of the Uruguay Round Agreement, affirmed by the Doha Round Agreement in which subsidies can still be granted to certain products in consideration of their specificity, Indonesia has set subsidies on some agricultural products and agricultural inputs, especially fertilizer, seed, and pesticides. For the Indonesian government, the disbursement of subsidies for fertilizer, seeds, and pesticides is a dilemma. On the one hand, the government is required to reduce the amount of the subsidy gradually so that the burden on the state budget can be reduced, thus achieving fiscal sustainability. On the other hand, the

reduction of subsidies may result in an increase in domestic prices of fertilizers, seeds and pesticides, which, were this to happen, would be perceived as being unfair to farmers, the producers.

Given that Indonesia has to abide with international trade agreements that aim to reduce or eliminate tariffs, the only trade protection it is allowed to use to a limited extent, are subsidies. In this chapter, the focus of agricultural protection is on fertilizer subsidy where it has remained high from year to year, while seed subsidy has increased only slightly (see Table 3.11) and pesticide subsidies have not been officially granted by the government since 1989 (Bappenas, 2011).

Simulations on the following policy scenarios were conducted:

- 1) SIM1: 30 per cent fall in import tariffs on agricultural commodities (sectors 1–26) and rice milling commodity (sector 29);
- 2) SIM2: eliminate import tariffs on agricultural commodities (sectors 1–26) and rice milling commodity (sector 29);
- 3) SIM3: 30 per cent fall in import tariffs on agricultural commodities (sectors 1–26) and rice milling commodity (sector 29) and increase fertilizer (sector 36) subsidy by 10 per cent; and
- 4) SIM4: eliminate import tariffs on agricultural commodities (sectors 1–26) and rice milling commodity (sector 29) and increase fertilizer (sector 36) subsidy by 10 per cent.

## **5.4 Model results: impact of changes in tariff and subsidy policies**

### **5.4.1 Macro-economic results**

Overall, tariff liberalization is welfare improving. The higher is the tariff reduction (SIM1 to SIM2), the higher the gains. A 30 per cent decrease in import tariffs on agricultural commodities (SIM1) results in a 0.036 per cent increase in real GDP by 2020. An elimination of tariffs on agricultural commodities (SIM2) leads to an increase in real GDP of 0.120 per cent. When tariff liberalization is combined with increases in fertilizer subsidy, this, too provide gains (SIM3 to SIM4). The reduction of tariffs and the increase of fertilizer subsidy are projected to increase the real GDP consistently in all simulations. A combination of a 30 per cent tariff reduction on agricultural commodities and a 10 per cent increase in fertilizer subsidy (SIM3) leads to an increase in real GDP by 0.038 per cent by 2020. A combination of tariff

elimination on agricultural commodities and a 10 per cent increase in fertilizer subsidy (SIM4) leads to a real GDP gain by 0.122 per cent in the same period (Table 5.4).

The expansion of aggregate economic activity with aggregate employment assumed to be fixed, results in an increase in real wages. In SIM1, economy-wide real wages increase by 0.823 per cent and by 2.744 per cent in SIM2. With a combination of the tariff cut and the fertilizer subsidy increase, real wages are projected to increase by more in SIM3 and SIM4.

Table 5.4 Macro-economic impact of tariff reductions for agricultural outputs and the increase of the fertilizer subsidy (in percentage changes)

Description	Symbols	SIM1	SIM2	SIM3	SIM4
Real GDP	x0gdpexp	0.036	0.120	0.037	0.122
Aggregate employment	employ_i	0.000	0.000	0.000	0.000
Aggregate capital stock	x1cap_i	-1E-14	1E-15	6E-15	4E-16
Real household consumption	x3tot	0.393	1.309	0.498	1.414
Real investment	x2tot_i	-0.006	-0.020	0.007	-0.007
Real government demands	x5tot	0.000	0.000	0.000	0.000
Exports (volume)	x4tot	0.037	0.122	-0.080	0.006
Imports (volume)	x0imp_c	0.815	2.717	0.909	2.811
Real wage	realwage	0.823	2.744	0.987	2.908
Consumer price index	p3tot	-0.489	-1.629	-0.494	-1.634
% (Balance of trade)/GDP	delB	-0.184	-0.613	-0.245	-0.674
Real devaluation	p0realdev	0.210	0.700	0.171	0.661

Source: PERTANINDO-F simulation results

Consistent in all simulations is the increase in real GDP from the expenditure side which is driven by the increase in consumption (x3tot) as a result of a decline in the consumer price index (p3tot). Import prices evidently fall as a result of tariff liberalization leading to overall imports expanding. The overall domestic price decline was greater than import price decline, thus real devaluation results. Real devaluation improves Indonesian products' competitiveness in world markets leading to higher exports. However, imports are stimulated more than exports.

The increase in fertilizer subsidy (SIM3 and SIM4) leads to a decline in fertilizer prices which is a major cost item in agricultural production. With cost of production falling, overall domestic agricultural output expands and at relatively lower domestic output price. The combined effect of tariff liberalization and subsidy increase contributes to a further increase in imports. As agricultural output gets

stimulated so does the demand, not just for fertilizer, but also for other agricultural inputs, including inputs that are imported.

Tariff cuts were forecast to reduce government revenue and subsequently contract government savings. Therefore, lower real investment results although relatively minimally at 0.006 per cent in SIM1 and 0.020 per cent in SIM2. The policy combination of fertilizer subsidy and tariff cuts could lead to a positive effect on investment. In SIM3, the combination of the fertilizer subsidy increasing by 10 per cent and a 30 per cent tariff reduction is projected to increase investment by 0.007 per cent. Subsidies push investment up in industries benefitting from the effects of a subsidy increase (eg. industries producing agricultural inputs such as seeds, fertilizer, etc). In contrast, if a 10 per cent fertilizer subsidy increase is combined with a 100 per cent tariff reduction, the real investment rate falls by 0.007 per cent. It appears that the negative effects on investment of tariff reductions weigh heavier than the effects of subsidies. Granting larger subsidies will offset the impact of tariff reductions on investment, but doing this has implications for government finances.

#### **5.4.2 Impact on selected industries**

##### *1) Soybean: the worst affected agricultural industry*

The domestic soybean industry only accounts for 1 per cent of total agricultural output and 12.3 per cent of total agricultural imports. Of the total soybean consumption in Indonesia, more than 51 per cent are from import sources.

*Soybean* is the worst affected industry experiencing the largest contraction in output in all simulations. From Table 5.5, it is observed that a 30 per cent tariff cut leads *Soybean* output to contract up to 10.258 per cent. When tariff is eliminated, the *Soybean* output contracts even more, by 34.193 per cent. The decline in *Soybean* output after a tariff cut can be explained as a result of an increase in imports as consumers substitute toward the more competitive lower priced imported *Soybean* and away from the relatively higher priced domestic product. With the demand moving out of domestically-produced soybean, the domestic *Soybean* price also falls but not as much as the fall in import price. Hence, the impact on the domestic industry is slightly less as the price difference between domestic and imported *Soybean* become narrower, cushioning the effect on the domestic industry. *Soybean* exports are projected to rise in all simulations. The fall in domestic *Soybean* prices

leads to a fall in export prices causing exports to increase. The overall fall in domestic soybean output reduces the demand for capital and labor, hence lower price of capital and wages. For all simulations, price of capital falls at a faster rate than wages, making capital relatively cheaper than labor increasing the capital-to-labor ratio (see Appendix tables 5.1 and 5.2).

## 2) *Coffee: the least affected agricultural industry*

*Coffee* is an export-oriented industry with approximately 42 per cent of its output being exported. Despite its output share in total agricultural output at only 2 per cent, the industry makes a significant contribution in terms of exports as it accounts for approximately 23 per cent of total agricultural exports. Of the total domestic consumption of *Coffee* in Indonesia, approximately only 0.22 per cent is from import sources.

Tables 5.5 and 5.6 show that *Coffee* is the least affected industry experienced the largest expansion in output in all simulations. In SIM1, with a fall in tariffs by 30 per cent, *Coffee* output increases by 1.597 per cent, and with a 100 per cent tariff cut, *Coffee* output increases by 5.322 per cent. In SIM3, output of *Coffee* increases by 2.622 per cent, and with the combination of a 100 per cent tariff reduction and a 10 per cent increase in fertilizer subsidy, *Coffee* output increases by 6.347 per cent. Exports and imports of *Coffee* are also projected to increase in all simulations. When tariff is cut or eliminated, import price of *Coffee* falls increasing the demand for imported coffee as consumers substitute imports for the domestic counterpart. This results to a fall in domestic prices for coffee causing export prices to drop and export levels to rise. With consumers buying more of the imported coffee, there is now more domestically-produced coffee becoming available for exports.

Table 5.5 Industry effects of a 30 per cent decrease in agricultural tariffs (SIM1) and elimination of agricultural tariffs (SIM2) (in percentage changes)

No.	Sectors	SIM1					SIM2				
		p0com	Output	Employment	Export	Import	p0com	Output	Employment	Export	Import
1.	Paddy	-2.646	-0.077	-0.089	-0.946	69.586	-8.82	-0.255	-0.298	-3.152	231.954
2.	Maize	-2.36	0.344	0.545	-0.946	66.205	-7.867	1.148	1.815	-3.152	220.684
3.	Cassava	-1.647	1.121	1.749	0.000	0.000	-5.491	3.735	5.831	0.000	0.000
4.	Sweet potatoes	-2.47	0.642	0.885	12.743	58.049	-8.232	2.139	2.949	42.477	193.495
5.	Groundnut	-3.047	0.046	-0.090	27.090	52.993	-10.157	0.153	-0.300	90.300	176.644
6.	Soybean	-13.434	-10.258	-16.361	119.427	16.432	-44.78	-34.193	-54.536	398.090	54.775
7.	Vegetables	-3.838	-1.078	-1.570	20.612	51.661	-12.795	-3.593	-5.234	68.707	172.202
8.	Fruits	-4.371	-1.023	-1.817	9.790	49.551	-14.569	-3.409	-6.058	32.634	165.171
9.	Other food crops	-9.759	-6.020	-9.771	21.861	3.821	-32.531	-20.066	-32.569	72.869	12.737
10.	Rubber	-2.596	-0.305	-0.389	5.815	52.067	-8.654	-1.017	-1.298	19.385	173.558
11.	Sugarcane	-1.401	1.158	1.711	5.407	55.721	-4.669	3.859	5.702	18.024	185.737
12.	Coconut	-1.548	0.872	1.373	5.977	56.594	-5.162	2.906	4.577	19.923	188.646
13.	Palm oil	-1.471	0.583	0.908	5.676	55.338	-4.902	1.942	3.028	18.921	184.461
14.	Tobacco	-1.085	0.751	1.416	0.000	0.000	-3.617	2.504	4.718	0.000	0.000
15.	Coffee	-0.717	1.597	2.546	2.767	32.926	-2.389	5.322	8.486	9.223	109.753
16.	Tea	-2.015	0.559	0.818	14.629	91.986	-6.717	1.862	2.725	48.764	306.621
17.	Clove	-1.263	1.185	1.928	9.172	109.794	-4.211	3.949	6.427	30.572	365.982
18.	Cocoa	-1.23	1.371	2.262	9.469	67.268	-4.099	4.568	7.540	31.563	224.227
19.	Cashew fruit	-0.795	1.574	2.567	6.125	58.333	-2.651	5.246	8.558	20.415	194.445
20.	Other estate crops	-1.097	0.834	1.486	6.594	69.974	-3.657	2.781	4.952	21.981	233.247
21.	Livestock	-3.296	-1.337	-1.975	18.128	43.437	-10.987	-4.458	-6.582	60.427	144.791
22.	Fresh Milk	-3.813	-5.099	-6.605	20.971	68.466	-12.709	-16.995	-22.018	69.902	228.220
23.	Poultry	-1.902	0.515	0.441	12.342	7.625	-6.339	1.718	1.470	41.140	25.418
24.	Other livestock raising	-3.157	-1.199	-1.643	20.491	54.417	-10.524	-3.998	-5.478	68.303	181.391
25.	Forestry and hunting	-2.389	0.182	-0.132	15.505	79.137	-7.963	0.607	-0.438	51.682	263.792
26.	Fishery	-1.03	0.648	1.461	4.211	57.943	-3.432	2.160	4.869	14.038	193.144
27.	Mining	-0.005	-0.120	-0.474	0.026	-0.317	-0.015	-0.401	-1.581	0.085	-1.056
28.	Other mining and quarrying	0.411	-0.207	-0.317	-3.047	0.494	1.369	-0.689	-1.057	-10.157	1.647

Table 5.5 Industry effects of a 30 per cent decrease in agricultural tariffs (SIM1) and elimination of agricultural tariffs (SIM2) (in percentage changes) (continued)

No.	Sectors	SIM1					SIM2				
		p0com	Output	Employment	Export	Import	p0com	Output	Employment	Export	Import
29.	Rice milling	-1.743	-0.071	-0.175	12.931	56.616	-5.809	-0.238	-0.585	43.105	188.718
30.	Flour	-5.336	4.179	6.500	39.595	-8.991	-17.788	13.931	21.668	131.983	-29.969
31.	Sugar	-0.346	1.239	1.766	2.571	0.035	-1.155	4.128	5.887	8.568	0.118
32.	Other food, beverages, and tobacco	-0.288	0.772	1.410	2.140	-0.255	-0.961	2.572	4.701	7.132	-0.851
33.	Textile, wearing apparel and leather	-0.278	1.345	1.863	2.066	-0.070	-0.928	4.485	6.210	6.885	-0.234
34.	Wood products	-0.006	0.040	0.076	0.045	0.016	-0.02	0.132	0.252	0.151	0.052
35.	Paper, paper products, transport equipment, machinery and iron	0.109	-0.353	-0.609	-0.871	0.148	0.364	-1.176	-2.031	-2.902	0.493
36.	Fertilizer	-0.161	-1.167	-1.784	-0.946	-1.584	-0.535	-3.889	-5.947	-3.152	-5.280
37.	Pesticide	0.05	-0.564	-0.892	-0.946	-0.367	0.165	-1.880	-2.974	-3.152	-1.222
38.	Other chemical and cement	0.102	-0.290	-0.439	-0.946	0.101	0.34	-0.965	-1.462	-3.152	0.338
39.	Electricity, Gas and Water	0.47	0.088	0.116	-0.946	0.000	1.567	0.294	0.388	-3.152	0.000
40.	Irrigation building	0.296	0.015	0.022	-0.946	0.000	0.986	0.050	0.075	-3.152	0.000
41.	Construction	0.272	-0.010	-0.026	-0.946	0.000	0.905	-0.033	-0.085	-3.152	0.000
42.	Trade	0.419	-0.038	-0.122	-0.946	0.000	1.398	-0.128	-0.406	-3.152	0.000
43.	Restaurant	-0.19	0.188	0.379	-0.946	-0.261	-0.632	0.627	1.264	-3.152	-0.871
44.	Hotel	-0.462	-0.269	-0.645	-0.946	-0.111	-1.541	-0.898	-2.149	-3.152	-0.369
45.	Road and railway transport	0.42	0.030	0.045	-0.946	0.892	1.401	0.099	0.151	-3.152	2.975
46.	Air and water transport, and communication	0.262	-0.147	-0.270	-0.946	0.526	0.872	-0.489	-0.902	-3.152	1.754
47.	Services allied to transport	0.221	-0.242	-0.469	-0.946	0.341	0.738	-0.805	-1.565	-3.152	1.138
48.	Bank and insurance	0.555	0.014	0.029	-0.946	0.977	1.85	0.047	0.095	-3.152	3.255
49.	Agriculture services	0.159	-0.096	-0.240	-0.946	0.000	0.529	-0.318	-0.801	-3.152	0.000
50.	Real estate and business service	0.263	-0.100	-0.271	-0.946	0.273	0.877	-0.335	-0.903	-3.152	0.910
51.	General government and defense, education, health, community services	0.358	-0.034	-0.038	-0.946	0.276	1.194	-0.112	-0.126	-3.152	0.920
52.	Personal, household and other services	0.313	0.055	0.088	-0.946	0.703	1.045	0.182	0.294	-3.152	2.344

Note: p0com is output price of locally produced commodity;  
Source: PERTANINDO-F simulation results

Table 5.6 Industry effects of a 10 per cent increase in fertilizer subsidy plus a 30 percent decrease in agricultural tariffs (SIM3) and a 10 per cent increase in fertilizer subsidy plus elimination of agricultural tariffs (SIM4) (in percentage changes)

No.	Sectors	SIM3					SIM4				
		p0com	Output	Employment	Export	Import	p0com	Output	Employment	Export	Import
1.	Paddy	-3.645	0.141	-0.366	-1.081	67.259	-9.819	-0.038	-0.574	-3.288	229.627
2.	Maize	-3.226	0.607	0.399	-1.081	64.514	-8.733	1.410	1.670	-3.288	218.993
3.	Cassava	-2.064	1.326	1.825	0.000	0.000	-5.908	3.940	5.907	0.000	0.000
4.	Sweet potatoes	-2.649	0.796	1.051	13.669	57.842	-8.412	2.293	3.115	43.403	193.288
5.	Groundnut	-3.266	0.225	0.070	29.038	52.759	-10.377	0.332	-0.140	92.248	176.410
6.	Soybean	-13.736	-9.909	-16.092	122.115	16.240	-45.082	-33.845	-54.267	400.778	54.582
7.	Vegetables	-4.445	-0.766	-1.479	23.870	50.799	-13.401	-3.281	-5.142	71.964	171.341
8.	Fruits	-4.698	-0.805	-1.667	10.523	49.155	-14.896	-3.191	-5.908	33.367	164.775
9.	Other food crops	-10.439	-5.530	-9.543	23.383	3.793	-33.21	-19.576	-32.341	74.391	12.709
10.	Rubber	-3.414	-0.367	-0.830	7.648	50.437	-9.472	-1.078	-1.739	21.217	171.928
11.	Sugarcane	-2.07	1.459	1.697	7.990	54.753	-5.339	4.160	5.689	20.607	184.769
12.	Coconut	-2.083	1.070	1.347	8.040	55.797	-5.696	3.104	4.551	21.986	187.849
13.	Palm oil	-2.38	0.685	0.435	9.185	53.685	-5.811	2.045	2.555	22.430	182.808
14.	Tobacco	-3.579	0.978	0.004	0.000	0.000	-6.111	2.730	3.307	0.000	0.000
15.	Coffee	-1.252	2.622	3.328	4.832	32.436	-2.924	6.347	9.269	11.288	109.263
16.	Tea	-2.812	0.763	0.659	20.416	89.536	-7.514	2.067	2.567	54.550	304.171
17.	Clove	-2.176	1.602	1.951	15.799	106.399	-5.124	4.366	6.450	37.199	362.586
18.	Cocoa	-1.358	2.216	3.128	10.454	67.149	-4.227	5.414	8.406	32.548	224.107
19.	Cashew fruit	-1.116	2.022	2.937	8.597	57.967	-2.972	5.694	8.928	22.888	194.078
20.	Other estate crops	-1.648	1.901	2.242	9.902	68.793	-4.208	3.847	5.709	25.289	232.066
21.	Livestock	-3.388	-1.216	-1.808	18.631	43.405	-11.078	-4.337	-6.415	60.931	144.759
22.	Fresh Milk	-3.921	-4.988	-6.457	21.566	68.270	-12.818	-16.884	-21.870	70.498	228.024
23.	Poultry	-1.984	0.601	0.551	12.873	7.692	-6.421	1.803	1.579	41.671	25.485
24.	Other livestock raising	-3.272	-1.050	-1.454	21.234	54.283	-10.639	-3.848	-5.288	69.046	181.257
25.	Forestry and hunting	-2.46	0.218	-0.085	15.963	78.895	-8.034	0.642	-0.392	52.141	263.549
26.	Fishery	-1.006	0.718	1.640	4.113	58.062	-3.408	2.230	5.049	13.940	193.263
27.	Mining	0.016	-0.143	-0.579	-0.093	-0.339	0.006	-0.423	-1.686	-0.033	-1.078
28.	Other mining and quarrying	0.526	-0.231	-0.370	-3.901	0.907	1.484	-0.713	-1.110	-11.011	2.060

Table 5.6 Industry effects of a 10 per cent increase in fertilizer subsidy plus a 30 per cent decrease in agricultural tariffs (SIM3) and a 10 percent increase in fertilizer subsidy plus elimination of agricultural tariffs (SIM4) (in percentage changes) (continued)

No.	Sectors	SIM3					SIM4				
		p0com	Output	Employment	Export	Import	p0com	Output	Employment	Export	Import
29.	Rice milling	-2.333	0.148	0.211	17.312	55.682	-6.4	-0.019	-0.198	47.486	187.785
30.	Flour	-5.34	4.255	6.605	39.620	-8.909	-17.791	14.006	21.773	132.009	-29.888
31.	Sugar	-0.609	1.546	2.200	4.521	-0.047	-1.418	4.436	6.321	10.519	0.036
32.	Other food, beverages, and tobacco	-0.301	0.856	1.556	2.230	-0.192	-0.973	2.656	4.847	7.223	-0.788
33.	Textile, wearing apparel and leather	-0.247	1.232	1.690	1.829	0.012	-0.896	4.371	6.037	6.649	-0.152
34.	Wood products	0.007	-0.007	-0.046	-0.054	0.067	-0.007	0.086	0.131	0.052	0.103
35.	Paper, paper products, transport equipment, machinery and iron	0.133	-0.419	-0.726	-1.060	0.192	0.387	-1.242	-2.147	-3.091	0.537
36.	Fertilizer	1.276	1.639	2.431	-1.081	4.624	0.901	-1.084	-1.732	-3.288	0.928
37.	Pesticide	0.165	-0.412	-0.685	-1.081	0.032	0.281	-1.728	-2.767	-3.288	-0.824
38.	Other chemical and cement	0.129	-0.351	-0.540	-1.081	0.128	0.366	-1.027	-1.564	-3.288	0.365
39.	Electricity, Gas and Water	0.561	0.094	0.103	-1.081	0.000	1.658	0.300	0.375	-3.288	0.000
40.	Irrigation building	0.425	0.042	0.059	-1.081	0.000	1.115	0.077	0.111	-3.288	0.000
41.	Construction	0.383	0.001	-0.017	-1.081	0.000	1.016	-0.022	-0.077	-3.288	0.000
42.	Trade	0.577	-0.034	-0.112	-1.081	0.000	1.555	-0.123	-0.396	-3.288	0.000
43.	Restaurant	-0.115	0.234	0.459	-1.081	-0.060	-0.558	0.673	1.343	-3.288	-0.670
44.	Hotel	-0.447	-0.317	-0.777	-1.081	0.016	-1.525	-0.946	-2.281	-3.288	-0.242
45.	Road and railway transport	0.558	0.059	0.092	-1.081	1.193	1.539	0.128	0.197	-3.288	3.275
46.	Air and water transport, and communication	0.367	-0.156	-0.323	-1.081	0.723	0.977	-0.498	-0.954	-3.288	1.951
47.	Services allied to transport	0.306	-0.284	-0.559	-1.081	0.483	0.823	-0.848	-1.654	-3.288	1.279
48.	Bank and insurance	0.745	0.023	0.032	-1.081	1.304	2.039	0.056	0.099	-3.288	3.583
49.	Agriculture services	0.825	0.126	0.292	-1.081	0.000	1.196	-0.097	-0.269	-3.288	0.000
50.	Real estate and business service	0.369	-0.115	-0.344	-1.081	0.400	0.983	-0.349	-0.976	-3.288	1.037
51.	General government and defense, education, health, community services	0.51	-0.040	-0.047	-1.081	0.395	1.346	-0.118	-0.135	-3.288	1.039
52.	Personal, household and other services	0.454	0.087	0.133	-1.081	1.011	1.186	0.214	0.339	-3.288	2.652

Note: p0com is output price of locally produced commodity

Source: PERTANINDO-F simulation results

The increase in *Coffee* output is also expected as a result of the lower input prices. Employment is projected to increase in the *Coffee* sector as a result of falling wages in all simulations, accompanied by capital increases due to the fall in capital's price.

When fertilizer subsidy is applied (SIM3 and SIM4), the size or magnitude of the fall in input costs is larger. Hence, employment increases are larger in SIM3 and SIM4 than in SIM1 and SIM2. The fertilizer subsidy causes domestic prices of *Coffee* to decline more due to lower production costs and push export levels higher. This explains why the increase in exports is larger in SIM3 and SIM4 than in SIM1 and SIM2.

### 3) *Paddy: the main staple food of the Indonesian people*

*Paddy* is classified within the *Food crops* industry which is the largest contributor to total agricultural output. *Food crops* accounted for about 49 per cent of total agricultural output. *Paddy*, on the other hand, contributes 18 per cent to the overall output of the agricultural sector and absorbs 27 per cent (11,498,391 workers) of the agricultural workforce, excluding workers in *Rice milling* (431,860 workers) (BPS, 2008). *Paddy* is processed by the *Rice milling* industry into rice which is a staple of Indonesian diet. Almost all *Paddy* requirements of the domestic market are met by domestic production. An insignificant amount (0.001 per cent) of *Paddy* demand is sourced from imports. *Paddy* requires more fertilizer than any other agricultural industry; in 2012 it utilized 6,511,146 tons of fertilizer or 61.8 per cent of the total fertilizer needs of the agricultural sector (Ministry of Agriculture Republic of Indonesia, 2013).

Table 5.5 shows that *Paddy* experiences a contraction in output in SIM1 and SIM2 simulations. This is mainly caused by substitution in demand from domestically-produced *Paddy* to imports which have become more price-competitive with the tariff cuts. Although *Paddy* accounts for almost nothing in terms of imports prior to tariff liberalization, the decline in import price makes it possible for domestic consumers to substitute towards the relatively cheaper *Paddy* imports. Imports of *Paddy* increase; the larger the tariff cut, the relatively cheaper the imports resulting in increased level of imports. Lower demand for the domestically-produced *Paddy* leads to its price falling. While this is happening, farmers adjust their behavior and

begin to switch planting other crops due to lower *Paddy* output prices. This further contracts output leading to lower exports, a fall in labor demand (i.e., fall in employment) and its wages and a fall in demand for capital and its rental price. These effects are similar to what occurs in SIM4.

Table 5.6 shows contrasting results for SIM3 and SIM4. When fertilizer subsidy is increased combined with a 30 per cent tariff reduction (SIM3), *Paddy* output increases by 0.141 per cent. However, when tariff protection is eliminated with the increase in fertilizer subsidy remaining (SIM4), *Paddy* output falls by 0.038 per cent. This result indicates that for *Paddy* output to increase, it requires a combination of some amount of tariff protection and some subsidy. A fertilizer subsidy alone is not adequate for the industry to expand its output as evident in SIM4.

*Paddy* output increases in SIM3 because domestic input costs fall with the fertilizer subsidy. *Paddy* requires 25 per cent of its inputs in the form of fertilizer. Lower input cost translates to a lower domestic *Paddy* price. The tariff cut also makes imports relatively cheap. Hence the combined effect of this simulation is for domestic output and imports to increase by some amounts depending on how much domestic consumers substitute their preferences for the domestic and imported output. The increase in imports in SIM3, however, is lesser than the increase in imports under the tariff liberalization only simulations (SIM1 and SIM2) as the fertilizer subsidy dilutes import demand. The combination of the fertilizer subsidy and the tariff cut drives the demand for domestic output and reduces the amount available for exports, hence the latter contracts. The output expansion in SIM3 is not adequate to make a positive impact on employment.

#### **5.4.3 Impact on employment by occupational types**

The impact of simulations on employment was undertaken decomposing labor by occupation:

- 1) Labor1 (agriculture worker),
- 2) Labor2 (production, transport equipment operators, manual and unskilled labor),
- 3) Labor3 (administration, sales, service),
- 4) Labor4 (leadership, management, military, professional and technician).

From Tables 5.5 and 5.6 agricultural industries are projected to experience employment increases due to tariff reduction and fertilizer subsidies. These industries include *Maize, Cassava, Sweet potatoes, Sugarcane, Coconut, Palm oil, Tobacco, Coffee, Tea, Clove, Cocoa, Cashew fruit, Other estate crops, and Poultry*. Agricultural industries which are projected to experience a decline in employment are *Paddy, Groundnut, Soybean, Vegetables, Fruits, Other food crops, Rubber, Livestock, Fresh milk, Other livestock, and Forestry and hunting*.

From the results of SIM1 and SIM2 in Table 5.7, the agricultural industries which experience a consistent effect on employment by labor types and total employment include *Paddy, Groundnut, Soybean, Vegetables, Fruits, Other food crops, Rubber, Coffee, Clove, Cocoa, Cashew fruit, Livestock, Fresh Milk, and Other livestock raising*. From the results of SIM3 and SIM4 shown in Table 5.8, the agricultural industries which experience a consistent effect on employment by labor types and total employment are *Paddy, Soybean, Vegetables, Fruits, Other food crops, Rubber, Coffee, Clove, Cocoa, Cashew fruit, Livestock, Fresh Milk, and Other livestock raising*.

In all simulations, it is worth noting that the effect on total employment follows the same effect exerted on the labor type which accounts for most of the labor force in that industry. Labor1 - unskilled workers - accounts for the highest share of the agricultural workforce. Hence, the impact on total employment for an agricultural industry is determined by its Labor1 effects. In some Manufacturing industries such as *Rice milling, Flour, and Sugar and Services allied to transport* where Labor2 is the dominant the labor type, the impact on total employment for these industries is determined by changes that occur in Labor2. In industries such as *Irrigation building, Construction, and Hotel*, the direction of total employment changes are determined by changes in Labor3 which accounts for the highest share of the workforce.

Table 5.7 Impact of tariff reduction and fertilizer subsidy increase on employment according to occupation type: SIM1 and SIM2 (in percentage)

No.	Sectors	SIM1				SIM2			
		Labor1	Labor2	Labor3	Labor4	Labor1	Labor2	Labor3	Labor4
1.	Paddy	-0.072	-1.972	-1.905	-1.917	-0.241	-6.573	-6.351	-6.390
2.	Maize	0.562	-1.338	-1.271	-1.283	1.873	-4.460	-4.237	-4.277
3.	Cassava	1.767	-0.133	-0.066	-0.078	5.889	-0.444	-0.221	-0.261
4.	Sweet potatoes	0.902	-0.998	-0.931	-0.943	3.007	-3.326	-3.103	-3.143
5.	Groundnut	-0.073	-1.972	-1.906	-1.917	-0.242	-6.575	-6.352	-6.391
6.	Soybean	-16.343	-18.243	-18.176	-18.188	-54.478	-60.811	-60.588	-60.627
7.	Vegetables	-1.553	-3.453	-3.386	-3.398	-5.176	-11.509	-11.286	-11.326
8.	Fruits	-1.800	-3.700	-3.633	-3.645	-6.001	-12.333	-12.111	-12.150
9.	Other food crops	-9.754	-11.653	-11.586	-11.598	-32.512	-38.844	-38.622	-38.661
10.	Rubber	-0.287	-2.187	-2.120	-2.132	-0.958	-7.290	-7.068	-7.107
11.	Sugarcane	1.813	-0.087	-0.020	-0.032	6.042	-0.290	-0.067	-0.107
12.	Coconut	1.475	-0.425	-0.358	-0.370	4.917	-1.416	-1.193	-1.232
13.	Palm oil	1.011	-0.889	-0.822	-0.834	3.368	-2.964	-2.741	-2.781
14.	Tobacco	1.518	-0.382	-0.315	-0.327	5.059	-1.274	-1.051	-1.091
15.	Coffee	2.648	0.748	0.815	0.803	8.826	2.493	2.716	2.677
16.	Tea	0.920	-0.980	-0.913	-0.925	3.066	-3.267	-3.044	-3.084
17.	Clove	2.030	0.130	0.197	0.185	6.768	0.435	0.658	0.618
18.	Cocoa	2.364	0.464	0.531	0.519	7.880	1.548	1.770	1.731
19.	Cashew fruit	2.669	0.770	0.837	0.825	8.898	2.566	2.788	2.749
20.	Other estate crops	1.588	-0.312	-0.245	-0.257	5.292	-1.040	-0.818	-0.857
21.	Livestock	-1.873	-3.772	-3.705	-3.717	-6.242	-12.574	-12.352	-12.391
22.	Fresh Milk	-6.503	-8.403	-8.336	-8.348	-21.678	-28.010	-27.788	-27.827
23.	Poultry	0.543	-1.357	-1.290	-1.302	1.810	-4.523	-4.300	-4.340
24.	Other livestock raising	-1.541	-3.441	-3.374	-3.386	-5.138	-11.471	-11.248	-11.287
25.	Forestry and hunting	0.263	-1.637	-1.570	-1.582	0.876	-5.457	-5.234	-5.274
26.	Fishery	1.563	-0.337	-0.270	-0.282	5.209	-1.123	-0.900	-0.940
27.	Mining	1.396	-0.504	-0.437	-0.449	4.652	-1.681	-1.458	-1.497
28.	Other mining and quarrying	1.553	-0.347	-0.280	-0.292	5.177	-1.156	-0.933	-0.973

Table 5.7 Impact of tariff reduction and fertilizer subsidy increase on employment according to occupation type: SIM1 and SIM2 (in percentage) (continued)

No.	Sectors	SIM1				SIM2			
		Labor1	Labor2	Labor3	Labor4	Labor1	Labor2	Labor3	Labor4
29.	Rice milling	1.710	-0.189	-0.123	-0.134	5.701	-0.631	-0.409	-0.448
30.	Flour	8.386	6.486	6.553	6.541	27.954	21.621	21.844	21.804
31.	Sugar	3.652	1.752	1.819	1.807	12.172	5.840	6.062	6.023
32.	Other food, beverages, and tobacco	3.296	1.396	1.463	1.451	10.987	4.654	4.877	4.838
33.	Textile, wearing apparel and leather	3.753	1.853	1.920	1.908	12.510	6.177	6.400	6.360
34.	Wood products	1.971	0.071	0.138	0.126	6.570	0.237	0.460	0.420
35.	Paper, paper products, transport equipment, machinery and iron	1.286	-0.614	-0.547	-0.559	4.286	-2.046	-1.824	-1.863
36.	Fertilizer	0.099	-1.801	-1.734	-1.746	0.328	-6.004	-5.781	-5.821
37.	Pesticide	0.991	-0.909	-0.842	-0.854	3.302	-3.031	-2.808	-2.847
38.	Other chemical and cement	1.444	-0.456	-0.389	-0.401	4.814	-1.519	-1.296	-1.336
39.	Electricity, Gas and Water	1.986	0.086	0.153	0.141	6.620	0.288	0.511	0.471
40.	Irrigation building	1.859	-0.040	0.026	0.015	6.198	-0.135	0.088	0.048
41.	Construction	1.811	-0.088	-0.021	-0.033	6.038	-0.294	-0.072	-0.111
42.	Trade	1.747	-0.153	-0.086	-0.098	5.822	-0.510	-0.288	-0.327
43.	Restaurant	2.222	0.323	0.390	0.378	7.408	1.076	1.298	1.259
44.	Hotel	1.192	-0.707	-0.641	-0.652	3.975	-2.358	-2.135	-2.175
45.	Road and railway transport	1.914	0.014	0.081	0.069	6.378	0.046	0.269	0.229
46.	Air and water transport, and communication	1.573	-0.327	-0.260	-0.272	5.243	-1.089	-0.867	-0.906
47.	Services allied to transport	1.399	-0.501	-0.434	-0.446	4.663	-1.670	-1.447	-1.487
48.	Bank and insurance	1.866	-0.034	0.033	0.021	6.219	-0.114	0.109	0.069
49.	Agriculture services	1.597	-0.303	-0.236	-0.248	5.323	-1.010	-0.787	-0.827
50.	Real estate and business service	1.566	-0.334	-0.267	-0.279	5.220	-1.112	-0.889	-0.929
51.	General government and defense, education, health, community services	1.806	-0.094	-0.027	-0.039	6.019	-0.314	-0.091	-0.130
52.	Personal, household and other services	1.932	0.032	0.099	0.087	6.439	0.106	0.329	0.290

Source: PERTANINDO-F simulation results

Table 5.8 Impact on employment of a 10% increase in fertilizer subsidy plus a 30% decrease in agricultural tariffs (SIM3) and a 10% increase in fertilizer subsidy plus elimination of agricultural tariffs (SIM4) (in percentage changes)

No.	Sectors	SIM3				SIM4			
		Labor1	Labor2	Labor3	Labor4	Labor1	Labor2	Labor3	Labor4
1.	Paddy	-0.346	-2.422	-2.406	-2.427	-0.515	-7.024	-6.852	-6.900
2.	Maize	0.418	-1.658	-1.642	-1.662	1.729	-4.780	-4.608	-4.656
3.	Cassava	1.844	-0.231	-0.215	-0.236	5.966	-0.542	-0.370	-0.418
4.	Sweet potatoes	1.070	-1.006	-0.990	-1.011	3.175	-3.334	-3.162	-3.210
5.	Groundnut	0.089	-1.987	-1.971	-1.992	-0.081	-6.589	-6.417	-6.466
6.	Soybean	-16.073	-18.149	-18.133	-18.153	-54.207	-60.716	-60.544	-60.592
7.	Vegetables	-1.460	-3.535	-3.519	-3.540	-5.083	-11.592	-11.420	-11.468
8.	Fruits	-1.648	-3.724	-3.708	-3.729	-5.849	-12.357	-12.185	-12.234
9.	Other food crops	-9.523	-11.599	-11.583	-11.604	-32.282	-38.790	-38.618	-38.667
10.	Rubber	-0.717	-2.793	-2.777	-2.798	-1.388	-7.896	-7.724	-7.773
11.	Sugarcane	1.810	-0.265	-0.249	-0.270	6.040	-0.469	-0.297	-0.345
12.	Coconut	1.460	-0.615	-0.599	-0.620	4.902	-1.606	-1.434	-1.483
13.	Palm oil	0.548	-1.528	-1.512	-1.532	2.906	-3.603	-3.431	-3.479
14.	Tobacco	0.117	-1.959	-1.943	-1.963	3.658	-2.851	-2.679	-2.727
15.	Coffee	3.442	1.366	1.382	1.361	9.620	3.111	3.283	3.235
16.	Tea	0.772	-1.303	-1.287	-1.308	2.918	-3.590	-3.418	-3.467
17.	Clove	2.064	-0.012	0.004	-0.016	6.801	0.293	0.465	0.416
18.	Cocoa	3.241	1.166	1.182	1.161	8.758	2.249	2.421	2.373
19.	Cashew fruit	3.050	0.974	0.990	0.970	9.279	2.770	2.942	2.894
20.	Other estate crops	2.356	0.280	0.296	0.275	6.060	-0.448	-0.276	-0.325
21.	Livestock	-1.695	-3.771	-3.755	-3.775	-6.064	-12.573	-12.401	-12.449
22.	Fresh Milk	-6.344	-8.420	-8.403	-8.424	-21.518	-28.027	-27.855	-27.903
23.	Poultry	0.664	-1.412	-1.396	-1.417	1.931	-4.578	-4.406	-4.454
24.	Other livestock raising	-1.340	-3.416	-3.400	-3.421	-4.937	-11.446	-11.274	-11.322
25.	Forestry and hunting	0.352	-1.724	-1.708	-1.728	0.965	-5.544	-5.372	-5.420
26.	Fishery	1.753	-0.323	-0.307	-0.327	5.400	-1.109	-0.937	-0.985
27.	Mining	1.493	-0.583	-0.567	-0.587	4.749	-1.759	-1.587	-1.636
28.	Other mining and quarrying	1.701	-0.374	-0.358	-0.379	5.325	-1.183	-1.012	-1.060

Table 5.8 Impact on employment of a 10% increase in fertilizer subsidy plus a 30% decrease in agricultural tariffs (SIM3) and a 10% increase in fertilizer subsidy plus elimination of agricultural tariffs (SIM4) (in percentage changes) (continued)

No.	Sectors	SIM3				SIM4			
		Labor1	Labor2	Labor3	Labor4	Labor1	Labor2	Labor3	Labor4
29.	Rice milling	2.285	0.209	0.225	0.204	6.276	-0.233	-0.061	-0.109
30.	Flour	8.678	6.603	6.619	6.598	28.246	21.737	21.909	21.861
31.	Sugar	4.273	2.198	2.214	2.193	12.794	6.285	6.457	6.409
32.	Other food, beverages, and tobacco	3.630	1.554	1.570	1.549	11.321	4.812	4.984	4.936
33.	Textile, wearing apparel and leather	3.764	1.688	1.704	1.684	12.521	6.012	6.184	6.136
34.	Wood products	2.029	-0.046	-0.030	-0.051	6.628	0.120	0.292	0.243
35.	Paper, paper products, transport equipment, machinery and iron	1.350	-0.726	-0.710	-0.731	4.350	-2.159	-1.987	-2.035
36.	Fertilizer	4.505	2.429	2.445	2.424	4.735	-1.774	-1.602	-1.650
37.	Pesticide	1.388	-0.688	-0.672	-0.692	3.699	-2.809	-2.637	-2.686
38.	Other chemical and cement	1.533	-0.543	-0.527	-0.547	4.903	-1.606	-1.434	-1.482
39.	Electricity, Gas and Water	2.174	0.099	0.115	0.094	6.809	0.300	0.472	0.424
40.	Irrigation building	2.121	0.046	0.062	0.041	6.460	-0.049	0.123	0.075
41.	Construction	2.045	-0.030	-0.014	-0.035	6.272	-0.237	-0.065	-0.113
42.	Trade	1.958	-0.118	-0.101	-0.122	6.034	-0.475	-0.303	-0.351
43.	Restaurant	2.532	0.456	0.472	0.451	7.718	1.209	1.381	1.333
44.	Hotel	1.286	-0.790	-0.774	-0.794	4.068	-2.440	-2.268	-2.317
45.	Road and railway transport	2.162	0.086	0.102	0.081	6.627	0.118	0.290	0.242
46.	Air and water transport, and communication	1.750	-0.326	-0.310	-0.330	5.420	-1.088	-0.916	-0.965
47.	Services allied to transport	1.511	-0.564	-0.548	-0.569	4.775	-1.733	-1.561	-1.610
48.	Bank and insurance	2.095	0.019	0.035	0.015	6.448	-0.061	0.111	0.063
49.	Agriculture services	2.354	0.278	0.295	0.274	6.080	-0.429	-0.257	-0.305
50.	Real estate and business service	1.718	-0.357	-0.341	-0.362	5.373	-1.136	-0.964	-1.012
51.	General government and defense, education, health, community services	2.026	-0.050	-0.034	-0.055	6.239	-0.270	-0.098	-0.146
52.	Personal, household and other services	2.206	0.130	0.146	0.125	6.713	0.204	0.376	0.328

Source: PERTANINDO-F simulation results

#### 5.4.4 *Impact on households' income*

Households receive income from three sources: 1) labor income in the form of wages and salaries, 2) capital income such as interest, dividends and other fringe benefits, and 3) the acceptance of transfers (BPS, 2007a). Tariff and subsidy policies affect households through the direct effects on their incomes. As the impact of the economic policy occurs, households, as the owner of primary factors receive more income if the price of the primary factor they own increases. In contrast, their incomes fall if the price of their primary factor falls. Since each household controls a different combination of primary factors, the effect of economic policies on their income also varies.

Of the total households, Rural2 is the largest household accounting for the largest share in terms of population and number of households. Rural1 is the second largest, and Rural4 is the smallest household (Table 5.9).

Table 5.9 Share of household in population and total number 2005 (in percentage)

Households	Population	Number
Rural1(Agricultural Employees)	15.18	14.20
Rural2(Farmers, Land Owner 0 - 0.5 Ha)	18.93	20.53
Rural3(Farmers, Land Owner 0.501 - 1 Ha)	6.39	5.50
Rural4(Farmers, Land Owner >1 Ha)	4.84	4.58
Rural5(Lower Level Rural Non Agricultural)	14.59	14.72
Rural6 (Rural, Non-Labor Force and Unclassified Household)	5.13	6.09
Rural7(Higher Level Rural Non-Agricultural)	6.46	6.17
Urban1(Lower Level Urban Non-Agricultural)	14.82	14.10
Urban2(Urban, Non-Labor Force and Unclassified Household)	5.14	5.96
Urban3 (Higher Level Urban Non-Agricultural)	8.52	8.15

Source: BPS (2007)

Table 5.10 shows that the policies of tariff reduction, SIM1 and SIM2, and the combination of tariff cuts and the fertilizer subsidy increases, SIM3 and SIM4, exert a relatively negligible effect on the distribution of household's nominal income. Several households experience a decline in income and some other households' income is projected to increase. A comparison of the simulation results shows that SIM1 and SIM2 share the same pattern on how income is affected for each household type. Also larger tariff cuts are shown as having a greater effect on household income. In general, an increase in the fertilizer subsidy is projected to push the income of all household categories up. The fertilizer subsidy increase seems

to quite effectively counterbalance the fall in nominal income which is caused by tariff cuts alone.

The incomes of the Rural1, Rural2, Rural3, Rural4, and Urban2 households are projected to decline in all policy simulations. As a result of the tariff reductions in SIM1 and SIM2, Rural6's nominal income is projected to decline; however as the combination of tariff cuts and the fertilizer subsidy increase in SIM3 and SIM4 causes Rural6's income to increase. Meanwhile, Rural5, Rural7, Urban1, and Urban3 are shown to receive benefits from all of the policy changes.

Looking into more detail for each household whose nominal income decreases as all policy changes take place, the tariff reduction is projected to lower the level of income of all agricultural households: Rural1, Rural2, Rural3, and Rural4. The largest decrease in income is experienced by the agricultural employee in Rural1, shrinking by 0.729 per cent in SIM1 and 2.429 per cent in SIM2. Rural1 relies most on labor as a source of income, which is the most reason why this household suffered large decreases in income. Tariff cuts are projected to lower the price of labor in the agricultural sector to -3.057 per cent in SIM1, -10.188 per cent in SIM2, -3.279 per cent in SIM3 and -10.411 per cent in SIM4, reducing the household income of Rural1 most, as compared to reductions in other households.

Table 5.10 Impact of tariff reduction and the fertilizer subsidy increase on nominal household income (in percentage changes)

Households	SIM1	SIM2	SIM3	SIM4
Rural1(Agricultural Employees)	-0.729	-2.429	-0.690	-2.391
Rural2(Farmers, Land Owner 0 - 0.5 Ha)	-0.187	-0.625	-0.099	-0.536
Rural3(Farmers, Land Owner 0.501 - 1 Ha)	-0.293	-0.976	-0.215	-0.899
Rural4 (Farmers, Land Owner >1 Ha)	-0.335	-1.115	-0.255	-1.036
Rural5(Lower Level Rural Non Agricultural)	0.255	0.852	0.389	0.986
Rural6(Rural, Non-Labor Force and Unclassified Household)	-0.004	-0.014	0.103	0.093
Rural7(Higher Level Rural Non-Agricultural)	0.157	0.524	0.286	0.652
Urban1 (Lower Level Urban Non-Agricultural)	0.207	0.689	0.329	0.811
Urban2(Urban, Non-Labor Force and Unclassified Household)	-0.165	-0.551	-0.065	-0.450
Urban3(Higher Level Urban Non-Agricultural)	0.147	0.491	0.270	0.614

Source: PERTANINDO-F simulation results

The nominal income of each agricultural household of Rural2, Rural3 and Rural4, is affected less than the income of Rural1. This indicates that the land-owning farmers, despite pressure on their nominal income, are more able to adjust to

the contraction of domestic output due to tariff reduction. Assuming a fixed quantity of land owned by these households, it is still possible for land-owning farmers to divert the function of their land in anticipation of the impact of tariff reductions on their income. However, the decline of income is projected to be greater for households with larger amounts of land, due to the lower prices of inputs including land, in most agricultural sectors.

When combined with the policy of tariff cuts in SIM3 and SIM4, fertilizer subsidies can stabilize the input costs, thus the domestic output prices do not fall too far, and hold down the income of the four household types.

For Rural6, Non-Labor Force and Unclassified Household, the decline in income due to tariff cuts is smaller than in agricultural households. The Rural6 income is indirectly affected by income levels in other rural households and as this household is a non-labor force, it is the most likely to have a fixed income. The increase of fertilizer subsidy raises Rural6's income, and this income still experiences positive changes when the subsidy is combined with tariff cuts in SIM3 and SIM4.

Although smaller in rural households, the decline in income was also experienced by Urban2, Non-Labor Force and Unclassified Household, as a part of a wide effect of the tariff decrease in agricultural commodities. These households are likely to have jobs related directly and indirectly to agriculture and rural economic activity.

Non-agricultural households with both lower and higher income levels benefited from the policy of tariff reduction and fertilizer subsidy increase. Based on the type of employment, it seems that these households benefit from the increase in output from non-agricultural sectors that occurs due to tariff reduction and the increase of the fertilizer subsidy, particularly the upper-class households, Rural7 and Urban3, as the owners of capital. The increase in incomes received by households in Rural5 and Urban1 indicates that the benefits from policy changes are more prevalent in goods distribution and trade.

A variable to measure the purchasing power of households is real income. Changes in this variable reflect changes in the level of household welfare. As shown in Table 5.11, Rural1 is the only household who experiences a decline in real income in all simulations. The decline in prices due to the tariff cuts and the fertilizer subsidy diminishes the welfare of households of agricultural labor. The fertilizer subsidy

does not positively affect the real income of this household type, because Rural1 are landless.

Other households are projected to gain in real income from all policy changes in SIM1, SIM2, SIM3, and SIM4. This indicates that the level of welfare increases in almost all households. The most positive benefit occurs to urban households, Urban1 and Urban3, and Rural7, which are the wealthiest sections of society. There are two explanations for the positive changes in household welfare: 1) the nominal income of several households increases, and 2) in general, the tariff cut and fertilizer subsidy is projected to reduce prices so some households can anticipate the decline in nominal income.

Table 5.11 Impact of tariff reduction and fertilizer subsidy increase on real household income (in percentage changes)

Households	SIM1	SIM2	SIM3	SIM4
Rural1(Agricultural Employees)	-0.240	-0.800	-0.196	-0.757
Rural2(Farmers, Land Owner 0 - 0.5 Ha)	0.301	1.004	0.395	1.098
Rural3(Farmers, Land Owner 0.501 - 1 Ha)	0.196	0.653	0.279	0.736
Rural4 (Farmers, Land Owner >1 Ha)	0.154	0.514	0.239	0.599
Rural5 (Lower Level Rural Non Agricultural)	0.744	2.481	0.883	2.620
Rural6 (Rural, Non-Labor Force and Unclassified Household)	0.485	1.615	0.597	1.727
Rural7 (Higher Level Rural Non-Agricultural)	0.646	2.153	0.779	2.287
Urban1(Lower Level Urban Non-Agricultural)	0.695	2.318	0.823	2.445
Urban2 (Urban, Non-Labor Force and Unclassified Household)	0.323	1.078	0.429	1.184
Urban3 (Higher Level Urban Non-Agricultural)	0.636	2.121	0.764	2.248

Source: PERTANINDO-F simulation results

## 5.5 Conclusion

This chapter analyzed the potential economy-wide impacts of tariff and subsidy policies which are a component of Indonesia's Agricultural Revitalization Program. The determination of agricultural tariffs and the subsidy on fertilizer aimed to protect the domestic industries, especially agriculture. However, as a consequence of commitments to international trade agreements, Indonesia has had to open its agricultural market to other countries by reducing import tariffs gradually. As a form of domestic support to producers, subsidies are still allowed to be provided by WTO members under the special rules of the Uruguay Round Agreement. A subsidy which creates minimal market distortion and which considers the social aspects of domestic

politics can still be provided by the government of the country concerned. In addition to Indonesia's commitment to international trade agreements, fertilizer subsidy itself is a policy dilemma for Indonesia, because it burdens the government's budget. Providing that the subsidy is gradually reduced for the realization of fiscal sustainability, together with tariff reduction, such subsidies may strengthen the industrial structure in the long term.

The impact of a fertilizer subsidy remains the priority of the Indonesian government particularly in its annual budget considerations, and is therefore the policy scenario simulated in this study. In a package of protection policies for agricultural producers, fertilizer subsidies are combined with a tariff reduction policy. The amount of the subsidy increase in the simulations is 10 per cent, due to fiscal sustainability considerations.

To simulate the policies, the PERTANINDO-F model was developed and employed. The implementation period adopted was until 2020 to coincide with the various international trade agreements and targets which were ratified by Indonesia. Hence, the relevant policy shocks are simulated on the Indonesian economy until 2020. The policy scenarios which are considered in this chapter include: 1) the decrease in tariffs on each agricultural commodity by 30 per cent, 2) the decrease in tariffs on each agricultural commodities by 100 per cent, 3) a combination policy of a 30 per cent agricultural tariff reduction and a 10 per cent increase of fertilizer subsidy, and 4) a combination policy of a 100 per cent agricultural tariff reduction and a 10 per cent increase of fertilizer subsidy.

Based on the impacts of the policy changes on the Indonesian macro-economy, it is indicated that in 2020 that the agricultural tariff cuts alone, as well as in combination with an increase in the fertilizer subsidy, are projected to increase GDP, real consumption, industry employment, wage levels, and stimulate exports and imports. These policies, as well as meeting the relevant targets for inflation, appear to be suitable for the macro-economy of Indonesia.

At the industry level, the impacts on output, employment, exports, and imports differ by industry. This indicates that the government needs to be careful when easing tariffs on certain commodities, such as *Paddy*. The large amount of labor that is employed in this sector and its role as a staple food provider means that this industry is a critical industry for economic and social stability. Besides *Paddy*, other agricultural industries such as *Groundnut*, *Soybean*, *Vegetables*, *Fruit*, *Other*

*food crops, Rubber, Livestock, Fresh milk, Other livestock raising, and Forestry and hunting*, also experience a contraction in output and employment in each of the simulated scenarios.

Looking at the impacts by composition of labor in each industry, it is known that Labor1 determines the direction and magnitude of total employment in each industry, due to the large share of Labor1 in each agricultural industry. Other labor types – except Labor1 – are projected to decline in general, even as the agricultural sector experiences an increase in employment. This occurs because of the increase in the price of labor due to tariff and subsidy policies.

In general, agricultural tariff cuts and the fertilizer subsidy increase have a positive impact on almost all households' real income, due to the decline in prices. However, these results should be addressed with caution, because in nominal terms the income of households, especially the vast majority of households in rural areas are reduced and households with the lowest income levels experience a negative impact not only in nominal income, but also in real income. Households with lower income levels are highly vulnerable to domestic output contractions. In other words, the welfare of these households deteriorates with tariff cuts and measures have to be put in place to cushion this effect.

## **Chapter 6**

### **The impact of agricultural productivity on the Indonesian economy using PERTANINDO-F**

#### **6.1 Introduction**

Indonesian government economic programs have placed agricultural productivity as a priority, along with business efficiency, conversion of land to agricultural land, infrastructure development and provision of agricultural credit and investment in agricultural research to revitalize the agricultural sector (Republik Indonesia, 2005a). Through the RPJMN 2004-2009, the government partly implemented policies that would improve agricultural productivity by targeting factors which affect it: intensification of land use, increase in investment, improvement in agricultural technology, irrigation systems and other infrastructure, development of farmers' training programs and use of quality seeds, crop varieties and fertilizers. These policies continued to be implemented in the RPJMN2010–2014 as there were continuing concerns regarding food self-sufficiency that relied on domestic production. RPJMN 2010–2014 also recognized the constraints and limitations in increasing the production capacity in agricultural commodities (Republik Indonesia, 2010a).

The World Bank (2010b) indicates that to revitalize the agricultural sector, Indonesia has to increase productivity by prioritizing investments that improve the quality and management of irrigation systems. Other policy responses include accelerating the certification of agricultural land to increase land tenure security and improve farmers' ability to obtain credit and create investments in productive technologies; supporting diversification through the improvement of agricultural services, such as research and development, and counseling, and supporting the involvement of small hold farmers in high-value commodities which can be attractive to domestic and export markets. Since the 1990s, Indonesia's agricultural sector experienced stagnation and low productivity due to reduced investment from the public and private sectors. In line with the World Bank's view, Oberman et. al. (2013) also emphasize that increasing agricultural productivity in Indonesia can be carried out by increasing the investment in large projects, particularly for

infrastructure improvements such as roads, cold-supply chains, and irrigation systems. Education and training are also needed in improving the productivity of farmers and fishermen.

This chapter analyzes the impact of agricultural productivity increase on the Indonesian economy and more specifically on agricultural industries in terms of output, trade, employment, and household welfare. Section 6.2 reviews the literature relating to effects of agricultural productivity on the economy. Section 6.3 discusses the trends in Indonesia's agricultural productivity and reviews the policies that affect agricultural productivity. Scenarios are generated and simulated using PERTANINDO-F. Section 6.4 analyzes the results of the simulation and Section 6.5 provides the chapter's conclusions.

## **6.2 Agricultural productivity and poverty alleviation**

A number of empirical studies (Mellor, 1999; Irz et al., 2001; Thirtle, 2003; UK Department for International Development, 2004; World Bank, 2007; Schneider and Gugerty, 2011) have supported the idea that agricultural productivity could affect poverty reduction through its impact on real household incomes, directly and indirectly. Some of these studies include. Directly, productivity affects poverty through household real incomes, and indirectly through employment creation, rural non-farm multiplier effects, and food price effects. These studies support the theory that if the real wage increases and non-agricultural industry in rural areas grows, real household income increases, and poverty declines.

Mellor (1999) examines agricultural productivity linkages to non-agricultural growth. His study concludes that real wages rise consistently with agricultural growth, which explains employment multipliers along with agricultural growth. The increase in real wages creates an incentive to raise labor productivity; much of the employment effect is likely to come from the non-agricultural sector. Thirtle et al. (2003) claims that productivity growth can cause a wide range of direct and indirect effects that lead to poverty alleviation. The World Bank (2007) asserts that one way to eradicate poverty is through agricultural development and that agricultural productivity in developing countries is a major factor in driving agricultural success. Agricultural development can be achieved by designing policies and decision-

making processes suited to each country's economic and social conditions, mobilizing political support, and improving the governance of agriculture.

Irz et al. (2001) attempts to explain how important is agricultural growth to poverty reduction, based on theoretical reasons and a cross-country estimation of the links between agricultural yield per unit area and measures of poverty. Irz et al. deduce that there is a significant relationship between agricultural production and poverty in many circumstances. In particular, agricultural growth can generate employment, encourage rural economic growth through direct and indirect linkages with agricultural activity, and reduce unemployment, resulting in less poverty.

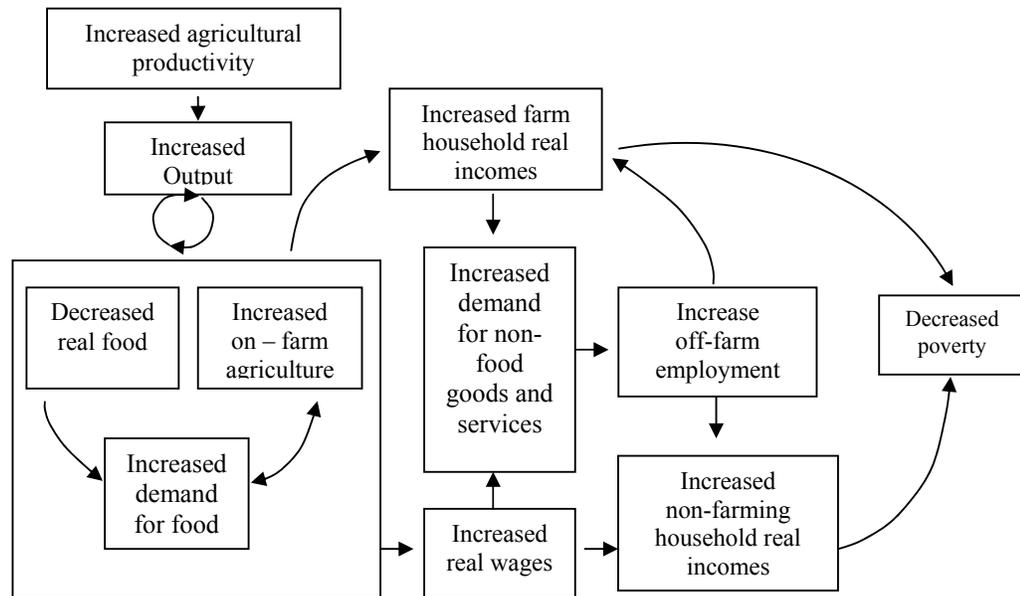
The UK Department for International Development (2004) emphasizes the impact of improvement of agricultural productivity in poverty reduction through four "transmission mechanisms". First, the increase in productivity directly enhances farmers' income and provides rural employment. Second, the increase in production generates cheap food for the poor in urban and rural areas. Third, the growth of the agricultural sector has a multiplier effect on the growth of non-agricultural sectors. Fourth, agriculture plays a role in stimulating and maintaining structural transformation as labor and growth shift from agriculture to manufacturing and services.

Schneider and Gugerty (2011) suggest that the impact of an increase in output and productivity towards poverty reduction are different. According to their study, in some cases, the increase of output and the increase of productivity simultaneously have similar impacts, while in other cases both of the increases can have opposite continuing impacts. A new technology, for example, is likely to have dissimilar effects and different consequences for output, profits, and employment. If the application of technology can save the use of inputs, then the production cost will decrease, increase profit, but the output will not be affected and employment will fall. If the technology can improve outcomes, outputs and most likely employment will increase, and profits should increase. Alternatively, if technology can increase the productivity of labor, the impact on profit and output is not clear. A technology that allows for the expansion of cultivation may increase output, employment, and profits, but perhaps with lower yields. Finally, the increase in productivity does not lead to poverty reduction if the reduction in output prices exceeds the benefits of productivity increase (Thirtle et al. 2003). Complex direct and indirect links with the

general equilibrium effects support the need for discussion of the relationship between agricultural productivity and poverty reduction.

Schneider and Gugerty illustrate the complexity of the pathway between increasing agricultural productivity and poverty alleviation in a semi-closed rural economy in which the food output is at least partially tradable (Figure 6.1).

Figure 6.1 Pathways to reduce poverty through increased agricultural productivity



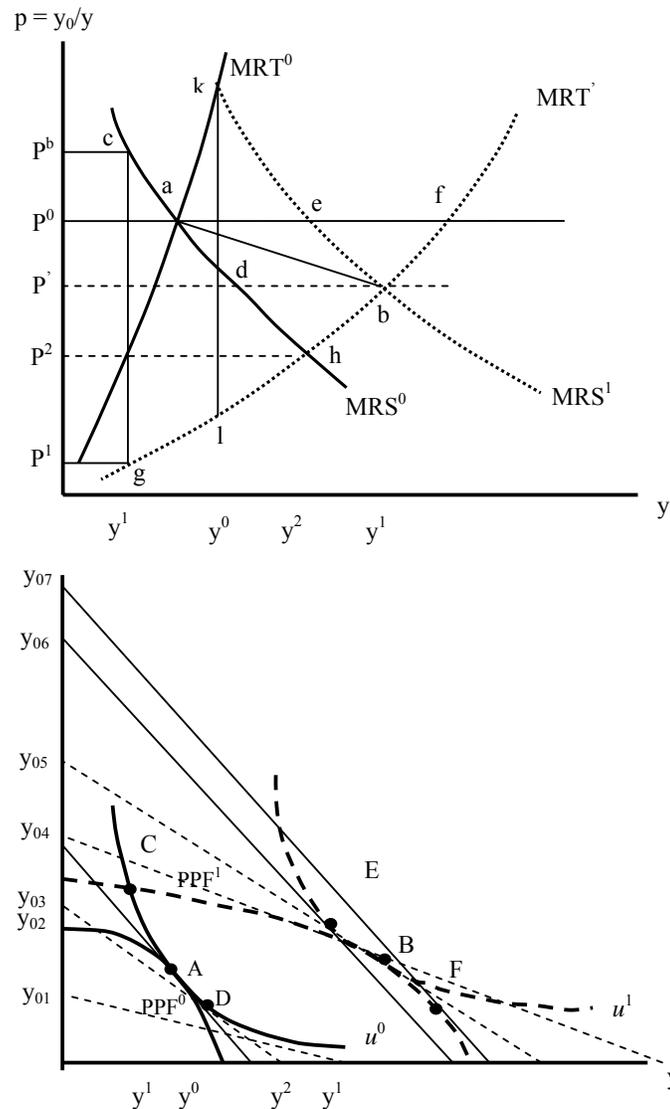
Source: Schneider and Gugerty (2011), p.61

The ownership of endowments, particularly land, constitutes the most significant factor which determines the ability of households to effectively access and use technology to increase productivity. Poor households encounter barriers to adopt technology and access the market. In short, the importance of productivity in the agricultural sector and poverty reduction is complex and depends on a variety of contextual factors including the initial distribution of income, asset endowments, network of market power, and level and nature of participation of the poor in the agricultural sector (Schneider and Gugerty, 2011)

Based on Fulginiti and Perrin (2005), productivity growth is traditionally defined as the difference between the growth rate of output produced with the inputs used. This difference reflects a change in technology that can produce more output using a given input. Changes in productivity indicate changes in technology of

production, which are typically measured using econometric methods as well as index numbers. The idea underlying these measurements is that productivity growth occurs when the cost of production of a given output decreases or if benefits increase at certain prices.

Figure 6.2 Welfare effects of technological change with no price distortions



Source: Fulginiti and Perrin (2005). p.135

Figure 6.2 illustrates how changes in agricultural productivity affect welfare with no price distortions. The change of production possibility frontier from  $PPF^0$  to  $PPF^1$  reflects technology change. The bottom panel shows the numeraire good  $y_0$  on the vertical axis, the other good  $y$  on horizontal axis, an initial technology and initial

welfare represented by the PPF<sup>0</sup> and  $u^0$ , and a subsequent technology and welfare level is represented by PPF<sup>1</sup> and  $u^1$ . On the upper panel the MRS curve, Hicksian demand schedules, are slopes of each corresponding indifference curves in the bottom panel, and MRT curves, supply schedules, are slopes of the production possibility curves. Initial equilibrium at point A in the bottom panel relates to point a on the top panel, as well as a new equilibrium B in the bottom panel corresponding to point b on the top panel. Technology improvement in productivity increases consumer utility or welfare on the equilibrium of the quantity of goods growing higher and the price dropping lower.

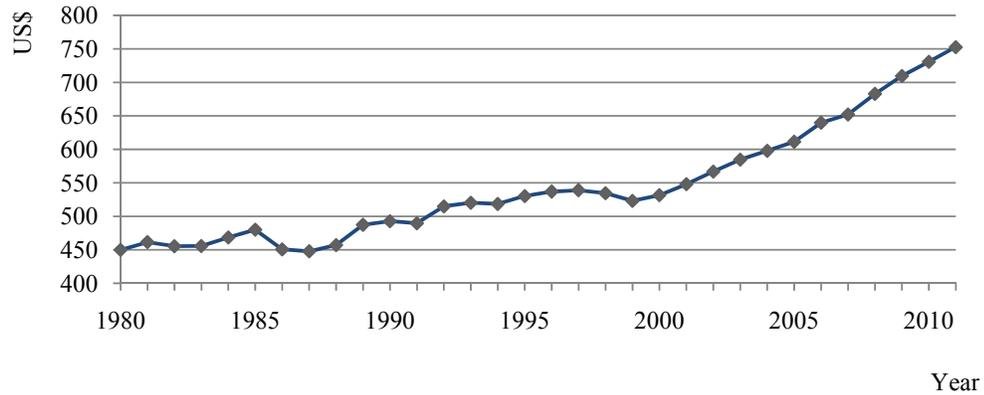
### **6.3 Indonesian agricultural productivity policy scenarios**

Sustaining productivity growth in agriculture continues to be critical in achieving food security, poverty reduction and broad-based economic growth. In most developing countries, including Indonesia, productivity in the context of agricultural development and food security is a primary concern because of very limited arable land (Zepeda, 2001). In the case of Indonesia, Krisnamurthi (2006) states that the limited areas of land tenure and the very large amount of labor relative to the availability of land have been the causes of low agricultural productivity.

In terms of labor productivity, the World Bank (2013) notes the general increasing trend in agricultural value added per worker (in constant terms), between 1980-2010 (Figure 6.3) but the rate of growth has been fluctuating (Figure 6.4). Between 2001–2010 agricultural labor productivity growth stagnated in the range of 2.0–2.5 per cent. Fuglie (2008) comprehensively analyzes the trends in total factor productivity (TFP) of 173 countries, including Indonesia. Figure 6.5 shows the comparative performance of TFP growth in selected Asian countries for the period 1991–2006. Indonesia's average TFP growth is less than 1.5 per cent per year, and this is considerably below the performance of other individual countries and the region as a whole.

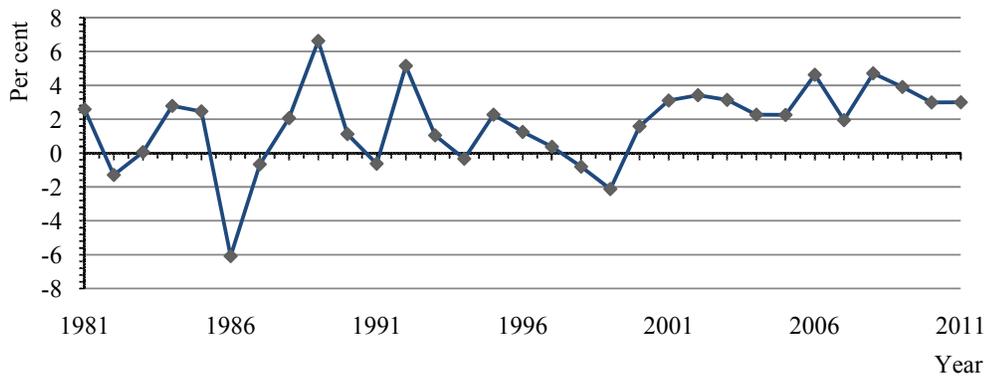
Indonesia's relatively low government spending and investment on agricultural Research and Development (R&D) continues to be a significant constraint to productivity growth, and the little productivity growth that occurs can be attributed to informal technological adoption from private rather than government sources (The Global Harvest Initiative, 2011; Warr, 2012).

Figure 6.3 Agriculture value added per worker at constant 2000US\$ price: 1980–2011 (US\$)



Source: The World Bank (2013)

Figure 6.4 Growth of agriculture value added per worker 1981–2011 (in percentage)

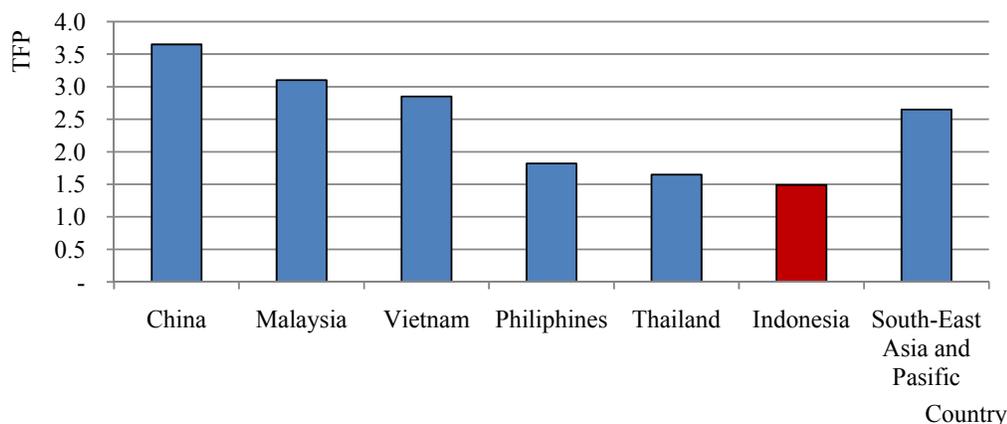


Source: The World Bank (2013)

Between 1961–1992, Indonesia gave priority to agriculture and food security, with subsidy disbursement for agricultural inputs. In the 1960s to mid-1980s, the government implemented the Green Revolution policy and it generated above average agricultural productivity (Table 6.1). Agricultural productivity growth slowed sharply with a period of stagnation after 1993, a consequence of the trade and fiscal imbalances sustained at the time and led the government to focus on policies that promoted the development of manufacturing exports. This in turn led to a reduction in agricultural subsidies and investments. During the Asian financial crisis in 1997–1998, a sharp devaluation of Indonesian currency caused some agricultural sectors to contract, particularly the livestock sector which was heavily dependent on

imported feed stock. After the crisis, the domestic agricultural markets became more open due to the economic reform the government embarked on. In 2001–2006, TFP growth rose again to the levels achieved in 1961–1970. Several factors that caused this productivity improvement included adoption of modern technology, diversification into high-value commodities, and expansion of agricultural land (Fuglie, 2009).

Figure 6.5 Total factor productivity in agriculture, average annual growth rates, 1991–2006 (in percentage)



Source: OECD (2010), p.13

Table 6.1 Average annual growth rates of output, input, and total factor productivity (TFP) indices for Indonesian agriculture 1961–2006 (in percentage)

Year	Output	Input	TFP
1961–1970	3.66	0.96	2.70
1971–1980	3.78	1.67	2.10
1981–1990	4.74	3.54	1.20
1991–2000	2.16	1.18	0.98
2001–2006	3.86	1.43	2.43
1961–2006	3.62	1.80	1.82

Source: Fuglie (2010), p.238

Warr (2012) uses Fuglie’s results to further estimate the total factor productivity (TFP) of Indonesia and this study implies that agricultural productivity accounts for 6.6 per cent of total real GDP growth. By regressing Fuglie’s TFP index, on time and time-squared, Warr confirms that the growth rate of agricultural TFP has slowed. Warr concludes that there has been significant under-investment in

agricultural research within Indonesia, and that it deserves a much higher policy priority than it has received in recent years.

This chapter examines the impact of agricultural productivity on macro-economic and industry indicators. The scenarios will simulate the impact of a 30 per cent increase in agricultural productivity through the primary factor productivity variable. The main scenario to be developed in this study is increasing the productivity of each of the 26 agricultural commodities. The increase in productivity of agricultural inputs, particularly fertilizer, is considered as a companion scenario. In particular, two different scenarios are conducted:

- 1) SIM5: 30 per cent increase in productivity of the agricultural sector (sectors 1–26); and
- 2) SIM6: 30 per cent increase in productivity of the agricultural sector (sectors 1–26) and fertilizer sector (sector 36).

## **6.4 Model results: impact of productivity increase in agriculture**

### **6.4.1 *Macro-economic results***

A summary of the economy-wide impacts of agricultural productivity under the two scenarios is presented in Table 6.2. Both simulations are welfare improving. A 30 per cent increase in agricultural productivity (SIM5) results in a 4.013 per cent increase in real GDP by 2020. The improvement in both agricultural and fertilizer productivity (SIM6) raises real GDP by 4.078 per cent. In these two simulations, the increase in GDP is triggered by the improvement in primary factor productivity where there is more output produced for each unit of input. The improvement of agricultural primary factors productivity lead to increase agricultural and other industries output, then aggregately increases the GDP.

The economy-wide impact of productivity improvements reduces the overall price — consumer price index (CPI) by 11.044 per cent in SIM5 and 11.103 per cent in SIM6 as production becomes more efficient. This drives an increase in real household consumption and exports as domestically-produced goods become more competitive in the world markets. The fall in overall prices implies a real devaluation making imports relatively more expensive, hence imports decline.

The increase in productivity in agriculture and fertilizer simultaneously appear to be appropriate actions to meet targets for inflation, GDP growth, a

favorable balance of trade, and consumption increases. The overall economic expansion in Indonesia drives up demand for labor. However, due to the fixed aggregate employment assumption, real wage rises. The same trend occurs for capital as an input. Overall simulation results show that aggregate real investment falls by 0.135 per cent in SIM5 and 0.178 per cent in SIM6 as it gets discouraged by higher input prices.

Table 6.2 Macroeconomic effects of productivity increase in agriculture and fertilizer (in percentage changes)

Description	Symbols	SIM5	SIM6
Real GDP	x0gdpexp	4.013	4.078
Aggregate employment	employ_i	0.000	0.000
Aggregate capital stock	x1cap_i	-3E-14	3E-15
Real household consumption	x3tot	4.506	4.607
Real investment	x2tot_i	-0.135	-0.178
Real government demands	x5tot	0.000	0.000
Exports (volume)	x4tot	2.961	2.936
Imports (volume)	x0cif_c	-1.631	-1.706
Real wage	realwage	11.765	11.876
Consumer price index	p3tot	-11.044	-11.103
% (Balance of trade)/GDP	delB	1.397	1.406
Real devaluation	p0realdev	5.858	5.873

Source: PERTANINDO-F simulation results

#### 6.4.2 Impact on selected industries

##### 1) Rubber: the worst affected agricultural industry

*Rubber* is a labor-intensive industry with 52 per cent of its primary inputs accounted for by labor. The *Rubber* industry contributes approximately 5 per cent to total agricultural output and only 0.2 per cent of its output is exported. Of the total domestic *Rubber* consumption, 99.8 per cent is from domestic production and 0.2 per cent originates from import sources.

*Rubber* is the only agricultural industry that experiences an output contraction as a result of both simulations (Table 6.3). A 30 per cent increase in agricultural productivity contracts *Rubber* output by 2.069 per cent and the combination of a 30 per cent increase in agricultural productivity and a 30 per cent in fertilizer productivity lead to *Rubber* output declining by 2.048 per cent. The decline in output as a result of an increase in TFP can be mainly explained by the dominant effect of

allocative efficiency over technical efficiency, where input use (in this case, labor) declines due to efficiency gains in productivity improvements (Macours and Swinnen, 1997). Employment needs to adjust and is projected to contract by 39.060 per cent in SIM5 and 39.827 per cent in SIM 6 which leads to wages falling. Labor then goes to other industries where employment expands.

*Rubber's* exports are projected to increase due to its (domestic and export) prices declining. Imports are projected to decrease as they become relatively more expensive than the domestic counterpart due to the domestic price falling.

## 2) *Cocoa: the least affected agricultural industry*

*Cocoa* contributes approximately 1 per cent of total agricultural output but is highly export-oriented with more than 75 per cent of its output being exported. These *Cocoa* exports account for more than 23 per cent of total agricultural exports. In terms of domestic consumption, approximately 8.5 per cent of domestic demand is met by *Cocoa* imports.

Table 6.3 shows that the *Cocoa* is the least affected industry which experiences the largest output growth in both SIM5 and SIM6. A 30 per cent increase in agricultural productivity is projected to increase *Cocoa* output by 86.137 per cent. A combination of a 30 per cent increase in agricultural productivity and a 30 per cent increase in fertilizer productivity lead this sector's output to increase by 88.009 per cent. Due to more productive inputs, the increase in *Cocoa* output causes prices (domestic and export prices) to fall which stimulates domestic consumption and exports. Imports decline as domestically-produced *Cocoa* becomes more competitive and consumers substitute domestic produce for imports. In both simulation results, *Cocoa* export is projected to increase by 99.404 per cent in SIM5 and 101.582 per cent in SIM6, while imports fall by 9.268 per cent in SIM5 and 9.534 per cent in SIM6. Overall simulation results show that employment in *Cocoa* industry increase by 99.551 per cent in SIM5 and 101.437 per cent in SIM6. The increase in employment is a result of a fall in labor price in conjunction with the general increase in output demand.

Table 6.3 Industry effects of a 30 per cent increase in agricultural productivity (SIM5) and a 30 per cent increase in agricultural productivity plus a 30 per cent increase in fertilizer productivity (in percentage changes)

No.	Sectors	SIM5					SIM6				
		p0com	Output	Employment	Export	Import	p0com	Output	Employment	Export	Import
1.	Paddy	-85.821	14.955	-15.913	-9.090	-214.784	-87.428	15.267	-16.375	-8.939	-218.565
2.	Maize	-80.406	23.832	-2.714	-9.090	-172.670	-82.001	24.282	-3.016	-8.939	-175.883
3.	Cassava	-86.593	26.220	-1.299	0.000	0.000	-87.303	26.504	-1.228	0.000	0.000
4.	Sweet potatoes	-87.804	30.775	4.871	480.012	-161.926	-88.281	31.016	5.047	482.475	-162.670
5.	Groundnut	-80.687	33.175	9.051	760.234	-134.310	-80.962	33.382	9.283	762.680	-134.650
6.	Soybean	-52.134	57.497	48.372	481.653	-33.638	-52.572	58.042	48.835	485.539	-33.824
7.	Vegetables	-82.193	33.704	10.062	464.020	-136.588	-83.251	34.177	10.151	469.704	-138.191
8.	Fruits	-82.150	33.797	10.647	194.869	-133.174	-82.801	34.127	10.817	196.326	-134.088
9.	Other food crops	-62.157	47.115	35.003	144.219	-0.071	-63.731	48.211	35.434	147.744	-0.050
10.	Rubber	-96.889	-2.069	-39.060	223.219	-193.435	-98.549	-2.048	-39.827	226.939	-196.603
11.	Sugarcane	-69.676	36.341	13.678	276.201	-99.508	-70.728	36.899	13.770	280.263	-100.944
12.	Coconut	-80.925	26.056	-2.848	325.295	-138.120	-82.114	26.449	-2.983	329.885	-140.016
13.	Palm oil	-69.053	17.229	-13.660	274.765	-119.311	-70.252	17.471	-14.124	279.394	-121.382
14.	Tobacco	-57.803	17.600	-2.164	0.000	0.000	-63.440	18.110	-5.382	0.000	0.000
15.	Coffee	-33.528	70.818	69.973	133.022	-20.790	-34.735	73.134	71.712	137.682	-21.870
16.	Tea	-80.586	28.130	1.503	599.999	-250.030	-82.209	28.584	1.202	611.779	-255.010
17.	Clove	-68.779	41.568	24.694	507.412	-252.579	-70.823	42.532	24.734	522.251	-260.166
18.	Cocoa	-12.570	86.137	99.551	99.404	-9.268	-12.853	88.009	101.437	101.582	-9.534
19.	Cashew fruit	-42.503	63.223	60.263	335.559	-66.988	-43.218	64.245	61.073	341.067	-67.999
20.	Other estate crops	-29.847	60.346	58.544	185.592	-67.841	-31.152	62.888	60.329	193.437	-70.662
21.	Livestock	-75.422	30.513	1.745	433.022	-103.764	-75.590	30.750	2.068	433.941	-103.910
22.	Fresh Milk	-64.148	30.586	1.688	370.240	-157.169	-64.361	30.803	1.977	371.409	-157.497
23.	Poultry	-60.474	12.766	-19.888	413.078	-2.860	-60.650	12.887	-19.731	414.223	-2.784
24.	Other livestock raising	-72.775	53.430	29.208	495.821	-133.906	-73.004	53.654	29.493	497.307	-134.243
25.	Forestry and hunting	-63.620	41.441	15.426	427.350	-185.008	-63.755	41.525	15.555	428.227	-185.379
26.	Fishery	-71.886	33.428	9.549	308.571	-131.613	-71.899	33.536	9.826	308.621	-131.558
27.	Mining	-8.806	-1.332	-5.596	0.413	-2.772	-8.680	-1.314	-5.540	-0.303	-2.532
28.	Other mining and quarrying	-27.649	-2.092	-3.532	-33.921	6.340	-27.569	-2.042	-3.470	-34.518	7.867

Table 6.3 Industry effects of a 30 per cent increase in agricultural productivity (SIM5) and a 30 per cent increase in agricultural productivity plus a 30 per cent increase in fertilizer productivity (in percentage changes) (continued)

No.	Sectors	SIM5					SIM6				
		p0com	Output	Employment	Export	Import	p0com	Output	Employment	Export	Import
29.	Rice milling	-52.287	14.976	26.802	419.594	-96.576	-53.295	15.289	27.389	427.074	-98.246
30.	Flour	-4.737	7.366	10.905	50.333	-10.273	-4.834	7.517	11.149	51.051	-10.364
31.	Sugar	-28.140	36.856	52.976	220.108	-16.418	-28.598	37.426	53.813	223.502	-16.622
32.	Other food, beverages, and tobacco	-5.876	16.845	30.911	54.035	-10.249	-5.955	17.066	31.330	54.626	-10.307
33.	Textile, wearing apparel and leather	1.823	-4.609	-7.189	-8.251	1.414	1.832	-4.618	-7.189	-8.317	1.475
34.	Wood products	-0.344	2.936	6.969	4.935	-0.980	-0.343	2.936	6.980	4.933	-0.984
35.	Paper, paper products, transport equipment, machinery and iron	1.241	-2.856	-5.267	-6.986	1.021	1.246	-2.849	-5.236	-7.021	1.043
36.	Fertilizer	-8.658	-23.426	-35.778	-9.090	-42.303	-29.052	-5.864	-54.516	-8.939	-70.070
37.	Pesticide	8.195	16.300	23.514	-9.090	33.829	8.371	16.728	24.159	-8.939	34.445
38.	Other chemical and cement	-0.492	-2.859	-4.633	-9.090	-1.599	-0.469	-2.821	-4.575	-8.939	-1.365
39.	Electricity, Gas and Water	5.154	-0.625	-1.753	-9.090	0.000	5.248	-0.579	-1.685	-8.939	0.000
40.	Irrigation building	3.711	1.423	2.246	-9.090	0.000	3.796	1.415	2.221	-8.939	0.000
41.	Construction	2.859	-0.147	-0.589	-9.090	0.000	2.913	-0.183	-0.681	-8.939	0.000
42.	Trade	7.930	-0.045	-0.268	-9.090	0.000	8.161	0.016	-0.085	-8.939	0.000
43.	Restaurant	-6.055	3.335	6.563	-9.090	-19.146	-6.044	3.407	6.694	-8.939	-19.063
44.	Hotel	-8.144	-1.968	-5.018	-9.090	-4.721	-8.009	-1.897	-4.870	-8.939	-4.505
45.	Road and railway transport	7.313	0.131	0.000	-9.090	8.296	7.432	0.204	0.133	-8.939	8.582
46.	Air and water transport, and communication	4.870	-1.966	-4.078	-9.090	4.312	4.997	-1.907	-4.021	-8.939	4.575
47.	Services allied to transport	3.619	-2.667	-5.333	-9.090	2.852	3.722	-2.626	-5.260	-8.939	3.048
48.	Bank and insurance	10.712	0.084	-0.141	-9.090	10.471	10.951	0.135	-0.038	-8.939	10.913
49.	Agriculture services	57.724	21.609	53.037	-9.090	0.000	58.655	21.971	53.912	-8.939	0.000
50.	Real estate and business service	5.030	-1.293	-4.039	-9.090	2.704	5.156	-1.276	-4.038	-8.939	2.887
51.	General government and defense, education, health, community services	6.648	-0.346	-0.432	-9.090	2.207	6.763	-0.342	-0.431	-8.939	2.306
52.	Personal, household and other services	5.690	0.303	0.328	-9.090	4.792	5.809	0.361	0.414	-8.939	5.060

Note: p0com is output price of locally produced commodity

Source: PERTANINDO-F simulation results

Table 6.4 Impact of productivity increase in agriculture and fertilizer on employment, by occupation type: SIM5 and SIM6 (in percentage changes)

No.	Sectors	SIM5				SIM6			
		Labor1	Labor2	Labor3	Labor4	Labor1	Labor2	Labor3	Labor4
1.	Paddy	-15.523	-57.678	-57.696	-57.650	-15.983	-58.298	-58.438	-58.412
2.	Maize	-2.325	-44.479	-44.498	-44.452	-2.624	-44.938	-45.079	-45.052
3.	Cassava	-0.910	-43.065	-43.083	-43.037	-0.836	-43.150	-43.290	-43.264
4.	Sweet potatoes	5.261	-36.894	-36.912	-36.866	5.440	-36.875	-37.015	-36.989
5.	Groundnut	9.441	-32.714	-32.733	-32.687	9.676	-32.639	-32.779	-32.753
6.	Soybean	48.762	6.607	6.589	6.635	49.226	6.912	6.771	6.798
7.	Vegetables	10.452	-31.703	-31.721	-31.675	10.543	-31.772	-31.912	-31.886
8.	Fruits	11.037	-31.118	-31.136	-31.090	11.209	-31.106	-31.246	-31.220
9.	Other food crops	35.393	-6.762	-6.780	-6.734	35.827	-6.488	-6.628	-6.602
10.	Rubber	-36.757	-78.912	-78.930	-78.884	-37.511	-79.825	-79.965	-79.939
11.	Sugarcane	15.982	-26.173	-26.191	-26.145	16.086	-26.228	-26.369	-26.342
12.	Coconut	-0.544	-42.699	-42.717	-42.671	-0.667	-42.981	-43.121	-43.095
13.	Palm oil	-11.356	-53.511	-53.529	-53.483	-11.808	-54.123	-54.263	-54.237
14.	Tobacco	0.140	-42.015	-42.034	-41.988	-3.066	-45.381	-45.521	-45.495
15.	Coffee	72.277	30.122	30.104	30.150	74.028	31.713	31.573	31.599
16.	Tea	3.807	-38.348	-38.366	-38.320	3.518	-38.796	-38.936	-38.910
17.	Clove	26.998	-15.157	-15.175	-15.129	27.050	-15.264	-15.404	-15.378
18.	Cocoa	101.855	59.700	59.682	59.728	103.753	61.438	61.298	61.324
19.	Cashew fruit	62.567	20.412	20.394	20.440	63.389	21.074	20.934	20.960
20.	Other estate crops	60.848	18.693	18.675	18.721	62.645	20.331	20.190	20.217
21.	Livestock	4.049	-38.106	-38.124	-38.078	4.384	-37.930	-38.071	-38.044
22.	Fresh Milk	3.992	-38.163	-38.181	-38.135	4.293	-38.022	-38.162	-38.136
23.	Poultry	-17.584	-59.739	-59.757	-59.711	-17.415	-59.729	-59.869	-59.843
24.	Other livestock raising	31.512	-10.643	-10.661	-10.615	31.809	-10.506	-10.646	-10.620
25.	Forestry and hunting	24.327	-17.827	-17.846	-17.800	24.505	-17.810	-17.950	-17.924
26.	Fishery	11.853	-30.302	-30.320	-30.274	12.142	-30.173	-30.313	-30.287
27.	Mining	36.560	-5.595	-5.613	-5.567	36.837	-5.477	-5.618	-5.591

Table 6.4 Impact of productivity increase in agriculture and fertilizer on employment, by occupation type: SIM5 and SIM6 (in percentage changes) (continued)

No.	Sectors	SIM5				SIM6			
		Labor1	Labor2	Labor3	Labor4	Labor1	Labor2	Labor3	Labor4
28.	Other mining and quarrying	38.624	-3.531	-3.549	-3.503	38.907	-3.408	-3.548	-3.522
29.	Rice milling	68.958	26.804	26.785	26.831	69.733	27.418	27.278	27.304
30.	Flour	53.061	10.906	10.888	10.934	53.493	11.179	11.038	11.065
31.	Sugar	95.133	52.978	52.959	53.005	96.157	53.842	53.702	53.728
32.	Other food, beverages, and tobacco	73.067	30.913	30.894	30.940	73.674	31.360	31.219	31.246
33.	Textile, wearing apparel and leather	34.967	-7.188	-7.206	-7.160	35.146	-7.169	-7.309	-7.283
34.	Wood products	49.124	6.969	6.951	6.997	49.304	6.989	6.849	6.875
35.	Paper, paper products, transport equipment, machinery and iron	36.888	-5.267	-5.286	-5.240	37.088	-5.226	-5.367	-5.340
36.	Fertilizer	6.378	-35.777	-35.796	-35.750	-12.165	-54.480	-54.620	-54.594
37.	Pesticide	65.669	23.514	23.496	23.542	66.510	24.195	24.055	24.081
38.	Other chemical and cement	37.522	-4.633	-4.651	-4.605	37.775	-4.540	-4.680	-4.654
39.	Electricity, Gas and Water	40.404	-1.751	-1.769	-1.723	40.693	-1.622	-1.762	-1.736
40.	Irrigation building	44.414	2.259	2.240	2.286	44.667	2.353	2.212	2.239
41.	Construction	41.578	-0.577	-0.595	-0.549	41.765	-0.550	-0.690	-0.664
42.	Trade	41.892	-0.263	-0.281	-0.235	42.296	-0.019	-0.159	-0.133
43.	Restaurant	48.708	6.553	6.535	6.581	49.126	6.811	6.671	6.697
44.	Hotel	37.149	-5.005	-5.024	-4.978	37.576	-4.738	-4.879	-4.852
45.	Road and railway transport	42.159	0.004	-0.014	0.032	42.513	0.199	0.058	0.085
46.	Air and water transport, and communication	38.067	-4.088	-4.106	-4.060	38.411	-3.904	-4.044	-4.018
47.	Services allied to transport	36.826	-5.329	-5.347	-5.301	37.120	-5.194	-5.335	-5.308
48.	Bank and insurance	42.026	-0.129	-0.147	-0.101	42.408	0.094	-0.047	-0.020
49.	Agriculture services	95.204	53.049	53.031	53.077	96.358	54.044	53.903	53.930
50.	Real estate and business service	38.129	-4.026	-4.044	-3.998	38.408	-3.907	-4.047	-4.021
51.	General government and defense, education, health, community services	41.713	-0.442	-0.460	-0.414	42.001	-0.313	-0.454	-0.427
52.	Personal, household and other services	42.472	0.317	0.299	0.345	42.846	0.532	0.391	0.418

Source: PERTANINDO-F simulation results

3) *Paddy: the main staple food of the Indonesian population*

*Paddy* is projected to increase in output by 14.955 per cent and 15.267 per cent as a result of SIM5 and SIM6, respectively (Table 6.3). As with the other industries, the increase in *Paddy* output is due to a rise in domestic demand caused by a decline in its domestic price. The improvement of productivity in the agricultural sector by 30 per cent leads to a decline in *Paddy*'s export and import. The SIM5 result shows a decline of *Paddy*'s export by 9.090 per cent, and in SIM6 *Paddy*'s export is down by 8.939 per cent. The export price of *Paddy*, which drops significantly by 90.212 per cent in SIM5 and 91.819 per cent in SIM6, does not push the export up as the increase in output is absorbed mostly by the domestic market. It is expected that the increase in domestic production is used more to meet domestic needs as *Paddy* output by nature, usually serves the domestic market and almost zero per cent to export. Since *Paddy* accounts for almost nothing in terms of imports, and with a relatively cheaper domestic price than import price, *Paddy* imports fall by 214.784 per cent in SIM5 and 218.565 per cent in SIM6. The rise of *Paddy* output is not followed by an increase in employment. Employment falls by 15.913 per cent in SIM5 and 16.375 per cent in SIM6. The fall in wages due to the agricultural productivity improvement does not lead to a growth in employment. This result indicates that there is excess of labor in the *Paddy* industry, such that when output expands due to improved productivity, labor moves elsewhere as wages fall.

**6.4.3 *The impacts on employment by occupational types***

The impact of simulations undertaken in this chapter is decomposed by types of labor identified in the model:

- 5) Labor1 (agriculture worker),
- 6) Labor2 (production, transport equipment operators, manual and unskilled labors),
- 7) Labor3 (administration, sales, service),
- 8) Labor4 (leadership, management, military, professional and technician).

The SIM5 and SIM6 results show that the direction of changes for Labor1 in all agricultural industries is similar with the direction of changes for total labor. This is due to the fact that Labor1 makes up the majority of total labor in every

agricultural industry. In terms of labor by occupation types, three agricultural industries, including *Rubber*, *Poultry*, and *Paddy* experience a fall in all of the types of labor. In other words, these industries are the three worst affected in their employment by occupation types. In these industries, labor will tend to move elsewhere in other industries. The amount of labor that has to be absorbed in other industries coming from *Paddy* and *Poultry* could be significant as these two industries account for almost 2.5 per cent of the total labor that is Labor1 alone. The largest gains in Labor1, Labor2, Labor3, and Labor4 occur in *Cocoa*, *Coffee*, and *Cashew*, the three least affected in their employment (Table 6.4).

The policy changes undertaken in SIM5 and SIM6 also produce interesting results for non-agricultural industries. Employment in Labor1 increases in all industries while Labor2, Labor3, and Labor4 decline in a number of industries including *Fertilizer*; *Textile and leather*; and *Mining*. Positive impacts in SIM5 and SIM6 on all types of labor occur in *Sugar*; *Other food, beverage, tobacco*; and *Rice milling* industries.

#### **6.4.4 The impacts on households' income**

Households, as the owner of primary factors gain more income if the price of a primary factor increases due to the positive effect of the economic changes, and their income goes down if the opposite situation occurs. The increase in agricultural productivity leads to various effects across households due to the differences in the combination of primary factors owned by each household. Rural2 is the largest household among households, Rural1 is the second largest, and Rural6 is the smallest household.

Table 6.5 shows the impacts of SIM5 and SIM6 for each type of household. Overall, 8 out of 10 types of households are projected to receive reduced nominal income as a result of an improvement in agricultural productivity in SIM5; while the nominal incomes of two other households increase (both are non-agricultural households). Similar trends in nominal income changes are evident from the simulation results of SIM6. The worst affected household due to the impact of policy changes on nominal income is Rural1. This household already has the lowest level of income to start with and will further suffer from the policy changes with wages going down. In addition, the ownership of primary factors other than labor is very small in

Rural1. This household is dominated by unskilled laborers (mostly farmers) who are the major income earners.

Table 6.5 Impact of productivity increase in agriculture and fertilizer on nominal household income (in percentage changes)

Households	SIM5	SIM6
Rural1(Agricultural Employees)	-22.143	-22.202
Rural2(Farmers, Land Owner 0 - 0.5 Ha)	-8.760	-8.732
Rural3(Farmers, Land Owner 0.501 - 1 Ha)	-11.144	-11.135
Rural4(Farmers, Land Owner >1 Ha)	-11.473	-11.445
Rural5(Lower Level Rural Non Agricultural)	1.166	1.244
Rural6(Rural, Non-Labor Force and Unclassified Household)	-4.593	-4.548
Rural7(Higher Level Rural Non-Agricultural)	-0.272	-0.173
Urban1(Lower Level Urban Non-Agricultural)	0.147	0.210
Urban2(Urban, Non-Labor Force and Unclassified Household)	-7.578	-7.533
Urban3(Higher Level Urban Non-Agricultural)	-0.260	-0.162

Source: PERTANINDO-F simulation results

Non-agricultural households that have lower income levels and who live in rural and urban areas benefit from the improvement of productivity in agriculture and fertilizer. The incomes of Rural5 and Urban1 are projected to increase with the improvement in productivity of agriculture and fertilizer. Rural5 and Urban1 are lower income households that are not directly employed in agriculture. According to BPS (2007a), these households are spread across several sectors and earn their income as independent businessmen, clerical workers, street traders, casual labor in the transportation sector (public transport drivers), self-employed individual services (such as domestic workers), and unskilled labor. These non-agricultural workers will experience an increase in their wage.

The variety of primary factors owned by other households beside Rural1 explains why the decline in households' input prices has a different impact on household incomes. It reflects that the share of other primary factors besides labor considerably influence the impact on household incomes.

Table 6.6 shows the impact of the productivity increase in agriculture and fertilizer on real household income. As an impact of the productivity improvement of agriculture and fertilizer, household real income is projected to increase in all except Rural1, Rural3, and Rural4. The decrease in farmers' wages and the reduction of employment of Labor1, mainly in the *Paddy* sector (see Table 6.3), leads to a

significant reduction in real household income. Moreover, in general, the rental of capital rises in agricultural and non-agricultural industries.

Table 6.6 Impact of productivity increase in agriculture and fertilizer on real household income (in percentage changes)

Households	SIM5	SIM6
Rural1(Agricultural Employees)	-11.099	-11.099
Rural2 (Farmers, Land Owner 0 - 0.5 Ha)	2.285	2.371
Rural3 (Farmers, Land Owner 0.501 - 1 Ha)	-0.100	-0.032
Rural4 (Farmers, Land Owner >1 Ha)	-0.429	-0.342
Rural5 (Lower Level Rural Non Agricultural)	12.210	12.347
Rural6 (Rural, Non-Labor Force and Unclassified Household)	6.452	6.555
Rural7 (Higher Level Rural Non-Agricultural)	10.773	10.930
Urban1 (Lower Level Urban Non-Agricultural)	11.191	11.313
Urban2 (Urban, Non-Labor Force and Unclassified Household)	3.467	3.570
Urban3 (Higher Level Urban Non-Agricultural)	10.785	10.941

Source: PERTANINDO-F simulation results

There are seven other households that are projected to benefit from the improvement of productivity of agriculture and fertilizer in real terms of welfare. The increase of real income in those households signifies that the level of welfare is projected to increase on those households. In general, the increase of agricultural and fertilizer productivity are simultaneously projected to reduce prices so it can anticipate the decline in nominal income in some households.

## 6.5 Conclusion

One of the government's development programs to assist agriculture is to increase productivity to achieve development targets such as public welfare improvement, food self-sufficiency, and economic growth. The government has issued policies to improve agricultural productivity by targeting one or more factors which affect productivity including the intensification of land, increase in investment, improvement in the quality of buildings and irrigation systems, improvement in other infrastructure, upgrade farmers' skills, use of quality seeds and crop varieties, increased use of quality fertilizers, and improvement in appropriate technology of agricultural tools.

The objective of this chapter is to simulate the impact of improvements in productivity in agricultural industries. Besides that, this chapter also simulated the

impact of added improvement in fertilizer productivity. The impact of the simulations on national and sectoral parameters including output, trade, employment, and households' income are examined using PERTANINDO-F.

The increase in agricultural productivity is projected to grow the Indonesian economy by 2020. The impact of fertilizer productivity further contributes to increased agricultural productivity. Based on simulation results the productivity improvement program in agriculture is an appropriate policy for Indonesia's macro-economy.

In terms of overall results, the agricultural productivity improvement program is projected to increase output, employment, and exports, reduce imports, and upgrade industry capabilities to meet demand. However, considering specific behavior of individual industries, it is possible to have a variety of impacts with different consequences for output, employment, export, and import. For example, among agricultural industries, *Rubber* output and employment are projected to contract. In contrast, there are several industries that experience increases in outputs, but fall in employment, such as *Paddy*, *Maize*, *Cassava*, *Coconut*, *Palm oil*, *Tobacco*, and *Poultry*. These industries, especially *Paddy*, play an important role in Indonesia's agriculture and economy. Besides being the major staple food sector, *Paddy* employs quite a lot of labor, especially unskilled labor. Therefore, the government needs to support productivity improvement programs with measures that will ensure that sectors and primary input factors (eg., labor) which experience losses are provided adjustment assistance towards efficiency. Labor decline in some agricultural industries is likely to occur as a consequence of technology improvement due to productivity increase. Nevertheless, the government can compensate the decline by increasing the skills of labor and providing jobs in other sectors, especially in rural areas.

In terms of trade, almost all of the agricultural industries are projected to experience an increase in exports as an impact of the 30 per cent increase in agricultural productivity and most of the agricultural industries are projected to reduce their imports. Simultaneous increases in agriculture and fertilizer productivity strengthen the domestic production capacity to meet demand.

In terms of employment by occupation types, Labor1 is projected to increase, while other labor types are projected to decrease. With the positive impact on employment in non-agricultural industries, labor migration apparently occurs,

particularly the skilled labor, Labor3 and Labor4, from agricultural to non-agricultural industries.

In terms of household welfare, the government of Indonesia needs to be aware of the consequences of the increase in agricultural productivity. Macroeconomic improvement is followed by a general decline in nominal household income. Although in real terms there is an increase in household income. The increase in agricultural productivity widens the income distribution gap. Households that suffer a decrease in real income are rural agricultural households, particularly Rural1 household. This is because the dominant primary factor that is owned by this household is labor, particularly Labor1. In *Paddy*, employment of Labor1 is projected decline and this is mainly unskilled labor. Government policies should provide support to cushion the impact of a widening income gap, particularly for rural low income households.

## **Chapter 7**

### **Conclusions**

#### **7.1 Introduction**

The agricultural sector is an important contributor to Indonesia's GDP and is the biggest employer of all sectors<sup>3</sup>. More than half of the Indonesian poor earn their livelihood from agriculture; this sector is crucial for poverty eradication and the main driver for food security.

Due to the significant role of agriculture, the government of Indonesia is deeply concerned about its performance and has issued several agricultural programs which aim to improve the welfare of society, especially that of farmers. These programs are measures within the Agricultural Revitalization Program. These programs have been introduced to increase food security, food safety, and diversification, as well as to enhance competitiveness, productivity and value-adding in agricultural products (Republik Indonesia, 2005a). Some of the programs include those of agricultural protection and agricultural productivity improvement.

The National Medium Term Development Plans of 2004–2009 and 2010–2014 point out that two of the government's agricultural policies are: protecting farmers from unfair competition and from unjust trading practices. The protection policy has been implemented by the imposition of import duties and subsidies for commodities most related to rural development, poverty alleviation and food security issues (Kementerian Pertanian Republik Indonesia, 2005; 2010). The Indonesian government has stated that productivity, business efficiency, conversion of farming land, lack of infrastructure, limited credit and investment are issues that need to be considered in depth, in order to revitalize the agricultural sector (Republik Indonesia, 2005a).

The main objective of this thesis was to examine the welfare effects and to quantify the impact of policies within Indonesia's Agricultural Revitalization Program, especially protection policies (tariffs and subsidies) and agricultural productivity, on national and industry outputs, employment, households' income, trade, and other economic parameters.

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<sup>3</sup>Accounted for 12.5 per cent of GDP and 35.1 per cent of total employment in 2012;

This thesis developed a recursive dynamic general equilibrium model for the Indonesian economy (referred to as PERTANINDO-F). This model has 52 industries, which decomposed the agricultural sector into 26 industries. The model quantified the impact of simulations up to the year 2020. The policy scenarios undertaken in this study related to protection policies and policies seeking to improve agricultural productivity.

Protection policies were enforced unilaterally and bilaterally by tariffs and subsidies both of which are affected by international agreements on trade, which have been ratified by Indonesia. As a consequence, Indonesia's tariffs needed to decline or be eliminated. Meanwhile, subsidies for fertilizer are expected to remain and required by the agricultural sector; as stipulated in the WTO agreements, these subsidies can be maintained due to 'special treatment', for reasons such as food security. Therefore, simulations on the following policy scenarios were conducted: 1) a 30 per cent tariff cut in agriculture; 2) a 100 per cent tariff cut (i.e., an elimination of agricultural import tariff); 3) a combination of a 30 per cent tariff cut in agriculture and a 10 per cent fertilizer subsidy increase; and 4) a combination of a 100 per cent tariff cut in agriculture and a 10 per cent fertilizer subsidy increase. The agricultural productivity policy scenarios included: 1) an increase in agricultural productivity by 30 per cent; and 2) a combination of a 30 per cent increase in agricultural productivity and a 30 per cent increase in fertilizer sector productivity.

This chapter summarizes the major findings of each chapter and the policy implications of the thesis. Section 7.2 summarizes the major empirical findings of this study and Section 7.3 briefly discusses the policy implications of the study. In addition, Section 7.3 identifies limitations of this study and provides suggestions for future research.

## **7.2 Summary of findings**

### **7.2.1 *General findings***

The study shows that reduction in agricultural tariffs, increase in fertilizer subsidy to cushion the impact of tariff liberalization, and improvement in agricultural and fertilizer productivity can stimulate the Indonesian macro-economy. In general, full tariff liberalization (with zero tariffs) stimulates macro-economic indicators by more than partial tariff liberalization. In addition, promoting trade openness along with

providing fertilizer subsidies boost the economy and achieve social objectives. The increase in fertilizer subsidy is adequate to cushion the decline in aggregate investment as a consequence of tariff liberalization. The combination of tariff cuts and increase in fertilizer subsidy is a suitable policy for the Indonesian macro-economy. Similarly, the combination of increases in agricultural and fertilizer productivity stimulates the economy of Indonesia.

At the industry level, all simulations indicated that output, employment, and exports increase and imports decline. However, as to industry-specific behavior, a variety of impacts on output, employment and trade were found to occur. Employment which was fixed at the aggregate level showed varying directions of change at the industry level; nevertheless, most industries experienced positive employment growth. As for employment by type of labor, Labor1 (agricultural worker) is projected to increase, while employment of other labor types dropped in almost all industries.

All simulation results suggested a general increase in household welfare. Most households were anticipated to benefit from tariff cuts, increase in fertilizer subsidy and increase in agricultural and fertilizer productivity, except for a small percentage of rural households belonging to the lowest income bracket, which were predicted to be worse off.

### ***7.2.2 Macro-economic impacts***

Overall the impact of tariff liberalization and increase in agricultural productivity are welfare improving. The decrease in agricultural tariffs, combined with the increase in fertilizer subsidy was expected to increase GDP, real consumption, wage levels, and to stimulate exports and imports. In these simulations, the aggregate investment was projected to decline by relatively small amounts. A 100 per cent tariff cut caused real GDP to grow higher than did a 30 per cent tariff cut. On the expenditure side, the growth of GDP was mostly driven by the increase in consumption. Simultaneously, the decline of import prices due to tariff reduction – including the prices of agricultural raw material imports – reduced agricultural commodity prices and then reduced the price of output and the consumer price index (CPI), which reflects the drop in market prices. A 100 per cent tariff cut resulted in the decline of CPI, by

more than the effect of a 30 per cent tariff cut. Providing a 10 per cent of fertilizer subsidy was found to strengthen these effects.

A 30 per cent increase in agricultural productivity led to a significant growth in real GDP, by 4.013 per cent, and when combined with fertilizer productivity increase was projected to be greater still. The increase in agricultural productivity contributed to primary inputs in industries becoming more efficient, and ultimately to greater output for the entire economy. These growth effects were found to be significantly higher than the effects of agricultural tariff cuts and increasing fertilizer subsidy. These policies, concurrent with targets for inflation, appear to be a suitable policy for macro-economy of Indonesia.

In all simulation results, with an assumed fixed aggregate employment, expanding aggregate economic activity as a result of agricultural tariff cuts, fertilizer subsidy increase, and agricultural productivity improvement was found to drive real wages up. A 100 per cent agricultural tariff cut affected real wages by more than a 30 per cent tariff cut. As a consequence of a combination of a tariff cut and a 10 per cent increase in the fertilizer subsidy, real wages increased by more than the tariff cut alone. Meanwhile, it was found that agricultural productivity increases could drive real wages significantly, by 11.8 per cent, and combination of a 30 per cent increase in agricultural productivity and a 30 per cent rise in fertilizer productivity further improved real wages. The improvement in productivity increased primary input efficiencies resulting in industry output expansion.

The tariff cut was projected to reduce government revenue, and subsequently reduce government savings. Therefore, it would result in lower government investment and a decline in total investment, albeit small. A 10 per cent increase in fertilizer subsidy combined with a 30 per cent tariff cut was seen to lead to a positive trend in investment, but when combined with zero tariffs the subsidy did not lead to positive investment growth. Subsidies were found to push industries' investment up through the increase in the demand for agricultural inputs. Granting larger subsidies will offset the impact of tariff reductions on investment, but doing this has implications for government finances.

Tariff cuts were shown to increase the demand for imports, due to the fall in import prices. The overall domestic price decline was greater than import price decline, thus real devaluation results. Real devaluation improves Indonesian products' competitiveness in world markets leading to higher exports. For all

simulation results, the imports stimulation effect exceeded that of exports, so the terms of trade improved. In aggregate, the agricultural productivity improvement led the output of agriculture other non-agricultural industries to increase. As a consequence, industries' output prices fell, as industries became more efficient. The level of competitiveness of domestic goods increased, leading to export rises. The fall in overall prices implies a real devaluation making imports relatively more expensive, hence imports decline.

### **7.2.3 Industrial output and trade impacts**

The reduction of tariffs was seen to exert a beneficial effect on agricultural commodities, particularly export-oriented (or-related) products such as *Cocoa*, *Coffee*, *Palm oil*, *Coconuts*, *Fisheries* and *Forest products*. Reducing import tariffs boosted the competitiveness of these products. The least-affected agricultural industry output due to tariff cuts was *Coffee*. Otherwise, some agricultural industries experienced contraction in output. The inability of these industries to compete with cheaper imports led to domestic production falling, particularly for industries which have a large share of imports, for example *Soybean*, the worst-affected industry. *Paddy*, the most important agricultural industry, also experienced a decline in output due to the tariff cut. Imported *Paddy* became cheaper (relative to domestically produced *Paddy*), so users (households and firms) switched from domestic to imported *Paddy*. In addition, the contraction was also caused by farmers planting other crops due to lower output prices for *Paddy*.

Increased agricultural productivity lifted output in most agricultural industries. The effect was strengthened by an increase in the productivity of fertilizer. Of 26 agricultural industries, only *Rubber* had a projected decline in output due to a fall in investment. Lower primary inputs' prices due to the increase in total factor productivity where the effect of allocative efficiency dominated over technical efficiency caused input utilization to decline and hence output.

In general, foreign trade in agriculture was projected to grow due to reduction in tariffs. The real exchange rate depreciation explains this projected rise in exports, increasing the competitiveness of Indonesian commodities. Tariff cuts led import prices to be relatively cheaper than previously, pushing the demand for imported goods up, as well as making the relative prices of imports cheaper than those of

domestic goods and, thereby, resulting in the substitution away from domestic goods towards imported goods. The fall in export prices would lead exports to increase. The fertilizer subsidy was predicted to push domestic prices down, due to the decline in production costs, which again would encourage higher export levels. In *Paddy* and *Maize*, exports were projected to decline. The subsequent drop in output price would lead to increase consumers' absorption of *Paddy* and *Maize* instead of supplying the export markets. The larger the tariff cut, the lower the price of output and the greater the decline in exports for these two industries.

As with the impacts of tariff cuts, the increase in productivity of agriculture and fertilizer led to greater depreciation of the real exchange rate. The real depreciation would explain the increase in exports attributed to increased competitiveness of Indonesian goods in the world market. Almost all agricultural industries were projected to increase in exports and decrease in imports, except for *Paddy* and *Maize*.

#### **7.2.4 *Employment impacts***

At the industry level, the impact on employment was mixed, although employment in most agricultural industries was projected to be positively affected. Almost all industries, whose output levels fell, also showed decreases in employment. Moreover, the results showed that the contractions in most industries' employment were greater than the contractions in their output due to the rising wage/rental ratios faced by these industries. Although both price of labor and capital were projected to decline, the rental price of capital was predicted to be lower than the price of labor. This would cause industries to increase their capital-labor ratio, as firms substitute capital for labor.

Combined tariff cuts and increases in fertilizer subsidies were projected to increase employment in most agricultural industries. This increase was driven by output improvement, and also by the fall in wages in these industries. Conversely, agricultural industries in which employment was projected to be lower as the tariff reduction and fertilizer subsidy increased included *Soybean*, *Paddy*, *Vegetables*, *Fruits*, *Other food crops*, *Rubber*, *Livestock*, *Fresh Milk*, and *Other livestock raising*. A 30 per cent agricultural tariff reduction affected the employment of these

industries less than a 100 per cent tariff cut was predicted to. An increased fertilizer subsidy could restrain the rate of this decrease in employment.

The impact of tariff cuts and increase in fertilizer subsidies on employment in each industry was decomposed according to four labor types, i.e. agricultural employees (Labor1), production, transport equipment operators, manual and unskilled labors (Labor2), administration, sales, service labors (Labor3) and leadership, management, military, professional and technician (Labor4). Simulation results showed that Labor1 in each industry determined the direction and magnitude of the effect on overall industry employment, due to the large share of this type of labor in each agricultural industry. The employment levels for other types of labor were projected to decline in general, although in total, the agriculture was still demonstrating increased employment levels.

As agricultural productivity increased in the simulations, employment levels grew in most agricultural industries. This increase in employment is in line with higher output production and fall in wages resulting from the policy shocks. Employment levels in *Paddy* were projected to decline, in spite of increased productivity and output. The decline of input prices in this industry due to productivity improvement would not increase labor demand. In other words, decreases in the cost of primary factors lead to the substitution of capital for labor in this industry, while the cost of land is fixed. Besides *Paddy*, several agricultural industries were similarly impacted, i.e. *Maize*, *Cassava*, *Coconuts*, *Palm oil*, *Tobacco* and *Poultry*.

Effects of agricultural productivity improvement on labor type show that the directions of Labor1 changes were similar to the directions of change for total (all types) labor in each industry. This is due to Labor1's very large share of the total labor in each agricultural industry. Several industries experienced a decrease in all types of labor, such as *Rubber*, *Poultry* and *Paddy*. In other words, these industries were the three worst-affected in terms of employment in all labor types. For these industries, the fall in Labor1 had a substantial impact on overall unemployment. The largest improvement of Labor1, Labor2, Labor3 and Labor4, occurred in *Cocoa*, *Coffee* and *Cashew* (the three least-affected industries in terms of employment). The improvement in agricultural and fertilizer productivity affected non-agricultural industries' employment levels in varying directions. However, in each non-agricultural industry, an increase in output was not always followed by an increase in

employment; but in contrast, a decrease in output is always accompanied with a decrease in employment.

#### **7.2.5 Households' welfare impacts**

The decreases in agricultural tariffs and the increase in the fertilizer subsidy positively impacted the real income of households in general. This was due to price declines and increases in the purchasing power of households, except for the rural lowest-income households. The rural lowest-income households (rural agricultural employees – Rural1) are highly vulnerable to contraction in domestic output. In other words, the welfare of these households would have deteriorated due to a tariff policy that led to contraction in agricultural output. Agricultural tariff reductions would benefit households – both low-level and high-level income households – whose livelihood comes from non-agricultural sources.

At the aggregate level, agricultural productivity improvements would play a crucial role in determining poverty levels, predominantly through the resultant positive changes in household income and expenditure. Agricultural productivity increases, together with increases in fertilizer productivity were projected to increase most households' real income and consumption. These results suggest the improvement of household welfare in aggregate, and the differences in the magnitude of the increases depend on the structure of primary factor owned by each household.

Real income was projected to decline for a small percentage of households, particularly rural agriculture households, with the rural lowest-income households suffering the worst losses. The reason is that unskilled labor (agriculture workers) income and employment would fall due to the increase in productivity of all primary inputs, mainly in the *Paddy* industry.

### **7.3 Policy implications**

Based on the findings of this study, this section makes several policy recommendations. If applied in the Indonesian context, these policies would need to be well coordinated, because they involve a number of institutions as well as a detailed mechanism. The policies recommended below, are interrelated; they are not stand alone.

### ***7.3.1 Macro-economic policy implications***

Promoting trade openness along with providing fertilizer subsidies enables greater economic expansion and realization of social objectives. Moreover, the increase in the fertilizer subsidy is itself adequate to cushion the decline in aggregate investment as a consequence of tariff liberalization. The fall in investment was relatively minor, however, public policy should heed this evidence and seek to design policies that facilitate and promote private and public investment and improve the investment climate overall. In addition, the decline in government savings – a source of fund for government investment – due to tariff cuts can be weathered through an effective taxation policy. Further, in order to increase investment, the government needs to support infrastructure development, improve national security, increase legal certainty and provide fair competition for businesses.

The Indonesian government should also aware of the impacts of trade liberalization and it should be ready to take any opportunities such liberalization presents. One example would be policies that encourage employment expansion in export-oriented industries, especially in agriculture. Moreover, the productivity of labor needs to be improved, especially that of agricultural workers. Primarily this would be through education to improve these workers' skills.

It is important to note that the subsidy increase as a policy could endanger the sustainability of the government budget. In addition, the subsidy reduction can reduce distortions between domestic and international prices, as anticipated in international trade agreements. Reducing the subsidy, as well as reducing tariffs, may strengthen Indonesia's industrial structure in the long-term. Industries would likely to benefit from competition, becoming more efficient. Therefore, policy-makers need to push for industries to become more competitive by improving production technologies, promoting better marketing management and improving distribution of inputs and outputs.

### ***7.3.2 Industrial output and trade policy implications***

Tariff cuts were shown to boost the economy and make agricultural industries more efficient. The positive effect of tariff cuts combined with fertilizer subsidies are similar to the impacts of agricultural and fertilizer productivity improvements. At the

industry level, the effects of these scenarios on output, employment, exports and imports are different among industries.

These indicators were projected to increase for some agricultural industries and contract for other industries such *Paddy*, *Soybeans*, *Vegetables*, *Rubber*, among others. This indicates that the government needs to be careful in easing tariffs on certain commodities, especially *Paddy*. The large amount of labor absorbed by this industry, and its role as a staple food provider, mean this industry is critical to economic and social stability. Based on simulation results, increasing fertilizer subsidies can be a flagship policy in the attempt to grow agricultural output. Furthermore, it seems the impact of the increase in fertilizer subsidies is more significant if combined with a 30 per cent tariff cut than if combined with a 100 per cent of tariff cut. Larger amount of fertilizer use in *Paddy* (up to 25 per cent of total input) and in other agricultural industries means fertilizer plays a significant role in agricultural production. In this area, improvements in production processes, the quality of land, the use of modern machinery, workers' skills and market distribution are also required and, thus, areas to which policy must attend.

To improve competitiveness, tariff cuts can be appropriate; they exert beneficial effects on several agricultural commodities, particularly export-oriented (or export-related) products such as *Cocoa*, *Coffee*, *Palm oil*, *Coconut*, *Fisheries* and *Forest products*. Reducing import tariffs boosts the competitiveness of these products, and simulation results show that given their relatively low level of competitiveness, some Indonesian agricultural products are able to adjust and improve their position in the global market. As to the impact of the increase in agricultural productivity, export levels in almost all agricultural industries were projected to increase. The governments needs to encourage the relevant industries to further boost production levels succeed in a free trade environment, and increase production levels, exports and competitiveness. Some of these objectives may be further pursued by use of more efficient technologies and energy-efficient work process, greater opportunity to access export credits, road and transport infrastructure developments, product exhibitions abroad to open up new trade possibilities, and attention to environmental issues such as the use of more eco-friendly technologies.

### ***7.3.3 Employment policy implications***

The changes in employment based on industry and job classification are varied. On industry average, Labor1 (agricultural employees) was projected to increase, while other labor types were projected to decrease. As well as implementing this policy in the agricultural industries, policy-makers must take the prudent step of implementing comprehensive employment policies in all industries.

The fertilizer subsidy appears to be a policy that can encourage domestic production and increase labor absorption in the agricultural sector. These policies need to be combined with other agricultural policies, such as those that seek to enhance the investment environment, to make more land available, to improve farmers' skills, and other policies to increase agricultural productivity. What also needs to be recognized with regards to the fertilizer subsidy is the possibility of a disproportionately large benefit for large agricultural producers when compared to small farmers; any government policy must take account of this inequity.

Due to the differing behaviors of the agricultural and non-agricultural industry, increased agricultural productivity may have different consequences for each industry's employment levels. Therefore, government needs to ensure that policies that enhance productivity are also capable of cushioning the impact of unemployment in some industries when output contracts. Labor decline in some agricultural industries is likely to occur as a consequence of technology improvements. Therefore, policy-makers should consider of setting this decline by improving labor skill levels and providing jobs in other sectors to accommodate labor from agricultural industries.

An increase in educated-labor movements from rural to urban areas is likely as labor level in non-agricultural industries increases with labor migration occurring from agricultural to non-agricultural industries, particularly of skilled-labor (Labor3 and Labor4). This suggests a possible excess of educated-labor in the agricultural sector to start with, hence the government may need to provide broader employment opportunities in this sector.

### ***7.3.4 Households' welfare implications***

Despite an increase in the welfare of households as a result of agricultural tariff cuts, increase in fertilizer subsidy, and the increase in agricultural and fertilizer

productivity, the Government of Indonesia should be careful when assessing the impact on specific households. In general, the decline in agricultural tariffs and the increased fertilizer subsidy should increase almost all households' welfare through the increase of real income, due to prices declining and households' purchasing power increasing-all households, except for those in Rural1 (rural agricultural employees). Rural1 households alone experienced a decline in real income in all simulations of tariff cuts and the fertilizer subsidy. The fertilizer subsidy has less effect on the real income of these households because they are landless. As the effects of agricultural productivity increase, real incomes of rural agricultural households decrease, particularly those of Rural1. In order to reduce poverty, the government should monitor the effects on these rural households.

The decline of Rural1's income is due to labor having the largest share of the primary factors owned by these households. This decline in households' income was seen in the results of simulations in some agricultural industries, for example *Paddy*. In such industries the government should seek to improve the skills of unskilled labor, and in the medium to long-term, support the development of other rural industries that can provide employment. In the short-term, compensation in the form of transfer funds may be considered. Policies that offset the impact of the widening income gap must also be consistent with liberalization policies and productivity improvements.

#### **7.4 Limitations and suggestions for further studies**

It is important to note some limitations and weaknesses of this study, and subsequent ways in which future studies might be improved. The limitations of the study include the nature of CGE models in general and the model data used.

Firstly, as with the majority of CGE models, the market structure in this model is competitive, and assumes constant returns to scale. This model does not accommodate monopoly market structures that assume increasing returns to scale. Such structures are likely to exist in Indonesia, particularly in the agricultural market. Applying the assumption of monopoly markets to further agricultural models is suggested in order to provide more realistic results.

Second, due to the large and detailed nature of model, the scarcity and lack of detail of the data is problematic. Several elasticity parameters were adopted from

previous studies or “borrowed” from other countries because of the lack of data and limited time available for the research. These parameters could be estimated to provide more accurate results. This could be achieved by survey or establishing more sophisticated econometric model estimations.

Third, the model in this study does not disaggregate each industry into production scale classification. Such disaggregation would enable researchers to observe the low-income section of each industry, as required in a poverty or welfare analysis. For this objective, each industry would need to be disaggregated into large, medium, small and micro-enterprises. Specific policies and targets in certain industries, such as protection for the production of micro and small-enterprises, or the determination of progressive taxes, could be determined with greater accuracy.

Fourth, further estimates could be made for the changes in income distribution before and after the policy shocks. In addition, the results of these simulations cannot be directly presented as the number of the poor. Therefore, further analysis related to income distribution and poverty figures is recommended.

Fifth, the size of shocks implemented in the model was the same for every agricultural industry. To improve results, separate analyses that employ unique size for each agricultural industry should be considered. In addition, the use of a survey or forecasting with sophisticated time-series models would enhance future studies. Finally, the forecasting model developed and employed in this study was recursive dynamic, meaning it could only be solved sequentially or one period at a time. More powerful forecasting could be obtained by using a full dynamic CGE model, which solves all periods simultaneously. Such a model would generate more accurate forecasting results.

## Appendices

Appendix table 3.1 Development Programs of Agricultural Revitalization in RPJMN 2004–2009

Programs and Objective	Activities
<p>1. Program for increasing food resiliency</p> <p>The objective of this program is to facilitate the increase and to maintain the sustainability of food security at the household level as part of national resiliency.</p>	<ol style="list-style-type: none"> <li>1. Maintaining the availability of food from domestic production, by among others safeguarding rice fields in irrigated areas, increasing the quality of intensification, and optimizing and expanding agricultural areas;</li> <li>2. Enhancing food distribution, by strengthening the capacity of food institutions and increasing the rural infrastructure that supports the food distribution system, so as to ensure access to food of the people;</li> <li>3. Increasing post-harvest and output processing activities, by optimizing the utilization of agricultural equipment and machinery, and by developing and applying agricultural technology to reduce losses;</li> <li>4. Diversifying food, by increasing food supply from animal products, fruits and vegetables, adjusting the consumption pattern of the population towards a better quality and more balanced patterns, and increasing the interest and ease for consuming local food products as alternatives to rice;</li> <li>5. Preventing and overcoming food problems, by increasing food assistance to poor/food-vulnerable families, strengthening food quality control and food safety, and by developing an early warning system to food vulnerabilities.</li> </ol>
<p>2. Program for developing agribusiness.</p> <p>The objective of this program is to facilitate the development of the agribusiness that covers upstream, on-farm, and downstream activities, and the supporting services.</p>	<ol style="list-style-type: none"> <li>1. Developing the agribusiness diversification, by encouraging the production of high value commodities and increasing off-farm activities so as to generate higher income and value added;</li> <li>2. Increasing the value added of agricultural and fishery products by enhancing post-harvest handling activities, quality, processing of output and marketing and development of the agro industry in rural areas;</li> <li>3. Developing and rehabilitating agricultural and rural infrastructure, by improving irrigation and farm roads, and other rural infrastructure;</li> <li>4. Increasing access to production resources, especially capital;</li> <li>5. Reducing trade barriers among local regions and providing protection from unfair world trade aspects;</li> <li>6. Increasing the application of science and technology in agriculture and developing agricultural research by developing and applying appropriate, location-specific and environmentally friendly technologies; and</li> <li>7. Developing rural financial institutions and the proper financing system for agricultural activities, among others by developing and strengthening micro-</li> </ol>

Appendix table 3.1 Development Programs of Agricultural Revitalization in RPJMN 2004–2009 (continued)

Programs and Objective	Activities
<p>3. Program for increasing the welfare of farmers. The objective of this program is to increase the capacity and competitiveness of agricultural communities, mainly farmers who do not have access to production resources of agricultural activities.</p>	<p>rural financial institutions, funding incentives and developing financing schemes that are proper and appropriate to agricultural undertakings.</p> <ol style="list-style-type: none"> <li>1. Revitalizing the extension system for agriculture, fishery, and forestry that must be highly coordinated with the provincial and district governments.</li> <li>2. Promoting and strengthening agricultural and rural institutions to enhance the bargaining position of farmers and fishermen;</li> <li>3. Simplifying the mechanism to support farmers and to reduce impediments to agricultural and agribusiness activities;</li> <li>4. Educating and training human resources in agriculture (among others, farmers, fishermen, extension workers and advisory personnel);</li> <li>5. Protecting farmers from unfair competition and from unjust trading practices; and</li> <li>6. Developing efforts to alleviate poverty.</li> </ol>
<p>4. Program for developing fishery resources. The objective of this program is to manage, promote, and utilize fishery resources in an optimal, just, and sustainable manner, in the context of increasing foreign exchange earnings, value added in fishery output, and income of fishermen, that of fish farmers and other coastal communities.</p>	<ol style="list-style-type: none"> <li>1. Empowering the economy of coastal communities;</li> <li>2. Developing areas for aqua-culture in brackish water and fresh water;</li> <li>3. Accelerating and restructuring the aqua-culture activities in ponds and fresh water;</li> <li>4. Improving science and technology and the seed breeding system;</li> <li>5. Developing the system for breeding centers certification and for the cultivation areas;</li> <li>6. Developing fishery ports for supporting oceanic fishery activities;</li> <li>7. Developing and rehabilitating fishery facilities and infrastructures;</li> <li>8. Increasing small-scale fishery activities, including in potential small islands;</li> <li>9. Controlling and enhancing business permit services;</li> <li>10. Formulating fishery policies and management plans in each area;</li> <li>11. Increasing the marketing, quality standards, and value added of fishery products;</li> <li>12. Strengthening institutions and institutional management;</li> <li>13. Developing science and technology and increasing fisheries research, including artificial breeding and genetic engineering of selected commodities that have high economic value;</li> <li>14. Developing the data, statistics and information system pertaining to fisheries;</li> <li>15. Increasing the quality of human resources, extension workers and facilitators/advisors in fisheries;</li> </ol>

Appendix table 3.1 Development Programs of Agricultural Revitalization in RPJMN 2004–2009 (continued)

Programs and Objective	Activities
<p>5. Program for increasing the utilization of forest resources potentials. The objective of this program is to attain the greater utilization of the potentials of forest resources in an efficient, optimal, just and sustainable manner.</p>	<p>16. Increasing the professionalism in planning and supervision of fisheries development.</p> <ol style="list-style-type: none"> <li>1. Developing high value timber products and promoting area-based forestry industrial clusters;</li> <li>2. Reducing the capacity of the timber processing industry and diversifying the sources of raw materials for the timber industry by seeking out the possibility of imports from neighboring countries;</li> <li>3. Marketing and controlling the circulation of forest products;</li> <li>4. Providing guidance to the primary forestry industry;</li> <li>5. Developing industrial tree-crop estates, especially in non-productive forest areas, including the facilitation for obtaining business licenses and for having access to capital/loans;</li> <li>6. Developing non-timber forest produce and environmental services, including the granting of management rights to the local communities for a certain period to utilize tree-crop estates and non-timber forest products;</li> <li>7. Increasing the awareness and participation of the people, specifically communities that are living in the vicinity of forests (slash-and-burn farmers, forest pioneers or trans-migrants, and so forth), in sustainable forest management; and</li> <li>8. Developing science and technology for supporting efforts to increase productivity of the forestry sector.</li> </ol>

Source: Republik Indonesia (2005a)

Appendix table 3.2 Development Programs of Agricultural Revitalization in RPJMN 2010–2014

Programs	Activities
A. The increase of production and productivity to ensure food security and industrial raw materials from domestic	
1. Program to improve production, productivity and quality of food crops to attain self-sufficiency and sustainable self-sufficiency	<ol style="list-style-type: none"> <li>1. Management of cereal crop production</li> <li>2. Management of legumes and tubers production</li> <li>3. Management of crop seed supply system</li> <li>4. Distribution of food crop seeds subsidy</li> <li>5. Management of systems and monitoring the provision of production facilities of food crops</li> <li>6. The distribution of subsidized fertilizer</li> <li>7. Strengthening the protection of crops from pests and DFI disorders</li> <li>8. Development of seed quality testing methods and application of quality system of seed testing laboratory</li> <li>9. Development of forecasting pests (OPT)</li> </ol>
2. Program to improve production of, productivity and product quality of sustainable horticultural crops	<ol style="list-style-type: none"> <li>1. The increase of production, productivity and product quality of sustainable fruit crop</li> <li>2. The increase of production, productivity and product quality of vegetables and medicinal plants sustainable</li> <li>3. The increase of production, productivity and product quality of sustainable ornamental plants</li> <li>4. The development of seed systems, fertilizers and other production facilities</li> <li>5. Development of horticultural plant protection system</li> </ol>
3. Program to improve production, productivity and quality of sustainable plantation	<ol style="list-style-type: none"> <li>1. Increased production, productivity and quality of crops</li> <li>2. Increased production, productivity and quality of herb plants and toners</li> <li>3. Support the provision of superior quality seeds and farm inputs</li> <li>4. Support protection of plantations and plantation business interruption handling</li> <li>5. Support the testing and quality control of seeds and crop protection technology implementation</li> </ol>
4. Achievement of self-sufficiency programs to improve the availability of beef and animal food that is safe, healthy, whole and halal	<ol style="list-style-type: none"> <li>1. Increasing the quantity and quality of seeds by optimizing local resources</li> <li>2. Improved ruminant production with the utilization of local resources</li> <li>3. The increase of non-ruminant livestock production with efficient use of local resources</li> <li>4. Control and prevention of animal infectious diseases strategic and zoonotic diseases</li> </ol>
5. Program of provision and development of infrastructure and agricultural facilities	<ol style="list-style-type: none"> <li>1. Expansion of agricultural areas</li> <li>2. Agricultural water management</li> <li>3. Development of agricultural land management</li> </ol>

Appendix table 3.2 Development Programs of Agricultural Revitalization in RPJMN 2010–2014 (continued)

Programs	Activities
6. Program to increase the competitiveness of value-added, downstream industries, marketing and export of agricultural produce	1. Development of post-harvest handling of agricultural
7. Program to increase diversification and food security community	1. Development of the availability and handling of food insecurity
8. Program creation and technology varieties competitive	<ol style="list-style-type: none"> <li>1. Research and development of animal husbandry and veterinary</li> <li>2. Research / analysis of socio-economic and agricultural policy</li> <li>3. Research and development of agricultural postharvest</li> <li>4. Research and development of food crops</li> <li>5. Research and development of plantation crops</li> <li>6. Library development and dissemination of agricultural technology</li> <li>7. Research / engineering and development of agricultural mechanization</li> <li>8. Research and development of biotechnology and resources</li> <li>9. Assessment and the acceleration of dissemination of agricultural technology innovation</li> <li>10. Research and development of horticulture</li> </ol>
9. Program to improve the quality of agricultural quarantine and bio-safety oversight	1. Service quality improvement of agricultural quarantine and bio-safety oversight
10. Program management support and implementation of other technical tasks of agriculture department	<ol style="list-style-type: none"> <li>1. Licensing service and agricultural investment</li> <li>2. Development and registration of plant variety protection</li> </ol>
11. Program development and management of fisheries	<ol style="list-style-type: none"> <li>1. Fish resources management</li> <li>2. Coaching and development of fishing boats, fishing equipment, fishing boats and crew</li> <li>3. Development of fisheries development and management of ports</li> <li>4. Fishing business services that are efficient, orderly, and sustainable</li> <li>5. KKP business development and empowerment of fishing small-scale fishermen</li> </ol>
12. Program to increase aquaculture production	<ol style="list-style-type: none"> <li>1. Development of fish farming production systems</li> <li>2. The development of fish seed systems</li> <li>3. Development of health systems of fish and fish farming environmentally sound aquaculture and fishery products are safe to eat</li> <li>4. The development of fish cultivation system</li> </ol>

Appendix table 3.2 Development Programs of Agricultural Revitalization in RPJMN 2010–2014 (continued)

Programs	Activities
	5. Development of infrastructure and systems of fish farming
	6. Escort and the application of adaptive technology applied aquaculture
13. Program research and development of marine and fishery science and technology	1. Research and development of fisheries science and technology
14. Increased production of forest utilization	1. Improved management of forest plantations 2. Increased production of natural forest management 3. Increased production of forest management planning 4. Improving primary industries of forestry
15. Improved functions and the carrying capacity of community-based watershed	1. Development of social forestry
B. Increased efficiency of distribution system and stabilization of food prices	
1. Program to increase the competitiveness of value-added, downstream industries, marketing and export of	1. Development of domestic marketing
2. Program to increase diversification and food security community	1. Development of distribution systems and food price stability
C. Increased food consumption needs	
1. Achievement of self-sufficiency programs to improve the availability of beef and animal food that is safe, healthy, intact and halal	1. Guarantee of animal food that is safe and halal and the fulfillment of preconditions non-food animal products
2. Program to improve the quality of agricultural quarantine and biosafety oversight	1. Increased plant quarantine system 2. Improved Animal quarantine system
3. Program to increase diversification and food security community	1. Development and increased diversification of food consumption of fresh food safety
4. Program to increase the competitiveness of fishery products	1. Facilitating the development of quality assurance and safety of fishery 2. Facilitate the strengthening and development of domestic marketing of fishery products
5. Program to increase support for the management and implementation of other technical tasks KKP	1. Development and enhancement of fish quarantine

Appendix table 3.2 Development Programs of Agricultural Revitalization in RPJMN 2010–2014 (continued)

Programs	Activities
D. Increasing the value added, competitiveness, and marketing of agricultural products, fishery and forestry	
1. Program to increase the competitiveness of value-added, downstream industries, marketing and export of agricultural produce	<ol style="list-style-type: none"> <li>1. Quality and standardization of agricultural development</li> <li>2. Development of agro-processing</li> <li>3. Development of international marketing</li> </ol>
2. Program to improve the quality of agricultural quarantine and bio-safety oversight	<ol style="list-style-type: none"> <li>1. Development of information systems security monitoring and improvement of biological systems</li> <li>2. Improving the quality of laboratory testing of agricultural quarantine standards</li> </ol>
3. Program to increase the competitiveness of fishery products	<ol style="list-style-type: none"> <li>1. Facilitating the development of fisheries product processing industry</li> <li>2. Facilitate the strengthening and development of overseas marketing of fishery products</li> <li>3. Facilitate training and development of business systems and fisheries investment</li> </ol>
4. Increased production of forest utilization	<ol style="list-style-type: none"> <li>1. Increased orderly circulation of forest and forest product fees</li> </ol>
5. Research and development of the forestry department	<ol style="list-style-type: none"> <li>1. Research and development of forest products</li> <li>2. Research and development of forest productivity improvement</li> </ol>
E. Increasing the capacity of the agricultural community, fisheries and forestry	
1. Agricultural human resource development programs and institutional farmers	<ol style="list-style-type: none"> <li>1. Strengthening agricultural training system</li> <li>2. Strengthening the agricultural extension system</li> </ol>
2. Program management support and implementation of other technical tasks of agriculture department	<ol style="list-style-type: none"> <li>1. Finance ministry of agriculture, rural agribusiness development and institutional strengthening of rural economy through LM3</li> </ol>
3. Human resource development programs of marine and fishery	<ol style="list-style-type: none"> <li>1. Training of maritime affairs and fisheries</li> <li>2. Extension of marine and fishery</li> <li>3. Marine and fisheries education</li> </ol>
4. Management support and other technical tasks of forestry department	<ol style="list-style-type: none"> <li>1. Forestry counseling</li> <li>2. Providing education and training of forest department officials and other human forest resources</li> </ol>

Source: Republik Indonesia (2010a)

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011

RKP	Programs
2005	<p>Program : Agribusiness development</p> <ol style="list-style-type: none"> <li>1. Growth, stabilization of development - leading commodity agribusiness area - with a focused on the aspects of processing and marketing to increase the added value;</li> <li>2. Quality improvement and development of agro-industries / processing in rural areas;</li> <li>3. Development of agribusiness services such as agricultural production facilities, equipment and agricultural machinery, technology, and capital;</li> <li>4. Development of agricultural production diversification;</li> <li>5. Agribusiness development in the area of <i>Kawasan Timur Indonesia</i> (KTI) or Eastern Indonesia and special areas;</li> <li>6. Development of infrastructure to support the system and agribusiness;</li> <li>7. Development of research and application of technology;</li> <li>8. Strengthening systems of quarantine and quality standards for agricultural commodities;</li> <li>9. Operation of system management and agribusiness; and</li> <li>10. Provision of personnel expenditure, goods, services, and implementation services in program development.</li> </ol> <p>Program : Improve food security</p> <ol style="list-style-type: none"> <li>1. Increased production of consumption patterns vary according to the nutritional balance;</li> <li>2. Increased government support in maintaining price stability and food availability at all times and the food trade policies are conducive;</li> <li>3. Reserves and development of alternative food sources in order to diversify production and consumption of food;</li> <li>4. Improving the quality of the intensification and expansion of plants through optimization of dry land, rained, lowland area, and the tide, especially in eastern Indonesia region, and western regions of potential;</li> <li>5. Development of integrated rice-based farming rice;</li> <li>6. Acceleration and revitalization of sugar cane plant-based industries;</li> <li>7. Development of food security in the area of KTI and special areas and food handling problems, especially for the poor and special groups;</li> <li>8. Development of infrastructure such as roads and irrigation farming to support efforts to increase food security;</li> <li>9. Improved quality and food safety;</li> <li>10. development of community participation in tackling food insecurity and</li> <li>11. Provision of personnel expenditure, goods and services of agricultural development.</li> </ol>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
2006	<p>Program: Empowering agriculture</p> <ol style="list-style-type: none"> <li>1. Training advice and assistance of farmers and actors;</li> <li>2. Implementation and improvement of guidance and counseling;</li> <li>3. Education and training of agricultural officers to improve services to farmers and agribusiness actors;</li> <li>4. Growing and strengthening farmers' organizations to increase business scale and bargaining position of farmers;</li> <li>5. Institutional development of agribusiness;</li> <li>6. Development of facilitation and support to farmers in order to increase the efficiency of his farming business management;</li> <li>7. Development efforts to eradicate poverty</li> </ol> <p>Program: Improve food security</p> <ol style="list-style-type: none"> <li>1. Formulation of measures to optimize the land, and the prevention of expansion of agricultural land conversion;</li> <li>2. Guidance to maintain and increase the level of domestic rice production;</li> <li>3. Strengthening the institutional capacity of food in the area;</li> <li>4. Strengthening Agriculture Quarantine;</li> <li>5. Formulation of measures to decrease post-harvest decrease gradually;</li> <li>6. Development of post-harvest and processing of strengthening institutions for quality improvement;</li> <li>7. Formulation of a strategy of national meat production increase;</li> <li>8. Development of alternative food sources;</li> <li>9. The expansion of the development of indicators in regional food insecurity and formulation of measures to address national food insecurity.</li> </ol> <p>Program: Agribusiness development</p> <ol style="list-style-type: none"> <li>1. Guidance for diversification of farming for increased revenue;</li> <li>2. Improvement of quality standards and improving quality of agricultural commodities according to international standards;</li> <li>3. Development of post-harvest handling and quality improvement of agricultural commodities;</li> <li>4. Guidance and support to farmer groups for increased participation in farming infrastructure maintenance;</li> <li>5. Development of the ability of farmers to access credit;</li> <li>6. Identification of the reduction in agricultural marketing constraints across regions;</li> <li>7. Identification and formulation of measures to protect agricultural business from unfair competition;</li> <li>8. Technology development and dissemination of appropriate technology and site-specific;</li> <li>9. Development of appropriate financing pattern for farming;</li> <li>10. Increasing the availability and access to facilities and infrastructure for agricultural business;</li> </ol>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
	<ul style="list-style-type: none"> <li>11. Improving processing technologies and agricultural products; and</li> <li>12. Increasing the productivity of land use and sleep</li> </ul> <p>Program: Improving the welfare of farmers</p> <ul style="list-style-type: none"> <li>1. Guidance for diversification of farming for increased revenue;</li> <li>2. Improvement of quality standards and improving quality of agricultural commodities according to international standards;</li> <li>3. Development of post-harvest handling and quality improvement of agricultural commodities;</li> <li>4. Guidance and support to farmer groups for increased participation in farming infrastructure maintenance;</li> <li>5. Development of the ability of farmers to access credit;</li> <li>6. Identification of the reduction in agricultural marketing constraints across regions;</li> <li>7. Identification and formulation of measures to protect agricultural business from unfair competition;</li> <li>8. Technology development and dissemination of appropriate technology and site-specific;</li> <li>9. Development of appropriate financing pattern for farming;</li> <li>10. Increasing the availability and access to facilities and infrastructure for agricultural business;</li> <li>11. Improving processing technologies and agricultural products; and</li> <li>12. Increasing the productivity of land use and sleep</li> </ul>
2007	<p>Program: Improve food security</p> <ul style="list-style-type: none"> <li>1. Increased food production and productivity in order to increase food availability, especially paddy/rice in the country through the development of Germination; development intensification of grains, nuts and tubers, development and provision of infrastructure facilities, including improvement of irrigation networks function at the level of farmers, extension acreage planted and harvested area; post-harvest handling, processing and marketing of agricultural produce; increased intensification and food security; development and protection of crops and livestock backed quarantine and surveillance system of food security are also controlling bird flu outbreaks in animals;</li> <li>2. Distribution system improvements and access to food through supporting the development of food between regions, a model of effective food distribution and development of food reserves;</li> <li>3. Increased consumption, diversification and food security by promoting food consumption patterns are balanced, providing subsidized rice for the poor</li> </ul> <p>Program: Improving the welfare of farmers</p> <ul style="list-style-type: none"> <li>1. Advocacy of the arrangement of property rights and certification of farmers' land</li> <li>2. Development of agro-industry partnership efforts in agriculture and rural infrastructure development (production/farming and dry land irrigation facilities).</li> </ul>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
Program: Agribusiness development	<ol style="list-style-type: none"> <li>1. Post-harvest handling and quality improvement;</li> <li>2. Development of processing and marketing of agricultural products.</li> <li>3. Increased productivity and plantation production, animal husbandry and horticulture;</li> <li>4. Commodity development and processing to increase the value of the plantation, animal husbandry and horticulture;</li> <li>5. Strengthening agricultural extension agencies, improvement of service institutions for farmers (financial and production facilities), improving human resource counselors, officials, farmers and agribusiness actors;</li> <li>6. Increased development and dissemination of appropriate technology to support increased productivity and quality of agricultural products;</li> <li>7. Increased competitiveness in the application of tariff harmonization and alignment of the agribusiness program policies, institutional development and market information, international trade cooperation, improve quality and standards of quality and implementation of the quarantine system to control the production of harmful diseases and product safety;</li> <li>8. Support for agricultural land preparation, development of procedures for the use of biodiesel and biofuel as renewable energy and storage procedures; impetus for the development of palm oil processing plants / distance for biodiesel and ethanol processing plants for gasohol (biofuels) with small production scale and medium (pilot scale); and increase research activities and research in the search for sources of renewable energy (biodiesel and biofuels) and technology processing applications</li> </ol>
2008	<p>Program: Improve food security</p> <ol style="list-style-type: none"> <li>I. Securing food supply from domestic production, including through securing land irrigated rice fields in the region, improving the quality of intensification, as well as optimizing and expansion of agricultural area <ol style="list-style-type: none"> <li>1. Help seed / seedlings to farmers in support of food security</li> <li>2. Provision and improvement of agricultural infrastructure in support of food security</li> <li>3. Germination institutional strengthening in support of food security</li> <li>4. Improvement of fertilizer subsidy mechanism</li> <li>5. The provision of fertilizer subsidy</li> <li>6. Seed subsidy</li> <li>7. Credit Subsidy Food Security (KKP)</li> <li>8. Provision of a special allocation of funds to support food security.</li> <li>9. Control of nuisance organism plant (OPT) animal diseases, quarantine and food security improvement</li> <li>10. Handling and control outbreaks of bird flu virus in animals and the restructuring of the poultry</li> <li>11. Mechanization of agricultural production activities of primary (pre-harvest)</li> </ol> </li> </ol>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
	<ul style="list-style-type: none"> <li>12. Increased agricultural production and productivity, and development of production central areas and agropolitan</li> <li>13. Development of cattle breeding</li> <li>14. Acceleration of research and dissemination of agricultural innovations in support of food security</li> <li>15. Coordination of aquaculture development</li> </ul>
	<ul style="list-style-type: none"> <li>II. Improved distribution of food through strengthening the institutional capacity of food and rural infrastructure improvements that support food distribution system, to ensure public accessibility to food <ul style="list-style-type: none"> <li>1. Stabilization of primary commodity prices through the DPM-LUEP.</li> <li>2. Coordination, monitoring, and evaluation of food reserves and strategic food handling.</li> <li>3. Coordination of rehabilitation and reconstruction of economic activities of farmers and fishermen after the disaster</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>III. Improved post-harvest and processing of results, by optimizing the use of tools and farm machinery for post-harvest and processing of results, and the development and utilization of agricultural technology to reduce the loss of. <ul style="list-style-type: none"> <li>1. Improved post-harvest activities and food processing</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>IV. Food diversification, through increased availability of animal food, fruit and vegetables, the social engineering of society toward the consumption patterns of food patterns with increasing quality, and increased interest and convenience food consumption of alternative / local food <ul style="list-style-type: none"> <li>1. Food self-reliant rural development, diversification of food, handling food scarcity and food security institutions</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>V. Prevention and control of food issues through increased food aid for the poor / food security, improving quality control and food safety systems and the development of early anticipation of food insecurity <ul style="list-style-type: none"> <li>1. Provision and distribution of subsidized rice for poor households</li> <li>2. Provision of government rice reserves</li> </ul> </li> </ul>
	<p>Program: Agribusiness development</p> <ul style="list-style-type: none"> <li>I. Development of agricultural diversification through the development of farming with high value commodities and the development of off-farm activities to increase income and value added. <ul style="list-style-type: none"> <li>1. Development of bio-energy raw materials</li> <li>2. Development of energy self-reliant villages.</li> <li>3. Development of integrated service facilities agro-industry</li> <li>4. Development of integrated agricultural-livestock crops, compost, and biogas</li> <li>5. The development of organic agriculture and the environment</li> <li>6. Replanting of smallholders</li> </ul> </li> </ul>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
	<ul style="list-style-type: none"> <li>7. Provision of subsidized interest rates, the provision of energy and revitalization vegetable plantations.</li> <li>8. Provision of a special allocation of funds to support agribusiness development.</li> <li>9. Coordination of farm restructuring</li> </ul>
	<p>II. Increasing the value added of agricultural and fishery products through improved post-harvest handling, quality, product processing and marketing and agro-industries in rural development</p> <ul style="list-style-type: none"> <li>1. Mechanization of agricultural production activities in supporting the post-harvest agribusiness</li> <li>2. Revitalization service units activity (UPJA) and group UPJA (KUPJA)</li> <li>3. Development of rural agro-industries</li> <li>4. Development of agricultural commodity marketing activities</li> <li>5. Increased activities of exhibitions, competitions, and awards to farmers/agribusiness actors</li> <li>6. Germination institutional strengthening in support of agribusiness development</li> </ul>
	<p>III. Development and rehabilitation of agricultural infrastructure and rural areas through improved irrigation and farming roads and other rural infrastructure</p> <ul style="list-style-type: none"> <li>1. Provision and improvement of agricultural infrastructure in support of agribusiness development</li> <li>2. Coordination, monitoring and evaluation of policies and regional infrastructure agriculture and fisheries</li> </ul>
	<p>IV. Increased access to productive resources, particularly capital</p> <ul style="list-style-type: none"> <li>1. Help seed / seedlings to farmers in support of agribusiness development</li> </ul>
	<p>V. Reduction of trade barriers between regions and the protection of the world trading system that is not fair</p>
	<p>VI. Improved agricultural technology and development of agricultural research through the development and utilization of appropriate technology and site-specific environmental friendly</p> <ul style="list-style-type: none"> <li>1. Acceleration of research and dissemination of agricultural innovations in support of agribusiness development</li> </ul>
	<p>VII. Development of rural financial institutions and adequate funding system for agricultural businesses, including through the development and strengthening of micro finance institutions / rural areas, financing incentives and development patterns appropriate financing and suitable for farming</p> <ul style="list-style-type: none"> <li>1. Coordination of agricultural investment climate and rural</li> <li>2. Coordination, monitoring and evaluation of plantation commodities policy</li> <li>3. Coordination, monitoring and evaluation of policies Vegetable Fuel</li> <li>4. Coordination, monitoring and evaluation of strategic policy horticultural commodities.</li> </ul>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
	<p>5. Coordination, monitoring and evaluation of institutional policies</p> <p>Program: Improving the welfare of farmers</p> <p>I. Revitalization of agricultural extension system, fishery and forestry should be coordinated extensively with both provincial governments and district</p> <p>1. Improving the system of agricultural extension services and human resources</p> <p>II. Growing and strengthening agricultural institutions and rural areas to improve the bargaining position of farmers and fishermen</p> <p>1. Formation / activation of farmer groups and farmer groups movement (<i>gabungan kelompok tani</i> or Gapoktan)</p> <p>III. Development of poverty reduction efforts</p> <p>1. Increased gender mainstreaming</p> <p>2. Institutional strengthening economic and PMUK farmers through LM3</p> <p>IV. Simplification of support mechanisms to farmers and reduction of agricultural barriers</p> <p>1. Direct Community Assistance for Relief of Agricultural Investment (BLM-KIP)</p> <p>V. Education and training of human resources</p> <p>1. Development of the field school internship</p> <p>2. Development of training activities, education, agriculture and agribusiness entrepreneurship of agriculture (ie farmers, fishermen, counselors and apparatus builder)</p> <p>VI. Protection of farmers from the competition is unhealthy business and unfair trade.</p> <p>1. Implementation and strengthening of good governance principles, the resolution of conflict, natural disaster, remote area and border</p>
2009	<p>Program: Improve food security</p> <p>I. Securing food supply from domestic production through land protection in the area irrigated rice fields, improvement of intensification, and the optimization and expansion of agricultural area</p> <p>1. Provision and Agricultural Infrastructure Improvement (PNPM-P)</p> <p>2. Control - Crop predatory organisms (OPT), Animal Disease, Quarantine and Food Safety Improvement</p> <p>3. Cattle Breeding Development</p> <p>4. Help Seed / seed production facilities and institutional strengthening agricultural Germination</p> <p>5. Handling and Control of Avian Influenza Virus and Animals and the restructuring of the poultry</p> <p>6. Increased production, productivity and quality of agricultural products</p>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
	<ul style="list-style-type: none"> <li>7. Research and dissemination of agricultural innovations (PRIMATANI and field schools PTT)</li> <li>8. Provision of loan interest subsidy funding food security and energy</li> <li>9. Provision of fertilizer subsidy</li> <li>10. Provision of seed subsidy</li> <li>11. Providing a special allocation of funds to support food security improvement</li> <li>12. Improved distribution of food through strengthening the institutional capacity of food and rural infrastructure improvements that support food distribution system to ensure public access to food: Coordination of monitoring and evaluation of food reserves and food handling strategic coordination, monitoring and evaluation of institutional policies</li> </ul>
	<ul style="list-style-type: none"> <li>II. Improved post-harvest and processing of results, by optimizing the use of tools, machinery for post-harvest and processing of results and the development and utilization of agricultural technology to reduce the loss of (looses):               <ul style="list-style-type: none"> <li>1. Mechanism of pre-and post-farm agriculture</li> </ul> </li> </ul>
	<p>Improving post-harvest and marketing of agricultural commodities</p> <ul style="list-style-type: none"> <li>I. Diversification of food through increased availability of animal foods, fruits, and vegetables; social engineering of society toward the consumption patterns of food patterns with increasing the quality and increase the interest and convenience food consumption of alternative / local food           <ul style="list-style-type: none"> <li>1. Food diversification</li> </ul> </li> <li>II. Prevention and control of food issues through increased food aid for the poor / food security, improving quality control and food safety systems and the development of early anticipatory eye for food insecurity           <ul style="list-style-type: none"> <li>1. Independent rural development and food handling food insecurity</li> <li>2. Development institutions rural economic enterprises</li> </ul> </li> <li>III. The provision and distribution of subsidized rice for the poor (<i>beras untuk rakyat miskin</i> or Raskin)</li> </ul>
	<p>Program: Agribusiness development</p> <ul style="list-style-type: none"> <li>I. Development of farm diversification through the development of farming with high value commodities and the development of off-farm activities to increase income and value added           <ul style="list-style-type: none"> <li>1. Crop-livestock integration, composting and biogas</li> <li>2. Replanting of smallholders and the development of commercial plantations (raw material energy)</li> <li>3. Development of organic agriculture</li> </ul> </li> </ul>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
II.	Increasing the value added of agricultural and fishery products through improved post-harvest handling, quality, product processing and marketing and agro-industries in rural development
1.	Development of integrated agro-industries
2.	Improvement activities exhibitions, contests and awards to farmers / agribusiness actors
III.	Development and rehabilitation of agriculture and rural infrastructure, through improved road networks and irrigation farming and other rural infrastructure
IV.	Reduction of trade barriers between regions and the protection of the world trading system that is not fair
V.	Development of rural financial institutions and adequate funding system for agricultural businesses, among others: through the development and strengthening of micro finance institutions / rural areas, incentives to capital and financing pattern of development that is proper and suitable for agricultural businesses
1.	Provision of interest subsidy, the provision - energy plant - and the revitalization of plantations
VI.	Increase in agricultural science and technology research and development of agriculture through the development and utilization of appropriate technology and site-specific environmental
VII.	Increasing access to productive resources, especially capital
	Program: Improving the welfare of farmers
I.	Revitalization of agricultural extension systems, fisheries and forestry is intensive and coordinated in the region
1.	Improving agricultural extension system and developing human resources farmer groups
II.	Growing and strengthening agricultural institutions and rural areas to improve the bargaining position of farmers and fishermen: Agribusiness Agricultural Business development (PUAP)
III.	Development of poverty reduction efforts: Institutional strengthening of rural economy through independent agencies and rooted in the community (LM3)
IV.	Education and training of agricultural resources
V.	Internships field schools and training, agricultural education and agribusiness entrepreneurship
VI.	Protection of farmers from the competition is unhealthy business and unfair trade: Implementation and the strengthening of good governance principles, the resolution of conflict, natural disaster, remote area, the outermost islands and borders, assistance and implementation of Presidential Instruction PHLN related and gender preference
VII.	Simplification of support mechanisms to farmers and reduction in agricultural business barriers

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
2010	<p>Farmer's welfare improvement program</p> <ol style="list-style-type: none"> <li>1. Development of agriculture agribusiness (PUAP)</li> <li>2. Institutional strengthening of rural economy through the LM3 and youth to build the village (PMD)</li> </ol> <p>Underdeveloped area development program</p> <ol style="list-style-type: none"> <li>1. Accelerating the development of underdeveloped regions and special (P2DTK/SPADA) – PNPM</li> </ol> <p>Program to improve rural infrastructure</p> <ol style="list-style-type: none"> <li>1. Acceleration of rural infrastructure development (P2IPDT)</li> </ol> <p>Program to improve the empowerment of rural communities</p> <ol style="list-style-type: none"> <li>1. Acceleration of socio-economic development of disadvantaged areas (P2SEDT)</li> </ol> <p>Fisheries resource development program</p> <ol style="list-style-type: none"> <li>1. Economic empowerment, social and business culture fisheries and coastal communities</li> </ol> <p>Science and technology research and development programs</p> <ol style="list-style-type: none"> <li>1. Research and development of forestry</li> <li>2. Planning, evaluation, cooperation and increased research and development facilities</li> <li>3. Application of research results and forestry development</li> </ol> <p>Diffusion and utilization of science and technology program</p> <ol style="list-style-type: none"> <li>1. Development of product diversification and corn-based food and animal protein (the assessment and application of technology for national food self-sufficiency)</li> </ol> <p>Program to improve food security</p> <ol style="list-style-type: none"> <li>1. Institute of Food Distribution Society (LDPM)</li> <li>2. Development of independent villages for food, and handling of food-insecure regions</li> <li>3. Improved post-harvest and marketing of agricultural commodities</li> <li>4. The provision and improvement of agricultural infrastructure</li> <li>5. Control of plant pests (OPT), animal disease, quarantine and food safety improvement</li> <li>6. Development of cattle breeding</li> <li>7. Help seed / seedlings, agricultural inputs, and fertilizer subsidy mechanism</li> <li>8. Research and dissemination of agricultural innovations</li> <li>9. Increased production, productivity &amp; quality of agricultural products</li> </ol>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
	<ul style="list-style-type: none"> <li>10. Restructuring the poultry</li> <li>11. Food diversification</li> <li>12. The provision of fertilizer subsidy fund</li> <li>13. Provision of seed subsidy funds</li> <li>14. Provision of a special allocation of funds in agriculture</li> <li>15. Provision of government rice reserve</li> <li>16. Improved agricultural extension system of human resources, and development of farmer groups</li> <li>17. Coordination, monitoring and evaluation of staple food price stabilization, food reserves and food handling strategic</li> </ul>
	Agribusiness development program
	<ul style="list-style-type: none"> <li>1. Development of integrated agro-industry</li> <li>2. Crop-livestock integration, composting and biogas</li> <li>3. Rejuvenation of smallholders and development commercial plantations (raw material for bio-energy)</li> <li>4. Development of organic farming and sustainable agriculture</li> <li>5. Movement production and quality improvement nationally</li> <li>6. Increased activities of exhibitions, competitions and awards to farmers / agribusiness</li> </ul>
	Program to improve food security
	<ul style="list-style-type: none"> <li>1. Agricultural mechanization pre and post harvest</li> </ul>
	Program to improve the welfare of farmers
	<ul style="list-style-type: none"> <li>1. Development of agriculture agribusiness (PUAP)</li> <li>2. Institutional strengthening of rural economy through the LM3 and youth to build the village (PMD)</li> <li>3. Internships, field schools and training, agricultural education, agribusiness and entrepreneurship</li> <li>4. Policy, planning, coordination, finance, staffing, monitoring, and evaluation, development of statistical data and information, cooperation, and mainstreaming gender and solving urgent problems and natural disasters</li> </ul>
	Fisheries resource development program
	<ul style="list-style-type: none"> <li>1. Economic empowerment, social, cultural, business actors fisheries and coastal communities</li> <li>2. Directions and fishery business system development</li> </ul>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
	<ol style="list-style-type: none"> <li>3. Development and implementation of fisheries quarantine and fish health management system</li> <li>4. Human resources development and improvement of marine and fisheries extension system</li> <li>5. Strengthening and development of domestic marketing and export of fishery products</li> <li>6. Improvement and development of fisheries infrastructure and other production inputs</li> <li>7. Improved quality and development of fisheries product processing</li> <li>8. Implementation of fisheries revitalization</li> <li>9. Engineering technology, applied fisheries development</li> <li>10. Provision of special allocation funds fisheries</li> </ol>
	<p>Program of stabilization and utilization of forest resources</p> <ol style="list-style-type: none"> <li>1. Development of the management of natural forests</li> <li>2. Control circulation of forest products</li> <li>3. Inauguration and use management of forest area</li> <li>4. KPH Construction</li> <li>5. Forest inventory and development of natural resources information and LH</li> <li>6. Development of plantation forest and forest people's crops</li> <li>7. Development of non-timber forest products utilization</li> <li>8. Management of production forests that are not encumbered with the rights / permission utilization</li> <li>9. Restructuring the primary industries of forestry</li> </ol>
	<p>Program protection and conservation of natural resources</p> <ol style="list-style-type: none"> <li>1. Management of parks and conservation areas, and other national conservation area (KSA/KPA /TB) and HL</li> <li>2. Biodiversity and ecosystem management</li> </ol>
	<p>Recovery and rehabilitation program reserves of natural resources</p> <ol style="list-style-type: none"> <li>1. Priority watershed of critical land rehabilitation</li> <li>2. Planning and land rehabilitation and forestry development social</li> <li>3. Watershed Management</li> <li>4. Planning, institutional development and community forests</li> <li>5. Planning and development of community forestry</li> <li>6. Water supply comes from ground water and basic sanitation</li> </ol>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
	Program protection and conservation of natural resources
	<ol style="list-style-type: none"> <li>1. Control of forest and land fires</li> <li>2. Development of environmental services and natural attractions</li> <li>3. Park management model</li> </ol>
	Recovery and rehabilitation program reserves of natural resources
	<ol style="list-style-type: none"> <li>1. Provision of DAK conservation of forest resources, forest land and water</li> </ol>
2011	A. Focus priorities: increasing production and productivity to ensure the availability of food and industrial raw materials from domestic
	Program to improve production, productivity and quality of food crops to attain self-sufficiency and sustainable self-sufficiency
	<ol style="list-style-type: none"> <li>1. Management of cereal crop production (national and sector priorities)</li> <li>2. Production management of legumes and tubers (national and sector priorities)</li> <li>3. Management of crop seed supply systems (national and sector priorities)</li> <li>4. Distribution of seed crop subsidies (national and sector priority)</li> <li>5. Management systems and monitoring the provision of food crop production facilities (national and sector priorities)</li> <li>6. The distribution of subsidized fertilizer (national and sector priorities)</li> <li>7. Strengthening the protection of crops from pest problems and DFI (sector priority)</li> <li>8. Development of seed quality testing methods and the application of seed testing laboratory quality system (sector priority)</li> <li>9. Development of forecasting attack plant pests (sector priority)</li> </ol>
	Program to improve production, productivity and product quality of sustainable horticultural crops
	<ol style="list-style-type: none"> <li>1. Increased production, productivity and product quality sustainable fruit crop (national and sector priorities)</li> <li>2. Increased production, productivity and product quality of vegetables and medicinal plants sustainable (national and sector priorities)</li> <li>3. Increased production, productivity and product quality sustainable ornamental plants (sector priority)</li> <li>4. The development of seed systems, fertilizers and other production facilities (national and sector priorities)</li> <li>5. Development of horticultural plant protection system (sector priority)</li> </ol>
	Program to improve production, productivity and quality of sustainable plantation
	<ol style="list-style-type: none"> <li>1. Increased production, productivity and quality of annual crops (national and sector priorities)</li> <li>2. Increased production, productivity and quality spices and toners (national and sector priorities)</li> <li>3. Support the provision of superior quality seeds and farm inputs (national and sector priorities)</li> <li>4. Support protection of plantations and plantation business interruption handling (sector priority)</li> </ol>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
	<ul style="list-style-type: none"> <li>5. Support testing and quality control of seeds and crop protection technology implementation plantation (sector priority)</li> </ul>
	Achievement of self-sufficiency programs to improve the availability of beef and animal food that is safe, healthy, whole and halal
	<ul style="list-style-type: none"> <li>1. Increasing the quantity and quality of seeds by optimizing local resources (national and sector priorities)</li> <li>2. Improved ruminant production with efficient use of local resources (national and sector priorities)</li> <li>3. The increase of non-ruminant livestock production with efficient use of local resources (national and sector priorities)</li> <li>4. Control and prevention of animal infectious diseases strategic and zoonotic diseases (sector priority)</li> </ul>
	Program provision and development of agricultural infrastructure and facilities
	<ul style="list-style-type: none"> <li>1. Expansion of agricultural areas</li> <li>2. Agricultural water management</li> <li>3. Development of agricultural land management</li> </ul>
	Program to increase the competitiveness of value-added, downstream industries, marketing and export of agricultural products
	<ul style="list-style-type: none"> <li>1. Development of post-harvest handling of agricultural</li> </ul>
	Program to increase diversification and food security community
	<ul style="list-style-type: none"> <li>1. Development of the availability and handling of food insecurity (national and sector priorities)</li> </ul>
	Program creation and technology varieties competitive
	<ul style="list-style-type: none"> <li>1. Research and development of animal husbandry and veterinary (national and sector priorities)</li> <li>2. Research / analysis of socio-economic and agricultural policies (sector priority)</li> <li>3. Research and development of postharvest agriculture (national and sector priorities)</li> <li>4. Research and development of food crops (priority and sector national)</li> <li>5. Research and development of plantation crops (national and sector priorities)</li> <li>6. Library development and dissemination of agricultural technologies (sector priority)</li> <li>7. Research / engineering and development of agricultural mechanization (sector priority)</li> <li>8. Research and development of biotechnology and resources agricultural genetic (national and sector priorities)</li> <li>9. Assessment and the acceleration of innovation dissemination of agricultural technologies (sector priority)</li> <li>10. Research and development of horticulture (national and sector priorities)</li> </ul>
	Program to improve the quality of agricultural quarantine and bio-safety oversight
	<ul style="list-style-type: none"> <li>1. Service quality improvement of agricultural quarantine and bio-safety oversight</li> </ul>

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
	Program management support and other technical duties agriculture ministry
	1. Licensing service and agricultural investment
	2. Development and registration of plant variety protection
	Program development and management of fisheries
	1. Management of fish resources (SDI)
	2. Coaching and development of fishing boats, fishing equipment, fishing boats and crew
	3. Development of fisheries development and management of ports
	4. Fishing business services that are efficient, orderly, and sustainable
	5. Development of fishing effort and the empowerment of small-scale fishermen
	Program to increase aquaculture production
	1. Development of fish farming production systems
	2. The development of fish seed systems
	3. The development of fish health and environmental system of fish farming
	4. The development of fish cultivation system
	5. Development of infrastructure systems and facilities of fish farming
	6. Escort and application of applied adaptive technology of aquaculture
	Program research and development of marine and fishery science and technology
	1. Research and development of fisheries science and technology
	2. Research and development of aquaculture science and technology
	Increased production of forest utilization
	1. Improved management of forest plantations
	2. Increased production of natural forest management
	3. Increased production of forest management planning
	4. Improving primary industries of forestry
	Improved functions and the carrying capacity of community-based das
	1. Development of social forestry
	B. Focus priorities: improving efficiency of distribution system and the stabilization of food prices

Appendix table 3.3 List of Government Agricultural Revitalization Policies in RKP 2005–2011 (continued)

RKP	Programs
	Program to increase the competitiveness of value-added, downstream industries, marketing and export of agricultural products
	1. Development of domestic marketing
	Program to increase diversification and food security community
	1. Development of distribution systems and food price stability.
	C. Focus priorities: increasing food consumption needs
	Achievement of self-sufficiency programs to improve the availability of beef and animal food that is safe, healthy, whole and halal
	1. Assurance of food of animal origin are safe and halal and the fulfillment of the requirements of non-edible animal products
	Program to improve the quality of agricultural quarantine and bio-safety oversight
	1. Increased plant quarantine system
	2. Improved animal quarantine system
	Diversification and improvement program community food security
	1. Development and increased diversification of food consumption of fresh food safety
	Program to increase the competitiveness of fishery products
	1. Facilitating the development of quality assurance and safety of fishery
	2. Facilitate the strengthening and development of domestic marketing of fishery products in KKP
	Program management support and implementation of other technical tasks of KKP
	1. Development and enhancement of fish quarantine

Source: Republik Indonesia (2005b, 2005c, 2006, 2007, 2008, 2009, 2010b)

Appendix table 4.1 Survey of CGE methodology in agriculture, income distribution, and poverty

Author & Year	Title	CGE Model & Data	Objectives & Shocks	Findings
Cabalu et al. (1997)	Indonesian agribusiness and agro-industry to the year 2020	Model: MEGABARE, multi country & multi-sector	Objectives: projection of the performance of the Indonesian agricultural sector Shocks: 1) an increase in productivity in grain and non-grain sectors 2) an increase in world trade liberalization 3) a trade liberalization backlash which leads to increase trade barriers in agricultural products 4) a reaction to global warming through greenhouse gas emission by the imposition of carbon taxes	The result of the initial stage, Indonesia's GDP and investment increase substantially. However, the impact on agriculture and foods is negative, with large declines in production evident everywhere, with the notable exception of forestry, which increases by 20 per cent above baseline levels. In the second stage, Indonesian economic activity and investment have a large negative impact.
Indonesia Erwidodo, Stringer, and Wittwer (1999)	The agriculturalization of Indonesia: In the aftermath of the socioeconomic crisis	Model: WAYANG, single country, 65 sector of the Indonesian economy, based on ORANI model, using GEMPACK Data: IO 1998	Objectives: Effects of economic change on the environment, and on the impacts on Indonesia's agricultural production and trade of changes in resources and environmental policy. Shocks: 1) a 25% real devaluation of the rupiah 2) a productivity decline in agriculture due to a decline in the growth of knowledge 3) a 5% run down in primary factor endowments (excluding land)	All industries suffer a loss of output compared with a base case. Most agricultural products designated as export-oriented within the model increase exports.
Abimanyu (2000)	Impact of agriculture trade and subsidy policy on macro-	CGE INDORANI Model, based on ORANI model, using GEMPACK Data: I-O & SAM 1993 which update	Objectives: Analyzes the wide economic, social, and environmental consequences of reducing import tariffs on agricultural inputs and increasing government subsidies to the agricultural sector as a part of the strategy for economic recovery.	Both trade liberalization and government subsidies enhanced GDP and real consumption. In the short term, reducing import tariffs on

Appendix table 4.1 Survey of CGE methodology in agriculture, income distribution, and poverty (continued)

Author & Year	Title	CGE Model & Data	Objectives & Shocks	Findings
Indonesia	economy, distribution, and environment in Indonesia: A strategy for future industrial development	to 1999/2000 with 1998 crisis simulation scenarios	<p>Shocks:</p> <p>1) a decrease in import tariffs on agricultural related input</p> <p>2) an increase in fertilizer subsidies</p> <p>3) a combination of a reduction in import tariffs and an increase in government transfer to poor farmers.</p> <p>1) crisis scenarios: a 10% increase in real exports, a 5% increase in household consumption shifter, a 10% decrease in fuel subsidies, a 35% decrease in electricity subsidies, a 10% increase in civil servants' salary, and a 20% increase in development spending</p> <p>2) a 10% reduction in import tariffs on fertilizer, pesticides, and chemicals</p> <p>3) a 10% increase in fertilizer subsidies</p> <p>4) a 10% reduction in import tariffs on fertilizer, pesticides, and chemicals, and a 10% increase in targeted subsidies to landless and poor farmers</p>	<p>agricultural inputs should exert a beneficial effect on the economy by raising the agricultural output and employment, stimulating imports, and, subsequently, exports. Increasing government subsidies induces an appreciation in the real exchange rate, which restricts exports and promotes imports.</p> <p>From the environmental perspective, imported agricultural inputs are relatively less harmful to the environment than domestically produced agricultural inputs. The results indicate that trade liberalization stimulates the inflow of fewer dirty products (inputs) to the agricultural sector.</p>
	Oktaviani and Drynan (2000)	The Impact of APEC Trade Liberalisation on the Indonesian economy and agricultural sector	CGE INDOF model (a recursive dynamic CGE model), based on ORANI-F model , GTAP Data: IO 1990 & SAM 1993	<p>Objectives:</p> <p>Analyze the impact of trade liberalization by the APEC members to the Indonesian macro-economy and its various sectors, especially the agricultural industries.</p> <p>Shocks:</p> <p>Various scenarios for tariff rates' changes made by Indonesia</p>

Appendix table 4.1 Survey of CGE methodology in agriculture, income distribution, and poverty (continued)

	Author & Year	Title	CGE Model & Data	Objectives & Shocks	Findings
Indonesia	Haryono (2008)	The impact of agricultural industrialization on agricultural sector performance and rural poverty: recursive dynamic CGE model	CGE recursive dynamic model: CGE-AGRINDO model, based on ORANI-F model Data: IO & SAM 2003	Objectives: Measure the impact of productivity improvement in the agricultural industry (agro-industry) on economic sector performance, macro-economy, household income, and rural poverty Shocks: 1) agro-industry productivity rise 2) increase the productivity of agro-industries followed by an increase in agricultural productivity 3) an increase in the productivity of agro-industry and agricultural sector followed by an increase in the productivity of financial institutions	The result of policy simulation shows that productivity improvement in agro-industries has a strong impact on total output in industry and increases labor absorption. Productivity improvement also affects rural and urban household income whose income is considered lower.
	Salma (1992)	Agricultural price policy in Bangladesh: General equilibrium effects on growth and sectoral income distribution	CGE Model for Bangladesh economy, 25 sectors and 35 commodities Data: IO Bangladesh 1984-85	Objectives: Evaluate the agricultural price policy that existed until 1985 in Bangladesh in terms of its impact on agricultural and national growth, efficiency, and equity. Shocks: Scenarios related to technological growth, increasing of infrastructure investment in rural areas, resource transfer to agriculture (as the constraining effect of unsuitable indirect policies), trade reforms, and currency depreciation.	The short-run simulation of policies generated fewer levels of growth than the long-run simulation. Indirect policies had a bigger impact on agricultural productivity and output than direct policies in both the short-run and the long-run.
Other countries	Dogruel, Dogruel, and Yeldan (2003)	Macro-economics of Turkey's	A six sectors dynamic CGE	Objectives: Investigates feasible options of the proposed	The model results suggest that even though there are expected normal

Appendix table 4.1 Survey of CGE methodology in agriculture, income distribution, and poverty (continued)

Author & Year	Title	CGE Model & Data	Objectives & Shocks	Findings	
Other countries		agricultural reforms: an intertemporal CGE analysis	model. Data: IO Turkey 1990	agricultural-cum-fiscal reform and analyzes the formal links between the public sector fiscal balances, accumulation patterns, dynamic resource allocation, and consumer welfare under a medium to long-term horizon.	welfare gains of consumers' intertemporal efficiency, the consequences of these policies on the rural economy and aggregate gross domestic product are likely to be deflationary
	Valenzuela et al (2007)	Assessing Global Computable General Equilibrium Model Validity Using Agricultural Price Volatility	GTAP Model Data: 17 world country regions	Objectives: Validating simulation models, on a sector-by-sector basis, with particular emphasis on agricultural market.	The model tends to under-predict price volatility for net exporters, and over-predict volatility for importing regions. The inadequate representation of government policies for wheat, including the presence of state-trading corporations, is an important limitation of the GTAP global CGE model.
	Zhai and Zhuang (2009)	Agricultural impact of climate change: A general equilibrium analysis with special reference to South East Asia	A Multi-country CGE-recursive dynamic: LINKAGE model Data: twenty-one countries/regions and nineteen sectors	Objectives: Assess the economic effects of climate change for South East Asian countries through 2080 Shocks: A baseline scenario from 2004–2080 was constructed under the assumption that there would be no climate change impacts on economic activities. In the counterfactual scenario with agricultural damages, it was assumed that productivity in four crop agricultural sectors (paddy rice, wheat, other grains, and other crops) would be lower than that in the baseline scenario because of the projected changes in climate.	The aggregate impacts of agricultural damages caused by climate change on the global economy are moderate. The expected increase of crop import dependence in the coming decades would make most South East Asian economies suffer more welfare losses from deteriorated terms of trade. Based on a country's economic structure; the negative effects are expected to be less for Singapore and Malaysia but to be greater for the Philippines, Indonesia, Thailand, and Vietnam

Appendix table 4.3 Model equations

No	Equation	Description
1.	<u>Demand for labor</u>	
(1.1)	$X1LAB\_O(i) = CES( All,o,OCC: X1LAB(i,o)$ where CES substitution between skill types is $SIGMA1LAB(i)$	Demand for labor
(1.2)	$x1lab(i,o) = x1lab\_o(i) - SIGMA1LAB(i)*[p1lab(i,o) - p1lab\_o(i)]$	Demand for labor by industry and skill group
(1.3)	$[TINY+V1LAB\_O(i)]*p1lab\_o(i) = \text{sum}\{o,OCC, V1LAB(i,o)*p1lab(i,o)\}$ where TINY = 0.000000000001; Small number to prevent singular matrix	Price to each industry of labor composite
2.	<u>Demands for primary factors</u>	
(2.1)	$X1PRIM(i) = CES( X1LAB\_O(i)/A1LAB\_O(i), X1CAP(i)/A1CAP(i), X1LND(i)/A1LND(i)$ where CES substitution, primary factors is $SIGMA1PRIM(i)$	Demands for primary factors
(2.2)	$x1lab\_o(i) - a1lab\_o(i) = x1prim(i) - SIGMA1PRIM(i)*[p1lab\_o(i) + a1lab\_o(i) - p1prim(i)]$	Industry demands for effective labor
(2.3)	$x1cap(i) - a1cap(i) = x1prim(i) - SIGMA1PRIM(i)*[p1cap(i) + a1cap(i) - p1prim(i)]$	Industry demands for capital
(2.4)	$x1lnd(i) - a1lnd(i) = x1prim(i) - SIGMA1PRIM(i)*[p1lnd(i) + a1lnd(i) - p1prim(i)]$	Industry demands for land
(2.5)	$V1PRIM(i)*p1prim(i) = V1LAB\_O(i)*[p1lab\_o(i) + a1lab\_o(i)] + V1CAP(i)*[p1cap(i) + a1cap(i)] + V1LND(i)*[p1lnd(i) + a1lnd(i)]$	Effective price term for factor demand equations
3.	<u>Demand for intermediate inputs</u>	
(3.1)	$X1\_S(c,i) = CES( All,s,SRC: X1(c,s,i)/A1(c,s,i)$	Import/domestic composition of intermediate demands
4.	<u>Demands for composite primary factors and intermediate inputs</u>	
(4.1)	$X1TOT(i) = \text{MIN}( All,c,COM: X1\_S(c,i)/[A1\_S(c,s,i)*A1TOT(i)], X1PRIM(i)/[A1PRIM(i)*A1TOT(i)], X1OCT(i)/[A1OCT(i)*A1TOT(i)] )$	Industry input demands
(4.2)	$x1\_s(c,i) - [a1\_s(c,i) + a1tot(i)] = x1tot(i)$	Demands for commodity composites
(4.3)	$x1prim(i) - [a1tot(i) + a1prim(i)] = x1tot(i)$	Demands for primary factor composite
(4.4)	$x1oct(i) - [a1oct(i) + a1tot(i)] = x1tot(i)$	Demands for other cost tickets

Appendix table 4.3 Model equations (continued)

No	Equation	Description
(4.5)	$V1TOT(i)*[p1tot(i)-a1tot(i)] = \sum\{c,COM, V1PUR\_S(c,i) * [p1\_s(c,i) + a1\_s(c,i)] \} + V1PRIM(i) * [p1prim(i) + a1prim(i)] + V1OCT(i) * [p1oct(i) + a1oct(i)]$	Zero pure profits in production
5.	<u>Commodity composites of industry outputs</u>	
(5.1)	$q1(c,i) = x1tot(i) + SIGMA1OUT(i)*[p0com(c) - p1tot(i)]$	Supplies of commodities by industries
(5.2)	$MAKE\_C(i)*p1tot(i) = \sum\{c,COM, MAKE(c,i)*p0com(c)\}$	Average price received by industries
(5.3)	$MAKE(c,i) = p0com(c)*q1(c,i)$	Multiproduction matrix
6.	<u>Demands for investment goods</u>	
(6.1)	$X2\_S(c,i) = CES( All,s, SRC: X2(c,s,i)/A2(c,s,i)$ where CES is SIGMA2(c); Armington elasticities: investment	Investment demand
(6.2)	$x2(c,s,i)-a2(c,s,i) - x2\_s(c,i) = - SIGMA2(c)*[p2(c,s,i)+a2(c,s,i) - p2\_s(c,i)]$	Source-specific commodity demands
(6.3)	$p2\_s(c,i) = \sum\{s, SRC, S2(c,s,i)*[p2(c,s,i)+a2(c,s,i)]\}$	Effective price of commodity composite
(6.4)	$x2\_s(c,i) - [a2\_s(c,i) + a2tot(i)] = x2tot(i)$	Demand for commodities
(6.5)	$V2TOT(i)*(p2tot(i) - a2tot(i)) = \sum\{c,COM, V2PUR\_S(c,i) * [p2\_s(c,i)+a2\_s(c,i)] \}$	Zero pure profits in investment
7.	<u>Demand for margins</u>	
	$x1mar(c,s,i,m) = x1(c,s,i) + a1mar(c,s,i,m)$	Margins to producers
	$x2mar(c,s,i,m) = x2(c,s,i) + a2mar(c,s,i,m)$	Margins to capital creators
	$x3mar(c,s,m,h) = x3(c,s,h) + a3mar(c,s,m)$	Margins to households
	$x4mar(c,m) = x4(c) + a4mar(c,m)$	Margins to exports
	$x5mar(c,s,m) = x5(c,s) + a5mar(c,s,m);$	Margins to government users
8.	<u>Household demands</u>	
(8.1)	$X3\_S(c,i) = CES( All,s, SRC: X3(c,s)/A3(c,s) )$	Import/domestic composition of household demands

Appendix table 4.3 Model equations (continued)

No	Equation	Description
(8.2)	$x3(c,s,h) - a3(c,s) = x3\_s(c,h) - \text{SIGMA}3(c) * [p3(c,s,h) + a3(c,s) - p3\_s(c,h)]$	Source-specific commodity demands
(8.3)	$(p3\_s(c,h) = \text{sum}\{s, \text{SRC}, S3(c,s,h) * [p3(c,s,h) + a3(c,s)] \}$	Effective price of commodity composite
(8.4)	$x3\text{sub}(c,h) = q(h) + a3\text{sub}(c,h);$	Subsistence demand for composite commodities
(8.5)	$x3\text{lux}(c,h) + p3\_s(c,h) = w3\text{lux}(h) + a3\text{lux}(c,h)$	Luxury demand for composite commodities
(8.6)	$x3\_s(c,h) = B3\text{LUX}(c,h) * x3\text{lux}(c,h) + [1 - B3\text{LUX}(c,h)] * x3\text{sub}(c,h)$	Total household demand for composite commodities
(8.7)	$\text{utility}(h) + q(h) = \text{sum}\{c, \text{COM}, S3\text{LUX}(c,h) * x3\text{lux}(c,h) \}$	Change in utility disregarding taste change terms
(8.8)	$a3\text{lux}(c,h) = a3\text{sub}(c,h) - \text{sum}\{k, \text{COM}, S3\text{LUX}(k,h) * a3\text{sub}(k,h)\}$	Default setting for luxury taste shifter #
(8.9)	$a3\text{sub}(c,h) = a3\_s(c,h) - \text{sum}\{k, \text{COM}, S3\_S(k,h) * a3\_s(k,h)\}$	Default setting for subsistence taste shifter
9	<u>Export and other final demand</u>	
(9.1)	$x4(c) - f4q(c) = \text{EXP\_ELAST}(c) * [p4(c) - \text{phi} - f4p(c)]$	Traditional export demand functions
(9.2)	$x4(c) = x4\_ntrad$	Non-traditional export demand functions
(9.3)	$V4\text{NTRADEXP} * p4\_ntrad = \text{sum}\{c, \text{NTRADEXP}, V4\text{PUR}(c) * p4(c)\}$	Average price of non-traditional exports
(9.4)	$x4\_ntrad - f4q\_ntrad = \text{EXP\_ELAST\_NT} * [p4\_ntrad - \text{phi} - f4p\_ntrad]$	Demand for non-traditional export aggregate
(9.5)	$x5(c,s) = f5(c,s) + f5\text{tot}$	Government demands
(9.6)	$f5\text{tot} = x3\text{tot} + f5\text{tot}2$	Overall government demands shift

Appendix table 4.3 Model equations (continued)

No	Equation	Description
10.	<u>Purchaser's prices</u>	
(10.1)	$[V1PUR(c,s,i)+TINY]*p1(c,s,i) =$ $[V1BAS(c,s,i)+V1TAX(c,s,i)]*[p0(c,s)+ t1(c,s,i)]$ $+ \text{sum}\{m,MAR,$ $V1MAR(c,s,i,m)*[p0\text{dom}(m)+a1\text{mar}(c,s,i,m)] \}$	Purchasers prices - producers
(10.2)	$[V2PUR(c,s,i)+TINY]*p2(c,s,i) =$ $[V2BAS(c,s,i)+V2TAX(c,s,i)]*[p0(c,s)+ t2(c,s,i)]$ $+ \text{sum}\{m,MAR,$ $V2MAR(c,s,i,m)*[p0\text{dom}(m)+a2\text{mar}(c,s,i,m)] \}$	Purchasers prices - capital creators
(10.3)	$[V3PUR(c,s,h)+TINY]*p3(c,s,h) =$ $[V3BAS(c,s,h)+V3TAX(c,s,h)]*[p0(c,s)+ t3(c,s)]$ $+$ $\text{sum}\{m,MAR, V3MAR(c,s,m,h)*[p0\text{dom}(m)+a3\text{mar}(c,s,m)]$ $\}$	Purchasers prices - households
(10.4)	$[V4PUR(c)+TINY]*p4(c) =$ $[V4BAS(c)+V4TAX(c)]*[pe(c)+ t4(c)]$ $+ \text{sum}\{m,MAR, V4MAR(c,m)*[p0\text{dom}(m)+a4\text{mar}(c,m)] \}$	Zero pure profits in exporting
(10.5)	$[V5PUR(c,s)+TINY]*p5(c,s) =$ $[V5BAS(c,s)+V5TAX(c,s)]*[p0(c,s)+ t5(c,s)]$ $+ \text{sum}\{m,MAR,$ $V5MAR(c,s,m)*[p0\text{dom}(m)+a5\text{mar}(c,s,m)] \}$	Zero pure profits in distribution of government
(10.6)	$p0(c, \text{"imp"}) = pf0\text{cif}(c) + \phi + t0\text{imp}(c);$	Zero pure profits in importing
11	<u>Market clearing conditions</u>	
(11.1)	$\text{DOMSALES}(n)*x0\text{dom}(n) =$ $\text{sum}\{i,IND, V1BAS(n, \text{"dom"}, i)*x1(n, \text{"dom"}, i)$ $+ V2BAS(n, \text{"dom"}, i)*x2(n, \text{"dom"}, i) \}$ $+ \text{sum}\{h,HH, V3BAS(n, \text{"dom"}, h)*x3(n, \text{"dom"}, h)\}$ $+ V5BAS(n, \text{"dom"})*x5(n, \text{"dom"}) +$ $100*LEVP0(n, \text{"dom"})*\text{del}x6(n, \text{"dom"})$	Demand equals supply for non margin commodities
(11.2)	$\text{DOMSALES}(m)*x0\text{dom}(m) = \text{sum}\{i,IND,$ $V1BAS(m, \text{"dom"}, i)*x1(m, \text{"dom"}, i)$ $+ V2BAS(m, \text{"dom"}, i)*x2(m, \text{"dom"}, i) \}$ $+ \text{sum}\{h,HH, V3BAS(m, \text{"dom"}, h)*x3(m, \text{"dom"}, h)\}$ $+ V5BAS(m, \text{"dom"})*x5(m, \text{"dom"}) +$ $100*LEVP0(m, \text{"dom"})*\text{del}x6(m, \text{"dom"}) + \text{sum}\{c,COM,$ $V4MAR(c,m)*x4\text{mar}(c,m) + \text{sum}\{s, \text{SRC}, \text{sum}(h,HH,$ $V3MAR(c,s,m,h)*x3\text{mar}(c,s,m,h)$ $+ V5MAR(c,s,m)*x5\text{mar}(c,s,m)$ $+ \text{sum}\{i,IND, V1MAR(c,s,i,m)*x1\text{mar}(c,s,i,m)$ $+ V2MAR(c,s,i,m)*x2\text{mar}(c,s,i,m) \}\}$	Demand equals supply for margin commodities

Appendix table 4.3 Model equations (continued)

No	Equation	Description
(11.3)	$[TINY + V0IMP(c)]*x0imp(c) =$ $\text{sum}\{i,IND, V1BAS(c,"imp",i)*x1(c,"imp",i)$ $+ V2BAS(c,"imp",i)*x2(c,"imp",i) \}$ $+ \text{sum}\{h,HH, V3BAS(c,"imp",h)*x3(c,"imp",h)\}$ $+ V5BAS(c,"imp")*x5(c,"imp")$ $+ 100*LEVPO(c,"imp")*delx6(c,"imp")$	Import volumes
(11.4)	$V1LAB\_I(o)*x1lab\_i(o) = \text{sum}\{i,IND,$ $V1LAB(i,o)*x1lab(i,o) \}$	Demand equals supply for labor of each skill
12.	<u>Indirect taxes</u>	
(12.1)	$t1(c,s,i) = f0tax\_s(c) + f1tax\_csi$	Power of tax on sales to intermediate
(12.2)	$Et2(c,s,i) = f0tax\_s(c) + f2tax\_csi$	Power of tax on sales to investment
(12.3)	$t3(c,s) = f0tax\_s(c) + f3tax\_cs$	Power of tax on sales to households
(12.4)	$t4(c) = f0tax\_s(c) + f4tax\_trad$	Power of tax on sales to traditional exports
(12.5)	$t4(c) = f0tax\_s(c) + f4tax\_ntrad$	Power of tax on sales to non-traditional exports
(12.6)	$t5(c,s) = f0tax\_s(c) + f5ta$	Power of tax on sales to government
(12.)	$[TINY + V1TAX\_CSI]*w1tax\_csi = \text{sum}\{c,COM,$ $\text{sum}\{s,SRC, \text{sum}\{i,IND,$ $V1TAX(c,s,i)*[p0(c,s)+x1(c,s,i)]+[V1TAX(c,s,i)+V1BAS(c,s,i)]*t1(c,s,i) \}\}$	Revenue from indirect taxes on flows to intermediate
(12.7)	$[TINY + V2TAX\_CSI]*w2tax\_csi = \text{sum}\{c,COM,$ $\text{sum}\{s,SRC, \text{sum}\{i,IND,$ $V2TAX(c,s,i)*[p0(c,s)+x2(c,s,i)]+[V2TAX(c,s,i)+V2BAS(c,s,i)]*t2(c,s,i) \}\}$	Revenue from indirect taxes on flows to investment
(12.8)	$[TINY + V3TAX\_CS]*w3tax\_cs = \text{sum}\{c,COM,$ $\text{sum}\{s,SRC, \text{sum}\{h,HH, V3TAX(c,s,h)*[p0(c,s)+ x3(c,s,h)]$ $+ [V3TAX(c,s,h)+V3BAS(c,s,h)]*t3(c,s)\}\}$	Revenue from indirect taxes on flows to households
(12.9)	$[TINY + V4TAX\_C]*w4tax\_c = \text{sum}\{c,COM,$ $V4TAX(c)*[pe(c) + x4(c)] + [V4TAX(c)+$ $V4BAS(c)]*t4(c) \}$	Revenue from indirect taxes on exports
(12.10)	$[TINY + V5TAX\_CS]*w5tax\_cs = \text{sum}\{c,COM,$ $\text{sum}\{s,SRC, V5TAX(c,s)*[p0(c,s)+ x5(c,s)] +$ $[V5TAX(c,s)+V5BAS(c,s)]*t5(c,s) \}\}$	Revenue from indirect taxes on flows to government

Appendix table 4.3 Model equations (continued)

No	Equation	Description
(12.11)	$[TINY+V0TAR\_C]*w0tar\_c = \text{sum}\{c,COM, V0TAR(c)*[pf0cif(c) + phi + x0imp(c)] + V0IMP(c)*t0imp(c)\}$	Tariff revenue
13.	<u>GDP from the income and expenditure sides</u>	
(13.1)	$V1LND\_i*w1lnd\_i = \text{sum}\{i,AGIND, V1LND(i)*[x1lnd(i)+p1lnd(i)]\}$	Aggregate payments to land
(13.2)	$V1LAB\_IO*w1lab\_io = \text{sum}\{i,IND, \text{sum}\{o,OCC, V1LAB(i,o)*[x1lab(i,o)+p1lab(i,o)]\}\}$	Aggregate payments to labor
(13.3)	$V1CAP\_I*w1cap\_i = \text{sum}\{i,IND, V1CAP(i)*[x1cap(i)+p1cap(i)]\}$	Aggregate payments to capital
(13.4)	$V1OCT\_I*w1oct\_i = \text{sum}\{i,IND, V1OCT(i)*[x1oct(i)+p1oct(i)]\}$	Aggregate other cost ticket payments
(13.5)	$V0TAX\_CSI*w0tax\_csi = V1TAX\_CSI*w1tax\_csi + V2TAX\_CSI*w2tax\_csi + V3TAX\_CS*w3tax\_cs + V4TAX\_C*w4tax\_c + V5TAX\_CS*w5tax\_cs + V0TAR\_C*w0tar\_c;$	Aggregate value of indirect taxes
(13.6)	$V0GDPINC*w0gdpinc = V1LND\_I*w1lnd\_i + V1CAP\_I*w1cap\_i + V1LAB\_IO*w1lab\_io + V1OCT\_I*w1oct\_i + V0TAX\_CSI*w0tax\_csi;$	Aggregate nominal GDP from income side
(13.7)	$V2TOT\_I*x2tot\_i = \text{sum}\{i,IND, V2TOT(i)*x2tot(i)\}$	Total real investment
(13.8)	$V2TOT\_I*p2tot\_i = \text{sum}\{i,IND, V2TOT(i)*p2tot(i)\}$	Investment price index
(13.9)	$w2tot\_i = x2tot\_i + p2tot\_i$	Total nominal investment
(13.10)	$V3TOT\_HH(h)*x3tot\_hh(h)=\text{sum}\{c,COM,\text{sum}\{s,SRC,V3PUR(c,s,h)*x3(c,s,h)\}\}$	Real consumption
(13.11)	$V3TOT\_HH(h)*p3tot\_hh(h)=\text{sum}\{c,COM,\text{sum}\{s,SRC,V3PUR(c,s,h)*p3(c,s,h)\}\}$	Consumer price index
(13.12)	$w3tot\_hh(h) = x3tot\_hh(h) + p3tot\_hh(h)$	Household budget constraint
(13.13)	$V4TOT*x4tot = \text{sum}\{c,COM, V4PUR(c)*x4(c)\}$	Export volume index
(13.14)	$V4TOT*p4tot = \text{sum}\{c,COM, V4PUR(c)*p4(c)\}$	Exports price index, rupiah
(13.15)	$V5TOT*x5tot = \text{sum}\{c,COM, \text{sum}\{s,SRC, V5PUR(c,s)*x5(c,s)\}\}$	Aggregate real government demands
(13.16)	$V5TOT*p5tot = \text{sum}\{c,COM, \text{sum}\{s,SRC, V5PUR(c,s)*p5(c,s)\}\}$	Government price index
(13.17)	$w5tot = x5tot + p5tot$	Aggregate nominal value of government demands

Appendix table 4.3 Model equations (continued)

No	Equation	Description
(13.18)	$V6TOT * x6tot = 100 * \sum \{c, COM, \sum \{s, SRC, LEVP0(c,s) * delx6(c,s) \} \}$	Inventories volume index
(13.19)	$[TINY + V6TOT] * p6tot = \sum \{c, COM, \sum \{s, SRC, V6BAS(c,s) * p0(c,s) \} \}$	Inventories price index
(13.20)	$w6tot = x6tot + p6tot$	Aggregate nominal value of inventories
(13.21)	$V0CIF\_C * x0cif\_c = \sum \{c, COM, V0CIF(c) * x0imp(c) \}$	Import volume index, C.I.F. weights
(13.22)	$V0CIF\_C * p0cif\_c = \sum \{c, COM, V0CIF(c) * [\phi + \phi0cif(c)] \}$	Imports price index, rupiah C.I.F.
(13.23)	$w0cif\_c = x0cif\_c + p0cif\_c$	Value of imports, rupiah C.I.F.
(13.24)	$V0GDPEXP * x0gdpepx = V3TOT * x3tot + V2TOT\_I * x2tot\_i + V5TOT * x5tot + V6TOT * x6tot + V4TOT * x4tot - V0CIF\_C * x0cif\_c$	Real GDP, expenditure side
(13.25)	$V0GDPEXP * p0gdpepx = V3TOT * p3tot + V2TOT\_I * p2tot\_i + V5TOT * p5tot + V6TOT * p6tot + V4TOT * p4tot - V0CIF\_C * p0cif\_c$	Price index for GDP, expenditure side
(13.26)	$w0gdpepx = x0gdpepx + p0gdpepx$	Nominal GDP from expenditure side
14.	<u>Trade balance and other aggregates</u>	
(14.1)	$V0GDPEXP * delB = V4TOT * w4tot - V0CIF\_C * w0cif\_c - (V4TOT - V0CIF\_C) * w0gdpepx$	Balance of trade)/GDP
(14.2)	$V0IMP\_C * x0imp\_c = \sum \{c, COM, V0IMP(c) * x0imp(c) \}$	Import volume index, duty paid weights
(14.3)	$V0IMP\_C * p0imp\_c = \sum \{c, COM, V0IMP(c) * p0(c, "imp") \}$	Duty paid imports price index
(14.4)	$w0imp\_c = x0imp\_c + p0imp\_c$	Value of imports (duty paid)
(14.)	$V1CAP\_I * x1cap\_i = \sum \{i, IND, V1CAP(i) * x1cap(i) \}$	Aggregate usage of capital, rental weights
(14.5)	$V1CAP\_I * p1cap\_i = \sum \{i, IND, V1CAP(i) * p1cap(i) \}$	Average capital rental
(14.6)	$V1LAB\_O(i) * employ(i) = \sum \{o, OCC, V1LAB(i,o) * x1lab(i,o) \}$	Employment by industry

Appendix table 4.3 Model equations (continued)

No	Equation	Description
(14.7)	$V1LAB\_IO * p1lab\_io = \sum\{i, IND, \sum\{o, OCC, V1LAB(i,o) * p1lab(i,o)\}\}$	Average nominal wage
(14.8)	$realwage = p1lab\_io - p3tot$	Average real wage
(14.9)	$V1PRIM\_I * x1prim\_i = \sum\{i, IND, V1PRIM(i) * x1tot(i)\}$	Aggregate output: value-added weights
(14.10)	$p0toft = p4tot - p0cif\_c$	Terms of trade
(14.11)	$p0realdev = p0cif\_c - p0gdpexp$	Real devaluation
15.	Rates of return and indexing and other equations	
(15.1)	$r1cap(i) = QCOEF(i) * (p1cap(i) - p2tot(i))$	definition of rates of return to capital
(15.2)	$(r1cap(i) - r1cap\_i) = BETA\_R(i) * [x1cap(i) - x1cap\_i] + flret(i)$	capital growth rates related to rates of return
(15.3)	$p1oct(i) = p3tot + floct(i)$	Indexing of prices of "other cost" tickets
<u>Equations for dynamic extension</u>		
16.	<u>Investment-capital accumulation</u>	
(16.1)	$R\_W(i) = R\_W(i) * [x2tot(i) - x1cap(i)] / 100;$ where W : number of years covered by simulation	Real investment/capital ratio
(16.2)	$x1cap(i) = K\_TERM(i) * delFudge + M\_term(i) * R\_W(i) * x2tot(i) + f\_accum(i);$	Investment/capital accumulation
17.	Real wage adjustment mechanism	
(17.1)	$V1LAB\_IO * employ\_i = \sum\{i, IND, V1LAB\_O(i) * employ(i)\}$	Aggregate employment: wage bill weights
(17.2)	$delempratio = 0.01 * EMPRAT * [employ\_i - emptrend]$ where emptrend : Trend employment EMPRAT : (Actual/trend) employment: i.e in steady state => 1 #	Ordinary change in (actual/trend) employment
(17.3)	$delwagerate = 0.01 * WAGERATE * realwage;$ where delwagerate : Change in real wage index, WAGERATE : Index of real wages	Change in real wage index
(17.4)	$delwagerate = delfwage + ELASTWAGE * \{[EMPRAT0 - 1.0] * delUnity + delempratio\};$ where ELASTWAGE : Elasticity of wage to employment, delfwage : Shifter for real wage adjustment mechanism	Real wage adjustment mechanism

Appendix table 4.3 Model naming system

Name	Description
<i>First, a letter or letters indicating the type of variables:</i>	
a	technical change
del	ordinary (rather than percentage) change
f	shift variable
H	indexing parameter
p	price, local currency
pf	price, foreign currency
S	input share
SIGMA	elasticity of substitution
t	tax
V	levels value, local currency
w	percentage-change value, local currency
x	input quantity.
<i>Second, one of the digits 0 to 6 indicating user:</i>	
1	current production
2	investments
3	consumption
4	export
5	government
6	inventories
0	all users, or user distinction irrelevant.
<i>Third (optional), three or more letters giving further information:</i>	
bas	(often omitted) basic – not including margins or taxes
cap	capital
cif	imports at border prices
imp	imports (duty paid)
lab	labor
lnd	land
lux	linear expenditure system (supernumerary part)
mar	margins
oct	other cost tickets
prim	all primary factors (land, labor or capital)
pur	at purchasers' prices
sub	linear expenditure system (subsistence part)
tar	tariffs
tax	indirect taxes
tot	total, or average, over all inputs for some user.
<i>Fourth (optional), an underscore character, indicating that this variable is an aggregate or average, with subsequent letters showing over which sets the underlying variable has been summed or averaged:</i>	
<u>c</u>	over COM (commodities)
<u>s</u>	over SRC (domestic + import)
<u>i</u>	over IND (industries)
<u>io</u>	over IND and OCC (skills).

Note: The naming variables in this research model followed the naming system for ORANI-G. Unless otherwise stated, all variables are percentage changes – to indicate this, their names appear in lower-case letters (Wittwer, 1999)

Appendix table 4.4 List of variables in the model

Variable	Set	Description
$x1_{csi}$	$c \times s \times i$	Demand for commodity $c$ , from source $s$ , by industry $i$ for current production
$x2_{csi}$	$c \times s \times i$	Demand for commodity $c$ , from source $s$ , by industry $i$ for capital formation
$x3_{cs}$	$c \times s$	Demand for commodity $c$ , from source $s$ , by household
$x4_c$	$c$	Export demand for commodity $c$
$x5_{cs}$	$c \times s$	Demand for commodity $c$ , from source $c$ by "others"
$delx6_c$	$c$	Ordinary change for commodity $c$ by inventories
$p0_{cs}$	$c \times s$	Basic price of commodity $c$ , source $s$
$a1_{csi}$	$c \times s \times i$	Input-augmenting technical change for commodity $c$ , from source $s$ for current production in industry $i$
$a2_{csi}$	$c \times s \times i$	Input-augmenting technical change for commodity $c$ , from source $s$ for capital formation
$a3_{cs}$	$c \times s$	Taste changes variable for commodity $c$ from source $s$
$f5_{cs}$	$c \times s$	Shifter for commodity $c$ from source $s$ for "other" demand
$x1mar_{csim}$	$c \times s \times i \times m$	Margin usage for commodity $c$ from source $s$ for current production in industry $i$ and margin $m$
$x2mar_{csim}$	$c \times s \times i \times m$	Margin usage for commodity $c$ from source $s$ for capital formation in industry $i$ and margin $m$
$x3mar_{csm}$	$c \times s \times m$	Margin usage for commodity $c$ from source $s$ for household and margin $m$
$x4mar_{cm}$	$c \times m$	Export margin usage for commodity $c$ and margin $m$
$x5mar_{csm}$	$c \times s \times m$	Margin usage for commodity $c$ from source $s$ for "others" and margin $m$
$t1_{csi}$	$c \times s \times i$	Power of sales tax on commodity $c$ from source $s$ for current production in industry $i$
$t2_{csi}$	$c \times s \times i$	Power of sales tax on commodity $c$ from source $s$ for capital formation in industry $i$
$t3_{cs}$	$c \times s$	Power of sales tax on commodity $c$ from source $s$ for household consumption
$t4_c$	$c$	Power of sales tax on commodity $c$ for export
$t5_{cs}$	$c \times s$	Power of sales tax on commodity $c$ from source $s$ for "other" demand
$p1_{csi}$	$c \times s \times i$	Purchaser's price of commodity $c$ from source $s$ for current production in industry $i$
$p2_{csi}$	$c \times s \times i$	Purchaser's price of commodity $c$ from source $s$ for capital formation in industry $i$
$p3_{cs}$	$c \times s$	Purchaser's price of commodity $c$ from source $s$ for household consumption
$p4_c$	$c$	Export price of commodity $c$
$p5_{cs}$	$c \times s$	Purchaser's price of commodity $c$ from source $s$ for consumption by "other"
$x1lab_{io}$	$i \times o$	Employment of occupation $o$ in industry $i$
$p1lab_{io}$	$i \times o$	Wage of occupation $o$ in industry $i$
$a1lab_{i_o}$	$i$	Labor augmenting technical change of industry $i$
$f1lab_{io}$	$i \times o$	Wage shift variable of occupation $o$ in industry $i$

Appendix table 4.4 List of variables in the model (continued)

Variable	Set	Description
$x1cap_i$	i	Current capital stock in of industry i
$p1cap_i$	i	Rental price of capital of industry i
$a1cap_i$	i	Capital augmenting technical change of industry i
$r1cap_i$	i	Net rates of return on fixed capital of industry i
$x1lnd_i$	i	Use of land for industry i
$p1land_i$	i	Rental price of land for industry i
$a1lnd_i$	i	Land augmenting technical change for industry i
$f1lnd_i$	i	Industry's land shifter
$x1oct_i$	i	Demand for "other cost" tickets for industry i
$p1oct_i$	i	Price of "other cost" tickets for industry i
$a1oct_i$	i	"other cost" tickets augmenting technical change for industry i
$f1oct_i$	i	Shift in price of "other cost" tickets for industry i
$q1_{ci}$	c x i	Output of commodity c by industry i
$t0imp_c$	c	Power of tariff of industry i
$x1_{ci\_s}$	c x i	Demand for import/domestic commodity composite c for current production in industry i
$x2_{ci\_s}$	c x i	Demand for import/domestic commodity composite c for capital formation in industry i
$x3_{c\_s}$	c	Household demand for import/domestic commodity composite c
$x3lux_c$	c	Household–supernumerary demands for import/domestic commodity composite c
$x3sub_c$	c	Household – subsistence demands for import/domestic commodity composite c
$p1_{ci\_s}$	c x i	Effective prices of import/domestic commodity composite c for current production in industry i
$p2_{ci\_s}$	c x i	Effective prices of import/domestic commodity composite c for capital formation in industry i
$p3_{c\_s}$	c	Effective prices of import/domestic commodity composite c for household
$a1_{ci\_s}$	c x i	Technical change for import/domestic composite commodity c for current production i
$a2_{ci\_s}$	c x i	Technical change for import/domestic composite commodity c for capital formation in industry i
$a3_{c\_s}$	c	Technical change for import/domestic composite commodity c for household
$a3lux_c$	c	Technical change for import/domestic composite commodity c for household – supernumerary demand
$a3sub_c$	c	Technical change for import/domestic composite commodity c for household – subsistence demands
$f0tax_{c\_s}$	c	General sale sax shifter
$f4p_c$	c	Price (upward) shift in export demand schedule
$f4q_c$	c	Quantity (right) shift in export demands
$pf0cif_c$	c	C.I.F. foreign currency import prices
$x0dom_c$	c	Total supplies of domestic goods

Appendix table 4.4 List of variables in the model (continued)

Variable	Set	Description
<i>x0imp<sub>c</sub></i>	c	Total supplies of imported goods
<i>a1prim<sub>i</sub></i>	i	All factor augmenting technical change
<i>a1tot<sub>i</sub></i>	i	All input augmenting technical change
<i>a2tot<sub>i</sub></i>	i	Neutral technical change-investment
<i>employ<sub>i</sub></i>	i	Employment by industry
<i>f1lab<sub>i_o</sub></i>	i	Industry-specific wage shifter
<i>f_accum<sub>i</sub></i>	i	Capital accumulation shifter
<i>f1ret<sub>i</sub></i>	i	Rate of return shifter
<i>p1lab<sub>i_o</sub></i>	i	Price of labor composite
<i>p1prim<sub>i</sub></i>	i	Effective price of primary factor composite
<i>p1tot<sub>i</sub></i>	i	Average input/output price
<i>p2tot<sub>i</sub></i>	i	Cost of unit of capital
<i>x1lab<sub>o_i</sub></i>	i	Effective labor input
<i>x1prim<sub>i</sub></i>	i	Primary factor composite
<i>x1tot<sub>i</sub></i>	i	Activity level of value-added
<i>x2tot<sub>i</sub></i>	i	Investment by using industry
<i>f1lab<sub>o_i</sub></i>	o	Occupation-specific wage shifter
<i>x1lab<sub>o_i</sub></i>	o	Employment by occupation
<i>delB</i>	1	(Balance of Trade)/GDP
<i>del Debt</i>	1	Ordinary change in real foreign debt
<i>delDebt_Ratio</i>	1	Ordinary change in Debt/GDP ratio
<i>delBT</i>	1	Ordinary change in real trade deficit
<i>delFudge</i>	1	"Fudge Factor": set to unity for dynamic simulation
<i>delUnity</i>	1	Dummy variable. Always exogenously set to unity
<i>levDebt_Ratio</i>	1	Level Debt/GDP ratio
<i>employ<sub>i</sub></i>	1	Aggregate employment-wage bill weights
<i>emprend</i>	1	Employment trend
<i>f1lab<sub>o_io</sub></i>	1	Overall wage shifter
<i>f1lnd<sub>i</sub></i>	1	Overall land rental shifter
<i>f1lnd<sub>e</sub></i>	1	Overall estate crops and forestry land rental shifter
<i>f1lnd<sub>r</sub></i>	1	Overall food crops land rental shifter
<i>f1lnd<sub>h</sub></i>	1	Overall other industries land rental shifter
<i>f1tax<sub>csi</sub></i>	1	Uniform % change in power of taxes on intermediate usage
<i>f2tax<sub>csi</sub></i>	1	Uniform % change in power of taxes on investment
<i>f3tax<sub>cs</sub></i>	1	Uniform % change in power of taxes on household usage
<i>f4<sub>ntrad</sub></i>	1	Demand shift, non-traditional export aggregate
<i>f4tax<sub>ntrad</sub></i>	1	Uniform % change in power of taxes on non-traditional exports
<i>f4tax<sub>trad</sub></i>	1	Uniform % change in power on taxes on traditional export
<i>f5tax<sub>cs</sub></i>	1	Uniform % change in power of taxes on "other" usage
<i>f5tot</i>	1	Overall shift term for "other" demands
<i>f5tot2</i>	1	Ratio between f5tot and x3tot
<i>p0cif<sub>C</sub></i>	1	Import price index, CIF, billion Rp
<i>p0gdpexp</i>	1	GDP price index, expenditure side
<i>p0imp<sub>c</sub></i>	1	Duty-paid import price index, billion Rp

Appendix table 4.4 List of variables in the model (continued)

Variable	Set	Description
<i>p0realdev</i>	1	Real devaluation
<i>p0toft</i>	1	Terms of trade
<i>p1cap_i</i>	1	Average capital rental
<i>p2tot_i</i>	1	Aggregate investment price index
<i>delr1rsk_i</i>	i	Ordinary change of net rate of return with risk premium
<i>delr1frsk_i</i>	i	Ordinary change of risk free net rate of return
<i>delr1rsk_i</i>	1	Aggregate ordinary change of net rate of return with risk premium
<i>delr1frsk_i</i>	1	Aggregate ordinary change of risk free net rate of return
<i>r1caprsk_i</i>	i	Net rate of return with risk premium
<i>r1capfrsk_i</i>	i	Risk free net rate of return
<i>r1capfi_i</i>	i	Future period expected rate of return
<i>r1capfi_i</i>	1	Aggregate expected rate of return
<i>slackapfi_i</i>	i	Ordinary change of slack variable of expected rate of return
<i>slackapf2_i</i>	i	Slack variable of expected rate of return
<i>x1grow_i</i>	i	The power of the net rate of capital growth
<i>x1grow_i</i>	1	Aggregate to the power of the net rate of capital growth
<i>x1capfi_i</i>	i	Future period capital stocks
<i>slackgrow_i</i>	1	Slack variable of the power of the net rate capital growth
<i>slackgrow_i</i>	i	Slack variable of the power of the net rate capital growth
<i>slackgrow2_i</i>	i	Slack variable of the power of the net rate capital growth
<i>slackorwalm_i</i>	i	Slack variable to not applied the ORANI investment equation
<i>slackstat_i</i>	i	Slack variable to relax stationarity condition
<i>slackstat2_i</i>	i	Slack variable to remove stationarity condition if not wanted.
<i>slackrisk_i</i>	i	Slack variable to remove the equal change of risk premium
<i>slackautorf_i</i>	1	Slack variable in the future average risk free rate of return equation
<i>slackautor_i</i>	1	Slack variable in the future average rate of return equation
<i>p3tot</i>	1	Consumer price index
<i>p4_ntrad</i>	1	Price, non-traditional export aggregate
<i>p4tot</i>	1	Exports price index
<i>p5tot</i>	1	"Other" demands price index
<i>p6tot</i>	1	Inventories price index
<i>phi</i>	1	Exchange rate
<i>q</i>	1	Number of households
<i>r1cap_i</i>	1	Average rate of return
<i>utility</i>	1	Utility per households
<i>w0cif_c</i>	1	CIF value of imports
<i>w0gdpexp</i>	1	Nominal GDP from expenditure side
<i>w0gdpinc</i>	1	Nominal GDP from income side
<i>w0imp_c</i>	1	Value of imports plus duty
<i>w0tar_c</i>	1	Aggregate tariff revenue
<i>w0tax_csi</i>	1	Aggregate revenue from all Indirect taxes
<i>w1cap_i</i>	1	Aggregate payments to capital
<i>w1lab_io</i>	1	Aggregate payments to labor
<i>w1lnd_i</i>	1	Aggregate payments to land

Appendix table 4.4 List of variables in the model (continued)

Variable	Set	Description
<i>w1oct_i</i>	1	Aggregate other cost ticket payments
<i>w1tax_csi</i>	1	Aggregate revenue from indirect taxes on intermediate
<i>w2tax_csi</i>	1	Aggregate revenue from indirect taxes on investment
<i>w2tot_i</i>	1	Aggregate nominal investment
<i>w3lux</i>	1	Total nominal supernumerary household expenditure
<i>w3tax_cs</i>	1	Aggregate revenue from indirect taxes on households
<i>w3tot</i>	1	Nominal total household consumption
<i>w4tax_c</i>	1	Aggregate revenue from indirect taxes on "other" demands
<i>w4tot</i>	1	Billion Rp Border Value of Exports
<i>w5tax_cs</i>	1	Aggregate revenue from indirect taxes on "other" demands
<i>w5tot</i>	1	Aggregate nominal value of "other" demands
<i>w6tot</i>	1	Aggregate nominal value of inventories
<i>x0cif_c</i>	1	Import volume index, CIF weights
<i>x0gdpxp</i>	1	Real GDP from expenditure side
<i>x0imp_c</i>	1	Import volume index, duty-paid weights
<i>x1cap_i</i>	1	Aggregate capital stock, rental weights
<i>x1prim_i</i>	1	Aggregate output: value-added weights
<i>x1lnd_i</i>	1	Aggregate land over industries
<i>x1lnd_e</i>	1	Aggregate land over estate crops and forestry industries
<i>x1lnd_r</i>	1	Aggregate land over food crops industries
<i>x1lnd_h</i>	1	Aggregate land over other industries
<i>x2tot_i</i>	1	Aggregate real investment expenditure
<i>x3tot</i>	1	Real household consumption
<i>x4_ntrad</i>	1	Quantity, non-traditional export aggregate
<i>x4tot</i>	1	Export volume index
<i>x5tot</i>	1	Aggregate real "other" demands
<i>x6tot</i>	1	Aggregate real inventories

Appendix table 4.5 List of content of database

No	Header	Size	Coefficient	Name
1	1BAS	c*s*i	V1BAS	Intermediate basic
2	2BAS	c*s*i	V2BAS	Investment basic
3	2BS_	c*s	V2BASOLD	Investment basic
4	3BAS	c*s*h	V3BAS	Households basic
5	4BAS	c	V4BAS	Exports basic
6	5BAS	c*s	V5BAS	Government basic
7	6BAS	c*s	V6DOM	Inventory changes
8	1TAX	c*s*i	V1TAX	Intermediate tax
9	2TAX	c*s*i	V2TAX	Investment tax
10	2TX_	c*s	V2TAXOLD	Investment tax
11	3TAX	c*s*h	V3TAX	Households tax
12	4TAX	c	V4TAX	Exports tax
13	5TAX	c*s	V5TAX	Government tax
14	1MAR	c*s*i*m	V1MAR	Intermediate margins
15	2MAR	c*s*i*m	V2MAR	Investment margins
16	3MAR	c*s*m*h	V3MAR	Households margins
17	4MAR	c*m	V4MAR	Exports margins
18	5MAR	c*s*m	V5MAR	Government margins
19	1LAB	i*o	V1LAB	Labor
20	1CAG	i	V1CAPA	Capital rentals
22	1LND	i	V1LND	Land rentals
23	CAPA	h	MMAN	MMAN(HH)
24	CAPN	h	MMNN	mobile cap owned by hh non agr
25	CAPS	h*i	FIXEDK	Fixed cap owned by hh non agr
26	0TAR	c	V0TAR	V0TAR(Com)
27	1OCT	i	V1OCT	Other cost tickets
28	LAND	i*h	LANDS	household land rental by ind
29	PINC	h	V0HHTAX	Personal income tax collection
30	1ARM	c	SIGMA1	SIGMA1(Com)
31	2ARM	c	SIGMA2	SIGMA2(COM)
32	3ARM	c	SIGMA3	SIGMA3(COM)
33	SLAB	i	SIGMA1LAB	SIGMA1LAB (IND)
34	P028	i	SIGMA1PRIM	Primary factor substitution elasticity
35	SCET	i	SIGMA1OUT	SIGMA1OUT
36	P021	h	FRISCH	Frisch LES parameter
37	TRAN	type	TRANSFER_F	Gov trans foreign (Type = expend, recp expenditure and
38	GOHH	h*type	TRANSFER_H	Gov trans household
39	HINC	h*o	HINC	HINC(HH:OCC)
40	P018	c	EXP_ELAST	Export demand elasticities
41	2TOT	i	V2TOT	Investment (by Ind)

Appendix table 4.5 List of content of database (continued)

No	Header	Size	Coefficient	Name
42	MAKE	c*i	MAKE	Multiproduct matrix
43	XPEL	c*h	EPS	Expenditure elasticities
44	P027	i	QCOEF	Gross/Net rate of return
45	BETR	i	BETA_R	Investment parameter
46	YBYK	i	R_W	Investment capital ratio
47	DPRC	i	DEP	Depreciation factors
48	ETOT	1	EPSTOT	initial average Engel
49	EXNT	1		Non-traditional export demand Elasticity
50	EMPR	1		actual/trend employment
51	ELWG	1		elasticity of wage to employment

Appendix table 4.6 Commodity and industry classification

No	Sectors/commodities	No	Sectors/commodities
1	Paddy	27	Mining
2	Maize	28	Other mining and quarrying
3	Cassava	29	Rice milling
4	Sweet potatoes	30	Flour
5	Groundnut	31	Sugar
6	Soybean	32	Other food, beverages, and tobacco
7	Vegetables	33	Textile, wearing apparel and leather
8	Fruits	34	Wood products
9	Other food crops	35	Paper, paper products, transport equipment, machinery and iron
10	Rubber	36	Fertilizer
11	Sugarcane	37	Pesticide
12	Coconut	38	Other chemical and cement
13	Palm oil	39	Electricity, gas and water
14	Tobacco	40	Irrigation building
15	Coffee	41	Construction
16	Tea	42	Trade
17	Cloves	43	Restaurant
18	Cocoa	44	Hotel
19	Cashew fruit	45	Road and railway transport
20	Other estate crops	46	Air and water transport, and communication
21	Livestock	47	Services allied to transport
22	Fresh milk	48	Banking and insurance
23	Poultry	49	Agriculture services
24	Other livestock raising	50	Real estate and business service
25	Forestry and hunting	51	General government and defense, education, health, community services
26	Fishery	52	Personal, household and other services

Appendix table 4.7 Households' classification

No.	Households classification	Code
	<i>Agricultural</i>	
1	Employees	Rural1
2	Operator, Land Owner 0.000–0.500 Ha	Rural2
3	Operator, Land Owner 0.501–1.000 Ha	Rural3
4	Operator, Land Owner >1.000 Ha	Rural4
	<i>Non Agricultural</i>	
	<i>Rural</i>	
5	Lower Level: Non-Agriculture Self-Employed, Clerical, Retail Sales, Personal Services, and Transport & Manual Workers	Rural5
6	Non-Labor Force and Unclassified Household	Rural6
7	Higher Level: Non-Agriculture Self-Employed, Clerical & Sales, Services, Managers, Supervisors, Technicians, Teachers, and Non-Civilians	Rural7
	<i>Urban</i>	
8	Lower Level: Non-Agriculture Self-Employed, Clerical, Retail Sales, Personal Services, and Transport & Manual Workers	Urban1
9	Non-Labor Force and Unclassified Household	Urban2
10	Higher Level: Non-Agriculture Self-Employed, Clerical & Sales, Services, Managers, Supervisors, Technicians, Teachers, and Non-Civilians	Urban3

Appendix table 4.8 List of exogenous variables of model's closure

Variable	Definition
q	Number of households
f5	Government demand shift
f4p	Price (upward) shift in export demand schedule
f4q	Quantity (right) shift in export demands
fx6	Shifter on rule for stocks
phi	Exchange rate, rupiah/\$world
a3_s	Taste change, hhold imp/dom composite
a1fac	Primary factor tech. change, agri.
a1tot	All input augmenting technical change
a2tot	Neutral technical change - investment
f1oct	Shift in price of "other cost" tickets
f3tot	Ratio, consumption/income
t0imp	Power of tariff
a1faco	Prim. factor tech. change, other
a1prim	All factor augmenting technical change
x5tot;	Ratio between f5tot and x3tot
fgov_f	Shift in transfers: govt. -- foreign
fgov_h	Shift in transfers: govt. -- households
pf0cif	C.I.F. foreign currency import prices
f0tax_s	General sales tax shifter
f3tot_h	Ratio, consumption/income by hh
f3tax_cs	Uniform % change in powers of taxes on household usage
f5tax_cs	Uniform % change in powers of taxes on government usage
f1inc_tax	Overall income tax shifter
f1lab_i_x	Skill-specific labor shifter
f1tax_csi	Uniform % change in powers of taxes on intermediate usage
f2tax_csi	Uniform % change in powers of taxes on investment
f4p_ntrad	Upward demand shift, non-traditional export aggregate
f4q_ntrad	Right demand shift, non-traditional export aggregate
x1cap_h	variable capital by household, agri.
x1cap_vnh	variable capital by household, non-agri.
x1lab_i_h	Household labor supply
x1lndi_hh	Household supply of land, agri.
f4tax_trad	Uniform % change in powers of taxes on tradtnl exports
x1cap_f_hh	fixed capital by hhold, non-ag.
f4tax_ntrad	Uniform % change in powers of taxes on nontradtnl exports
employ_i	Aggregate employment: wage bill weights
delUnity	dummy variable, always exogenously set to one
f_accum	shifter to switch on accumulation equation
delfudge	Fudge Factor set to Unity for dynamic simulation#
r1cap_i	Average Rate of Return
f_accum	shifter to switch on accumulation equation
r1cap_i	Average Rate of Return

Appendix table 5.1 Industry effects on prices of a 30 per cent decrease in agricultural tariffs (SIM1) and elimination of agricultural tariffs (SIM2) (in percentage changes)

No.	Sectors	SIM1				SIM2			
		Export prices (pe)	Primary input prices (plprim)	Labor prices (pllab_o)	Capital prices (plcap)	Export prices (pe)	Primary input prices (plprim)	Labor prices (pllab_o)	Capital prices (plcap)
1.	Paddy	-2.646	-3.048	-3.022	-3.605	-8.820	-10.159	-10.074	-12.017
2.	Maize	-2.360	-2.621	-3.022	-3.605	-7.867	-8.738	-10.074	-12.017
3.	Cassava	-1.647	-1.765	-3.022	-3.605	-5.491	-5.882	-10.074	-12.017
4.	Sweet potatoes	-2.470	-2.536	-3.022	-3.605	-8.232	-8.453	-10.073	-12.017
5.	Groundnut	-3.047	-3.293	-3.022	-3.605	-10.157	-10.978	-10.073	-12.017
6.	Soybean	-13.434	-15.227	-3.022	-3.605	-44.780	-50.758	-10.074	-12.017
7.	Vegetables	-3.838	-4.006	-3.022	-3.605	-12.795	-13.354	-10.073	-12.017
8.	Fruits	-4.371	-4.612	-3.022	-3.605	-14.569	-15.372	-10.074	-12.017
9.	Other food crops	-9.759	-10.524	-3.022	-3.605	-32.531	-35.080	-10.073	-12.017
10.	Rubber	-2.596	-3.021	-2.852	-3.605	-8.654	-10.071	-9.508	-12.017
11.	Sugarcane	-1.401	-1.746	-2.852	-3.605	-4.669	-5.822	-9.508	-12.017
12.	Coconut	-1.548	-1.850	-2.852	-3.605	-5.162	-6.166	-9.508	-12.017
13.	Palm oil	-1.471	-2.201	-2.852	-3.605	-4.902	-7.336	-9.508	-12.017
14.	Tobacco	-1.085	-1.524	-2.852	-3.605	-3.617	-5.079	-9.508	-12.017
15.	Coffee	-0.717	-0.954	-2.852	-3.605	-2.389	-3.180	-9.508	-12.017
16.	Tea	-2.015	-2.335	-2.852	-3.605	-6.717	-7.782	-9.508	-12.017
17.	Clove	-1.263	-1.365	-2.852	-3.605	-4.211	-4.551	-9.508	-12.017
18.	Cocoa	-1.230	-1.069	-2.852	-3.605	-4.099	-3.564	-9.508	-12.017
19.	Cashew fruit	-0.795	-0.865	-2.852	-3.605	-2.651	-2.884	-9.508	-12.017
20.	Other estate crops	-1.097	-1.550	-2.852	-3.605	-3.657	-5.165	-9.508	-12.017
21.	Livestock	-3.296	-4.127	-2.852	-3.605	-10.987	-13.756	-9.508	-12.017
22.	Fresh Milk	-3.813	-5.866	-2.852	-3.605	-12.709	-19.554	-9.508	-12.017
23.	Poultry	-1.902	-3.002	-2.852	-3.605	-6.339	-10.005	-9.508	-12.017
24.	Other livestock raising	-3.157	-3.740	-2.852	-3.605	-10.524	-12.468	-9.508	-12.017
25.	Forestry and hunting	-2.389	-2.895	-2.268	-3.605	-7.963	-9.651	-7.560	-12.017
26.	Fishery	-1.030	-1.227	-2.852	-3.605	-3.432	-4.089	-9.508	-12.017
27.	Mining	-0.005	-0.025	0.684	-0.122	-0.015	-0.082	2.278	-0.405
28.	Other mining and quarrying	0.411	0.463	0.684	0.333	1.369	1.543	2.278	1.110

Appendix table 5.1 Industry effects on prices of a 30 per cent decrease in agricultural tariffs (SIM1) and elimination of agricultural tariffs (SIM2) (in percentage changes) (continued)

No.	Sectors	SIM1				SIM2			
		Export prices (pe)	Primary input prices (p1prim)	Labor prices (p1lab_o)	Capital prices (p1cap)	Export prices (pe)	Primary input prices (p1prim)	Labor prices (p1lab_o)	Capital prices (p1cap)
29.	Rice milling	-1.743	0.507	0.715	0.455	-5.809	1.689	2.383	1.515
30.	Flour	-5.336	5.357	0.715	7.544	-17.788	17.857	2.383	25.146
31.	Sugar	-0.346	1.770	0.715	2.326	-1.155	5.899	2.383	7.754
32.	Other food, beverages, and tobacco	-0.288	1.992	0.715	2.581	-0.961	6.641	2.383	8.602
33.	Textile, wearing apparel and leather	-0.278	1.758	0.723	2.249	-0.928	5.861	2.411	7.496
34.	Wood products	-0.006	0.806	0.734	0.835	-0.020	2.687	2.446	2.782
35.	Paper, paper products, transport equipment, machinery and iron	0.109	0.221	0.734	0.033	0.364	0.736	2.446	0.109
36.	Fertilizer	-0.161	-0.526	0.709	-1.363	-0.535	-1.753	2.363	-4.542
37.	Pesticide	0.050	0.053	0.709	-0.100	0.165	0.176	2.363	-0.332
38.	Other chemical and cement	0.102	0.411	0.709	0.261	0.340	1.370	2.363	0.870
39.	Electricity, Gas and Water	0.470	0.739	0.683	0.758	1.567	2.464	2.277	2.528
40.	Irrigation building	0.296	0.632	0.617	0.647	0.986	2.108	2.058	2.158
41.	Construction	0.272	0.586	0.617	0.568	0.905	1.954	2.058	1.893
42.	Trade	0.419	0.513	0.680	0.444	1.398	1.711	2.267	1.479
43.	Restaurant	-0.190	1.012	0.630	1.249	-0.632	3.374	2.101	4.164
44.	Hotel	-0.462	-0.133	0.617	-0.458	-1.541	-0.444	2.058	-1.528
45.	Road and railway transport	0.420	0.711	0.680	0.734	1.402	2.371	2.267	2.448
46.	Air and water transport, and communication	0.262	0.383	0.630	0.293	0.872	1.276	2.101	0.978
47.	Services allied to transport	0.221	0.224	0.680	-0.086	0.738	0.748	2.267	-0.287
48.	Bank and insurance	0.555	0.646	0.617	0.659	1.850	2.155	2.058	2.195
49.	Agriculture services	0.159	0.328	0.617	0.194	0.529	1.093	2.058	0.645
50.	Real estate and business service	0.263	0.277	0.617	0.208	0.877	0.922	2.058	0.694
51.	General government and defense, education, health, community services	0.358	0.622	0.630	0.562	1.194	2.074	2.101	1.875
52.	Personal, household and other services	0.313	0.698	0.630	0.765	1.045	2.326	2.101	2.550

Source: PERTANINDO-F simulation results

Appendix table 5.2 Industry effects on prices of a 10 per cent increase in fertilizer subsidy plus a 30 percent decrease in agricultural tariffs (SIM3) and a 10 per cent increase in fertilizer subsidy plus elimination of agricultural tariffs (SIM4) (in percentage changes)

No.	Sectors	SIM3				SIM4			
		Export prices (pe)	Primary input prices (plprim)	Labor prices (pllab_o)	Capital prices (plcap)	Export prices (pe)	Primary input prices (plprim)	Labor prices (pllab_o)	Capital prices (plcap)
1.	Paddy	-3.645	-4.254	-3.241	-3.773	-9.819	-11.365	-10.292	-12.185
2.	Maize	-3.226	-3.656	-3.241	-3.773	-8.733	-9.773	-10.292	-12.185
3.	Cassava	-2.064	-2.241	-3.241	-3.773	-5.908	-6.358	-10.292	-12.185
4.	Sweet potatoes	-2.649	-2.731	-3.241	-3.773	-8.412	-8.648	-10.292	-12.185
5.	Groundnut	-3.266	-3.552	-3.241	-3.773	-10.377	-11.237	-10.292	-12.185
6.	Soybean	-13.736	-15.606	-3.241	-3.773	-45.082	-51.136	-10.292	-12.185
7.	Vegetables	-4.445	-4.666	-3.241	-3.773	-13.401	-14.014	-10.292	-12.185
8.	Fruits	-4.698	-4.965	-3.241	-3.773	-14.896	-15.726	-10.292	-12.185
9.	Other food crops	-10.439	-11.266	-3.240	-3.773	-33.210	-35.822	-10.292	-12.185
10.	Rubber	-3.414	-3.980	-3.053	-3.773	-9.472	-11.030	-9.708	-12.185
11.	Sugarcane	-2.070	-2.576	-3.053	-3.773	-5.339	-6.652	-9.708	-12.185
12.	Coconut	-2.083	-2.498	-3.053	-3.773	-5.696	-6.814	-9.708	-12.185
13.	Palm oil	-2.380	-3.553	-3.053	-3.773	-5.811	-8.688	-9.708	-12.185
14.	Tobacco	-3.579	-5.000	-3.053	-3.773	-6.111	-8.555	-9.708	-12.185
15.	Coffee	-1.252	-1.639	-3.053	-3.773	-2.924	-3.865	-9.708	-12.185
16.	Tea	-2.812	-3.260	-3.053	-3.773	-7.514	-8.708	-9.708	-12.185
17.	Clove	-2.176	-2.355	-3.053	-3.773	-5.124	-5.540	-9.708	-12.185
18.	Cocoa	-1.358	-1.227	-3.053	-3.773	-4.227	-3.723	-9.708	-12.185
19.	Cashew fruit	-1.116	-1.222	-3.053	-3.773	-2.972	-3.241	-9.708	-12.185
20.	Other estate crops	-1.648	-2.369	-3.053	-3.773	-4.208	-5.985	-9.708	-12.185
21.	Livestock	-3.388	-4.236	-3.053	-3.773	-11.078	-13.865	-9.708	-12.185
22.	Fresh Milk	-3.921	-5.991	-3.053	-3.773	-12.818	-19.679	-9.708	-12.185
23.	Poultry	-1.984	-3.153	-3.053	-3.773	-6.421	-10.156	-9.708	-12.185
24.	Other livestock raising	-3.272	-3.861	-3.053	-3.773	-10.639	-12.588	-9.708	-12.185
25.	Forestry and hunting	-2.460	-3.010	-2.404	-3.773	-8.034	-9.766	-7.697	-12.185
26.	Fishery	-1.006	-1.208	-3.053	-3.773	-3.408	-4.071	-9.708	-12.185
27.	Mining	0.016	-0.008	0.864	-0.127	0.006	-0.065	2.459	-0.411
28.	Other mining and quarrying	0.526	0.585	0.864	0.421	1.484	1.666	2.459	1.198

Appendix table 5.2 Industry effects on prices of a 10 per cent increase in fertilizer subsidy plus a 30 percent decrease in agricultural tariffs (SIM3) and a 10 per cent increase in fertilizer subsidy plus elimination of agricultural tariffs (SIM4) (in percentage changes) (continued)

No.	Sectors	SIM3				SIM4			
		Export prices (pe)	Primary input prices (p1prim)	Labor prices (p1lab_o)	Capital prices (p1cap)	Export prices (pe)	Primary input prices (p1prim)	Labor prices (p1lab_o)	Capital prices (p1cap)
29.	Rice milling	-2.333	0.995	0.868	1.027	-6.400	2.178	2.536	2.087
30.	Flour	-5.340	5.569	0.868	7.783	-17.791	18.068	2.536	25.385
31.	Sugar	-0.609	2.176	0.868	2.865	-1.418	6.305	2.536	8.293
32.	Other food, beverages, and tobacco	-0.301	2.269	0.868	2.914	-0.973	6.918	2.536	8.936
33.	Textile, wearing apparel and leather	-0.247	1.785	0.869	2.219	-0.896	5.888	2.557	7.466
34.	Wood products	0.007	0.794	0.872	0.763	-0.007	2.675	2.584	2.711
35.	Paper, paper products, transport equipment, machinery and iron	0.133	0.258	0.872	0.033	0.387	0.773	2.584	0.109
36.	Fertilizer	1.276	2.453	0.868	3.527	0.901	1.226	2.522	0.348
37.	Pesticide	0.165	0.321	0.868	0.193	0.281	0.444	2.522	-0.039
38.	Other chemical and cement	0.129	0.490	0.868	0.300	0.366	1.449	2.522	0.909
39.	Electricity, Gas and Water	0.561	0.881	0.863	0.887	1.658	2.606	2.457	2.657
40.	Irrigation building	0.425	0.880	0.846	0.915	1.115	2.356	2.287	2.425
41.	Construction	0.383	0.810	0.846	0.789	1.016	2.178	2.287	2.114
42.	Trade	0.577	0.705	0.861	0.640	1.555	1.903	2.448	1.675
43.	Restaurant	-0.115	1.316	0.867	1.595	-0.558	3.678	2.338	4.510
44.	Hotel	-0.447	-0.072	0.846	-0.470	-1.525	-0.383	2.287	-1.540
45.	Road and railway transport	0.558	0.927	0.861	0.976	1.539	2.587	2.448	2.690
46.	Air and water transport, and communication	0.367	0.533	0.867	0.412	0.977	1.426	2.338	1.096
47.	Services allied to transport	0.307	0.311	0.861	-0.063	0.823	0.835	2.448	-0.264
48.	Bank and insurance	0.745	0.865	0.846	0.873	2.039	2.374	2.287	2.410
49.	Agriculture services	0.825	1.178	0.846	1.332	1.196	1.943	2.287	1.784
50.	Real estate and business service	0.369	0.387	0.846	0.295	0.983	1.032	2.287	0.781
51.	General government and defense, education, health, community services	0.510	0.852	0.867	0.737	1.346	2.303	2.338	2.049
52.	Personal, household and other services	0.454	0.959	0.867	1.050	1.186	2.587	2.338	2.835

Source: PERTANINDO-F simulation results

Appendix table 6.1 Industry effects on prices due to productivity increase in agriculture and fertilizer

No.	Sectors	SIM5				SIM6			
		Export prices (pe)	Primary input prices (p1prim)	Labor prices (p1lab_o)	Capital prices (p1cap)	Export prices (pe)	Primary input prices (p1prim)	Labor prices (p1lab_o)	Capital prices (p1cap)
1.	Paddy	-90.212	-77.012	-75.277	-68.246	-91.819	-78.939	-75.655	-68.549
2.	Maize	-84.240	-68.368	-75.276	-68.246	-85.835	-70.249	-75.655	-68.549
3.	Cassava	-91.798	-70.315	-75.277	-68.246	-92.508	-71.118	-75.655	-68.549
4.	Sweet potatoes	-93.026	-67.084	-75.276	-68.246	-93.503	-67.592	-75.654	-68.549
5.	Groundnut	-85.516	-63.525	-75.276	-68.246	-85.791	-63.852	-75.654	-68.549
6.	Soybean	-54.179	-33.526	-75.277	-68.246	-54.616	-34.070	-75.656	-68.549
7.	Vegetables	-86.410	-62.560	-75.276	-68.246	-87.468	-63.707	-75.654	-68.549
8.	Fruits	-86.995	-61.576	-75.276	-68.246	-87.646	-62.274	-75.655	-68.549
9.	Other food crops	-64.383	-39.499	-75.275	-68.246	-65.957	-41.207	-75.653	-68.549
10.	Rubber	-99.651	-85.432	-71.448	-68.246	-101.312	-87.364	-71.807	-68.549
11.	Sugarcane	-71.555	-56.774	-71.448	-68.246	-72.607	-58.064	-71.807	-68.549
12.	Coconut	-84.273	-69.256	-71.448	-68.246	-85.462	-70.670	-71.807	-68.549
13.	Palm oil	-71.183	-73.226	-71.448	-68.246	-72.382	-74.998	-71.807	-68.549
14.	Tobacco	-59.143	-50.977	-71.448	-68.246	-64.780	-58.791	-71.807	-68.549
15.	Coffee	-34.462	-13.138	-71.448	-68.246	-35.669	-14.650	-71.807	-68.549
16.	Tea	-82.645	-64.702	-71.448	-68.246	-84.267	-66.570	-71.807	-68.549
17.	Clove	-69.891	-45.196	-71.448	-68.246	-71.935	-47.401	-71.807	-68.549
18.	Cocoa	-12.910	15.379	-71.448	-68.246	-13.192	15.048	-71.807	-68.549
19.	Cashew fruit	-43.579	-17.369	-71.448	-68.246	-44.294	-18.151	-71.807	-68.549
20.	Other estate crops	-30.881	-15.052	-71.448	-68.246	-32.186	-16.924	-71.807	-68.549
21.	Livestock	-78.731	-68.985	-71.448	-68.246	-78.898	-69.170	-71.807	-68.549
22.	Fresh Milk	-67.316	-69.243	-71.448	-68.246	-67.529	-69.459	-71.807	-68.549
23.	Poultry	-63.648	-76.757	-71.448	-68.246	-63.825	-77.041	-71.807	-68.549
24.	Other livestock raising	-76.398	-59.892	-71.448	-68.246	-76.627	-60.128	-71.807	-68.549
25.	Forestry and hunting	-65.848	-50.283	-58.253	-68.246	-65.983	-50.480	-58.540	-68.549
26.	Fishery	-75.445	-59.205	-71.448	-68.246	-75.457	-59.227	-71.807	-68.549
27.	Mining	-0.073	-0.273	8.256	-1.441	0.053	-0.137	8.315	-1.295
28.	Other mining and quarrying	4.572	5.375	8.256	3.677	4.652	5.459	8.315	3.775

Appendix table 6.1 Industry effects on prices due to productivity increase in agriculture and fertilizer (continued)

No.	Sectors	SIM5				SIM6			
		Export prices (pe)	Primary input prices (p1prim)	Labor prices (p1lab_o)	Capital prices (p1cap)	Export prices (pe)	Primary input prices (p1prim)	Labor prices (p1lab_o)	Capital prices (p1cap)
29.	Rice milling	-56.549	31.910	8.257	37.854	-57.557	32.449	8.249	38.531
30.	Flour	-6.783	15.335	8.257	18.670	-6.880	15.514	8.249	18.936
31.	Sugar	-29.664	40.498	8.257	57.501	-30.122	41.023	8.249	58.308
32.	Other food, beverages, and tobacco	-7.282	36.389	8.257	49.344	-7.362	36.777	8.249	49.915
33.	Textile, wearing apparel and leather	1.112	3.095	8.257	0.650	1.121	3.089	8.232	0.653
34.	Wood products	-0.665	16.321	8.254	19.522	-0.665	16.298	8.210	19.507
35.	Paper, paper products, transport equipment, machinery and iron	0.875	3.432	8.254	1.664	0.880	3.436	8.210	1.686
36.	Fertilizer	-6.068	-16.449	8.255	-33.185	-26.462	-29.042	8.262	-54.313
37.	Pesticide	8.427	22.682	8.255	26.033	8.603	23.125	8.262	26.578
38.	Other chemical and cement	0.347	4.707	8.255	2.921	0.369	4.753	8.262	2.987
39.	Electricity, Gas and Water	4.798	6.003	8.259	5.237	4.893	6.104	8.316	5.353
40.	Irrigation building	3.341	9.925	8.279	11.584	3.427	10.066	8.454	11.692
41.	Construction	2.614	7.395	8.279	6.879	2.668	7.458	8.454	6.876
42.	Trade	5.885	7.817	8.263	7.631	6.115	8.120	8.322	8.036
43.	Restaurant	-9.890	14.691	8.233	18.698	-9.880	14.999	8.425	19.078
44.	Hotel	-7.428	2.179	8.279	-0.464	-7.293	2.508	8.454	-0.070
45.	Road and railway transport	4.392	7.999	8.263	7.806	4.511	8.180	8.322	8.076
46.	Air and water transport, and communication	2.687	4.009	8.233	2.480	2.814	4.198	8.425	2.667
47.	Services allied to transport	2.594	2.930	8.263	-0.704	2.697	3.054	8.322	-0.536
48.	Bank and insurance	6.593	7.829	8.279	7.641	6.832	8.109	8.454	7.965
49.	Agriculture services	53.064	71.133	8.279	100.324	53.995	72.336	8.454	102.004
50.	Real estate and business service	2.569	2.788	8.279	1.687	2.694	2.929	8.454	1.822
51.	General government and defense, education, health, community services	3.479	8.063	8.233	6.791	3.594	8.248	8.425	6.923
52.	Personal, household and other services	2.133	8.283	8.233	8.333	2.252	8.531	8.425	8.636

Source: PERTANINDO-F simulation results

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