



WORKING PAPER 01.01

EFFECTS OF FARM POLICY REFORM ON INDONESIA'S SECONDARY FOOD CROPS

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between

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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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The economic crisis of the late 1990s led to an overhaul of Indonesia's agricultural policies. Influenced by the conditional loan requirements set by the International Monetary Fund (IMF) and other donor institutions, the government has liberalised trade policies. As pre-crisis policies imposed less interventions on secondary food than other crops, however, the impact of policy reform (especially trade policies) on these commodities is expected to be less.

This paper has several objectives. It provides background data on secondary crops. It also contains details of institutional arrangements concerning these crops. Finally, it contains analysis of the assumed effects of altering R&D investments, so that they favour secondary food crops (i.e. maize, soybean and cassava) more than in the past, using the economy-wide WAYANG model (described in Appendix 1 of this volume).

Production and trade

Indonesia's agricultural land decreased around 1.1 million hectares during the period 1983-1993 (Kasryno, 1997). However, the harvested area of agricultural commodities has increased: an increase of cropping intensity has compensated for a decrease in land usage. During the period from 1969 to 1999, the harvested area of rice increased by 1.6 percent, maize 1.4 percent and soybean 3.5 percent annually, while cassava slightly decreased by 0.5 percent.

Up to mid-1997, the agricultural sector was very instrumental in supporting Indonesia's economic development. Growth in agricultural output, which was around 3 percent over 25 years, made it possible to provide relatively cheap food for the domestic population of more than 200 million people. Agriculture absorbs around 50 percent of employment, and supports the development of manufacturing industries by providing raw materials and cheap labour.

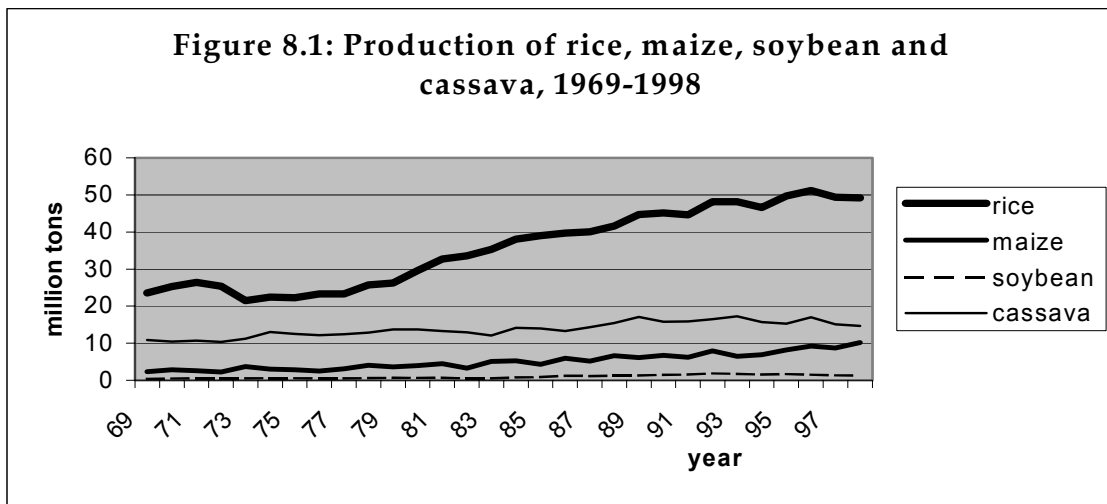
In the second half of 1997, El Nino hit the country causing the worst drought for half a century. This led to a temporary decline of agricultural production capacity of the country. Moreover, the financial crisis exacerbated the decline in farmers' real incomes. The price of agro-inputs also increased with the rupiah's collapse. Consequently, food production in 1997 and 1998 was lower than in 1996.

Rice production declined from 51 million tons (unhusked paddy) in 1996 to 49 million tons in 1997, and dropped again to 49 million tons in 1998 (Figure 8.1). The decline of rice production in 1997 was mainly due to a decrease in harvested area of around 430,000 hectares. In 1998, the government launched its special effort to increase production by expanding planted acreage and increasing cropping intensity. As a result, in 1998 harvested acreage was around 500,000 hectares higher than that of 1997. But because farmers could not afford key inputs, notably fertiliser, the rice yield in 1998 was lower than that of the previous two years.

Production of maize declined from 9.3 million tons (dry kernel) in 1996 to 8.8 million tons in 1997. This was largely due to the decline of harvested acreage from 3.7 million hectares in 1996 to 3.4 million hectares in 1997, even though yields increased from 2.5 tons to 2.6 tons per hectare. In 1998, production of maize increased from 8.8 million tons to 10.2 million tons due to an increase in harvested acreage (from 3.4 million to 3.8 million hectares) and yields (by 0.03 tons per hectare). These increases resulted from government programs to boost the production of three main food-crop commodities, namely rice, maize and soybean.

Unlike rice and maize, which recovered in 1998 as a result of government intervention, production of soybean decreased from 1.5 million tons in 1996 to 1.3 million tons in 1999. This was largely due to a decrease in harvested acreage (from 1.3 million hectares to 1.1 million hectares) and yield increases from 1.19 tons to 1.21 tons per hectare. The relatively wet dry season in 1998 hindered soybean production.

President Habibie's administration, with its Cabinet of Reformation, paid close attention to food supplies (rice in particular) for the majority of Indonesians. Two policies included permitting imports of rice, and *Gema Palagung* (a self-reliance movement that sought to increase production of rice, soybean and maize).



Even though *Gema Palagung* showed some success, food imports in 1997 and 1998 increased sharply. Imports of rice were 3.6 million tons in 1997 and 5 million tons in 1998. Among other foods, soybean imports increased from 0.6 million tons in 1996 to 0.7 million tons in 1998, and imports of maize increased from 0.6 million to 1.1 million tons. Exports of cassava decreased from 0.29 million tons in 1996 to 0.18 million tons in 1997.

Table 8.1: Shares of food in household expenditure by income group, Indonesia, 1999

Commodity	Group of yearly expenditure (Rp.000)					
	< 100 (%)	100- 299 (%)	300- 499 (%)	500- 749 (%)	>= 750 (%)	Average (%)
Rice						
Share (%)	35.2	23.8	11.9	8.7	8.4	26.6
Participation (%)	99.1	98.6	89.6	80.1	81.1	96.1
Maize						
Share (%)	1.7	0.2	0.1	0.1	0.1	0.7
Participation (%)	11.1	7.2	5.1	3.6	6.1	8.0
Soybean						
Share (%)	2.6	2.5	1.9	1.4	1.3	2.4
Participation (%)	59.8	66.7	65.3	63.3	59.0	63.7
Cassava						
Share (%)	1.1	0.5	0.2	0.1	0.1	0.7
Participation (%)	39.6	33.4	21.3	15.4	15.1	32.4
Instant noodle						
Share (%)	0.7	1.4	1.9	1.6	1.3	1.2
Participation (%)	28.1	40.5	53.2	53.8	47.8	39.0
Chicken meat						
Share (%)	0.5	1.6	2.9	3.1	3.2	1.4
Participation (%)	6.3	20.4	39.4	44.1	44.7	20.1
Eggs						
Share (%)	1.7	2.6	2.8	2.4	2.5	2.3
Participation (%)	45.4	61.5	70.0	67.5	70.0	57.7
Total food						
Share (%)	74.9	67.4	53.0	44.5	31.3	68.5
Total expenditure (Rp.000)	361.6	630.3	1,208.4	1,785.9	3,511.5	606.0
No. of HH	17,282	30,545	3,137	678	272	51,914

samples						
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Source: Calculated from BPS's SUSENAS 1999

How important are secondary food crops for Indonesia?

According to Shindo (1991) many countries in Asia during the 1970s and 1980s pushed their secondary food crops onto marginal and rain-fed lands. In Indonesia, this is also the case, despite maize accounting for 40 to 60 percent, and soybean meal for 20 percent of animal feed.

Table 8.2: Indonesia's rice, maize, and soybean production, 1996 to 1999

Year/ Commodity ^(a)	Production (000 ton)	Harvested area (000 ha)	Yield (ton/ha)
Rice :			
1996	51,102	11,570	4.42
1997	49,377	11,140	4.43
1998	48,472	11,613	4.17
1999 ^{b)}	48,663	11,494	4.23
Maize :			
1996	9,307	3,743	2,49
1997	8,771	3,355	2,61
1998	10,059	3,834	2,62
1999 ^(b)	8,682	3,267	2,64
Soybean :			
1996	1,517	1,279	1,19
1997	1,357	1,119	1,21
1998	1,306	1,091	1,20
1999 ^{b)}	1,296	1,076	1,21

a Rice (unhusked paddy), maize (dry kernel) and soybean (dry seed)

b Estimate

Source: Suryana et al. (1999) and Solahuddin (1999).

During the past 30 years rice accounted for almost 65 percent of harvested area, maize around 20 percent and both soybean and cassava around 7 percent each (Table 8.2). Secondary food crops are not competing with rice in terms of land use. Indonesian farmers use irrigated land for rice.

Farmers plant secondary food crops on irrigated land only in the dry season, when water is not sufficient for rice to grow. Such crop rotations help reduce the incidence of pests and diseases. However, there is a trend to push secondary food crops to less fertile, non-irrigated lands.

Table 8.1 shows that only 8 percent of the population consumes maize, 33 percent cassava and 64 percent soybeans, compared with 96 percent for rice. Out of the 69 percent of aggregate income spent on food, maize and cassava account for less than 1 percent and soybean 2 percent. For rice, the proportion is 27 percent. About 39 percent of households consume instant noodles, which are processed from wheat, a fully imported raw material.

Rice is the main food of 96 percent of the Indonesian population. Beyond its economic value, it also has political and social importance. Only after 1985, when Indonesia achieved rice self-sufficiency, did the government turn to maize and soybean as crops worthy of attention in terms of policy targets and R&D funding. Since the economic crisis, the government has turned back to rice. Old political and social considerations have resulted in a return to a policy bias towards rice, regardless of the economic possibilities for other crops.

The growth of animal feed industries, the increase in demand for fresh and processed products due to income increases, and derived demand due to increasing demand for chicken and eggs are driving an increase in demand for secondary food crops. In addition, secondary crops are becoming increasingly important as staple foods.

Pre-crisis policies on secondary food crops

By presidential decree in 1978, BULOG's mandate was to maintain the price of rice, sugar, wheat and other main food (including maize and soybean). The role of BULOG decreased after the economic crisis, in response to the demands of the International Monetary Fund (IMF). A floor price policy, implemented in 1980 and applied to maize, soybeans and mung beans, was terminated in 1990.

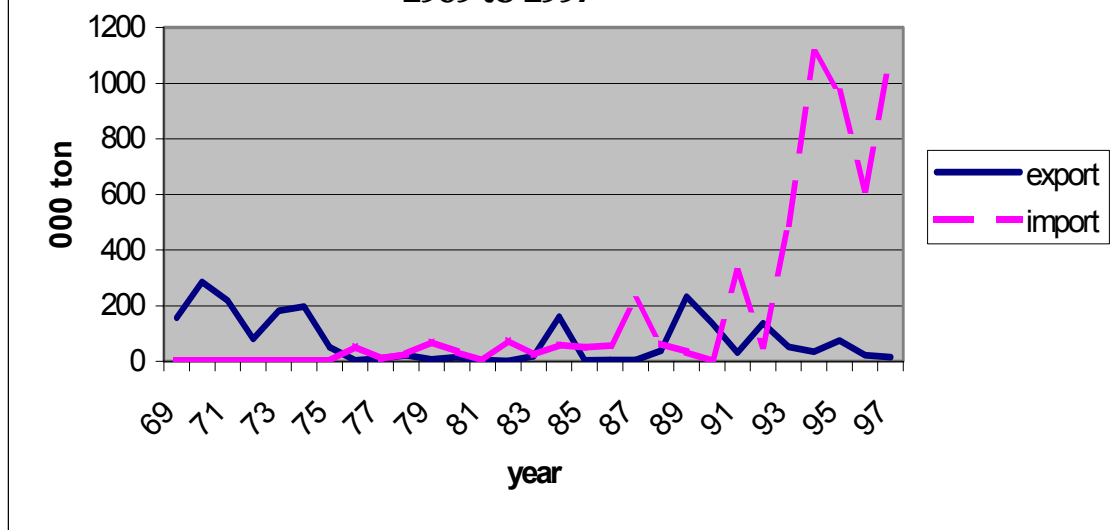
The following are some details of policies implemented for each of the secondary crops.

Maize

The floor price policy of maize was initially implemented on February 1978 on the basis of production costs, the market price of the previous year and the expected possible producers' margin. The floor price was adjusted every year. This policy was ineffective, as the prevailing farm gate market price was generally higher.

An input subsidy was implemented to encourage farmers to use improved technology such as fertilisers. Yet fertiliser subsidies were basically applied to all agriculture commodities. Due to budgetary

Figure 8.2: Maize imports and exports,, Indonesia, 1969 to 1997



considerations, the government gradually reduced the subsidy. In 1998, only a subsidy on urea fertiliser remained, but it too was removed in 1999.

BULOG and village cooperatives (KUD) had a large influence on marketing and distribution policies. KUD purchased maize from farmers and then sold it to BULOG. In the early years, the procurement policy was considered manageable, and up to 1988 BULOG had control over inter-island and inter-provincial marketing.

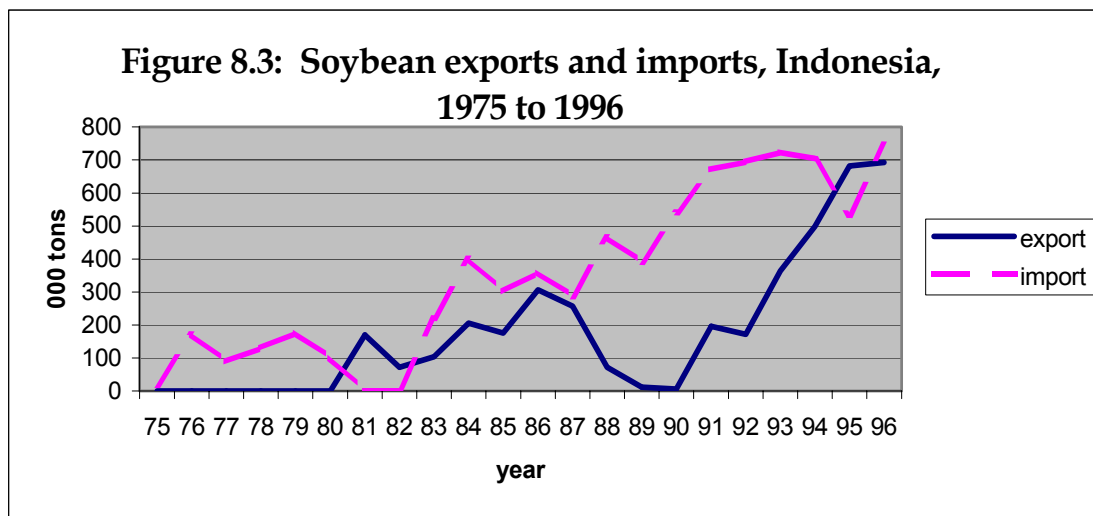
However, major production areas of maize spread to new cropping lands in Sulawesi and Sumatra, while consumption remained concentrated in Java. Transport costs became increasingly expensive, as BULOG centralised sales to maintain price stabilisation. In 1988, BULOG relinquished its role for all crops other than rice.

Self sufficiency in maize fell over the mid-1990s (Figure 8.2). In 1998, domestic production of maize increased, but the demand by feed industries sharply declined due to the economic crisis: most poultry farms collapsed, the farm gate price dropped and farmers suffered substantial losses and increasing insolvency. In trade policy, the main instrument was an import tariff, but this was eventually removed.

Soybean

Soybean received special attention because of its importance as a main source of protein. Indonesia has been a net importer of soybean. To reduce Indonesia's dependence on the international market (see Figure 8.3), the government proclaimed a policy objective of self-sufficiency in soybean in 1986. A series of intensification programs were implemented to increase

soybean production. The government defined areas for expansion, and improved seed distribution and credit provision.



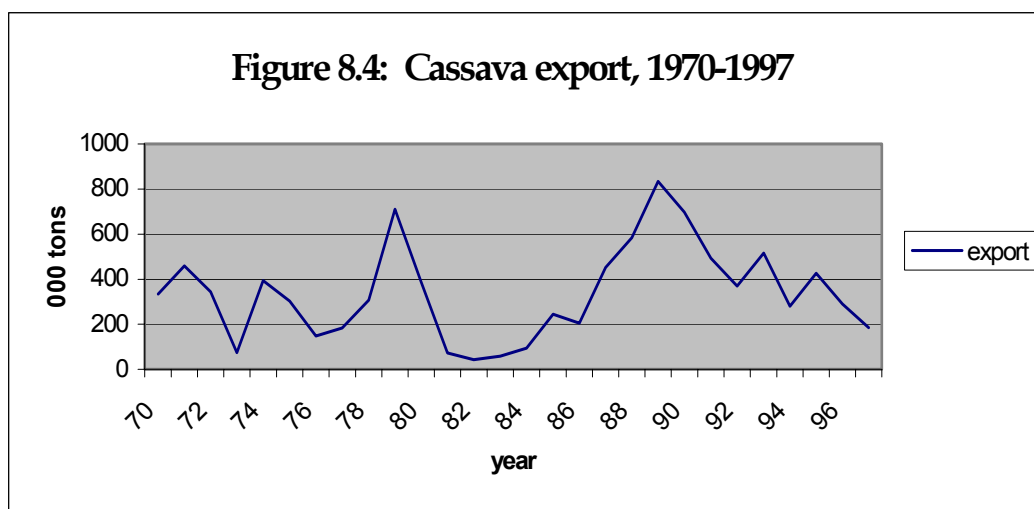
Import controls have insulated the domestic price of soybeans from the international market. BULOG imported and sold soybeans to private traders or producers of tofu and *tempe* (the cooperatives called KOPTI) at a higher price. However, since 1988, soybean imports have been mainly in the form of beans since domestic soybean meal industries began operating. To protect that infant processing industries, an import tariff of 35 percent was imposed on soybean meal. The government also used a floor price policy, but without effect as again it was usually lower than the farm gate price. In June 1991, the government removed BULOG's monopoly on soybean meal importation. In addition, the import tariff was reduced from 10 to 5 percent, but a 30 percent surcharge was implemented. In 1993, this surcharge was removed and in return the government implemented a local content requirement: the feed industries were obliged to purchase 40 percent of their need from domestic sources. In June 1994, the local content requirement was reduced to 30 percent, and the import tariff was eliminated. Local content was further reduced to 20 percent and then in April 1996, all trade regulation on soybean meals was completely removed.

Cassava

There has been no prominent government policy related to production of cassava, with attention instead paid to marketing and trade. In domestic marketing, business associations were expected to deal within the cassava marketing system. The association has to ensure the procurement of dried and sliced manioc at the minimum price of 70 percent of current FOB price at the exporter level. The association also has to buy cassava from farmers at the price of 13.6 percent of the current tapioca price.

The government imposed an export quota and import tariff on cassava. The quota applied only to exports to Europe, ostensibly to prevent the price of cassava falling, despite Indonesia's small share (8 percent) of global cassava trade. This annual quota increased from 500,000 tons in 1982 to 700,000 tons in 1983-1984, and eventually to 825,000 tons in 1985-1988. This remained unchanged, but was attained only between 1988 and 1993 (see Figure 8.4).

An import tariff was imposed on various cassava products. The highest rate, 30 percent, was imposed on primary products including dried-sliced cassava and pellet. The lowest, on manioc starch, was 5 percent. The entire tariff remained unchanged until 1998, when it was reduced reducing from 10 to 5 percent.



Wholesalers and factory owners dominated the marketing structure of cassava, setting the price. Prices of fresh and dried cassava fluctuated erratically year by year, leading to generally low farm gate returns. In response, a price agreement policy was implemented in 1987. This was between farmers and cassava flour millers, and between traders and millers. The price for fresh cassava was agreed at 13.6 percent below the selling price of cassava flour and the price of dried cassava was 70 percent below the selling price of cassava chips/pellets. The average of fresh cassava at the farm gate in the year 1987 and 1988 was above the agreement level and hence encouraged farmers to increase production. Subsequently Indonesia was able to fulfil the cassava chip and pellet export quota to the European Community. However, the prices of fresh and dried cassava dropped in the year of 1989 and 1990 when the price agreement ceased.

Post-crisis agricultural policy changes

On December 2, 1998 the government announced various deregulations. One was to end BULOG's monopoly on imports of rice. Another was to impose an import tariff on food (including rice) of just 5

percent. Recognising the differences in production costs across regions, the government set three regional floor prices for rice, i.e. Java plus several neighboring provinces (with floor price at Rp.1,400/kg unhusked rice, equivalent to Rp.2,390/kg rice), Sumatra (Rp.1,450/kg) and Eastern Indonesia (Rp.1,500/kg).

The distribution of cheap rice was targeted to the poor (the families of laid-off workers and people under the poverty line). Each poor household was entitled to get 20 kg of rice at Rp.1,000/kg (about one third of the market price).

Also, the subsidy on fertiliser was eliminated, as had already happened to pesticides and other agro-chemicals. PT PUSRI's government-sanctioned monopoly on fertiliser distribution ceased. Any firm can now import and distribute fertiliser down to, and including, the district level. Cooperatives and local traders are encouraged to become local suppliers at the farm level. However, for specific remote areas, a distribution subsidy is still provided. PT PUSRI retains its responsibility to provide fertilisers to remote areas for the KUT program.

Subsidised farm credit has widened its scope and its credit limit per hectare. The coverage of crops eligible for KUT was increased from 19 to 34 commodities. The government has increased the ceiling of allocated credit funds from Rp.150 billion in 1997 to Rp.3,500 billion in 1998, and to Rp.6,500 billion in 1999. In Java, 50 percent of the total amount covers rice farming, compared with only 25 percent elsewhere.

The interest rate of farm credit was lowered to only 10.5 percent. This implies a huge subsidy compared to even the pre-crisis period, let alone the current market interest rate. In 1996, the market interest rate was 20 percent and the rate in recent years has been well above 30 percent (which includes a substantial risk premium).

These deregulations may, in the long term, encourage Indonesian farmers to modernise, become self-reliant and business oriented. The role of government in this environment should be to improve transport and communications infrastructure, particularly in more remote areas. These, together with the remarkable efforts of the government in raising literacy rates over the past three decades, should improve the access of farmers to necessary market information.

What can secondary food crops expect from current policy adjustment?

An important issue concerns greater regional autonomy that leads to decentralisation of development activities. The intent is that each province will focus on its own programs. Suryana et al. (1998) predict that in the future Java will concentrate on high value commodities such as horticulture, beef and dairy cattle, broiler and hens, fresh fish, prawns, and high quality rice to fulfill urban demand and provide export revenues.

There is a rapid conversion of agricultural land to non-agricultural uses in Java. Hence, the opportunity cost of agricultural land keeps

increasing, indicating that secondary crops appear unlikely to have a bright future in Java. Any positive impact arising in Java from secondary crops will be through indirect impacts leading to lower input costs for feed industries and processed food. As the economy returns to growth, incomes will increase and so too will demands for secondary food crops.

We now turn to modelling a scenario in which we assume that R&D funds have been diverted from rice to three secondary crops, soybeans, maize and cassava. We use WAYANG, a 65 sector model of the Indonesian economy with features designed to capture key elements of a strongly agrarian economy (see Warr, Marpudin, daCosta and Tharpa 1998; Wittwer 1999 and Appendix 1 of this volume). WAYANG is designed to depict a medium-term time horizon, possibly of two to four years, in which we compare the effects of a modelled shock to a base case. In agricultural industries, unskilled labour and variable capital are mobile between industries. The land allocation, which accounts for about one-fifth of total costs of production, is assumed fixed. And fertiliser is a fourth primary factor of production, substitutable with labour, capital and land in agriculture. These assumptions imply that there is a moderate degree of supply responsiveness, but not as much as if we assumed that land also was transferable between activities.

The modelled scenario is an all-input productivity increase of 10 percent for these three crops relative to the base case. Our reasoning is based on the economic principle that in activities with a sub-optimal level of investment, the rate of return or realised earning on that investment will be higher than if such activities receive an optimal level of investment. Therefore, on the premise that increasing investment on these crops moves R&D investment closer to an optimal allocation between activities, we impose a productivity gain to denote the increase in returns arising from this reallocation.

First, we consider the impact of the assumed productivity gain on these secondary crops (Table 8.3). Each of the three crops gains. For soybeans and maize, most of the output gain is import replacing. For cassava, the local market absorbs all the increased output. The only other industry we note is fertiliser: as output growth for both maize and cassava is slightly smaller than the reduction in input requirements, in percentage terms, derived demands for inputs decrease in each of these industries. The reduced derived demand for fertiliser results in a slight decrease in fertiliser output.

Table 8.3: Effects of productivity gains in soybean, maize and cassava cropping in Indonesia (percentage change from base case)

Industry output	Local market	Import	Export	Total output
Soybeans	0.4	6.7	0.0	7.1
Maize	0.9	7.8	0.0	8.8
Cassava	6.3	0.0	0.0	6.3
Fertiliser	-0.3	0.0	0.0	-0.3
Household real consumption ^a				
Rural 1	0.11		Rural 6	0.18
Rural 2	0.21		Rural 7	0.12
Rural 3	0.12		Urban 1	0.18
Rural 4	0.15		Urban 2	0.09
Rural 5	0.05		Urban 3	0.27
Regional impacts		Labour income	Output	Employment
Java/Bali		0.05	0.23	0.00
Sumatra		0.06	0.19	0.07
Other		-0.25	0.30	-0.07

^a Rural 1 = landless; Rural 2 = < 0.5 ha; Rural 3 = 0.5-1.0 ha; Rural 4 = > 1.0 ha; Rural 5 = low income, non-ag.; Rural 6 = medium income, non-ag., Rural 7 = high income, non-ag; Urban 1 = low income; Urban 2 = medium income; Urban 3 = high income.

Source: Authors' WAYANG model projections.

All households gain from productivity growth in secondary crops. Aggregate consumption is the only macroeconomic entity on the consumption side to be endogenous, so that all variations from base-case welfare are reflected in household consumption.

Finally, at the regional level, there is an increase in output in each region, although returns to labour decrease in regions other than Java/Bali and Sumatra. Consequently, there is a small transmigration from other regions to Sumatra. The issue of what happens to agricultural land with urban encroachment in Java is not modelled, and in all probability would result in output and employment declines in Java relative to other regions.

In conclusion, we believe that Indonesia will gain from a greater emphasis on secondary crops via a re-allocation of R&D funds. Output gains depend both on the assumed magnitude of productivity growth arising from a partial redirection of funds, and on the ability of individual industries to export.

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