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THE AGRICULTURALIZATION OF INDONESIA: IN THE AFTERMATH OF THE SOCIOECONOMIC CRISIS

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CASER/CSIS/CIES/ANU
joint research project on
policy analysis of linkages between
Indonesia's agricultural production, trade and
environment

Rapid economic growth in Indonesia has been accompanied by significant structural changes, including for its agricultural sector and its unique natural environment. Recently questions have been raised about the impact of Indonesia's agricultural, industrial, trade and environmental policies on sustainable rural development. The nature of interactions between the economic activities of different sectors and the environment are such that an intersectoral, system-wide perspective is essential for assessing them. An international perspective also is needed to assess the impact on Indonesia of major shocks abroad, such as the implementation of the Uruguay Round agreements, APEC initiatives, or reforms in former centrally planned economies. There is increasing pressure on supporters of liberal trade to demonstrate that trade reforms at home or abroad affecting countries such as Indonesia will not add to global environmental problems (e.g., deforestation, reduced biodiversity). Again, this requires system-wide quantitative models of the economy and ecology, because typically there are both positive and negative effects at work, so the sign of the net effects ultimately has to be determined empirically.

To begin to address these issues, the Australian Centre for International Agricultural Research (ACIAR) has generously provided funds for a collaborative 3-year project (to mid-1999) involving the University of Adelaide's Centre for International Economic Studies (CIES) as the lead institution, Bogor's Centre for Agro-Socioeconomic Research (CASER) which is affiliated with the Ministry of Agriculture, Jakarta's independent Centre for Strategic and International Studies (CSIS), and the Economics Division of the Research School of Pacific and Asian Studies (RSPAS) at the Australian National University in Canberra. Being based on Indonesia with its rich diversity of environmental resources (and on which there are relatively good data) and its rapid economic growth, the project could also serve as a prototype for similar studies of other developing countries in Southeast Asia and elsewhere.

The key objective of the project is to assess the production, consumption, trade, income distributional, regional, environmental, and welfare effects of structural and policy changes at home and abroad particularly as they will or could affect Indonesia's agricultural sector over the next 5-10 years. Among other things, the analysis will focus both on the effects of economic changes on the environment, and on the impacts on Indonesia's agricultural production and trade of resource and environmental policy changes. The implications of regional and multilateral trade liberalization initiatives and Indonesia's ongoing unilateral trade reforms will be analysed, along with other potential domestic policy changes and significant external shocks such as the entry of China and Taiwan into the World Trade Organization. The analysis will draw on and adapt computable general equilibrium (CGE) models such as the national INDOGEM Model (built as part of an earlier ACIAR project) and the global GTAP Model.

The project is being undertaken in close collaboration with the Indonesian Ministry of Agriculture and ministries involved in trade, planning, and the environment. A Research Advisory Committee has been established to encourage close collaboration of representatives from those and other ministries.

ACIAR INDONESIA RESEARCH PROJECT

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CRISIS**

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SUMMARY

The ongoing socioeconomic crisis enveloping Indonesia has dramatically reversed decades of rapid economic growth, steady progress in poverty reduction, and substantial improvements in food security. This paper attempts to provide insights into how agriculture can contribute best to overcoming the negative consequences of the crisis in the medium-term period. A computable general equilibrium (CGE) model of Indonesia, WAYANG, is used to model the consequences of a real devaluation, productivity declines and a loss of the country's endowment factors. WAYANG is a single country, 65 sector CGE model of the Indonesian economy. An important purpose of this paper is to provide insights into how agriculture can contribute best to overcoming the negative consequences of the crisis in the medium-term period.

The analysis focuses on medium-term shifts in production across industries to provide some indication of expected output changes arising from three key crisis-related impacts: (1) a 25 percent real devaluation of the rupiah; (2) a productivity decline in agriculture due to a decline in the growth of knowledge; and (3) a 5 percent run down in primary factor endowments (excluding land).

The Agriculturalization of Indonesia: in the Aftermath of the Socioeconomic Crisis

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1. Introduction and Overview

The ongoing socioeconomic crisis enveloping Indonesia has dramatically reversed decades of rapid economic growth, steady progress in poverty reduction, and substantial improvements in food security.¹ Before the crisis, Indonesia was frequently cited as one of the highest performing Asian economies with per capita GDP growth in the top 10 percent of all developing countries. Since the crisis began in August 1997, however, the rupiah's value has dropped by as much as 80 percent (before a partial recovery). In 1998, inflation soared to an estimated 100 percent; and GDP fell by an estimated 14 percent in 1998 (World Bank, 1998). Indonesia's poor are especially vulnerable to the falling incomes, increasing prices and rising unemployment and underemployment brought on by these crisis induced events. World Bank simulations suggest a 12 percent decline in real GDP in 1998 would add some 9 million people to the more than 20 million living in poverty before the crisis began (World Bank, 1998).

Indonesia's capacity to address the crisis has been greatly complicated by forest fires, drought, floods and a sharp decline in crude oil prices. During 1997, one million hectares of forest fires in Kalimantan and Sumatra damaged ecosystems, destroyed crops, disrupted transport and tourism, increased the incidence of respiratory problems and strained Indonesia's relations with neighbouring Singapore and Malaysia (Solahuddin, 1998). Estimates of the economic damage to Indonesia's logging and timber industries, (excluding environmental and health costs) are set at more than US\$900 million (Tay, 1998). One estimate of the 1997 fire's

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¹A recent World Bank report (July 1998) suggests four key microeconomic causes of Indonesia's crisis: the rapid build up of private debt; (2) well-recognized flaws in the banking system; (3) inadequate governance; and (4) the timing of the crisis in relation to political events (World Bank, 1998).

impact on increased health care costs and foregone tourism income for Indonesia, Malaysia and Singapore is US\$1.4 billion (Tay, 1998).

A prolonged drought throughout 1997/98 reduced export crop production and, more importantly for the country's food security objectives, contributed to a large drop in paddy production. Initial estimates suggest that the 1998 paddy crop is nearly 10 percent below the 1996 production level (FAO, 1998; CBS, 1999). The drought's impact has been worse in the islands of the country's east, which is drier and contains a higher proportion of low income households than Java.

Around one-third of the country's population spend 69 percent or more of their total expenditures on food (SUSENAS, 1996). Thus, the collapsing demand, rising unemployment, falling food production, increasing food prices and rapidly expanding numbers of malnourished stress the fundamental role agriculture must play in revitalizing the economy. The agricultural sector's potential to contribute has been greatly enhanced by crisis-induced policy reforms which have removed many of the long standing disincentives facing producers, traders and processors. This dramatically changed policy environment provides an important foundation for the agriculturalization of the economy.

An important purpose of this paper is to provide insights into how agriculture can contribute best to overcoming the negative consequences of the crisis in the medium-term period. A computable general equilibrium (CGE) model of Indonesia, WAYANG, is used to model the consequences of a real devaluation, productivity declines and a loss of the country's endowment factors. WAYANG is a single country, 65 sector CGE model of the Indonesian economy².

The analysis focuses on medium-term shifts in production across industries to provide some indication of expected output changes arising from three key crisis-related impacts: (1) a 25 percent real devaluation of the rupiah; (2) a productivity decline in agriculture due to a decline

² The model, based on the PARA CGE model of the Thai economy, was developed at ANU by Peter Warr and Prem Tharpha with assistance from Helder da Costa.

in the growth of knowledge; and (3) a 5 percent run down in primary factor endowments (excluding land).³

The paper is organized into five sections. Section 2 provides an overview of how the socioeconomic crisis has impacted on the agricultural sector. Section 3 details the agriculture-related policy responses induced by the crisis. Section 4 outlines the modelling scenarios and presents an analysis of the results. The final section presents a brief discussion of the results.

2. Crisis related impacts on rural communities and agriculture

Among the ongoing concerns facing agricultural policymakers is what the devaluation means for food security and what can be done to minimize the negative consequences for both food production and access to food. The devaluation's direct and indirect impacts on food consumers and producers work in opposing directions. For example, while agricultural wages represent an important cost component for food production, they are also the primary income source for many households. In part, the crisis shocks should encourage food production since drops in real wages reduce food production costs, increase producer profits and provide incentives to boost production further through both extensive and intensive techniques.

For wage-dependent landless workers, however, falling incomes reduce food demand, counteracting the production enhancing effects of lower production costs. Likewise, as the price of export crops increase relative to non-exported food crops, producers will shift land, labour and other inputs towards the more profitable opportunities.

It is ironic that in Indonesia, agricultural households tend to be more vulnerable to food insecurity than urban residents. Before the crisis, the average per capita expenditure of agricultural households was about 57 percent higher than the poverty line (World Bank, 1998). In contrast, average per capita expenditure among households in both manufacturing and construction was more than twice the poverty line. Unskilled agricultural wages have fallen in real terms as urban workers whose jobs are lost in construction, manufacturing, and import-dependent food processing activities migrate back to the countryside to look for work.

³ No attempt is made to model the production and welfare impacts of the drought. Instead, the analysis focuses on shocks that are likely to endure well beyond one or two crop cycles.

Empirical evidence demonstrates that this influx of labour into the countryside is placing downward pressure on agricultural wages. Table 1 presents some recent evidence of real wage declines in Indonesia during the period of January 1997 to January 1998. As expected, regions closest to Jakarta, Central and East Java have seen the largest declines, 12 percent and 13 percent respectively.

The devaluation provides increased opportunities for expanding traditional exports crops (cocoa beans, coffee, tea and fishery and forestry products), as well as exports of fruits and vegetables (See Figure 1). As prices of vegetables increase relative to rice prices, producers will tend to substitute vegetables for rice production. Table 2 highlights the trend in relative output prices. The price ratio of paddy to agricultural wages has changed significantly compared with the price ratio of vegetables to agricultural wages between August 1997 and June 1998. As the relative output prices of these two commodities continue to diverge, policymakers attempting to control rice prices through generalized subsidies will find it increasingly difficult to compensate rice producers via input subsidies.

The increasing food prices and falling real input costs stimulate production and agricultural income, but reduce the real income, effective demand and food security situation of landless agricultural workers and consumers who depend on the market for their food supplies. For agricultural workers, declining real wages harm their ability to feed their families, to school their children, and to provide adequate health care. These are especially important concerns for Indonesia where 11 million rice producers cultivate less than 0.35 hectares and an estimated 7 million rural households are landless (Tabor, Dillion and Sawit, 1998).

Figure 2 provides data showing just how much faster food prices are rising than are wages. The partial equilibrium impact on income of a 40 percent rise in the real price of rice (the estimated price rise if trade were liberalized at prices prevailing in late -1998) is simulated in Table 3. The income losses range from 7.5 percent to 14 percent. Income declines of this proportion for the poorest one-third of the country's population have serious implications for the country's food security objectives. On the other hand, what is not taken into account in the simulations presented in Table 3, is that rice producers gain from the real price rise.

The Ministry of Population (BKKBN) estimates for May 1998 are that 16.7 percent of the households in Indonesia (some 34 million individuals) could be classified as badly impoverished -- households that are unable to satisfy their basic needs. Table 4 presents data on changes in poverty since 1976, including recent estimates of the growth in poor since the crisis. The Ministry of Food and Horticulture estimates that 40 percent could be classified as food insecure. The highest absolute number of food insecure rural households are in Java.

Food insecurity and malnutrition have immediate consequences for those households effected. Chronic malnutrition blinds, otherwise debilitates and kills, reducing physical capacity, lowering productivity, stunting growth, and inhibiting learning. In the world's poorest regions and countries, one-third of deaths among children are due to malnutrition (Del Rosso 1992). Decreased access to food and nutrition leads to declining learning capacity, school performance, and school attendance; to more school and work days lost to sickness; and to lower earnings, shorter work lives and a less productive work force.

In a recent review of the crisis, Tabor, Dillion and Sawit (1998) argue that three events contributed to a significant increase in absolute poverty: (1) a fall in average real incomes of 10 to 14 percent, (2) a rise in urban unemployment; estimated to be as high as 15 million persons, and (3) a rise in food prices facing the poor – between January 1996 and May 1998, food prices rose 11 per cent in real terms. Tabor et. al. estimate that the crisis could cause an increase of 8 million urban poor and 23 million rural poor; and there would be approximately 9.6 million urban and 24.3 million rural food-insecure individuals in mid-1998 (Table 4).

The highest estimate of poverty levels was that of Ministry of Women's Affairs. This ministry classified 56 percent of the population, or around 113 million persons, as poor. In 1996, 22.5 million persons were classified as absolutely poor of which about 7.2 million were in urban area and 15.3 in rural area. Another 37 million were reported as "nearly poor". With falling real wages and shocks to food production, the great majority of these "nearly poor" households would have fallen below the poverty line. This implies that 50-55 million persons could be classified as absolutely poor, of which 38 million live in the rural areas.

These crisis related impact have long term consequences for future income, agricultural productivity and production possibilities. Many households respond to negative economic

shocks by pulling their children out of school. An estimated 17.5 million school age children (out of a total 53 million) in 1997 were reported to be out of school to earn an income (Tabour et. al. 1998). Even with the planned abolition of school fees, these numbers will undoubtedly rise as the increased opportunity cost of keeping children in school rises. The government estimates suggest that about 6 percent of primary school students and 13 percent of junior secondary school students are at risk of dropping out (approximately 1,650,000 and 1,100,000 students respectively), while an additional 400,000 primary school graduates are unlikely to continue their education (World Bank, 1998)⁴.

The outlook for health is also sobering. The sharp exchange rate depreciation has raised the prices of medicines, vaccines, contraceptives, and other medical supplies. Drug prices have increased two- to three-fold since the crisis began. In some communities, health centres have had to close because of a lack of medicines.

Recent estimates suggest that primary, junior and secondary school drop out rates are rising rapidly. Government estimates presented in Table 5 show that drop out rates more than doubled between 1997/98 to 1998/99. Evidence from the much smaller 1986/87 shock, however, suggests the overall impacts are likely to be large. During that period enrolment rates fell from 62 percent to 52 percent at the junior secondary level and took a decade to recover. Virtually the entire decline was from poor households (Atinc and Walton 1998).

The drop in enrolment levels raises serious medium and long term growth implications for Indonesia's economy. The development literature suggests strongly that basic education, skill development and institutional reforms are all necessary conditions for increasing productivity growth and taking advantage of the increased competition resulting from market liberalization (Krueger, 1995; Rodrigo and Thorbecke, 1997; World Bank, 1998) While measuring how much basic education actually contributes to economic growth remains part of an ongoing empirical debate, few dispute the fundamental role played by education in the agricultural development process. Schooling and basic education foster agricultural innovations, enhance producers' abilities to reallocate resources in response to policy reforms and to adapt to

⁴ As cited by Tabor et al. (1998), UNICEF estimates that 8 percent of the 30 million primary school children and 14 percent of the 10 million junior high school students may drop out of school as a result of the economic crisis.

fluctuating input and output prices; and promote the use of new technologies, including best practice resource management techniques (World Bank, 1998; Foster and Rosenzweig, 1993; Foster and Rosenzweig, 1995; Foster and Rosenzweig, 1996).

3. Crisis-Induced Agricultural Policy Responses

Crisis-induced policy responses impact directly and indirectly on producer and consumer price incentives, affecting competition in output, input and credit markets, and the use of natural resources and environmental services. Moreover, agricultural suppliers, producers, processors, and traders are influenced directly by the policy response and indirectly via how producers and consumers respond.

Among its many attempts to address the impacts of the drought and the economic crisis, Indonesia's policymakers have worked with the international community to establish a series of appropriate policy responses. The Minister For Economy, Finance and Industry provides periodically a letter of intent to the Managing Director of the International Monetary Fund which includes an outline of the government's policy reforms and specifies the types and timing of the actions to be taken.

The macroeconomic, trade and agriculture policy reforms implemented in response to the crisis are wide ranging. Since September 1997, Indonesian policy-makers have taken steps to reduce tariffs on more than 500 food items to 5 percent. They have eliminated local content requirements for dairy products and dismantled export controls for plywood and wood products. The government has withdrawn BULOG's import and trading monopolies for wheat, wheat flour, garlic, sugar and soybeans, abolished the clove monopoly and reduced agricultural export taxes to 10 percent. Inter-provincial commodity trade restrictions have been eliminated. Other policy reforms include removing the export restriction on oil palm products, privatising plantations, estates and input suppliers, liquidating cooperatives and removing land use regulations restricting producer crop choices.

The September 1998 memorandum includes an annex outlining a strategy for Indonesian food subsidies and another annex outlining a Seven Point Strategy for Rice. Important food

and agricultural sector reforms include: (a) eliminating BULOG's monopoly on wheat, sugar and soybeans imports; (b) suspending the VAT on rice and other essential commodities; (c) eliminating wheat and sugar subsidies (while soybean subsidies are to be phased out); (d) removing export bans on wheat, soybeans and sugar; (e) eliminating import subsidies and relevant import duties for soybean meal and fishmeal; and (f) for the first time in 30 years, allowing private traders to import rice.

Unlike pre-crisis reforms which were often motivated by budgetary constraints, the present price and trade reforms reflect the government's inability to enforce export bans and to hold down food prices in local markets. Illegal exports and trader markups forced the early implementation of these policies (Third Memorandum, 1998). Indeed, the government's price interventions have not been effective. From January to June 1998, BULOG raised procurement and market operation prices three times. Procurement prices for paddy were increased to Rp. 600, then to Rp. 700 and finally to Rp. 1000 per kilogram in June. BULOG also attempted to lower rice prices for consumers by selling large quantities in the market at Rp. 1750 to Rp. 2000 per kilogram. Prices remained high, among other reasons, because the rice distribution system allowed speculators to buy subsidised rice and sell it at higher prices. In addition, large amount of rice were being exported illegally to neighbouring countries⁵. In an attempt to curb speculation, BULOG raised its reference price to between Rp. 2000 and Rp. 3500 per kilogram, depending on the quality of the rice.

Due to the lower than expected second rice harvest, panic hoarding and sharp rises in rice prices, the current targeted rice price program (covering 2 million people) is to be expanded to cover 7.5 million people by October. The targeted rice program may ultimately cover 15 million families. In addition, BULOG plans to increase substantially the quantity of rice released into the market at below market prices and maintain a high release level until the main harvest.

Making the best use of agriculture to address poverty and food security

⁵ More than 1900 tons of rice were seized at Sunda Kelapa harbour in North Jakarta as it was being prepared to be exported to Kuching, Malaysia. The rice was found in boats, containers, trucks, and warehouses at the harbour. The remaining 380 tons were seized from traders who tried to mixing low quality rice and good quality rice before selling it in open market to gain greater profit.

One of the most important short term goals for improving food security in Indonesia will be utilising the poverty reduction potential of its agricultural sector. Periods of high agricultural growth rates are associated with falling rural poverty and increasing food security (Binswanger and von Braun 1991; Timmer 1992; Bell and Rich 1994; Johnson 1993). Strong agricultural growth leads to: (1) lower food prices (for urban consumers and rural net-food buyers); (2) increased income generating opportunities for food producers and jobs for rural workers (thus reducing rural-urban migration, with positive consequences for real urban wage rates); and (3) positive intersectoral spillover effects including migration, trade and enhanced productivity (Lipton and Ravallion, 1995; Timmer 1992). In the past, Indonesia's rapid agricultural growth substantially reduced rural poverty, improved food security in both rural and urban sectors, and provided a significant demand side stimulus for non-agricultural goods and services.

Much of this past progress in providing increased food availability in Indonesia have resulted primarily from increased domestic food production. Despite rapid industrialisation, Indonesia's cereal self-sufficiency ratio increased from 90 percent to 95 percent, with rice yields increasing from 3.3 kg/ha to 4.3 kg/ha during this period between 1979/81 to 1989/91. Martin and Warr (1993) conclude that technical change in Indonesia has been faster in agriculture than in the rest of the rest of the economy due to such programs as rice intensification (BIMAS, INMAS, INSUS), public investment in irrigation and in adaptive research and dissemination of modern varieties, and the subsidies for credit, fertilisers and pesticides.

Indonesia's rice self-sufficiency initiatives involved a range of food and agricultural policies aimed at boosting rice production. The government established public investment programs, import restriction, procurement policies and price controls. Rice intensification provided irrigation, fertiliser, pesticides, HYV seeds, credit extension, technical assistance and related capital improvements. Irrigation alone is credited with contributing to around 50 percent of the growth in rice production through increased yields during the 1980s and early 1990s. In total, the rice area under HYVs increased by 75 percent since the late 1970s, bringing the new technology to 3.5 million hectares and 6 million farmers.

The subsidised inputs and credit, expanded marketing channels and extension services contributed to sharp increases in fertiliser and pesticide use. Fertiliser subsidies kept the retail

price 40 percent below its economic value and helped keep Indonesian farmgate prices among the lowest in Asia during the 1980s. Fertiliser applications increased by 500 percent in many areas, with applications rates more than twice those in the Philippines and three times those in Thailand (FAO, 1992). Subsidy programs maintained a prominent role throughout the 1980s. By 1987, the fertiliser subsidy alone consumed 35 percent of the government's expenditure on agriculture. The irrigation subsidy cost about US \$110 per hectare. Together, rice-related subsidies for fertilisers, pesticides, HYV seeds, credit and irrigation amounted to more than US \$1 billion per years in the late 1980s.

However, after three decades of steady gains in agricultural productivity, growth rates of food production have begun to lag. Annual rice yield growth in Indonesia has dropped from 5.2 percent in the 1971-83 period, to 3.1 percent in 1984-90, to less than 3 percent today. Warning signs include declining growth of arable and irrigated areas, and increasing competition for resources between agriculture and other sectors. The use of inputs such as fertiliser and pesticides has declined due to environmental and health concerns. Falling world food prices have discouraged investment in agriculture, and neglect of agricultural research at national levels – although productivity growth arising from the latter is a means of dealing with price falls.

Indonesia's agricultural sector was growing relatively slowly even before the drought and economic crisis hit. The same trend of declining agricultural comparative advantage in the process of industrialization experienced by structural changes in developing countries worldwide. The share of agricultural output in total production in developing countries as a group, has declined from 29 percent in 1965 to 17 percent in 1990 (Pandya-Lorch 1994). In Indonesia, agriculture's share of GDP has fallen from 45 percent in the early 1970s to around 17 percent in the mid-1990s and is expected to be less than 10 percent by 2020 (Anderson and Pangestu, 1995).

Anderson and Pangestu (1995) examine how three sets of influences affected structural change in Indonesia's agricultural sector: external events, domestic macroeconomic and non-agricultural policies, and domestic food and agricultural policies. Their study suggests that while petroleum sector prices represents the most important external event influencing the country's economic growth pattern (both the boom period during the 1970s and the critical 60

percent drop in real oil prices between 1982-86), it has been the prudent, market-driven approach to macroeconomic management and the liberalization of foreign trade and investment since 1985 which laid the foundation for the continuous and rapid economic growth in all sectors.⁶

4. Modelling the aftermath of the Indonesian crisis

The gravity of the problems facing Indonesia makes modelling of crisis-related scenarios a task that is potentially trivialising. Nevertheless, with this qualification, we present the projections of three experiments here to gain some insights into effects on income and distribution: (1) a 25 percent real devaluation of the rupiah; (2) a productivity decline in agriculture due to a decline in the growth of knowledge; and (3) a 5 percent run down in primary factor endowments (excluding land).

Table 6 summarises the closures used in the three simulations. The national stocks of both labour and mobile capital are exogenous, but endogenous at the industry level. That is, if an industry responds positively to a particular shock, it attracts labour and mobile capital from other industries. The government's budget balance remains exogenous, so any change in expenditure is accompanied by the same rupiah change in receipts. The consumer price index is the numeraire. Table 6 contains the exogenous variables used to shock the model and to depict each of the effects above.

The scenarios presented here assume a great deal of adjustment within the Indonesian economy. As noted above, the Indonesian government has responded to the crisis by liberalizing markets and by removing legislative restrictions on agricultural land use. Given the nature and extent of the crisis, a much longer period may be needed before agents respond fully to liberalization and before market and social institutions begin operating effectively.

⁶ While these policies and programs have been highly successful, Indonesia's economic success is also due, in no small part to an abundant natural resource base. Oil, natural gas, coal, tin, nickel and gold are all found in substantial amounts, along with one of the world's richest tropical commercial forests. With more than 13,000 islands, the country's marine area is six times larger than its land area. Together renewable and exhaustible primary resources contribute to 40 percent of GDP. Primary sector exports account for 70 percent of total exports, with agriculture contributing about 50 percent of non-oil exports.

(1) a 25 percent real devaluation of the rupiah

In this experiment, the economy experiences a real devaluation in the medium term of around 25 percent. The inflation which followed the initial collapse of the rupiah is subtracted from the nominal depreciation of the rupiah to obtain a real change. The rupiah in the early part of 1998 suffered from a classic overshoot, reaching a bottom of 15,000 to the US dollar. By late October 1998, its value had settled at around 7,500. The magnitude of the real devaluation is likely to have a smaller confidence interval than the nominal devaluation. If the nominal devaluation is larger than expected, inflation will also be larger.

Given the potential array of influences, the model is used to predict which industries might win and might lose from the real devaluation. The magnitude of the gain or loss to a particular industry from a real devaluation depends on a number of influences including: (a) the export intensity of sales of the industry's output; (b) the export demand elasticity of the output; (c) the import intensity of production; (d) the structure of production and overall cost changes; (e) the fate of other industries intensive in purchases of the output of this industry; and (f) household demand and income elasticities.

With real investment and real government spending fixed, real household consumption, becomes the most appropriate indicator of national welfare. The real devaluation shock reduces consumption by 6.9 per cent, with losses across all commodities. As the cost of imports rise, the volume of imports contracts. The domestic economy must supply a larger proportion of household consumption and goods and services for intermediate usage. Consequently, there is only a moderate export-enhancing effect stemming from the real devaluation, as exports and domestic sales compete. This implies that the export-orientation of a particular industry may not be a good predictor of whether that industry will expand or contract following the real devaluation.

Land is not transferable between crop types within the model. In this circumstance, land essentially is a form of fixed capital. Scope for adjustment still exists by moving labour and mobile capital from one cropping activity to another. Fixed land acts as a constraint on how much adjustment can take place (without preventing such adjustment altogether).

Within agriculture, the real devaluation results in a redistribution of productive resources towards more export-oriented activities. Forestry industries are big winners with output increases of 21 percent for wood products and 31 percent in other forest products (Table 7). In downstream industries, food processing expands output by 29 percent and exports by 81 percent, while output of manufactured oils and fats increases by about 7 percent and exports by 28 percent. Among the primary production activities, oil palm increases output by 6 percent, other estate crops by 6 per cent and other agriculture by 4 percent.

For some commodities, the export effect is direct. For example, other estate crops' exports are equal to around one third of total industry costs. On the other hand, no oil palm is exported. But the largest single point of sale for oil palm is as an intermediate input to the export-oriented manufactured oil and fat industry. Among the food processing industries, only milled rice output contracts.

The outcome for the textile industry demonstrates the importance of modelling since it would be difficult to predict the result from *a priori* reasoning. Textiles are highly export-intensive, with exports equal to over 70 percent of the costs of production. The industry is also import-intensive in purchases of yarns and textiles. In addition, textiles are income-elastic for seven out of ten households. The decline in national real household consumption of 6.9 percent implies a larger proportional decline in consumption of textiles for these seven household types. In the simulation, household textiles consumption declines 14 percent and exports decline 13 percent. In this case, the highly export-oriented industry is overwhelmed by the relatively intensive use of inputs whose prices rise.

The export-enhancing effect of the real devaluation is limited because key export industries actually experience contractions in exports. These include crude oil and, as discussed, textiles. Crude oil is a key input into petrol, whose use in transport industries increases with the real devaluation, thereby diverting sales from exports.⁷

⁷ Will the effects of a sharp decrease in oil prices be the mirror image of the effects of the oil shocks of the 1970s and 1980s? This is unlikely due to the structural changes and rapid growth of the Indonesian economy in the interim. One consequence of rapid economic development is that domestic usage of petroleum products has grown rapidly. Within the WAYANG database, exports of crude oil account for 40 percent of total sales, and exports of petroleum products account for 36 percent of sales. Given that more than half of sales are to domestic users, it is probable that the benefits of

In summary, the model indicates a weaker export-enhancing effect than we expect from *a priori* reasoning.⁸ Productive resources need to cater increasingly for domestic demand in addition to exports, in response to the rising cost of imports. Not only does this reduce export growth. It also means that household consumption falls. The medium-term scenario allows sufficient time for some resource reallocation, thereby providing for moderation of the severe welfare losses that Indonesia has experienced in the short term.

(2) productivity declines in agriculture due to a decline in the growth of knowledge

As mentioned in the introduction, the Indonesian government (with World Bank support) is attempting to address the rapid deterioration of access and provisions of education. But the problem is potentially so large that even with active measures, millions of future producers are likely to drop out. In the second experiment, a decline in productivity growth arising from a loss in the social stock of knowledge is modelled. The government has many different issues to address in choosing the best way of responding to the crisis.

The decrease in productivity growth due to the crisis results in a loss in output across all agriculture industries and downstream processing. This downturn in agricultural output leads to a decline in real consumption of 1.2 percent. As the loss in national real consumption is a smaller proportion than the output losses of any agricultural industry, this has an export-decreasing effect with an increasing proportion of output being sold domestically (Table 6).

cheaper inputs of petroleum products for other industries and cheaper petroleum for household use will partly offset the negative effects of lower export prices.

A 30 per cent decline in the world price of oil within WAYANG results in a decrease in the terms of trade in Indonesia of 4.5 percent and a real devaluation of 3.6 percent. This increases the competitiveness of export-oriented industries, with an increase in the volume of exports and, despite the fall in price oil, an increase in the value of exports.

Real GDP declines only slightly (-0.1 percent), while real consumption declines by 2.3 percent. While the crude oil and petroleum industries suffer declines in production, a number of agricultural, forestry and downstream industries increase output. From a national perspective, sustained low crude oil prices would result in a redistribution of production from oil-rich provinces to provinces more reliant on other primary industries.

⁸ The mechanism for inducing a real devaluation in the model is to impose a terms of trade shock, while allowing the prices of both exports and imports to rise relative to non-traded goods and services. This differs from the initial cause of the devaluation, which was a collapse of the financial sector, which we cannot model directly within WAYANG.

One of the disturbing aspects of the real depreciation is the rising costs of some essential imports. The difficulties Indonesia faces maintaining health services with the spiralling cost of pharmaceutical items is outlined above. An important concern is whether the social effects of these increasing costs may be far greater than indicated by the model. While the motivation for the second scenario is related to access and provision of education, access and provision of health services is equally important.

(3) a 5 percent run down in primary factor endowments (excluding land)

Over the past 18 months, the crisis in Indonesia has resulted in civil disturbances, capital flight, rising unemployment, and the loss of social and market institutions. Without specific information on how these events have impact on various sectors, the third experiment imposes shocks to depict a 5 percent reduction in national employment, national variable capital and fixed capital in non-agricultural industries.

This simulation results in an 8.3 percent decline of real consumption. Domestic savings fall by 7 percent with the decline in household income. Imports and exports decrease in volume and value terms (Table 6) due to the reduced productive capacity in the economy.

As a consequence of these shocks, all industries suffer a loss in output compared with a base case. Most agricultural products designated as export-oriented within the model increase exports. This is because the sharp decline in national real consumption is much greater than the output decline of any agricultural industry. No commodity has such a low income elasticity that the proportion of output accounted for by domestic consumption increases. Therefore, sales are diverted to exports.

5. Summary and discussion

The depth and extent of the Indonesian economic crisis suggests that several years are required before the resumes its past growth rates. Supposing the economy, in the absence of a crisis, had continued to grow at more than 5 percent a year. With the contractions in 1997 and 1998 alone, the crisis would have the effect, by 2003, of reducing national income by around 25 per cent from the counter-factual with no crisis (Figure 3). The “slow recovery” path

shown in Figure 3 indicates a more grave outcome, in which real income has not recovered its 1996 level by 2003 (per capita would be even worse).

The modelling in this paper is an early attempt to understand how the Indonesian economy might alter in the wake of the crisis. There are several difficulties in using a comparative static approach to model elements of the crisis:

(1) *What effect will current high levels of inflation have on distribution of income between different factors?* Inflation creates uncertainty which in turn exacerbates a loss in investor confidence. Partial indexation of wages in Indonesia has the effect of increasing the share of income accruing to certain types of labour at the expense of other factors.

(2) *What would be a realistic growth rate to assume in the counter-factual?* It would appear that the no Asian economy has escaped the crisis of 1997/98. Indonesia appears to have suffered more than other nations. The drought of 1997 alone would have caused difficulties which would have lasted beyond the next year or two. Even without the dramatic capital flight and loss of investor confidence that occurred in the wake of the drought, it is highly probable that the economy would still have contracted in 1997. The stylised ‘no drought, no crisis’ growth path shown in Figure 3 assumes away a natural event and implies a growth rate that, in 1997 at least, would not have been possible even had the most judicious of economic management been in place for some time.

A more reasonable counter-factual from which to consider policy analysis is the ‘drought only’ growth path. The difference between the ‘slow recovery’ income and ‘drought only’ income by 2003 is around 30 percent, compared with around 10 percent between the ‘rapid recovery’ and ‘drought only’ scenarios.

(3) *How much will the crisis run down provision of education, and what will the extent of this be on productivity?* The purpose in asking this question is more to understand the potential gravity of the problem than to gain an accurate measure. The Indonesian government and foreign aid donors need to consider the costs and benefits of trying to restore different sorts of services as they allocate public resources. Adequate health and education services are vital to

economic well being. Yet, demands on public resources are huge and allocation decisions requires difficult choices.

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Table 1

Changes in Real Wages for Weeding in Selected Provinces

Province	12 Month Change Jan 97 to Jan 98	6 Month Change July 97 to Jan 98
West Java	-6.8	-10.0
Central Java	-12.1	-13.4
East Java	-13.1	-11.2
West Sumatra	-5.2	-5.0
South Sulawesi	-8.0	-5.7
West Nusa Tenggara	-8.2	-12.0

Source: World Bank, 1998b

Table 2

**Percentage Increase in the Ratio of Paddy Price
to Wages vs. Vegetables to Wages**

Province	August 1997 to June 1998 Percentage Change	
	Paddy	Vegetables
West Java	35%	79%
Central Java	30%	44%
Yogyakarta	54%	156%
East Java	31%	89%
Sumatera Utara	9%	86%
Sulawesi Selatan	32%	23%

Source: Authors' calculations based on BPS, 1997
and 1998 various issues.

Table 3
Simulations of 40 percent real price rise for rice

Expenditure Group 1996 (Rp/month)	Under 15000	15000- 19999	20000- 29999	30000- 39999	40000- 59999
Rice Expenditure Share	43.53%	33.63%	26.47%	20.85%	14.87%
Income Elasticity	0.7	0.6	0.6	0.5	0.3
Compensated Demand Elasticity	-0.14	-0.14	-0.14	-0.14	-0.14
Price Elasticity (Slutsky Equation)	-0.44	-0.34	-0.30	-0.25	-0.19
Kg purchased per month before price rise	6.25	7.39	8.26	8.70	8.73
Price per Kg before price rise	850	850	850	850	850
Real rice Price Rise (40% increase)	1190	1190	1190	1190	1190
Kg purchased per month after price rise	5.14	6.35	7.11	7.78	6.97
Food expenditure share	82.68%	72.15%	68.98%	65.94%	62.33%
Expenditure on food (Rupiahs/month)	10,095	13,475	18,305	23,384	31,100
Expenditure on cereals (Rupiahs/month)	6,467	7,115	7,705	7,998	8,377
Expenditure on rice (Rupiahs/month)	5,315	6,280	7,024	7,392	7,418
Average Monthly Expenditure	12,210	18,676	26,537	35,463	49,896
Loss in Consumer Income	-14.32%	-11.73%	-9.17%	-7.58%	-5.56%

Source: SUSENAS, 1996 and author's calculations.

Table 4**Changes in Poverty: 1976-1998**

Year	Millions			Percentage		
	Urban	Rural	Total	Urban	Rural	Total
1976	9.5	44.2	54.2	38.8	40.4	40.1
1980	9.4	32.8	42.3	29	28.4	28.6
1990	7.2	17.2	25.9	16.8	14.3	15.1
1996	10	15.3	22.5	9.7	12.3	11.3
1998 (est.)	15	32	53	20	30	26
1998 Severely food insecure	9.6	24.3	32			

Source: BPS (1998) and Tabor, et al., (1998). Note: 1976-1996 were BPS statistics while the 1998 values were estimated by Tabor et al.

Table 5**Estimated impact of the Crisis on School Enrollment**

	1967/97	1997/98	1998/99	Change 98/98 to 98/99	
				Absolute	Percentage
PRIMARY					
Enrollment (millions)	29.24	29.27	28.99	-0.28	-1.0%
Drop Outs (millions)	0.88	0.76	1.65	0.89	117.1%
Drop out rate	3.0%	2.6%	5.7%	3.1	119.2%
JUNIOR SECONDARY					
Enrollment (millions)	9.28	9.69	8.33	-1.36	-14.0%
Drop Outs (millions)	0.3	0.47	1.11	0.64	136.1%
Drop out rate	3.6%	5.1%	11.5%	6.4	125.5%

Source: World Bank: 1998a

Table 6

Key closure choices for modelling

National K (mobile)	X	Industry K (mobile)	N
National L	X	Industry L	N
National land	X	Industry land	X
Sector-specific K	X	Tariff rate	X
Capital inflow	X	Various tax rates	X
Wage shifter	X	Change in budget deficit	X
Import prices	X	Technological change	X
Export demand	X	Current account deficit	X

K= capital; L = labour; X = exogenous; N = endogenous.

Table 7
Summary of Scenarios

Variable	(1) Real devaluation	(2)TFP shock to ag.	(3) Endowment
	% change from a base case		
Real GDP	1	-0.6	-4.5
Real consumption	-6.9	-1.2	-8.3
Export value	10	-1.2	-0.6
Import value	10.7	-1.2	-0.7
Export volume	7.8	0.1	-1.8
Import volume	-13.2	-0.1	-1.8
Domestic savings	-7.1	-1.6	-7.1
Terms of trade	-21.8	-0.2	0.1
Real devaluation	25	-0.5	-2

Selected industries	Output	Exports	Output	Exports	Output	Exports
Paddy rice	-4.6	0	-1.8	0	-6.1	0
Beans	1.8	0	-4.2	0	-3.7	0
Maize	-0.8	233.8*	-3.6	-82.9*	-3	230.9*
Cassava	-1.1	189.8*	-4.2	-74.1*	-2.9	121.9*
Veg & fruit	-3.4	0	-4.1	0	-4.9	0
Other crops	2	0	-4.3	0	-5.4	0
Rubber	-0.4	93.8*	-5.5	-60.3*	-1.9	24.9*
Sugarcane	0.1	0	-1.9	0	-5.9	0
Coconut	0.7	144.3*	-3.2	-74.4*	-4.3	86.4*
Oilpalm	6.3	0	-1.7	0	-3.4	0
Tobacco	1.1	0	-2.7	0	-4.4	0
Coffee	-3.5	0	-2	0	-5.6	0
Tea	-1.2	0	-2.4	0	-5.9	0
Clove	-4.1	0	-1.6	0	-6.1	0
Fibre	-4.9	0	-0.1	0	-3.5	0
Other estate crops	6.1	21.9	-11.5	-29.3	0.2	14.2
Other agriculture	3.5	45.6	-7.9	-50.3	-0.8	32.7
Livestock	-5.1	0	-3.2	0	-9.5	0
Meat products	-6.7	0	-3.4	0	-10.7	0
Poultry	-6	0	-3	0	-9.9	0
Wood	21.4	0	1.5	0	-3.3	0
Other forest products	30.7	33.5	1.6	0	-4.5	-2.1
Sea fish	5.6	96.8	-0.4	3.7	-6.7	6.2
Metals	9.9	13.3	1.2	1.9	-4.5	-5.5
Crude oil	2.8	-2.3	0.3	-0.6	-4.8	-7.6
Other mining	3.3	0	0.1	0	-0.6	0
Food processing	29.4	80.5	-2.3	-3.7	-0.3	9.7
Manuf. oils & fats	6.6	27.6	-2.5	-4.8	-4.2	3
Rice milled	-4.7	210.3	-1.9	-55.7	-6.2	48.2
Flour	-1.4	0	-1.7	0	-6.1	0
Sugar	0.5	0	-1.8	0	-5.6	0
Manuf. other food	-2	0	-1.6	0	-5.9	0
Beverages	-1.4	0	-1.2	0	-7.6	0
Cigarettes	-4.3	67.6	-1.7	-3.8	-6.3	7.8
Yarn	-3.9	0	0.8	0	-3.4	0
Textiles	-10.7	-12.9	1.1	1.4	-3.3	-1.5

*Changs from a low export base

Source: Authors' WAYANG simulations

Figure 1
Wholesale Price Indices For Export
Commodity Groups (1983 = 100)

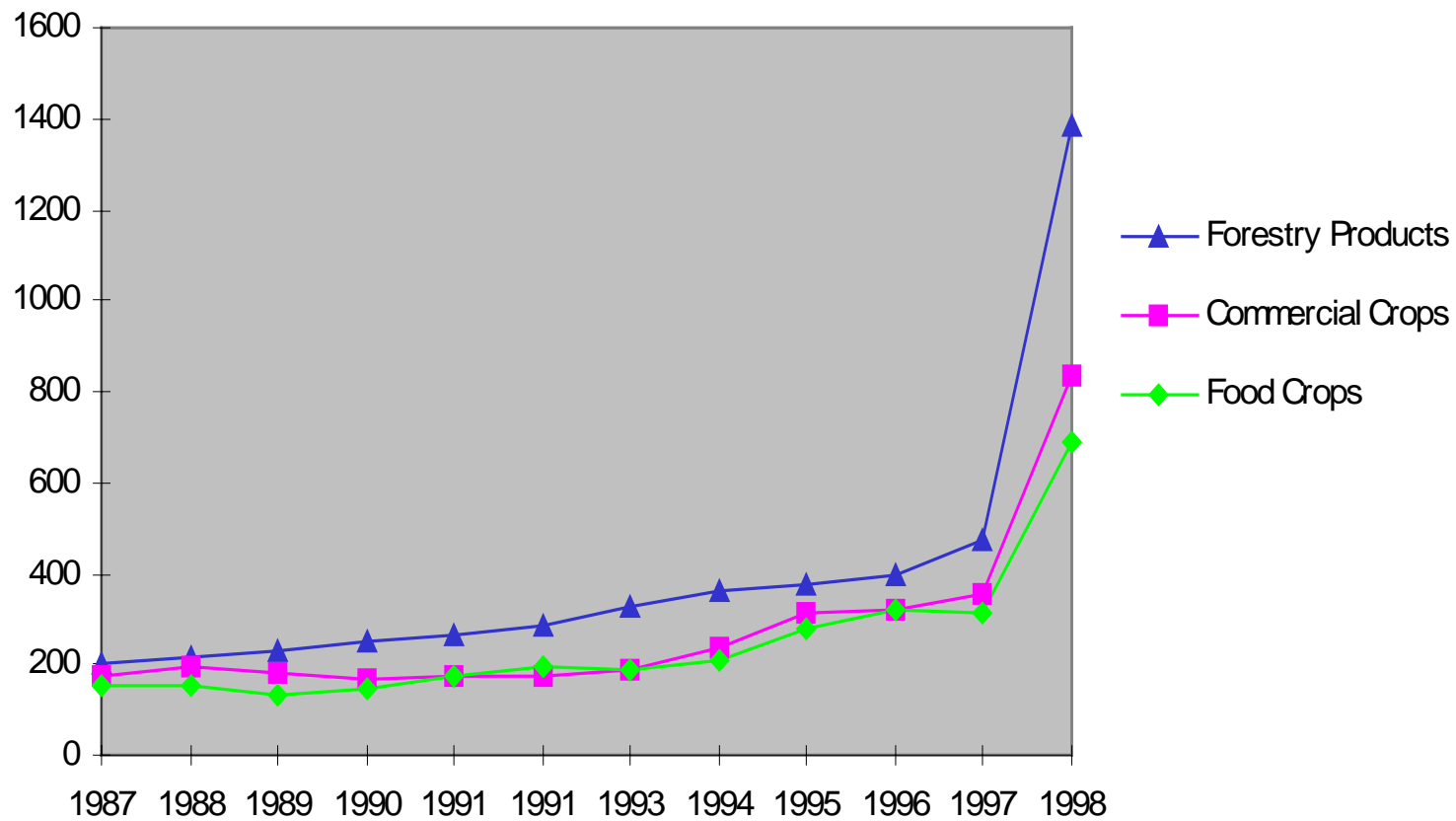


Figure 2
Indices of Farmer's Consumer Prices, Food
and Agricultural Wages: West Java
(1983 = 100)

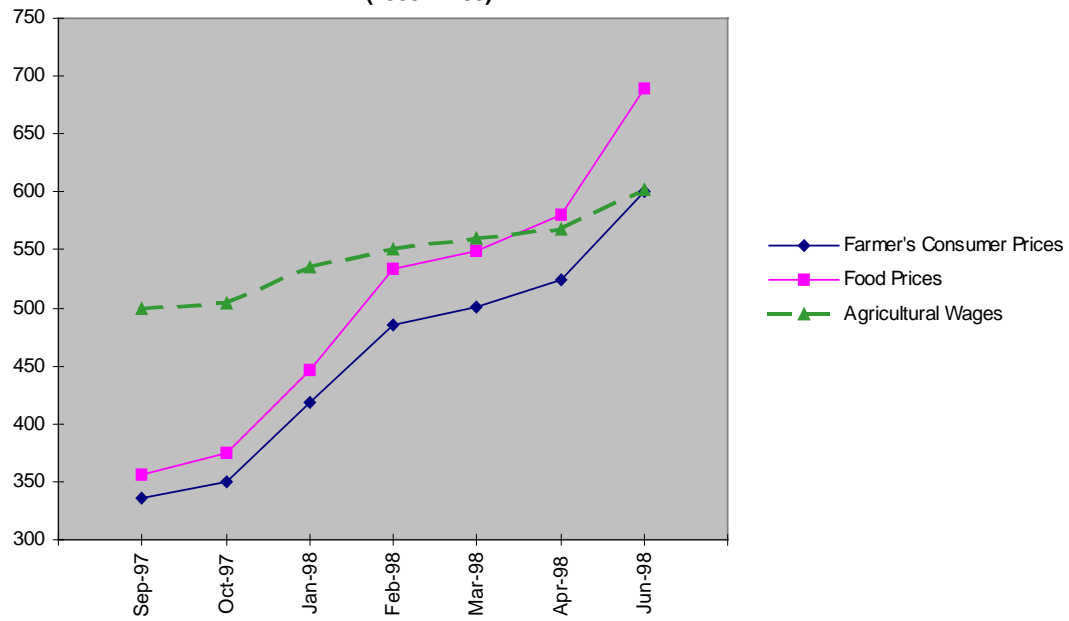


Figure 3

Stylised growth scenarios for Indonesia in the wake of the crisis

