

Chapter 8: An Application of Computable General Equilibrium to the Indonesian Economy with Special Reference to the Agricultural Sector

8.1 Introduction

This chapter presents the results of the external shock and policy experiments. Section 2 describes the structure of the Indonesian economy using the benchmark Social Accounting Matrix. Section 3 presents results of the counterfactual analysis. Section 4 presents some sensitivity analyses of the model. Section 5 tests the hypotheses posited in this study. Finally, concluding remarks are given in Section 6.

8.2 Structure of the Economy: the Benchmark

The base structure of the Indonesian economy, including sectoral production, value added, trade and trade ratios, is summarised in Table 8.1. This information is necessary to understand simulation results reported later in this section. Table 8.1 notes that the non-agricultural sectors dominate the production side of the economy, generating 82.26 per cent of domestic output, 83.10 per cent of composite good supply and 75.93 per cent of total value added. The majority of exports are in non-agricultural sectors (89.52 per cent) and the agricultural sector contributes only 10.48 per cent in total exports.

Trade dependence can be measured by exports in domestic output and imports in good supply. These ratios are presented in the last two columns in Table 8.1. The Indonesian economy exports only 12.62 per cent of domestic output and imports 12.69 per cent of total composite good supply. The most export-intensive sectors are LNG sector (99.75 per cent), followed by gas and oil mining sector (59.50 per cent) and coal mining sector (40.27 per cent). Within agriculture, farm nonfood is the most export-intensive sector (28.25 per cent). Exports tend to be natural resource based although a few manufacturing sectors (wood furniture, and textiles and leather) are important. The most import-dependent sectors are metal products and machines (53.25 per cent), followed by chemicals and fertilisers (41.59 per cent), basic metals (41.59 per cent), and social and other services (35.58 per cent). Imports are clearly important inputs in both agricultural and non-agricultural sectors.

Table 8.1: Structure of the Indonesian economy, 1985, the base year for the model (all figures in percentage)

Sector	X	Q	V	E	M	E/X	M/Q
1. Farm food crops	8.75	8.93	13.66	0.56	2.01	0.80	2.86
2. Farm nonfood crops	3.80	2.95	4.52	8.50	1.77	28.25	7.64
3. Livestock	2.91	2.90	2.59	0.14	0.07	0.61	0.31
4. Forestry	1.00	0.95	1.53	0.36	0.02	4.58	0.22
5. Fishery	1.29	1.17	1.77	0.92	0.01	9.03	0.07
<i>Agriculture</i>	<i>17.74</i>	<i>16.90</i>	<i>24.07</i>	<i>10.48</i>	<i>3.88</i>	<i>7.46</i>	<i>2.92</i>
6. Coal mining	0.05	0.03	0.05	0.14	0.03	40.27	11.35
7. Gas and oil mining	8.53	4.02	13.28	40.19	4.51	59.50	14.23
8. Other mining	0.75	0.76	1.06	0.87	0.95	14.61	15.78
9. Food beverages and tobacco	9.88	9.93	3.11	0.72	1.11	0.92	1.42
10. Textiles and leather	2.17	1.85	1.26	3.34	0.79	19.42	5.42
11. Wood and furniture	1.62	1.02	1.05	4.78	0.02	37.23	0.24
12. Paper and printing	0.53	0.71	0.33	0.10	1.46	2.28	26.22
13. Chemicals and fertilisers	2.27	3.59	1.21	1.37	11.78	7.60	41.59
14. Oil refining	3.99	3.85	1.62	3.46	2.38	10.95	7.84
15. LNG	2.37	0.01	2.74	18.69	0.00	99.75	0.00
16. Nonmetallic mineral	0.97	1.09	0.66	0.11	1.12	1.46	12.95
17. Basic metals	1.10	1.28	0.77	2.78	4.18	32.01	41.62
18. Metal products and machines	3.64	7.57	2.01	0.77	31.77	2.65	53.24
19. Other industry	0.15	0.16	0.10	0.09	0.19	7.76	14.36
20. Electricity and gas	1.00	1.00	0.35	0.00	0.00	0.00	0.00
21. Water supply	0.08	0.08	0.07	0.00	0.00	0.00	0.00
22. Construction	11.60	11.59	6.59	0.00	0.00	0.00	0.00
23. Trade and storage	9.24	8.53	13.28	6.33	0.74	8.65	1.10
24. Restaurant and hotels	3.36	3.60	2.40	0.80	2.71	3.02	9.55
25. Rail and road transport	3.43	3.33	3.41	1.11	0.34	4.08	1.30
26. Sea air transport and communication	1.74	1.89	1.54	1.83	3.00	13.29	20.16
27. Financial services and insurance	1.71	1.81	2.30	1.93	2.77	14.31	19.39
28. Real estate	2.87	3.24	4.02	0.00	0.00	0.00	0.00
29. Public administration	3.83	3.82	6.80	0.04	2.92	0.14	9.69
30. Social and other services	5.38	8.34	5.94	0.04	23.37	0.10	35.58
<i>Non-agriculture</i>	<i>82.26</i>	<i>83.10</i>	<i>75.93</i>	<i>89.52</i>	<i>96.12</i>	<i>13.74</i>	<i>14.68</i>
Total	100.00	100.00	100.00	100.00	100.00	12.62	12.69

Notes:

X = domestic output.

Q = good supply.

V = value added.

E = exports.

M = imports.

Table 8.2: Characteristics of household groups in base year

	Number of employment ^{a/}	Number of population ^{b/}	Household income ^{c/}	Number of employment ^{d/}	Number of population ^{e/}	Household income ^{f/}	Average income per capita ^{g/}
<i>Rural</i>							
Agricultural employee	4669.82	16.41	2794.99	7.08	10.00	4.26	170.32
Small farmer	15083.14	64.00	8827.95	22.87	39.00	13.46	137.94
Medium farmer	5195.79	11.49	4390.76	7.88	7.00	6.69	382.24
Large farmer	6084.28	11.49	8469.07	9.23	7.00	12.91	737.27
Rural low	11474.81	18.05	8367.36	17.40	11.00	12.76	463.54
Rural high	5618.97	6.56	6945.88	8.52	4.00	10.59	1058.18
Total Rural	48126.82	128.00	39796.02	72.97	78.00	60.67	310.91
<i>Urban</i>							
Urban low	11392.67	27.90	13698.96	17.27	17.00	20.88	491.05
Urban high	6432.18	8.21	12101.16	9.75	5.00	18.45	1474.85
Total Urban	17824.85	36.10	25800.12	27.03	22.00	39.33	714.65
Total							
Rural + Urban	65951.67	164.10	65596.14	100.00	100.00	100.00	399.73

Notes:

- a/ In thousands of worker equivalents.
- b/ In millions of people.
- c/ In billions of rupiah.
- d/ As percentage of total number of employed workers.
- e/ As percentage of total population.
- f/ As percentage of total household income.
- g/ In thousands of rupiah.

Table 8.2 shows the socio-economic characteristics of the Indonesian economy in the benchmark equilibrium. Note that even though the non-agricultural sector is much more important than agriculture, rural inhabitants still greatly outnumber urban dwellers by over three to one. Furthermore, 39 per cent of the total Indonesian population belonged to small farmer households. In total, 63 per cent of the population is directly involved in agriculture. In the benchmark year, it is shown that the rural sector accounts for 72.97 per cent of total employment, while the urban sector accounts for 27.03 per cent of total employment.

Total household income was approximately 65 596.14 billion rupiahs. Although urban high households formed only 5 per cent of total population in the country, the total income of urban high households contributed 18.4 per cent to total household income. In contrast, agricultural employee and small farmer households represented 10 and 39 per cent of the total population, respectively, but received only 4.26 and 13.46 per cent of total household income. About sixty one per cent of income goes to rural areas and 37.32 per cent to agricultural households.

Based on the average income per capita (last column Table 8.2), the richest group is the urban high household, and the poorest group is the small farmer household. This

phenomenon is not surprising for Indonesia, where the households that work in the non-agricultural (urban) sectors are usually richer than those groups that live in the agricultural sectors. Somewhat surprising is that agricultural employees earn on average slightly more than small farmers. This may be due to the fact that some agricultural employees have stable, relatively well paid employment with larger farmers.

8.3 Results of Model Simulations

This section presents the results from the two sets of external shocks and four sets of policy experiments described earlier in Chapter 7, focusing on selected aggregate economy-wide and income distribution effects. The model simulations and results are summarised in Table 8.3.

Table 8.3: Aggregate economy-wide effects of external shocks and changes in domestic policies (percentage change from base year value)

Variables	Base	EXP1	EXP2	EXP3	EXP4	EXP5	EXP6
Real GDP	97848.18	-2.07	-0.08	3.08	-0.01	1.09	3.00
Exchange rate	1120.00	26.86	3.20	0.26	-0.13	26.11	3.99
Domestic price index	1.00	-5.88	-0.23	0.00	0.01	-5.84	-0.27
Domestic output	167177.94	-2.61	-0.11	3.07	-0.01	0.55	2.91
Agricultural output	29654.47	1.41	-1.11	11.22	0.12	12.96	9.80
Non-agricultural output	137523.47	-3.47	0.11	1.31	-0.04	-2.13	1.43
Aggregate exports	21102.40	8.34	-0.60	2.27	0.06	10.44	1.62
Agricultural exports	2211.21	29.15	-19.68	25.33	0.86	58.31	2.03
Non-agricultural exports	18891.20	5.90	1.64	-0.43	-0.04	4.84	1.57
Aggregate imports	21236.12	-20.90	-2.42	2.41	0.06	-18.31	-0.56
Agricultural imports	824.20	-13.61	-5.40	2.13	0.45	-10.66	-4.28
Non-agricultural imports	20411.93	-21.20	-2.30	2.42	0.05	-18.62	-0.41
Balance of trade	-133.72	4635.92	289.63	-24.33	0.93	4554.98	344.79
Government revenue	19252.53	-26.62	1.72	1.79	-0.56	-25.09	3.73
Total investment	24872.57	-25.33	1.49	2.18	-0.47	-23.43	3.83
Household income							
Rural	39796.02	0.96	-2.79	3.40	0.34	5.30	-0.04
Ag-worker	2794.99	6.27	-4.89	3.77	0.58	11.60	-2.19
Farmer-sml	8827.95	4.33	-4.01	3.04	0.54	8.73	-1.86
Farmer-med	4390.76	6.07	-4.49	2.88	0.59	10.48	-2.59
Farmer-lrg	8469.07	7.68	-4.96	2.74	0.63	12.12	-3.29
Rural-low	8367.36	-7.43	-0.06	3.98	-0.04	-3.41	3.80
Rural-high	6945.88	-6.80	0.04	4.15	-0.05	-2.68	4.08
Urban	25800.12	-7.24	0.15	4.05	-0.06	-3.26	4.11
Urban-low	13698.96	-7.71	0.19	4.01	-0.07	-3.78	4.12
Urban-high	12101.16	-6.70	0.11	4.08	-0.05	-2.68	4.09
<i>Total Households</i>	<i>65596.14</i>	<i>-2.26</i>	<i>-1.63</i>	<i>3.65</i>	<i>2.51</i>	<i>1.93</i>	<i>1.59</i>
Household income distribution ^{b/}	3610.49	-9.97	1.58	4.20	-0.23	-6.27	6.05
Sectoral share of value added							
Agriculture	24.07	1.47	-0.29	0.09	-1.45	0.65	-0.27
Manufacturing	36.26	-2.00	0.25	-0.16	2.04	-2.18	0.12
Services	39.67	0.94	-0.05	0.09	-0.93	1.05	0.03

Notes:

a/ For quantities and income, base values are in billion 1985 rupiah.

b/ The measurement is a standard deviation coefficient of household income.

8.3.1 EXP1: Decline in Oil Price

The results of the 50 per cent decline in oil prices are presented in the second column of Table 8.3. In the absence of any fiscal or trade policy interventions, oil price decline is contractionary: real GDP is 2.07 per cent lower than in the base run. The shock has significant direct impact on government revenues, which are tied closely to petroleum earnings. The decreased oil price results in a decline of 26.10 per cent in government revenues, since exchange rate adjustments dampen the rupiah denominated change in oil sector earnings.

With the exchange rate as the equilibrating variable in the foreign exchange market, the oil price decline results in a 26.86 per cent rise against the US currency. This means that the rupiah has significantly depreciated. The lower oil export earnings lead to lower incomes and reduced spending on domestic goods so that the price of non-tradable goods falls relative to tradable goods whose prices are linked to world market prices. The depreciation of real exchange rate helps to reduce import demand, and spur non-oil exports particularly agricultural exports which increase by 29.15 per cent. Aggregate imports decline by 20.91 per cent and exports of agricultural products and non-agricultural products rise by 29.15 and 5.90 per cent, respectively.

In addition to forcing a depreciation of the real exchange rate, the decline in oil revenues also affects the macroeconomy by directly lowering incomes and total earning. Total investment falls by 25.33 per cent because of the reduced savings, lowering demand for other sectors (such as construction services) and investment goods. With government consumption assumed fixed in real terms, government investment falls by 63.18 per cent.

The price shock affects income distribution because profits flowing to households from oil accrue mostly to the urban household group. The urban household group experiences substantially lower income with a reduction of 7.24 per cent, and suffers the most in this scenario. Agricultural households gain, however, due to increased agricultural exports and decreased agricultural imports and overall there is only 2.26 per cent decrease in total household income. This changing composition of household income reduces the level of income inequality in the economy by 9.97 per cent lower than the benchmark figure.

The simulation shows that oil price decline causes the value-added shares of both agriculture and services to increase by 1.47 and 0.94 per cent, respectively. The oil price decline reduces manufacturing's share in total value added by 2 per cent from the benchmark figure.

The biggest changes of exports and imports are in the sectors experiencing the shocks. The oil refinery sector is the major downstream user of oil. In general, it is shown that with declines in world oil prices, the exchange rate depreciation produces an export surge in all other sectors. These increased exports work to offset the negative shocks. The oil-using industrial sectors are the major beneficiaries with the declines in world oil prices. Data on imports show a parallel story. Imports for all sectors decrease, and the total imports decrease by 2.42 per cent.

8.3.2 EXP2: Decline in Agricultural Export Price

The results of the 20 per cent decline in agricultural export price are shown in column 3 of Table 8.3. Under this scenario, real GDP declines as the economy suffers the effects of the terms-of-trade shock. Real GDP shows a decrease of 0.08 per cent. Although the 20 per cent decline in the prices of agricultural exports has minimal impact on real gross domestic product, it changes the agricultural terms of trade, thus affecting income distribution. The decline of agricultural export commodity price induces a contraction in agricultural exports, as well as output and incomes for the rural households group. Unlike the oil sector, the agricultural sector has no strong linkage to the government budget, so that changes in this sector's export revenues have little direct impact on fiscal position.

The exchange rate does not respond much and devalues by only 3.20 per cent. This helps maintain domestic demand, in the face of a substantial decline in agricultural exports. It is worth noting that the decline in the price of export agriculture does not stimulate domestic demand. This is an indication of the low substitutability of agricultural export commodities for goods in the domestic market.

In terms of income distribution among households, the rural households observed a decrease of income by 2.79 per cent, while urban household income increased by 0.15 per cent. These results indicate that the major groups hurt are the rural households that derive significant incomes from agricultural exports. This changing composition of household income, however, increased the level of income inequality in the economy by 1.58 per cent.

The simulation shows that an agricultural export price decline causes the value-added shares of both agriculture and services to decrease by 0.29 and 0.05 per cent, respectively. The value-added share of manufacturing increases by 0.25 per cent over its benchmark figure.

As expected, exports of agriculture contract as a consequence of the price decrease. In line with a general equilibrium framework of analysis, output and trade in the other sectors in the economy adjust to the decline in the agriculture sector and the ensuing rate adjustment. The currency depreciation encourages exports and discourages imports in the other sectors. The exports-imports balance in other sectors of the economy improves more than in the agricultural sector.

With an agricultural export price decline, all other sectors experience an increase in their exports. The food beverages and tobacco, textiles and leather, and wood and furniture, for example, which are the downstream users of the agricultural sector, benefit the most with agricultural export price decline.

8.3.3 EXP3: Agricultural Development-Led Industrialisation (ADLI)

The results of the ADLI experiment are presented in the fourth column of Table 8.3. As would be expected, a 10 per cent improvement in agricultural productivity results in a large boost to agricultural production (11.22 per cent). The overall effects on real GDP, government revenues and agricultural exports are significantly positive.

Agricultural exports increase significantly (by 25.33 per cent) leading to overall exports rising by 2.27 per cent. Agricultural imports increase by only 2.13 per cent. Government revenues, total household income, and total investment increase by 1.79, 3.65 and 2.18 per cent, respectively. The comparative effect on real GDP (3.08 per cent) indicates relatively strong macrolinkages of agricultural demand-led industrialisation.

The increase in crop outputs raises agricultural income and farmer's demand and, as a result, non-agricultural production. A simultaneous increase in total productivity in agricultural sector (farm food crops, farm nonfood crops, livestock, forestry and fishery) leads to a significant response in sectoral output, ranging from 8.32 per cent for forestry to 14.49 per cent for farm nonfood crops. In contrast with the results of the two previous experiments, the domestic price index does not change. The real exchange rate is only slightly increased by 0.26 per cent.

Rural income is observed to increase by 3.40 per cent and urban households gain even more by 4.05 per cent. The findings of the study indicate that increasing agricultural productivity does not necessarily result in a reduction in rural income. The results are consistent with the observed reduction in poverty incidence in Indonesia. However, the results of the study provide empirical support to the view that agricultural productivity

improvements are likely to benefit rural households less than urban households. The changing composition of household income increases the level of income inequality in the economy by 4.20 per cent.

By raising agricultural production, ADLI (in this case, productivity improvement in agriculture) leads to downward pressure on agriculture commodity prices. In addition, it raises demand for manufactured goods. This is due to the fact that the increase in agricultural (rural) incomes is followed by domestic private consumer demand. The increase in aggregate imports (by 2.41 per cent) is more than offset by a rise in aggregate exports (2.27 per cent), and a rise in domestic private consumer demand (4.87 per cent) from the benchmark figure.

The results from this experiment suggest that policies which are successful in raising agricultural production and real income, through enhancing the size of the home market, also lead to a significant improvement in non-agricultural performance.

ADLI reduces manufacturing's share of total value added, while it increases both agriculture's and services' shares of total value added from benchmark figures.

8.3.4 EXP4: Reduction in Agricultural Export and Indirect Taxes

The results of the tax reduction experiment are presented in column 5 of Table 8.3. Simulations using a CGE model of Indonesia suggest that increase in producer prices of agricultural commodities, achieved through a reduction in the export and indirect taxes on the agricultural sector, would result in a 0.86 per cent increase in agricultural production. With the increase in exports, the real exchange rate would appreciate by 0.13 per cent over its base run levels. The currency appreciation has an adverse impact on non-agricultural exports, which decline by 0.05 per cent. Reduction of the export and indirect taxes leads to only small reduction in real GDP. The reduction of the export and indirect taxes reduces government revenue by 0.56 per cent.

The major beneficiaries of the export and indirect taxes reduction are the agricultural workers and owners in the rural household group, who are among the major export crop producers. A reduction in the export and indirect taxes reduces demand by income-elastic urban households, lowering returns to capital and real wages in urban areas. This changing composition of household income reduces the level of income inequality in the economy by 0.23 per cent from its base run levels.

The reduction in the export and indirect taxes causes the value-added shares of both agriculture and services to fall, while it causes the value-added share of manufacturing to increase.

8.3.5 EXP5: Combination of EXP1 with EXP3

In this experiment, the implementation of ADLI strategy is analysed as an alternative policy in response to the external shock in experiment 1 on the performance of the agricultural sector in terms of their effects on output, trade and income distribution. The results are presented in column 6 of Table 8.3.

The results of the experiment show that the effects of the implementation of ADLI strategy mitigate the adverse effects of the oil price decline. The contraction that would have been expected to occur in the economy due to prevailing low world oil prices was reversed by the more than proportionate expansion in the economy that resulted from the boom in the agricultural sector. Hence, in the absence of any fiscal or trade policy interventions by the Indonesian government, real GDP would have increased 1.09 per cent. Agricultural exports increase significantly leading to overall exports rising by 10.44 per cent. Aggregate imports decline by 18.31 per cent, less than the decline in experiment 1, so that there is a dramatic increase in balance of trade. The declines in government revenue and total investment are also reduced by the implementation of ADLI strategy.

The introduction of ADLI strategy to mitigate the negative impacts of the decline in oil prices has large positive impacts on rural household income due to the simultaneous depreciation of the exchange rate and increase in productivity. While urban households lose, the decline in urban households' income in this experiment is less than that of experiment 1. Overall there is 1.93 per cent increase in total household income. This changing composition of household income reduces the level of income inequality in the economy by 6.27 per cent lower than the actual benchmark figure.

The simulation shows that the introduction of ADLI strategy to mitigate the oil decline causes the value-added shares of both agriculture and services to increase by 0.65 and 1.05 per cent, respectively, while the value-added share of manufacturing decreased by 2.18 per cent.

8.3.6 EXP6: Combination of EXP2 and EXP3

This simulation shows the combined effects of implementation of ADLI strategy and terms-of-trade shock (decline in agricultural exports prices). The results of the experiment show that the effects of the implementation of ADLI strategy mitigate the adverse effects of the decline in agricultural exports prices. The contraction of the economy due to the decline in agricultural exports prices in EXP2 is reversed by the more than proportionate expansion in the economy that resulted from the implementation of ADLI strategy.

The overall effects on real GDP, domestic output, aggregate exports, balance of trade, government revenue and total investment are significantly positive. However, income inequality increases because the rural household group observed a decrease of income by 0.04 per cent, while urban household income increased by 4.11 per cent.

8.4 Sensitivity Analyses

The parameters estimated in the GEMINA model inevitably have errors or contain uncertainty. The errors or uncertainties further affect the policy simulation results of the model. The question now is how sensitive the model results are to changes in the values of the various parameters. To answer this question, sensitivity analyses were conducted to test the robustness of the simulation results to changes in the parameter.

According to Harrison et al. (1993), sensitivity analyses can be classified as conditional systematic sensitivity analyses (CSSA) and unconditional systematic sensitivity analyses (USSA). In the USSA approach, a probability distribution to each parameter is attached. Multiple simulations are then performed, each time perturbing the parameters according their probability distribution. This produces an implicit probability distribution for the model results to which appropriate confidence intervals can be attached. In the CSSA approach, the key parameters under study are disturbed one by one while the others are held constant at their point estimates.

According to Harrison et al. (1993), the USSA approach is more complete and accurate than the CSSA approach, but at a severe cost in terms of the number of required solutions. Most CGE models have so many parameters that a vast number of simulations would have to be performed and analysed. In addition, there are some problems in applying the USSA approach. First, not all key parameters have been estimated econometrically, therefore a distribution must be imposed for some parameters. Second, even for estimated

parameters, there is usually a wide range of values to choose from in the literature. For these reasons, the USSA approach has not been adopted in this study.

In this study, the CSSA approach was adopted because of its parsimony in computation and lack of need for a large amount of prior information. This method involves selecting key blocks of parameters and perturbing them from their base values by the same scalar value, rather than conducting experiments with individual parameters. The emphasis here is on two sets of key parameters relevant to the present study, namely the elasticity of substitution between primary factors and the elasticity of substitution between domestic and export goods.

There are three blocks of sensitivity tests carried out in this study. First, the elasticities of substitution between primary factors for all sectors were decreased and increased by 50 per cent on the model results of EXP1 (decline in oil prices), while all the other parameters were held at their benchmark levels. Second, the elasticities of substitution between domestic and imported goods (elasticity 'rho_c') in the oil sectors (gas and oil mining, oil refining and LNG) were decreased and increased by 10 per cent on the results of the oil prices decline (EXP1) simulation. Third, the elasticities of substitution between domestic and exported goods (elasticities 'rho_t') for the farm nonfood sector were decreased and increased by 10 per cent on the model results of EXP2 (decline in agricultural export prices), while all the other parameters were held at their benchmark levels.

It is interesting to note that changes in the elasticities of substitution between primary factors have no effect on the model results. They suggest the results of the experiment undertaken in this study are robust around the current values of the key parameters.

Table 8.4 presents the effects of changing the elasticity of substitution between domestic and imported goods in the oil sectors by 10 per cent on the results of the declining oil prices. In general, there is little effect on the model results associated with changes in macroeconomic variables. It is interesting to note that changing the assumption regarding elasticity between domestic and export goods has little effect on real GDP, imports, as well as on balance of trade. The lower the elasticity of substitution between domestic and imported goods, the more expansionary are the effects on real GDP and balance of trade.

Table 8.4: Aggregate economywide effects of sensitivity with respect to elasticities of substitution between domestic and imported goods in oil sectors on experiment 1 (percentage change from base year value)

Variables	Base^{a/}	BE^{b/}	BE -10%^{c/}	BE +10%^{d/}
Real GDP	97848.18	-2.07	-1.86	-2.27
Exchange rate	1120.00	26.86	26.67	27.06
Domestic price index	1.00	-5.88	-5.71	-6.04
Domestic output	167177.94	-2.61	-2.47	-2.75
Agricultural output	29654.47	1.41	1.41	1.41
Non-agricultural output	137523.47	-3.47	-3.30	-3.64
Aggregate exports	21102.40	8.34	8.11	8.58
Agricultural exports	2211.21	29.15	28.62	29.68
Non-agricultural exports	18891.20	5.90	5.71	6.11
Aggregate imports	21236.12	-20.90	-21.12	-20.70
Agricultural imports	824.20	-13.61	-13.34	-13.88
Non-agricultural imports	20411.93	-21.20	-21.43	-20.97
Balance of trade	-133.72	4635.92	4632.95	4641.48
Government revenue	19252.53	-26.62	-26.37	-26.87
Total investment	24872.57	-25.33	-25.03	-25.63
Household income				
Rural	39796.02	0.96	1.24	0.69
Ag-worker	2794.99	6.27	6.48	6.06
Farmer-sml	8827.95	4.33	4.58	4.09
Farmer-med	4390.76	6.07	6.30	5.85
Farmer-lrg	8469.07	7.68	7.89	7.48
Rural-low	8367.36	-7.43	-7.07	-7.77
Rural-high	6945.88	-6.80	-6.42	-7.17
Urban	25800.12	-7.24	-6.86	-7.61
Urban-low	13698.96	-7.71	-7.33	-8.07
Urban-high	12101.16	-6.70	-6.32	-7.08
<i>Total Households</i>	<i>65596.14</i>	<i>-2.26</i>	<i>-1.95</i>	<i>-2.58</i>
Household income distribution ^{e/}	3610.49	-9.97	-9.57	-10.35
Sectoral share of value added				
Agriculture	24.07	1.47	0.58	0.60
Manufacturing	36.26	-2.00	-2.01	-2.00
Services	39.67	0.94	0.95	0.92

Notes:

a/ For quantities and income, base values are in billion 1985 rupiah.

b/ Base elasticity.

c/ A cut of 10 per cent from base values.

d/ A rise of 10 per cent from base values.

e/ aThe measurement is a standard deviation coefficient of household income.

The variability of changes is not substantial. Low values of substitution elasticities between domestic and imported goods mean that imports are complements of domestic products rather than substitutes. The aggregate imported goods do not vary much from the base year.

It is shown in Table 8.5, that there is also little effect of sensitivity on the model results associated with changes in macroeconomic variables. The higher the elasticity of

substitution between domestic and exported goods, the more expansionary are the effects on exports and balance of trade. However, the variability of changes is not substantial.

Table 8.5: Aggregate economy-wide effects of sensitivity with respect to the substitution elasticities in production between domestic and exported goods in farm nonfood crops on experiment 2 (percentage change from base value).

Variables	Base ^{a/}	BE ^{b/}	BE - 10% ^{c/}	BE + 10% ^{d/}
Real GDP	97848.18	-0.08	0.02	-0.16
Exchange rate	1120.00	3.20	4.00	2.51
Domestic price index	1.00	0.00	-0.36	-0.12
Domestic output	167177.94	-0.11	0.00	-0.20
Agricultural output	29654.47	-1.11	-1.50	-0.82
Non-agricultural output	137523.47	0.11	0.32	-0.07
Aggregate exports	21102.40	-0.60	-1.11	-0.16
Agricultural exports	2211.21	-19.68	-27.84	-12.82
Non-agricultural exports	18891.20	1.64	2.02	1.32
Aggregate imports	21236.12	-2.42	-2.79	-2.11
Agricultural imports	824.20	-5.40	-7.90	-3.22
Non-agricultural imports	20411.93	-2.30	-2.58	-2.06
Balance of trade	-133.72	289.63	266.99	308.66
Government revenue	19252.53	1.72	2.31	1.20
Total investment	24872.57	1.49	2.08	0.97
Household income				
Rural	39796.02	-2.79	-3.09	-2.55
Ag-worker	2794.99	-4.89	-6.04	-3.93
Farmer-sml	8827.95	-4.01	-4.50	-3.62
Farmer-med	4390.76	-4.49	-5.20	-3.90
Farmer-lrg	8469.07	-4.96	-5.88	-4.19
Rural-low	8367.36	-0.06	0.34	-0.42
Rural-high	6945.88	0.04	0.48	-0.35
Urban	25800.12	0.15	0.61	-0.25
Urban-low	13698.96	0.19	0.66	-0.22
Urban-high	12101.16	0.11	0.55	-0.28
<i>Total Households</i>	<i>91396.27</i>	<i>-1.63</i>	<i>-1.64</i>	<i>-1.64</i>
Household income distribution ^{e/}	3610.49	1.58	2.49	0.81
Sectoral share of value added				
Agriculture	24.07	-0.29	-0.50	-0.14
Manufacturing	36.26	0.25	0.34	0.17
Services	39.67	-0.05	-0.01	-0.08

Notes:

a/ For quantities and income, base values are in billion 1985 rupiah.

b/ Base elasticity.

c/ A cut of 10 per cent from base values.

d/ A rise of 10 per cent from base values.

e/ The measurement is a standard deviation coefficient of household income.

8.5 Hypotheses Testing

This study utilises a CGE model of the Indonesian economy to analyse macroeconomic agricultural linkages and evaluate sectoral effects of changes in the external shocks on agricultural development performance in Indonesia. In order to quantify the effects of external shocks and changes in the domestic policies, two hypotheses are posited in this study. First, it is hypothesised that the external shocks have important consequences for Indonesia's agriculture. In the first experiment, the decline in oil prices does not affect agricultural performance. Because of the tight link between the oil sector and the government budget, changes in oil export revenues have a strong impact on government revenues and spending. The major impact of the oil price shock is only macroeconomic, operating through the government budget and balance of payments. With the decline in oil prices, the induced exchange rate depreciation evokes an export surge in all other sectors, which works to partially offset the shock. The results demonstrate the growing resilience of the increasingly diversified Indonesian economy to external shocks. In addition, the negative oil price shock affects income distribution because profits flowing to households from the oil accrue mostly to the urban household group. The rural households group benefits the most under a negative oil price shock. The negative oil price shock reduce the level of income inequality in the economy. The simulation results of the oil price decline would not support the null hypothesis.

In the second experiment, agricultural export prices decline has a minimal impact on real GDP. However, the shock changes the agricultural terms of trade, thus affecting income distribution. The decline of agricultural export commodity price induces a contraction in agricultural exports, as well as output and incomes for the rural households group. Unlike the oil sector, the agricultural sector has no strong linkage to the government budget, so that changes in this sector's export revenues have little direct impact on fiscal position. The simulation results of the oil price decline indicate that the agriculture sector and industrial sectors that are downstream from the agricultural sector are most affected by the shock. With these results, the first hypothesis is thus maintained.

Second, it is hypothesised that agriculture and the economy in general would gain from the implementations of ADLI strategy and reduction of agricultural exports and indirect taxes. The simulation results indicate that ADLI strategy has relatively strong macro-linkages, yielding a significantly large increase in real GDP. Rural and urban households incomes are both observed to increase; however, urban households gain more than rural households do. The findings of the study indicate that increasing agricultural productivity does not

necessarily result in a reduction in rural income. The results of the study provide empirical support to the view that agricultural productivity improvements are likely to benefit rural households less than urban households. Even when implemented simultaneously with the oil price decline (EXP5) and with the export price decline (EXP6), ADLI is found to benefit all household groups and the overall economy and particularly mitigate the negative results of these shocks. With these results, the second hypothesis is thus maintained.

As expected, a reduction by 50 per cent of the agricultural and indirect taxes leads to an increase in agricultural exports. These gains are obtained at the expense of the other sectors, and consequently real GDP slightly falls. Nevertheless, the welfare of the rural households group is improved, while that of the urban households group declines. All agricultural workers' and owners' income in the rural households group is increased.

8.6 Concluding Remarks

This study used a computable general equilibrium model, applied to the Indonesian economy, to quantify the effects of external shocks and agricultural policy reform to revitalise agriculture from the external shocks which were faced by Indonesia in the 1980s. The results obtained in this study indicate that the external shocks and changing agricultural domestic policy in response to the external shocks have important consequences for Indonesian agriculture. The oil and agricultural export price shocks are transmitted to the Indonesian economy by very different mechanisms. The economy-wide and sectoral effects of the oil price shocks were not very large because the oil sector has a weak linkage with the rest of the economy. Because the oil sector is the major source of government revenues, the decline in oil exports has significant implications for the government budget and balance of payments. The results also indicate the growing resilience of the increasingly diversified Indonesian economy to external shocks. Although real GDP declines as the economy suffers the effects of the terms-of-trade shock, the agricultural output, agricultural exports and aggregate exports increase. The real exchange rate depreciation improves for export production. In addition, the oil price shock has income distribution consequences. Because profits from the oil sector accrue mostly to the urban household, the urban households suffer more.

The decline in agricultural export prices leads to a substantial reduction in agricultural production and exports. The decline in agricultural export prices has no direct impact on government fiscal position. Instead, the major impact is in the agricultural sectors and downstream users of raw agricultural commodities. Since the decline in agricultural export

prices lowers rural wages and returns to capital for agricultural sector, the rural households group is worse off.

The CGE simulation results indicate relatively strong macrolinkages of agricultural demand-led industrialisation, yielding a large increase in real GDP. The findings of the study indicate that increasing agricultural productivity does not necessarily result in a reduction in rural income. The results are consistent with the observed reduction in poverty incidence in Indonesia. However, the results of the study provide empirical support to the view that agricultural productivity improvements are likely to benefit rural households less than urban households, owing to the deterioration in the agricultural terms of trade.

The major beneficiaries of the export and indirect taxes reduction are the agricultural workers and owners in the rural household group, who are among the major export crop producers. A reduction in the export and indirect taxes reduces demand for income-elastic urban households, lowering returns to capital and real wages in urban areas. The reduction of agricultural exports and indirect taxes reduces the level of income inequality in the economy over its base run levels.

The implementation of ADLI successfully mitigates the negative terms-of-trade shocks in the economy. The contractions that are expected to occur in the economy due to the adverse effects of the declining oil and agricultural exports prices are reversed by more than proportionate expansion in the economy that resulted from the boom in agricultural production and exports. This findings lends support to the hypothesis of strong macrolinkages of ADLI to overcome the adverse effects of terms-of-trade shocks.

It has been demonstrated that the CGE model represents a useful tool to quantitatively evaluate the policy implications of alternative policies designed to revitalise the agricultural sector from external shocks. However, any debate on policy implications generated from this study is conditional on model specifications (the model is static in nature and focuses only on the real side of the economy, and key parameters are not econometrically estimated) and the magnitude of shocks.

Chapter 9: Indonesia's Crisis and the Agricultural Sector

9.1 Introduction

By the mid 1960s the Indonesian economy had achieved a remarkable combination of rapid growth, macroeconomic stability and steadily declining poverty incidence. Over the period 1966 to 1996, the average annual growth rate of Indonesia's real GNP per capita was well over 5 per cent, compared with an average of 2.4 per cent for low and middle income countries (World Bank 1998a). Agencies like the World Bank, the International Monetary Fund and the United Nations Development Program were celebrating Indonesia's overall economic performance as a model of sustained development.

The crisis of 1997 changed all that. Indonesia has witnessed a dramatic reversal of fortune. The nominal value of the rupiah fell at one point by 80 per cent, annual inflation reached almost 80 per cent, the economy swung from rapid growth to even more rapid contraction, unemployment and underemployment climbed, poverty incidence was rising, and the US dollar equivalent value on the stock exchange fell by more than 90 per cent at its low point.

The causes of the Indonesian crisis are not simple. They result from the dynamic effect of a complex set of factors (Montes 1998). Although the Thailand crisis may have been the trigger, internal and external conditions combined to move Indonesia's problems from foreign contagion to macro collapse (World Bank 1998a). According to the World Bank (1998a), the proximate causes of the crisis were the rapid build-up of short-term, unhedged private external debt in recent years combined with the weak banking system and financial sector. Indonesia was hit by the severe drought associated with the El Nino phenomenon, a collapse in regional demand and the lowest international oil prices in decades. In addition, KKN (Bahasa Indonesia for corruption, cronyism and nepotism) has been cited as the fatal flaw in this crisis. Well before July 1997, investors showed concern about the bureaucracy, red tape, corruption, insider trading, the soundness of the financial system, the weak legal system, arbitrariness of decisions, and the political strength of established commercial interests. These weak institutional infrastructures have now become one of the main impediments to recovery.

The effects of the economic crisis have seriously undermined social welfare gains made by Indonesia over the past three decades. Indonesia has commenced a comprehensive

program of economic and social reform aimed at restructuring the economy. This paper provides an overview of the social impact of economic crisis and how the economic crisis has impacted on the agricultural sector. Particular emphasis is placed on the relevance of agricultural demand-led industrialisation (ADLI) to address the economic crisis in Indonesia.

This chapter is organised into five sections. Section 9.2 provides an overview of social impact of the economic crisis. Section 9.3 provides an overview of how the economic crisis has impacted on the agricultural sector. Section 9.4 details the agriculture-related policy responses induced by the crisis. Section 9.5 outlines the relevance of agricultural demand-led industrialisation during the turbulence of economic crisis in Indonesia. The final section gives concluding remarks.

9.2 Social Effects of the Crisis

Indonesia has been affected seriously by the Asian crisis. From an economy that has grown by about 7 per cent per annum throughout the past decade, the Indonesian economy contracted by 13.7 per cent in 1998. As the economy contracted, the demand for labour fell, resulting in layoffs in construction and manufacturing, and in falling real wages.

The social impact of the crisis in Indonesia has been immediate and dramatic, bringing to light underlying social tensions which had previously been obscured by relative stability. Price rises, including in particular the withdrawal of fuel subsidies, triggered outbreaks of rioting in which the main targets were the economically dominant ethnic Chinese minority. Following widespread looting, burning and rioting in several major cities, President Soeharto finally bowed to demands for his resignation after 32 years as head of state. The massive depreciation of the real exchange rate resulted in the technical insolvency of much of the Indonesian corporate sector. Prior to the crisis, the proportion of population living below the poverty line had fallen from 60 per cent in 1970 to 11 per cent in 1996. Since the onset of the crisis, this process has gone into reverse. Indonesia's poor are especially vulnerable to the falling incomes, increasing prices, rising unemployment and underemployment brought on by these crisis-induced events. World Bank simulations suggest that poverty has increased from about 10 per cent in 1997 to about 14 per cent (almost 30 million people) in 1998 (World Bank 1998b). Urban areas have been hit harder than rural areas and the people on Java appear to have been affected more than those on outer islands (Sumarto, Wetterberg and Pritchett 1998). However, not all poor people in Indonesia have been affected badly. Some smallholder agricultural producers whose products are exported benefited substantially from the depreciation of the rupiah (Sumarto, Wetterberg and Pritchett 1998).

Unemployment and layoff estimates for Indonesia are very unreliable, and should be treated with caution. In early June 1998 the Minister of Manpower said that unemployment could rise to 15.4 million people or 17.1 per cent of the labour force by the end of 1998 (*Indonesian Observer*, 3 June 1998), while in July 1998, private economists and the World Bank put overall unemployment at 20 million (*The Australian*, 20 July 1998). ILO (1998) estimated that unemployment could rise to 15 per cent of the labour force by the end of 1998. Subsequent data on actual employment do not support this statement. The 1998 unemployment rate which was calculated by the Central Bureau of Statistics (BPS) in August, is less than 6 per cent. The lower BPS estimate reflects the fact that the informal labour market was more able to absorb those who lost jobs in the formal sector than the others have assumed.

Since a large proportion of manufacturing activities is in Java, the decline in manufacturing would result in significant job losses in Java, especially around Jakarta and West and East Java. According to Hugo (1998), about half of the lost jobs are thought to have come from the Jabotabek area (Jakarta and environs).

Those still in work complain of a freeze on overtime, leaving them on the Jakarta region's minimum wage of Rp 5 700 a day (worth about 60 US cents), which has not changed since April 1997. As a consequence, the real wages have fallen very significantly. In agriculture, for example, there is an indication that real agricultural sector wages on Java and in selected Outer Island provinces have fallen by about 40 per cent since the crisis hit in mid 1997 (Cameron 1999). This suggests that agriculture, one of the few sectors to experience positive growth in 1998 (0.2 per cent), has absorbed some labour from the non-agricultural sector, which has contracted.

The fall in labour demand also reduced the remittances received by rural households from urban relatives. In addition, some of the retrenched labourers have gone back to villages to earn a livelihood in the rural informal sectors and in agriculture, somewhat reversing the village-to-city migration trends which occurred in the previous years of high economic growth. The returning migration could impose an extra cost on rural households: there is an additional household member to support.

In the past, poor families tended to withdraw their children from school as a result of economic shocks (World Bank 1998b). A smaller shock in 1986/1987 caused junior secondary enrolment rate to fall from 62 per cent to 52 per cent. This evidence from a smaller economic shock suggests that the overall impacts from the current crisis are likely to be large. Official estimates suggest that dropout rates in primary and junior secondary

schools have more than doubled. Dropout rates are higher among poorer households (Cameron 1999).

Prices, particularly those of basic necessities such as food and medicine, have risen dramatically because of exchange rate devaluations. Because medical supplies and equipment have become prohibitively expensive, the poor, including expectant mothers, are now less likely to seek formal medical treatment, and immunisation coverage appears to have fallen. These factors, combined with the reduced ability of the poor to purchase staple foods, have raised the risks of malnutrition and micronutrient deficiencies, particularly for infants and children (World Bank 1998b).

9.3 Impact on Agriculture

Agricultural development in Indonesia during the last three decades (1966-1996) has been a success story. The impressive growth performance of the sector contributed substantially to the achievement of Indonesia's development objectives: food security, low and stable prices, generation of employment and foreign earnings/savings. Indonesia is an excellent example of Mellor's theories (1966) on the role of agriculture in economic development.

Three decades of steady progress in agricultural development were abruptly interrupted by financial and environmental shocks. The consumer price index (CPI) for food increased by more than 50 per cent between June 1997 and March 1998, compared with a 38 per cent rise for the general CPI. With consumer prices of food continuing to increase, basic commodities disappear quickly from the shops as people begin to hoard. Fears of food shortages have proved self-fulfilling, triggering hoarding, and speculation, disrupting food supplies and causing shortages. Although food shortages could be supplemented by imports, the cost is prohibitive and in any case foreign exporters are refusing to accept letters of credit issued by Indonesian banks, causing trade to come to a halt (Japan Economic Institute 1998). Frustration and anger have been directed at the largely Christian Chinese minority. In many towns and villages, the Chinese are the merchants and shopkeepers and therefore blamed for rising prices and shortages. In February, the government was able to set up financing mechanisms in Singapore to ensure crucial rice imports by using international reserves up front to pay for them.

The rocketing prices of all imported goods have hit all sectors of the economy. The poultry business, an important source of protein, is collapsing as it is heavily dependent on imported feed and medicines, which are now completely unaffordable.

Food production has been affected by the long drought that struck the country at a most unfortunate time. The El Nino weather pattern has created a drought across much of Indonesia, causing widespread crop delay or failure. The country's main staple, rice, declined by 4 per cent in 1997. In 1998, rice production is estimated to have fallen by 8 per cent, the biggest single-year decline in the past two decades. The crop failure and the decline in family income will see the incidence of poverty dramatically increase. However, the impact of the drought is not evenly distributed across the country. Eastern Indonesia has been hit hardest by the El Nino drought. Since Eastern Indonesia was already the poorest region of the country, the large impact of drought and the crisis worsens an already serious problem of long-term rural poverty in the region. Widespread famine and deaths in the thousands in this region have been reported (van Diermen 1998).

The decline in domestic food production was partly offset by an increase in food imports and diversion of secondary food crop use from livestock feed to human consumption. Table 9.1 presents an estimate of changes in food crop trade for the main staples during the 1990 to 1998 period. It is shown that imports of rice, wheat, soybeans and sugar were significantly increased to offset the low levels of domestic production in 1997 and 1998.

The effect of the economic crisis has greatly increased the vulnerability of large sections of the population to food insecurity. Food prices have risen sharply, whilst purchasing power has fallen dramatically due to rising unemployment and falling real wages. Moreover, amongst the poorest sectors of the population there are now growing concerns that savings and assets are being depleted rapidly, significantly compromising their ability to cope in future (World Bank 1998b).

The available evidence suggests that rising food insecurity in Indonesia was not a problem of aggregate food availability (FAO/WPF 1999, Tabor, Dillon and Sawit 1999). Food insecurity is primarily a problem of reduced incomes and erosion of purchasing power rather than aggregate production and supply. The decline in food production in Indonesia was offset by rising imports and government grain stock releases, but at a cost that increasing numbers of poor people find difficult to afford.

The economic crisis has caused an adverse effect on the food crops and livestock subsectors. However, the other subsectors (farm nonfood crops, forestry and fishery), which are export-oriented and low import-oriented, have enjoyed a 'boom' from the economic crisis. The booming sector is gaining due to rupiah depreciation.

Table 9.1: Food imports, 1990-1998 ('000mt)

Year	Rice	Corn	Soybean	Wheat	Sugar
1990	29	-127	475	1680	278
1991	178	292	526	2071	306
1992	634	-81	558	2270	316
1993	0	442	752	2459	260
1994	876	1084	697	3188	128
1995	3104	894	473	3614	687
1996	1090	595	593	3820	975
1997	3582	619	779	3958	1336
<i>1998 forecast</i>	<i>4200</i>	<i>500</i>	<i>700</i>	<i>4250</i>	<i>1716</i>

Source: Tabor, Dillon and Sawit (1999)

Despite the large contraction of Indonesia's GDP in 1998 due to the economic crisis, the agriculture output did not decline. Agriculture has been the one relatively bright spot during the crisis. Table 9.2 shows the agricultural growth performance. As shown in Table 9.2, the sectors suffering the most are food crops and livestock.

Table 9.2: Growth rates of the agriculture sector

Sectors	1996-1997	1997-1998
Farm food crops	-2.66	-1.15
Farm nonfood crops	1.24	6.55
Livestock	4.90	-8.25
Forestry	8.01	3.01
Fishery	5.79	6.21
Total agriculture	0.72	0.38

Source: Tambunan (1999)

9.4 Crisis-induced Agricultural Policy Responses

Due to severe drought, the economic downturn and political turmoil, the price of rice in Indonesia has sky-rocketed. To ease the impact of rice changes, the Habibie government is subsidising rice and making an effort to import enough to feed the poor. Last year the price more than tripled. To ease the adjustment of the poor to the new price, the government sells the imported rice to the poor at a subsidy. In July 1998 the government introduced a special market operations program (OPK). Under the OPK program, BULOG sells rice to 7.5 million low income families at a subsidised price of Rp 1 000 per kg. Each family was entitled to receive 10 kg of rice/month. Despite some difficulties, the program appears to have been implemented effectively to low income families using

BULOG's extensive marketing network (SMERU 1998). However, the program has had little impact on the large number of urban poor who have no official resident status. In addition, the poverty indicators from a 1996 BKKBN (Ministry of Family Planning) survey used for the OPK program did not capture urban poverty that emerged in the aftermath of the economic crisis (FAO/WFP 1999). In October 1998, the government ambitiously announced that the OPK program would be extended to 17 million families with each family entitled to receive 20 kg per month. In addition, a supplementary food program for children and expectant and lactating women was initiated in October 1998 in conjunction with FAO/WFP. It is estimated that over 1 million children as well as 400 000 to 700 000 mothers could be covered by this program. The World Bank (1998b) has recommended a phasing out of rice subsidies once the agricultural sector has returned to normal production levels.

Early during the crisis (until November 1998) fertiliser use in food production was heavily subsidised at less than half the world market price, to compensate farmers for rice prices being held down. Because some subsidised fertilisers were diverted to nonfood crops or export, these in turn have led to domestic shortages of fertiliser. In November 1998, the subsidy on fertiliser was terminated.

To stimulate production and reduce the impact on farmers of the removal of fertiliser subsidies, as well as increasing the floor price of rice, the government reduced the interest rate in the subsidised farm credit program (KUT) from 14 per cent to 10.5 per cent per annum, and the ceiling on loans per hectare has been raised to Rp 2 million. The annual aggregate maximum value of subsidised loans has been set at Rp 6.9 trillion.

Indonesia has implemented extensive general economic reform since the 1980s, including relaxation of foreign investment regulations, reduction in many tariffs and qualitative import restrictions, a more flexible exchange rate policy, and phasing out of price subsidies for many goods. But the agriculture sector and agricultural trade had been slow and limited during the pre-crisis period. The following is a listing of some significant reform imposed through the IMF loan agreement that has a bearing on the agriculture sector.

- (a) From February 1998, BULOG's monopoly was limited solely to rice. This means its existing monopoly over the import and distribution of sugar as well as its monopoly over the distribution of wheat flour was eliminated.
- (b) From February 1998, all restrictive marketing arrangements were abolished, leaving firms free to produce and export their products as they wish and as the market decides. The Indonesian Plywood Association (APKINDO) monopoly over plywood

exports was eliminated, and the Clove Marketing Board was also eliminated from June 1998.

- (c) From February 1998, all formal and informal restrictions to investment in palm oil plantation were removed.
- (d) From April 1998, the ban on palm oil product exports was removed and replaced with an export tax of 40 per cent.

A further reform package which was announced by the government on 1 December 1998 includes the following features:

- (a) For the first time in 30 years, the private sector is permitted to import rice.
- (b) Special market operations (OPK) for rice at subsidised prices are to be targeted to those with incomes below the official poverty line.
- (c) The rates of rice subsidies are to be reduced once the agricultural sector has returned to normal production levels.
- (d) Food subsidies for commodities other than rice are to be eliminated.
- (e) Fertiliser subsidies are to be eliminated and their prices determined by market mechanisms.

According to this reform package, the government reduced the scope of BULOG's role. Opening the economy up to greater competition will lead to increased efficiency and the dissipation of rents, such as those often associated with monopoly arrangements (Simmons and Daryanto 1999).

9.5 The Relevance of Agricultural Demand-Led Industrialisation

Agriculture cannot be regarded as a neglected sector in the Indonesian economy. Agricultural and rural development has consistently been given high priority in national development planning. The transfer of resources out of agriculture in the form of direct and indirect taxes was partially balanced by infusions of capital into the agricultural and rural sector for infrastructure development and services. The oil boom profits allowed high levels of government investment in agriculture in the 1970s and 1980s for the provision of

subsidised credit to farmers, extension of irrigation infrastructure, provision of modern high-yielding rice varieties and other extension services, and rice and secondary crops market interventions. As a result, technical change has been faster in agriculture than in the rest of the Indonesian economy (Martin and Warr 1993).

Table 9.3 reveals that public expenditures on agriculture in Indonesia have been relatively high by developing country standards. Between 1984 and 1988, public expenditures on agriculture in 40 developing countries averaged 7.5 per cent of total budgetary expenditures (Knudsen and Nash cited in World Bank 1992). Over the same period, Indonesia allocated 9.3 per cent of its total budgetary expenditures to agriculture (World Bank 1992). This fairly significant share of total budgetary expenditures helped maintain the momentum of agricultural growth during the period of study.

Table 9.3: Public expenditures on agricultural sector, 1984-1988 average

	As percentage of		Agriculture GDP/Total GDP	Expenditure ratio ^{a/}
	Total expenditure	Agriculture GDP		
Thailand	10.5	11.9	17	0.62
Indonesia	9.3	8.4	23	0.41
Mexico	3.6	10.5	9	0.40
India	8.3	4.9	32	0.26
Nigeria	8.4	4.7	34	0.25
Philippines	5.7	2.9	23	0.25
Bangladesh	11.5	2.7	46	0.25
Turkey	1.5	2.1	17	0.09

a/ Ratio of (Agriculture Expenditures/Total Expenditures) to (Agricultural GDP/Total GDP).
Source: World Bank (1992)

Agricultural development in Indonesia has been argued persuasively as a significant determinant of growth in other sectors of the economy. During three decades of palpable economic progress, the agriculture sector, which is expanded mostly by smallholder activity, propelled the Indonesian economy through forward and backward linkages and through demand creation (Uphoff 1999). Daryanto and Morison (1992) found that the consumption linkage effect of the induced growth in agricultural sector represents a more potent intersectoral influence than the production linkages of agricultural growth.

Expansion of agriculture is seen as one of the main ways to overcome the crisis. There are five features of agriculture that make it an attractive option (Sunderlin 1998, Daryanto 1998a, Daryanto 1998b). First, provision of adequate basic need commodities (which include agricultural products) is a strategic priority of the government in order to preserve the conditions of stable rule and legitimacy. Second, the low proportion of imported inputs in the agriculture sector means agriculture has not been as badly affected as other sectors by the crisis. Mounting food imports and foreign exchange constraints have

increasingly turned attention towards the need to expand food production. Third, the agricultural sector functions as a 'social safety valve', by absorbing some of the retrenched labour, as well as new entrants to the labour force unable to find work in urban areas. Fourth, the agriculture sector can make useful contributions to foreign exchange either by raising a country's earning from exports or by producing agricultural import substitutes. The drastic currency depreciation provides increased opportunities for expanding traditional crops (such as coffee, tea, cocoa beans, fishery and forestry products). Fifth, the agricultural sector is an important potential source of demand for other sectors. A growing agricultural sector will stimulate the demand for industrial products. With increasing incomes in the agricultural sector, the effective demand for domestic manufactured goods would be bolstered.

In principle, the general arguments presented above are in favour of the adoption of an ADLI strategy in which agriculture is developed as a leading sector in the industrialisation process. The ADLI strategy has many positive macroeconomic consequences: it generates economic growth, employment, industrialisation and foreign exchange savings, while improving the size distribution of income and increasing the supply of basic needs goods.

A very recent study indicates that the results of SAM multiplier analysis show relatively strong macrolinkages from ADLI industrialisation, yielding a significantly larger increase in real GDP compared to that arising from industrial development oriented to either food processing or light manufacturing (Bautista, Robinson and El-Said 1999). This study uses an adjusted 1995 Indonesian SAM to reflect equilibrium conditions in a post-shock environment. Based on the 1995 Indonesian SAM, the income multipliers representing the induced effect on GDP at factor cost are as follows: 2.45 for food crops, 2.30 for nonfood crops, and 2.28 for livestock; 1.93 for processed food; and 1.71 for light manufacturing. The income multipliers for agriculture-based development are significantly higher than those of two industrial sectors. An increase in income of food crops, nonfood crops and livestock producers by one million rupiahs leads to an increase in GDP by 2.45 million, 2.30 million and 2.28 million rupiahs, respectively; while the same income increase in the food processing and light manufacturing sectors leads to an increase in GDP by 1.93 million and 1.71 million rupiahs, respectively. Evidently, the demand stimulus generated by agricultural growth significantly exceeds that from the expansion of that in either of two industrial sectors. This finding lends support to the hypothesis of strong macrolinkages of rising agricultural incomes.

The calculated income multiplier also provides information on the relative strength of sectoral growth linkages to household incomes. Table 9.4 indicates the additional incomes generated for the seven household groups from an exogenous income injection of one

million rupiahs to each of the seven groups. A general agricultural expansion is seen to benefit the less affluent households – farm-worker, small-farm, non-farm low-income and low income – associated with income multipliers that are higher than those for the three most affluent households groups – large-farm, non-farm high-income rural, and high income urban. This result indicates that income increases for the less affluent households groups represent a more potent demand stimulus to industrial growth.

It has been argued that the consumption patterns of less affluent households favour locally produced and labour-intensive goods and services, while the consumption patterns of higher income households are heavily oriented to capital-intensive products and imported goods. On this basis, the higher income households are relatively weaker and less labour-intensive linkages in the domestic economy.

Table 9.4: Income multipliers by household group

	GDP
<i>Rural households</i>	
Farm-worker	1.673
Small-farm	1.614
Large-farm	1.569
Non-farm low-income	1.601
Non-farm high-income	1.538
<i>Urban households</i>	
Low-income	1.676
High income	1.428

Source: Bautista, Robinson and El-Said (1999)

9.6 Conclusion

Indonesia is experiencing economic and social shocks of unprecedented severity. Output has contracted, and inflation and unemployment rates have soared. The status of health and education has greatly deteriorated. These facts are sharply in contrast with the picture in the recent past when Indonesia has seen high growth, low unemployment and visible improvements in many indicators of social development. The crisis threatens to reverse many of the past achievements. However, efforts are being made by the government and international community to minimise the damage.

Despite the Indonesian economy's contraction by 13.7 per cent in 1998, the agriculture sector did not decline. This draws attention to the expansion of agriculture as one of the

main ways to overcome the crisis. The agricultural sector functions as a 'social safety valve', by absorbing some of the retrenched labour, as well as new entrants to the labour force unable to find work in urban areas. Farmers appear to have responded by hiring more than the usual amount of labour at lower wages.

It is time now for Indonesia to reevaluate the development strategy of the last three decades. One possible option is agricultural demand-led industrialisation. The ADLI strategy argues that agriculture can be developed as a leading sector in the industrialisation process. The case for agriculture as a motor for overall growth is enhanced by focusing on the impact which that growth in the agricultural sector has on incomes and hence on rural demand for consumer goods and services from outside the agricultural sector.

Chapter 10: Conclusions

10.1 Introduction

This chapter is devoted to a summary of the findings of this study. Section 10.2 summarises the dissertation. In section 10.3 several suggestions are advanced for future Indonesian CGE modelling efforts, with a particular emphasis on model specifications.

10.2 Summary and Conclusions of the Dissertation

The objectives of this research were threefold. The first was to analyse the patterns of output and employment change in Indonesian agriculture compared to other sectors. The second was to utilise a CGE model of the Indonesian economy to analyse macroeconomic agricultural linkages and evaluate sectoral effects of changes in the external shocks and changes in domestic policies on agricultural development performance in Indonesia. The third was to analyse existing agricultural development policies in response to the external shocks with a view to finding the ones that generate most rapid rates of economic growth and equal income distribution.

Chapter 1 began with a background of the study, and the discussion focused on the need for the identification of the economic forces which drive the process of structural transformation in the Indonesian economy with emphasis on the agricultural sector in the past. The results may have some implications for restructuring economic policy for the benefit of the agricultural sector.

Before the crisis began in July 1997, Indonesia was frequently cited as one of superstars of sustained development. Since the mid 1960s it had achieved a remarkable combination of rapid growth, macroeconomic stability and steadily declining poverty incidence. Despite highly successful agricultural development due to green revolution success in Indonesia that increased agricultural yield and production, the Indonesian economy has undergone rapid structural change. By international standards, the decline in agriculture's share of GDP during the last three decades of development process was quite high.

There is wide agreement in the development literature that sustained economic growth in agricultural countries such as Indonesia is not likely to be achieved without a prior, or simultaneous development of agriculture. In fact, during the last three decades (1966-

1996), the positive association between agricultural growth and overall growth is firmly established. Over the past three decades, it is clear that despite the discernible shift in development strategy towards the industrial and service sectors, the agricultural sector has not been totally neglected. The agricultural sector of the Indonesian economy performed remarkably well during the 1965-1980 period, the height of the so-called green revolution. However, the growth in the 1980s and early 1990s was slower due to the combined effects of lower world commodity prices, a slow-down in the expansion of new areas, increasing competition for resources between agriculture and other sectors, the declined use of input such as fertiliser and pesticides due to environmental and health concerns, ecological limits and increases in cropping intensity, the neglect of agricultural research at national level and near completion of the green revolution advances for rice.

The annual agricultural growth in Indonesia has dropped from 4.3 per cent in 1965-1980 to 3.2 per cent in 1980-1990, to less than 2.5 per cent today. It is then argued that if the growth rate were unlikely to exceed the growth in the 1980s and 1990s, it would dampen overall GDP growth.

External events and changes in domestic macroeconomic policies influence structural change in Indonesia's agricultural sector. Because of the interdependence of the agricultural sector and the economy as a whole, the analysis of the effects of external events and changes in domestic macroeconomic policies requires an economy-wide framework.

Chapter 2 reviewed the literature on the determinants of structural change and economic development from theoretical and empirical perspectives. A review of the literature leaves the impression that the pattern of structural change associated with rising income has been broadly similar in most countries. But because individual countries have deviated significantly from the average pattern, it is important to consider Indonesia's starting point and circumstances.

In this chapter, the theoretical and empirical presumptions which lie behind the neglect of agriculture in development policies were also discussed. In the tradition of Hirschman's (1958) work in Latin America, early studies on economic linkages between industries or sectors, focused only on production linkages. Agricultural growth was thought not to have strong backward and forward production linkages. This led to the conclusion that encouraging agriculture was not a high priority for fostering growth in developing countries. An 'anti-agriculture' mindset was undoubtedly encouraged by the elasticity pessimism debate of the time concerning agricultural exports (Prebisch 1959), domestic demand pessimism (Engel's Law) and stylised facts of economic development which

proposed that the more developed the country is economically the smaller the share of agriculture in value added and employment.

It has also been shown in the chapter that agriculture can provide the push to industrialisation by serving as a leading sector that induces demand for the output of manufacturing industries. Adelman (1984) recognised that agriculture can be the leading sector promoting growth and industrialisation. Under Adelman's agricultural demand-led industrialisation strategy, investment in agriculture and rural development are promoted. Improvements in irrigation systems, access to credit, dissemination of new seeds and fertilisers, better roads to markets, and fair prices for agricultural produce would not only energise the agriculture sector, but would enhance industrialisation. ADLI has substantial consumption linkages that can create a mass market for domestically produced goods, including in particular labour-intensive manufactures, and provide the impetus to a rapid and equitable growth of the national economy.

Chapter 3 described the Indonesian economy in general and the external and domestic macroeconomic environments under which the agricultural sector functions. The most important external events influencing the country's economic growth pattern were the two oil booms in 1972-1975 and 1979-1981, drop in real oil prices in 1982-1986, and the decline in world prices of agricultural commodity exports in the 1980s and 1990s. On the domestic front, through disciplined macroeconomic policy, pro-rural expenditure bias, well-designed smallholder development programs, and liberalisation of foreign trade and investment, the country achieved continuous and rapid economic growth in all sectors. However, it has been noted in this chapter that the impressive progress in a number of socio-economic areas has been reversed since the onset of the financial crisis in July 1997.

Chapter 4 presented the input-output framework, which were used to analyse growth and structural change in the Indonesian economy with special reference to the agricultural sector. Growth and structural changes are examined in terms of how changes in a sector's output and employment can be apportioned between changes in (1) domestic final demand, (2) export demand, (3) import substitution, and (4) technological change.

Chapter 5 presented the results of the model described in Chapter 4, determining the sources of growth and change of output and employment in Indonesia for the periods 1971-1985 and 1985-1995.

The analysis at the aggregate level indicates that the major factor of output growth in the Indonesian economy during both periods under study was consistently the increase in output induced by changes in domestic demand. The export demand effect was

consistently the second largest component of output growth. The contribution from domestic final demand tended to decline over time. The main cause of the rapid decline in the percentage contribution of domestic final demand to output growth was a declining role of consumption and investment in the economy. It was found that the contribution of exports to output growth became relatively stronger in the process of economic development, especially in the manufacturing sectors. The increasing role of export demand effect in total output growth reflects that the phase of export expansion as an important source of growth has taken place in the Indonesian economy.

Over the periods of study, final demand was consistently the largest influence component of output growth. The agriculture sector always recorded positive net effects due to trade. It was also found that the most important sources of growth in employment were changes in domestic final demand and labour productivity.

Over the periods of study, the output deviation for the agriculture sector was negative. This means that the agriculture sector deviated from its past proportional growth trend. Changes in technology were the second largest impact on structural change in agriculture.

Changes in domestic final demand had the greatest effect on changes in industry employment over the periods of study. Technological changes had the third largest and second largest impact on changes in employment in the first period of study and the second period of study, respectively.

A Social Accounting Matrix (SAM) has been developed to extend the basic input-output table to include the distribution of income among, and expenditure by, households and institutions.

Chapter 6 provided an overview of the developments in the application of the SAM model. This chapter also reviewed the literature on CGE modelling. The chapter suggested that the CGE approach, defined by its endogenous determination of prices, non-linearity, and inclusion of supply constraints, is capable of more accurately simulating the general equilibrium effects of an external shock or a policy change than other types of economic modelling techniques, such as the input-output technique.

The proposed Indonesian CGE model was presented in Chapter 7. The Indonesian economy was disaggregated into 30 sectors, of which 5 sectors each accounted for an agricultural activity/commodity. There were 10 primary factors of production (land, capital and eight categories of household), and six institutional actors (households,

enterprises, borrowing agencies, government, capital account and rest-of-the-world), which record all transactions in the macroeconomic circular flow of income.

The model was implemented in a modelling language called GAMS (General Algebraic Modelling System). The GAMS optimisation program using the MINOS 5.2 algorithm was utilised to solve simultaneous and nonlinear problems of the model, and attain the optimal solutions of the CGE model.

Chapter 8 applied the CGE model for Indonesia to estimate the economy-wide and sectoral effects of changes in external economic environmental and domestic economic policies on the agricultural development in Indonesia. The findings of the counterfactual simulations are summarised as follows.

First, the oil and agricultural export price shocks were transmitted to the Indonesian economy by very different mechanisms. The major impact of the 50 per cent decline in oil price was only macroeconomic, operating through the government budget and balance of payments. This was due to the strong link between the oil sector and the government budget. The economy-wide and sectoral effects of the 50 per cent decline in oil price were not large due to the weak linkage of the oil sectors and the rest of economy. Because profits from the oil sector accrue mostly to the urban household, the welfare of urban households group declined. On the other hand, the decline in agricultural export prices had little direct impact on the government's fiscal position. The fall in world prices for Indonesia's agricultural exports led directly to a substantial reduction in agricultural production and exports and a decline in real incomes for farm households.

Second, the CGE simulation results indicated relatively strong macroeconomic linkages of ADLI, yielding a large increase in real GDP. Rural and urban household group income were both observed to increase, but urban households gained more than rural households did. The results from the ADLI experiment suggested that policies which are successful in raising agricultural production and real income, also lead to a significant improvement in non-agricultural performance. However, the ADLI experiment is likely to benefit rural households less than urban households, owing to the deterioration in the agricultural terms of trade. The challenge for policy makers is how to devise ways that will ensure farmers a greater share of gains from implementation of ADLI strategy.

Third, the major beneficiaries of increase in producer prices of agricultural commodities, achieved through a reduction in export and indirect taxes on the agricultural sector, were the agricultural workers and owners in the rural household group. A reduction by 50 per cent of the agricultural and indirect taxes led to an increase in agricultural production and

exports. However, these gains were obtained at the expense of the other sectors; as a result, real GDP slightly declined.

Fourth, the implementation of ADLI successfully mitigated the adverse terms-of-trade shocks in the economy. The contractions due to the negative shocks in the economy were reversed by more than proportionate expansion that resulted from the boom in agricultural production and exports.

Chapter 9 presented analysis on the impacts of the current economic crisis on less fortunate people and agriculture, policy responses of the government and the relevance of ADLI to address the economic and financial crisis in Indonesia.

10.3 Directions for Future Research

All models have their strengths and weaknesses and the results obtained should be interpreted with attention to these traits.

The CGE model used in this study is a flexible and powerful tool for analysing the effects of external shocks and agricultural policy changes on agriculture and economy as a whole. Compared to partial equilibrium, general equilibrium approaches (IO, SAM and CGE) can better capture the intersectoral and macroeconomic linkages. However, IO and SAM are linear and impose significant rigidities, including fixed prices and zero-substitution elasticities in consumption and production. CGE models allow analysts to relax these rigidities while retaining depiction of sectoral linkages, by introducing non-linear functions in production and consumption and allowing endogenously determined prices. It also provides some indication of income distribution through the effect on labour income. In addition, the influence of macro aggregates and prices, especially exchange rates, is not ignored. This multisectoral and economy-wide approach is necessary for analysing changes in external and domestic policy environments as applied in this study.

The microeconomic foundations, that is, the incorporations of behavioural relationships based on economic theory and use of data that are consistent with the national accounts, add to the strength of the CGE model for policy analysis.

It is possible to analyse various agricultural policy changes with the model developed. However, because the model is fairly general, it may need to be adapted and extended for special research questions. In addition, the model provides decision-makers and policy analysts with an opportunity to conduct policy analysis from various policy

perspectives. It is relatively easy to calculate the effects of agricultural policy changes but also the effects of other policies, technological changes, world market price changes, and the policy measures for stabilisation and structural adjustment on the whole economic system of Indonesia.

The model results are however always conditional on the model characteristics. Some of them are model-specific; some of them are typical CGE model features. The most important model characteristics are the static nature of the model, the functional form used, the parameter selection procedure chosen and the data used. Nevertheless, the findings reported in this study indicate the potential usefulness of an Indonesia CGE model that emphasises the agricultural sector and therefore provides support for future development of such models.

One of the problems posed by the present CGE model is its comparatively static nature. This implies that no explicit time path from initial to final situation is given. This static model can be extended into a family of dynamic CGE models in order to provide a better comprehension of the dynamic process of economic development in Indonesia. There are two forms of dynamics: recursive dynamics and real dynamics (Gunning and Keyzer 1995). With real dynamics there is an inter-temporal optimality criterion that has to be satisfied like the inter-temporal maximisation of profits of an industry. However, the development of real dynamic CGE models is a demanding task with respect to the data requirements. Recursive dynamics can be considered as an alternative. In the case of recursive dynamics, a true sequence of single-period equilibrium is computed. Periods are related through the updating of some exogenous variables like the capital stock or the total amount of labour in the economy. The model in this research could be used as a recursive dynamic model, for example by updating the aggregate capital stocks in the economy by investment. With the recursive dynamic CGE model, we could evaluate dynamic effects of investment in agriculture.

The numerical estimation of parameters, which forms the backbone of most simulations, also needs to be assessed, since any CGE model is critically based on various parameters. If such parameters are incorrect, the whole model is undermined. For the conclusions of a CGE model to be more reliable, it needs to be based on as near as possible complete and up-to-date information. Therefore, further research has to be done on the values of parameters.

With respect to the estimation procedure, the numerical specification of the present CGE model was not estimated econometrically. All sets of 'key' parameters, such as elasticity parameters of production functions, heavily relied on literature search and reasonable

guesses. Although it may well be impossible to estimate a CGE model of large dimensions using a complete estimation procedure that incorporates all restrictions on parameters, it is suggested for future work that 'key' parameters be estimated, so that statistical tests can be applied to validate the model.

This study used a 1985 SAM database. In 1985, Indonesia suffered major economic setbacks from a worsening external environment. The main source of the external shocks was severe deterioration in Indonesia's external terms of trade, primarily due to the collapse of the world oil price. This is a major reason for using 1985 SAM database in the Indonesian context in view of the economy's vulnerability to drastic oil price decrease. The choice of base year 1985 was also favoured by the additional consideration of data availability.

Although only one SAM database was used in this study, a SAM database can be compiled for any year. Therefore many different sets of data (SAMs) could be used in a study. The Central Bureau of Statistics published a SAM for 1995 very recently. This table could be used to construct a new data sets for the CGE model developed here and would help to improve the model specification and validation.

Finally, most CGE applications, including this study, are limited to the real sector. Theoretical arguments for incorporating aspects of the financial sector into dynamic CGE modelling have recently been developed. If the financial variables were endogenised in the present CGE model, it would more accurately capture the effects of external shocks and policies on the economy, and it could be used to evaluate ADLI strategy considering the current financial crisis.