# THE IMPACT OF APEC TRADE LIBERALISATION ON THE INDONESIAN ECONOMY AND AGRICULTURAL SECTOR

**BY**

**RINA OKTAVIANI[1)], ROSS G. DRYNAN[2)]**

This paper contributes to the empirical literature on trade liberalisation. The impacts of trade liberalisation by APEC member countries on the Indonesian macroeconomy, and its various sectors, especially the agricultural industries, are assessed and analysed. An Indonesian Forecasting Model is developed based on the ORANI-F general equilibrium model for Australia. The model is more detailed sector-wise than existing Indonesian CGE models and incorporates flexibility to capture alternative assumptions regarding land and investment behaviour. The effects of trade liberalisation on Indonesia are found by imposing changes in world market conditions resulting from trade liberalisation as exogenous shocks in the Indonesian Forecasting Model. The Global Trade Analysis Project (GTAP) model is Z first used to estimate the impacts of APEC trade liberalisation on changes in global market conditions. Two specifications of trade liberalisation are considered, namely trade liberalisation by the developed APEC countries only, which is to be implemented by 2010 and second, full trade liberalisation by all APEC countries, which is to be implemented by 2020. The impacts are assessed under several alternative settings including several variations in the database, various scenarios for the tariff rate changes made by Indonesia and several prospective economic developments in Indonesia.

**Paper presented at the Third Annual Conference on Global Economic Analysis**
**June 28th – 30th 2000, Melbourne, Australia**

1) Department of Agricultural Economics, Bogor Agricultural Economics, Jalan Raya Pajajaran, Bogor 16143, Indonesia and Phd Candidate at the Department of Agricultural Economics, The University of Sydney. e-mail : r_oktavi@indo.net.id
2) Department of Agricultural Economics, The University of Sydney, Science Road (A04), NSW 2006. e-mail: r.drynan@agec.usyd.edu.au

The authors acknowledge the URGE (University Research for Graduate Education) Project of the Directorate General of Higher Education, Indonesian Ministry of National Education for making available the International Conference grant of this paper.

# 1. INTRODUCTION

## 1.1 Background

The APEC (Asia Pacific Economic Cooperation) agreement was declared in November 1994 and was intended to deliver free and open trade and investment in the Asia-Pacific region no later than 2020 for developing countries and no later than 2010 for industrialised countries. Most of the APEC members protect their domestic industries against imports with protection varying across countries and between commodities. The GTAP (Global Trade Analysis Project) database (McDougall and Hertel, 1997) reveals the highest levels of import protection in agricultural products to be in Japan in 1992. Trade liberalisation, in the form of reduced protection, can be expected to have a significant impact on APEC countries' economies. Policy makers have a need not only to assess the likely effects of these changes on their individual countries, but also to evaluate their own policy reactions to these changes.

In studying the effect of these trading system developments on Indonesia, it is necessary to recognise and address the role of the agricultural sector. In relation to trade, the agricultural sector and its estate crops sub-sector are very important in terms of export value and share. The value of agricultural exports doubled from US$ 6 804 million in 1988/1989 to US$ 12 647 million in 1995/1996. Estate crops export value has also almost doubled from US$ 2 552 million in 1988/89 to US$ 4 495 million in 1995/1996 (Bank Indonesia, 1993/94-1995/96). More than half of the non oil and gas export value was derived from agricultural products in 1988/1989. This had decreased to 39.37 per cent by 1995/1996 (Bank Indonesia, 1993/94-1995/96). Within the agricultural sector, the estate crops and forestry sub-sector have the biggest share of the export value (Bank Indonesia, 1993/94-1995/96).

A number of economists have already attempted to estimate the impact of trade liberalisation on Indonesian's macroeconomy and agricultural sector using either single country or multi country general equilibrium models. Erwidodo (1995) and Trewin *et al.* (1995) analysed trade liberalisation in agriculture by using a single country model. These studies are necessarily limited as trade studies in that the setting of exogenous global market shocks are taken as given rather than generated within the study.

Murtough *et al.* (1994), and Erwidodo and Feridhanusetyawan (1997) have used the GTAP model to analyse the formation of APEC and its impact on the Indonesian economy. Anderson *et al.* (1996), Anderson *et al.* (1997) and Strutt (1997) analyse the impact of trade liberalisation in APEC countries including Indonesia. Because of the inevitable model size constraint, multi-country models used for global trade analysis may not permit sufficient disaggregation to represent every market adequately. One way to capture more detail in an individual country without making the model excessively large, is to link a global trade with a detailed national model of an economy of particular interest. Linking between a multi-country (GTAP) and a single country model for Australia (MONASH) has been used by Huff *et al.* (1995) and Adams *et al.*(1997) to predict the prospects of the Australian economy under the APEC agreement. There has been no previous study of this kind for Indonesia.

The results reported in this paper are part of such a study. The study was directed at analysing the impacts of APEC trade liberalisation on the Indonesian

macroeconomy and on individual sectors, especially the agricultural sector and its estate-crops sub-sector.

### 1.2 Research Objectives

The ultimate objectives of the study are to analyse

1. the impacts of APEC trade liberalisation on the economies of Indonesia;
2. the impacts of APEC trade liberalisation on individual sectors of the Indonesian economy, especially the agricultural sector and estate-crops sub-sector.

## 2. METHODOLOGY

The impacts of trade liberalisation are explored with two computable general equilibrium models, namely the GTAP model (Hertel, 1997), which focuses on global trading relations among countries, and an Indonesian Forecasting Model, which focuses on the detailed sectoral structure (especially agriculture and estate-crop commodities). This section is primarily a description the flexibility of the Indonesian Forecasting Model and how results from the GTAP model are linked to simulations with the Indonesian Forecasting model.

### 2.1 Indonesian Forecasting Model

The Indonesian Forecasting model has a similar structure to the Australian ORANI-F model (Horridge *et al.*, 1993) except there is added flexibility in dealing with investment, drawing in particular on ideas used by Walmsley (1998). The Indonesian Forecasting Model also has the flexibility to capture land mobility among sectors in estate crops and food crops groups or among industries instead of fixing the land used in each industry. In order to avoid a restatement of the ORANI-F model, only the modifications are described here.

#### *2.1.1 Rates of return on capital (Equation block 15 in the model - See Oktaviani (2000))*

Capital differs from other inputs in the model in that it is both producible and depletable. The price of constructing (for adding to or replacing existing capital) (***P2TOT$_i$***) is related to the price of capital in use (***P1CAP$_i$***) by virtue of investors' willingness to invest. Equation block 15 defines the rate of return on capital, which links the supply and demand side prices of capital, and includes an equation specifying an equilibrium condition on rates of return to capital creation. Using slack variables, several alternative variants of the component for investment are included in the model. The alternatives differ by virtue of different assumptions about the driving force for investment and about how investors deal with risk premiums in choosing investment levels.

The model can be used either under an assumption of no risk (the conventional ORANI-F model) or under an assumption of recognition of the possible existence of

sectoral risk premiums. The word "possible" is used here since, when risk premiums are included in the formulation, these premiums may nevertheless be zero.

The (net) rate of return (***R1CAPRSK$_i$***), which would include the risk premium, if any, is the gross rate of return less the depreciation rate ($DEPRAT_i$). The gross rate of return (***G1CAP$_i$***) is the use (or rental) price of capital relative to the cost of producing capital for the particular industry. Thus,

$$\boldsymbol{R1CAPRSK_i = G1CAP_i} - DEPRAT_i = \boldsymbol{(P1CAP_i / P2TOT_i)} - DEPRAT_i$$

To allow for the possibility of risk, risk premiums are made explicit in the rental returns on capital earned by investors in a sector. The risk premium for sector i is initially defined relative to a riskless rate of return for the sector:

$$\boldsymbol{R1CAPRSK_i = R1CAP_i + R1RSK_i}$$

where ***R1CAP$_i$*** is the riskless net rate of return and ***R1RSK$_i$*** is the risk premium for sector i. This formulation follows Walmsley's (1998) treatment of (regional) risk in the global GTAP model.

To allow for a formulation in which risk is not recognised, the risk premium variable is multiplied by a 0-1 flag parameter *RISKFLAG*. That is,

$$\boldsymbol{R1CAPRSK_i = R1CAP_i} + RISKFLAG * \boldsymbol{R1RSK_i}$$

When the user sets parameter *RISKFLAG* = 0, risk is absent from, or not recognised in, the model. The variable ***R1CAPRSK$_i$*** then does not include risk, despite its name: it is then identical to ***R1CAP$_i$***. When *RISKFLAG* =1, risk is allowed for in the model, though the level of the risk premium could still be zero. The equation can be expressed in percentage change terms as

$$R1CAPRSK_i * r1caprsk_i = R1CAP_i * r1cap_i + RISKFLAG * R1RSK_i * r1rsk_i$$

Substituting for ***R1CAPRSK$_i$*** in the rate of return equation (the first equation of this block), that equation becomes

$$\boldsymbol{R1CAP_i} + RISKFLAG * \boldsymbol{R1RSK_i} = \boldsymbol{(P1CAP_i / P2TOT_i)} - DEPRAT_i$$

which in percentage change terms (except for ***R1RSK$_i$***) is

$$R1CAP_i * r1cap_i + 100 * RISKFLAG * delr1rsk_i = (P1CAP_i / P2TOT_i) * (p1cap_i - p2tot_i)$$

Letting ***QCOEF$_i$*** be the ratio of the gross rate of return (including any risk) to net rate of return (excluding any risk),

$$\boldsymbol{QCOEF_i} = \boldsymbol{(P1CAP_i / P2TOT_i) / R1CAP_i}$$

then

$$r1cap_i + 100 * RISKFLAG / R1CAP_i * delr1rsk_i = QCOEF_i * (p1cap_i - p2tot_i) \quad (15.1)$$

which is the equation included in the linearized model.

Although risk is not recognised in the formulation when *RISKFLAG* = 0, the variable $\boldsymbol{R1RSK_i}$ still exists as a variable. With the zero coefficient on this variable wherever it occurs in equations, the solution value of the variable $\boldsymbol{R1RSK_i}$, and changes in it ($delr1rsk_i$) in the linearized equations, will be undefined. The variable $delr1rsk_i$ needs to be set exogenously to zero (any other value could be used since the particular value will have no effect on the solution, but to avoid confusion in interpreting results, 0 is preferred) when *RISKFLAG* = 0. The variable $\boldsymbol{R1RSK_i}$, too, must be set since, although changes in it are no longer explicit in the equations, the value of $\boldsymbol{R1RSK_i}$ will affect the value of other coefficients in the equations. Logically, if risk does not exist, $\boldsymbol{R1RSK_i}$ should be set to zero.

In contrast to the model described here, the standard ORANI-F model does not include an explicit allowance for risk. When *RISKFLAG* is set to zero in the Indonesian Forecasting Model, Equation 15.1 corresponds to the ORANI-F rate of return equation. If there are apparent risk premiums in the database, the ORANI-F specification and the Indonesian Forecasting Model with *RISKFLAG* = 0 would be inconsistent with the database. A discrepancy slack variable would be needed in each equation of type Equation 15.1 to achieve an initial model solution compatible with the database. These slacks could be altered appropriately to force the equivalent level slacks to zero. However, slack variables for Equation 15.1 would look exactly like the risk premium variables. Thus by viewing the risk premiums as discrepancies and forcing them to zero, one obtains a database consistent with a riskless model solution.

When the formulation recognises risk (*RISKFLAG* = 1), discrepancies in the database in relation to Equation (15.1) would be indistinguishable from risk premiums (assuming the risk premium variables do not enter other restricting equations). These risk premiums could be forced to zero by exogenously setting $delr1rsk_i$ to -1. Having done so, one would have a discrepancy-free, risk-free solution to the model, that is the same as when *RISKFLAG* = 0. On the other hand, if the apparent discrepancies in the initial database were viewed as genuine risk premiums, they could be allowed to persist in equilibrium by exogenously setting $delr1rsk_i$ to 0. Finally, if there were estimates of the risk premiums from other sources, the apparent risk premiums in the database could be separated into actual premiums and discrepancies, and the $delr1rsk_i$ variables could be shocked to remove the discrepancies, leaving a database with risk premiums.

Three alternative investment formulations are included in the Indonesian Forecasting Model: one based on the ORANI specification, one based on the ORANI-F specification and one based on Walmsley's (1998) specification. Slack variables are defined to allow removal of the unwanted versions from any particular simulation. In all three versions, it is assumed that riskless rates of return are the relevant ones in determining equilibrium. The Walmsley investment specification differs from the ORANI investment specification in that there is a given relationship between the ratio

of current and expected future rates of return and the relative growth rates of capital; whereas in the latter specification, the relationship is between the ratio of current and expected rate of return and the ratio of the level of expected and current capital. The Walmsley investment specification then gives a more general treatment of the long-run equilibrium condition because it allows the current and future rates of return in an industry to be equal even though the industry is growing. On the other hand, the ORANI-F investment specification assumes that the relative current rates of return in industries are related to the relative levels of capital stocks via a constant elasticity relationship. The detail of these three specifications is available in Oktaviani (2000).

In summary, equation block 15 describes the six alternative specifications for investment as included in the model. These comprise the factorial combinations of (a) an assumption about the existence or not of risk premiums in returns (2 possibilities); and (b) an assumption about the driving force for investment (3 possibilities). To implement a particular specification, particular choices of exogenous variables are required.

*2.1.2 Land Specification (Equation block 11 in the model - See Oktaviani (2000))*

The ORANI-F model as described by Horridge *et al.* (1993) assumes that land is specific to each industry. Land prices are established without any direct relationship. For the Indonesian model, particularly with a relatively disaggregated agricultural sector and with no multi-commodity industries, it is important that the model allow for land mobility between industries. Accordingly, the Indonesian Forecasting Model differs from ORANI-F through the inclusion of equations and variables that facilitate making alternative assumptions about land, namely that it is:

(i) fully mobile between all industries (all land prices then change in proportion);
(ii) fully mobile between industries within three defined sets of industries, namely estate crops and forestry, food crops and other industries;
(iii) specific to an industry (land prices have no direct relationship one to another)

The constrained mobility assumption (case ii) is perhaps the most appropriate, especially for long run analysis, and most of the analysis of trade liberalisation in the study is based on this assumption.

In the market clearing conditions, the supply and demand of land must be the same in aggregate, as well as for each type of land. The market clearing equation for aggregate land is the following:

$$x1\ln d\_{i} = \frac{1}{V1LND\_{i}} \sum_{i \in IND} V1LND_i \times x1\ln d_i \qquad (11.6)$$

where $x1ln\ d\_i$ is the percentage change of aggregate land, $x1ln\ d_i$ is the ercentage change of land in industry i, $V1LND\_i$ is the total payment to land over industries and $V1LND_i$ is the total payment to land in industry I

The market clearing equations for the three types of land are provided in Oktaviani (2000). The price equation in each industry in the estate crops group can be defined in
percentage change terms as:

$$p1lnd_i = f1ln\ d\_e + f1ln\ d_i + f1ln\ d\_i \quad (11.10)$$

where $p1ln\ d_i$ is the price of land in estate crops industry I, $f1ln\ d\_e$ is the aggregate estate crop's land rental shifter, $f1ln\ d_i$ is the industry i's land price shifter (a slack variable for the price equation), $f1ln\ d\_i$ is the overall land rental shifter.By varying the settings for the shifter variables, various land mobility assumptions can be modelled.

## 2.2 Modified Model and Closure of the GTAP model

The impact of trade liberalisation is assessed in relation to a long run steady state database constructed following the procedures used by Walmsley (1998). Steady state GTAP databases were computed under the alternative assumptions of the absence of long run regional risk premiums and the existence of such premiums. The implied premiums were found to be quite large for some countries, and in particular, Indonesia. Walmsley (1998) also found this. When risk premiums are forced to zero and the data base forced to adjust to exhibit equality of expected future and current rates of return, the data base alters significantly, and particularly so for Indonesia. In the absence of strong reasons to believe that no risk premiums would exist in equilibrium, and given that the investment model remains pragmatic, it was assumed here that risk premiums do exist in equilibrium and would continue to do so, unchanged, following trade liberalisation. That is, only a risk-affected, or "risk adjusted" steady state database is used.

A GTAP simulation using the updated steady-state database is needed to derive the terms of trade changes that Indonesia will confront after trade liberalisation. For this, Indonesia is treated as an isolated country. This closure follows the methods of Adams *et al.* (1997). Some changes to the standard closure of GTAP model are made.

*Changed from endogenous to exogenous:*

- all bilateral trade flows into and out of Indonesia;
- the flow of the "savings good" from Indonesia into the global pool of saving;
- the flow of savings of real capital funds from the global pool into Indonesia.

*Changed from exogenous to endogenous:*

- all tax rates on bilateral trade flows into and out of Indonesia;
- the slack variable in the equation global rate of return to remove this equation from the model;
- the slack variable in equation regional income to remove this equation

There are some exceptions to the above "rules". Not all commodities are exported by or imported from Indonesia to every region. Neither do all commodities have an export tax or import tariff. For example, wheat exports from Indonesia and

rice imports from Japan have no taxes or tariffs. In these cases, no swapping between the endogenous and exogenous variable specification of the standard GTAP long run closure is made.

This approach to determining the effects of trade liberalisation on Indonesia assumes Indonesia is a small country. The assumption needs checking. Following Adams *et al.* (1997), this can be done by comparing the equilibria with Indoensia alternatively exogenized and not exogenized. As well, it is useful to examine the Indonesian results to ensure that the changes in imports and exports under trade liberalistaion are not excessive in terms of world trade in the various commodities. In addition to the empirical evidence acquired from running the models, one can also refer to the GTAP database. A small country should hold only a small share of total world trade's position in most commodities (ideally all) and not be in a position to dominate any trade. From all these perspectives, Indonesia was found to satisfy the small country assumption.

### 2.3 Data Base and Parameter Settings

The GTAP version 3 data base and parameter values are used. In order to satisfy the steady state long run closure, the standard GTAP data base is first adjusted to be the steady state data base, that is, regioanl growth rates are forced to be equal. Some APEC members are present as individual regions, while all other countries are aggregated and defined as the rest of the world (Table 1). The economies are disaggregated into 20 sectors as listed in Table 2. Each of these GTAP sectors is linked to one or more narrowly defined sectors (35 in total) as used in the national model. The principal database required for the Indonesian Forecasting Model is the Input-Output Table of the Indonesian Economy 1990 and the Social Accounting Matrix 1993 as published by the Indonesian Central Bureau of Statistics. The Indonesian behavioural parameters used are based on various pieces of other research. Details of the construction of the database are in Oktaviani (2000).

Table 1. Regional Aggregation for the GTAP Model

| No | Countries forming a Region | Short Name |
|---|---|---|
| 1 | Australia, New Zealand | ANZ |
| 2 | Japan | JPN |
| 3 | Indonesia | INA |
| 4 | North America | NAM |
| 5 | Malaysia, Singapore, Philippines, Thailand | ASEAN4 |
| 6 | Korea, China, Hongkong, Taiwan | OAPEC |
| 7 | Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, United Kingdom | EU12 |
| 8 | Rest of the world | ROW |

Table 2. Commodity Aggregation in the GTAP and in the Indonesia Forecasting Model

| No | GTAP Sectors used in the Study | Indonesian Sectors used in the Study |
|---|---|---|
| 1. | PDR | Paddy |
| 2. | WHT | CerOthGrain |
| 3. | GRO | Maize, CerOthGrain |
| 4. | NGC | RootCrop, Beans, VegFruit, Rubber, Sugarcane,Coconut, OilPalm, OthEstate, Coffee, Tea, OthEstate, OthAgr, |
| 5. | LVS | Livestock |
| 6. | FOR | Forestry |
| 7. | FSH | Fishery |
| 9. | COL&OMN | CoalOthMin |
| 8. | OIL&GAS | OilGas |
| 9. | COL&OMN | CoalOthMin |
| 10. | PCR | Rice |
| 11. | LVSPROC | LivProc |
| 12. | OFP | FoodProc, FishProc, EstateProc, OthFoodProc, |
| 13. | B_T | BevTob |
| 14. | TEX&LEATH | TxtLthr |
| 15. | LUM | WoodPrd |
| 18. | OMF | OthManufac |
| 17. | MIN | CoalOthMin |
| 16. | CRP | Chemical, Fertiliser, Pesticide |
| 17. | MIN | MinMet |
| 18. | OMF | OthManufac |
| 19. | T_T | TradTrans |
| 20. | SVC | Service |

## 3. RESULTS AND ANALYSIS

### 3.1 GTAP-simulated Changes in Prices for Indonesian Imports and Exports and Effective Tariffs

The GTAP results for Indonesian trading prices and tariff changes based on various assumptions can be seen in Table 3. Two simulations are reported: full APEC trade liberalisation and trade liberalisation just by the developed APEC countries. In both simulations, Indonesia is treated as an isolated country, that is, its import and export quantities are held fixed, while the prices it faces vary endogenously as do the tariff rates needed to maintain these imports and exports. The last two columns of Table 3. do not relate to the GTAP results themselves but relate to the tariff rates applying in Indonesia, first based on the Post-NAFTA database before trade liberalisation; and second, on the updated database after all APEC countries (except Indonesia) have reduced their tariffs. The reported figures are the percentage changes needed to the powers of the Indonesian tariffs implicit in these databases to fully remove Indonesian tariffs.

Table 3. Indonesian Import and Export Weighted-Average Price Changes and Tariff Changes Simulated Using the Risk Adjusted Steady State Database (Percentage Change)

| Commodities | APEC[1] | | | APEC Developed countries[2] | | | tms-ave (original)[4] | tms-ave[5] |
|---|---|---|---|---|---|---|---|---|
| | Pcif-ave | Pfob-ave | tms-ave | pcif-ave | pfob-ave | tms-ave | | |
| PDR | 10.49 | 25.18 | -9.35 | 1.61 | 1.19 | 0.00 | -8.25 | 2.36 |
| WHT | 3.94 | 0.00[3] | -4.65 | -0.36 | 0.00[3] | -4.74 | 0.00 | 5.83 |
| GRO | -0.62 | 15.72 | -0.01 | 3.05 | 1.74 | 0.00 | -5.98 | -5.78 |
| NGC | 3.06 | 15.84 | -3.71 | 0.61 | 10.25 | -9.96 | -35.36 | -32.69 |
| LVS | 4.21 | -3.22 | -4.41 | 1.49 | 2.94 | -0.37 | -5.09 | -0.44 |
| FOR | -2.05 | 7.49 | 1.65 | -2.53 | 1.17 | 0.00 | -12.69 | -14.06 |
| FSH | 2.40 | 7.16 | -2.94 | 1.67 | 2.75 | -0.34 | -22.65 | -20.24 |
| C_M | -0.38 | 2.56 | -0.48 | -0.11 | 0.65 | 0.00 | -3.47 | -2.93 |
| O_G | -1.44 | 2.00 | 0.58 | -0.14 | 1.40 | 0.00 | 0.00 | -0.58 |
| PCR | 8.31 | -0.43 | -8.05 | 2.2 | -0.07 | 0.00 | 0.00 | 9.43 |
| LVP | 1.79 | 4.69 | -2.49 | 0.24 | 3.06 | -6.50 | -13.62 | -11.18 |
| OFP | -6.11 | -1.38 | 6.00 | 0.5 | -0.01 | -0.68 | -10.76 | -15.45 |
| B_T | -1.94 | 6.45 | 1.25 | 0.08 | 3.15 | -4.89 | -19.14 | -20.10 |
| T_L | -3.58 | -1.30 | 1.72 | 1.72 | 2.90 | -1.72 | -21.56 | -22.71 |
| LUM | 2.45 | 8.11 | -2.92 | 1.97 | 4.56 | -5.02 | -25.47 | -22.98 |
| OMF | 2.10 | 1.66 | -2.64 | 2.24 | 1.83 | -1.99 | -13.61 | -10.93 |
| MIN | 0.69 | 4.12 | -1.24 | 1.68 | 1.96 | -1.27 | -9.36 | -8.08 |
| CRP | -0.08 | 3.55 | -1.24 | 0.99 | 2.59 | -1.67 | -6.09 | -4.70 |
| T_T | -0.66 | 0.86 | -0.27 | -0.4 | 0.80 | 0.00 | 0.00 | 0.37 |
| SVC | -0.44 | 0.06 | -0.51 | -0.19 | 0.02 | 0.00 | 0.00 | 0.61 |

[1] APEC tariffs are removed in all APEC countries excluding Indonesia

[2] APEC tariffs are removed in all APEC developed countries

[3] The zero value is because Indonesia is not an exporting country for wheat.

[4] Percentage changes needed to the powers of the Indonesian tariffs to removed those tariffs, calculated from the Post-NAFTA database

[5] Percentage changes needed to the powers of the Indonesian tariffs to removed those tariffs, calculated from GTAP database after removing tariff and non tariff barriers of all APEC countries except Indonesia.

Which of these sets of shocks to the Indonesian tariffs is most relevant? If the aim is to identify how the Indonesian economy will be affected as she and other countries remove their import protection, the final column of Table 3. is the relevant one. The shocks here remove the implied tariffs that would apply were Indonesia to be importing and exporting after APEC trade liberalisation exactly what it was before liberalisation. The shocks in the second last column change tariffs as they existed prior to trade liberalisation. These will not exactly remove the tariffs which exist after liberalisation. In general the tariff changes in this set will be excessive, since Indonesia's implied tariff barriers generally fall as world prices rise under liberalisation. This set of changes will mean, in effect, that Indonesia introduces subsidies on imports. It would be anticipated that the benefits of trade liberalisation for Indonesia would be less under this set of distortionary tariff shocks.

## 3.2 The Impacts of APEC Trade Liberalisation

The Indonesian general equilibrium model has been developed to allow some flexibility in its precise specification. The database in the Indonesian Forecasting Model is not uniquely defined since there are some alternatives for arriving at some items of important "missing" data. Decisions have first to be made in relation to these details in order to develop the estimates of the effects of trade liberalisation.

### *3.2.1 Sensitivity of Results to Model Specification*

The model includes three investment specifications and three types of land mobility. In relation to land mobility between sectors, the choice of specification can be made more positively. In generating the estimates of the impacts of trade liberalisation, land is assumed to be mobile among estate crops and food crops, with no mobility between other sectors. This choice, from amongst the three alternatives regarding land mobility, is based on the notion that the land used in these sectors is agronomically suitable to the range of estate crops and secondary food crops. The time period associated with the long run effects of trade liberalisation is sufficient to allow the economic replacement of these crops and the reallocation of land use within this form of agriculture. Preliminary simulations show that the results of using the assumption of land mobility among estate crops and food crops, and fixed land in each other industry are smaller impacts compared to assuming land mobility among all industries, as would be expected.

In the absence of actual data on investment and the beginning capital stocks for each industry in Indonesia, it is assumed that the investment capital ratio among industries is the same and the investment share of each industry is the same as its share of capital stock (see Oktaviani (2000) for details). These assumptions mean that the future and current rates of return within industries and the rates of capital growth across industries are already equal and the database is already in the balanced growth condition. Therefore, the results under the Walmsley and the ORANI-F investment specifications are likely to be similar.

The Walmsley investment specification is arguably a better choice than either the ORANI or the ORANI-F investment specifications because it is more general and complete in covering the long run equilibrium. However, because of the limitations in the database, especially in the data for beginning capital stocks and investment in each industry, the inherent flexibility of the Walmsley type of investment cannot be exploited. This research therefore uses the assumption of a fixed investment capital ratio and the ORANI-F specification to analyse the impact of trade liberalisation. The assumptions regarding investment and capital also mean that the risk premiums are the same for all industries. Again, the full capability of the Walmsley type of investment model to capture the differences of risk premiums among industries could not be used.

The results described to this point have all related to the 1990 database. Because of the growth and developments that have occurred in Indonesia's population and macroeconomy, the analysis was repeated using a 1997 database as updated from the 1990 database. While the results for 1997 are potentially interesting in their own right and potentially more relevant than those based on the 1990 database for analysing trade liberalisation to be implemented into the future, also of interest is the comparison between the results from each of the two databases. As noted by a number of other

authors, the results are not expected to be overly sensitive to the database. To the extent that the results confirm this general expectation, greater confidence may be placed in the results from the more reliable, even if outdated, 1990 database.

*3.2.2 Trade Liberalisation Impacts on Macroeconomic Variables*

There are two stages to APEC trade liberalisation. In the first stage, APEC developed countries liberalise their trade by 2010. In the second stage, all APEC countries will liberalise their trade by 2020. Japan, North America, Australia and New Zealand are defined as developed countries. Three scenarios (scenario 4, 5 and 6) have been simulated here relating to the first stage and three scenarios (scenario 1,2, and 3) to the second stage. The tariff's calculation of these scenarios can be seen at the explanation of the Table 4. Besides these Indonesian tariff changes, the terms-of-trade shocks (average cif and fob price) associated with trade liberalisation are also simulated in all scenarios. These shocks are those generated from the GTAP risk-adjusted steady-state model, with the risk-adjusted steady-state database and with Indonesia assumed to be a small country. All of the world price and tariffs shock can be seen in Table 3.

Table 4. shows that the impact on Indonesia of trade liberalisation by APEC developed countries is to increase real GDP by 0.44 percent if Indonesia also alters its tariffs in accordance with the GTAP results (scenario 4). The increase is even greater (scenario 5) if Indonesia fully removes its tariffs based on Post-NAFTA database. The latter tariff changes are greater than those associated with the GTAP run. However, when Indonesia does not participate in tariff reductions (scenario 6), real GDP decreases by 0.51 per cent. From the perspective of overall economic growth, it is better for Indonesia to also reduce its tariffs when APEC developed countries liberalise their trade.

The positive gains achievable by Indonesia from trade liberalisation are greater if all APEC countries liberalise their trade (scenarios 1, 2 and 3) than if only the developed countries do so. This is to be expected. Again, the gains are greater when Indonesia eliminates tariff barriers (scenarios 2 and 3) rather than applying the small changes derived from the GTAP simulation. Furthermore, the positive percentage change in scenario 3 is bigger than in scenario 2. Indonesia gains more if she eliminates (as in scenario 3) the implied barriers after APEC trade liberalisation than if she under adjusts (scenario 1) or over-adjusts barriers and introduces import subsidies (scenario 2).

Table 4. Simulated Indonesian Macroeconomic Changes under Different APEC Trade Liberalisation Scenarios Using the 1990 Database (Percentage Change from Base)[1]

| Macroeconomic Variables | All APEC Countries | | | APEC developed countries | | |
|---|---|---|---|---|---|---|
| | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 | Scenario 5 | Scenario 6 |
| Real GDP (x0gdpexp) | 1.32 | 2.84 | 3.65 | 0.44 | 3.24 | -0.51 |
| GDP price deflator (p0gdpexp) | -0.04 | -5.06 | -0.99 | -0.01 | -0.4 | -0.19 |
| Average capital rental (p1cap_i) | -1.33 | 3.11 | -3.42 | -0.18 | -0.69 | 0.28 |
| Wage rate (w1lab_io) | 0.6 | 8.48 | 1.49 | 0.72 | 4.47 | -0.2 |
| Land rental (w1lnd_i) | 5.84 | -3.44 | 14.15 | 1.47 | 4.69 | 0.36 |
| Capital stock (x1cap_i) | 2.38 | 5.26 | 6.79 | 0.8 | 6.04 | -0.9 |
| Aggregate employment (employ_i) | 0 | 0 | 0 | 0 | 0 | 0 |
| Aggregate land (x1lnd_i) | 0 | 0 | 0 | 0 | 0 | 0 |
| Land shifter in all estate crops industry (f1lnd_e) | 18.67 | 23.29 | 19.21 | 11.6 | 14.36 | 10.58 |
| Land shifter in all food crops industry (f1lnd_r) | 3.18 | -21.69 | 2.62 | -2.97 | -9.02 | -1.75 |
| Consumer price index (p3tot) | 0 | 0 | 0 | 0 | 0 | 0 |
| Investment price deflator (p2tot_i) | -1.35 | 3.05 | -3.45 | -0.19 | -0.72 | 0.27 |
| Real private consumption (x3tot) | 1.79 | -4.29 | 6.34 | 0.36 | 1.56 | -0.15 |
| Real investment (x2tot_i) | 2.29 | 19 | 0.00025 | 0.94 | 7.07 | -1.06 |
| Real public consumption (x5tot) | 0 | 0 | 0 | 0 | 0 | 0 |
| Real inventories (x6tot) | 0 | 0 | 0 | 0 | 0 | 0 |
| Import price index (p0cif_c) | -2.4 | 2.73 | -3.66 | -0.09 | 0.72 | -0.22 |
| Duty-paid import price index (p0imp_c) | -3.74 | -5.06 | -9.88 | -1.55 | -7.03 | -0.19 |
| Export price index (p4tot) | -0.49 | 3.2 | -2.53 | 0.1 | -0.26 | 0.24 |
| Import volume (x0imp_c) | 4.29 | 14.67 | 11.52 | 2.3 | 11.71 | 0.17 |
| Export volume (x4tot) | 2.25 | 12.61 | 9.95 | 1.9 | 11.84 | -0.3 |
| Real devaluation (p0realdev) | -2.36 | 1.12 | -2.7 | -0.07 | 1.12 | -0.4 |
| Term of trade (p0toft) | 1.96 | 0.47 | 1.17 | 0.19 | -0.97 | 0.46 |

[1] Scenario 1: Terms-of-trade and tariffs shocks to Indonesian model are calculated from the GTAP model

Scenario 2: Terms-of-trade shocks to Indonesian model are calculated from the GTAP model and tariffs shock are calculated from the GTAP Post-NAFTA database

Scenario 3: Terms-of-trade shocks to Indonesian model are calculated from the GTAP model and tariffs shock are calculated from the updated database after all APEC countries except Indonesia have reduced their tariffs

Scenario 4: Terms-of-trade and tariffs shocks to Indonesian model are calculated from the GTAP model.

Scenario 5:Terms-of-trade shocks to Indonesian model are calculated from the GTAP model and tariffs shock are calculated from the GTAP Post-NAFTA database

Scenario 6:Terms-of-trade shocks to Indonesian model are calculated from the GTAP model. There are no tariffs shock to Indonesian model

From the income side, generally, trade liberalisation will encourage reductions to capital cost because of the reductions in tariff barriers on imported capital goods. Because the change to the rate of return on capital is zero in the long run closure, reducing the average capital rental implies reducing the capital cost and this brings about an increase in total capital stock because the employment is assumed to be fixed. Table 4. suggests that under full APEC trade liberalisation, the capital cost will reduce more and capital stock will increase more than if Indonesia joins in trade liberalisation with only APEC developed countries.

A decrease of the average capital rental is generally accompanied by an increase of the wage rate. Under the perfect competition assumption, the ratio of factor payment (which implies the ratio of marginal products) is the same as the negative ratio of the demand of both inputs. Because the supply of employment is assumed to be fixed, a decrease in the average capital cost and an increase in wage cost tends to increase the capital stock. Therefore, industry tends to become more capital-intensive.

In other simulations (scenarios 2 and 6), the change in average capital rental is positive. However, the increase of the average rental of capital is less than the increase in the wage rate and it still encourages the demand for capital in scenario 2. An increase in the average capital rental is compensated with a decrease on the wage rate in the scenario 6 and encourages a decrease of capital demand. Without reducing the tariffs while developed countries liberalise their trade (scenario 6), the capital labor ratio in industries tends to decrease and industries tend to become more labor intensive.

From the expenditure side, public consumption is assumed never to change in any of the simulations. Capital growth and investment are directly related through the assumed capital-accumulation relationship. Therefore, an increase in capital growth leads to an increase in investment. The simulations indicate that investment in Indonesia will be greater when other countries liberalise their trade. The increase is significantly greater if Indonesia also eliminates its tariffs.

An increase of investment in the simulations is accompanied with an increase of private consumption in scenarios 1, 3, 4 and 5. The consumption changes are generally not as big as for investment. On the other hand, in both the more extreme tariff rate change scenarios (2 and 6), private consumption decreases. In scenario 2, the shift to subsidising imports leads to a large increase in imports and investment which can only be accommodated with a fall in private consumption. In scenario 6, with no tariff reductions to offset the domestic price for importing commodity changes, the investment decreases. So does real GDP.

In all scenarios, the percentage change in real GDP following trade liberalisation is smaller than the percentage change in investment. Increases in private consumption are also smaller than the increases in investment. Based on the scenarios of full APEC trade liberalisation (scenarios 1 and 2), it is evident that if the government objective was to increase private consumption instead of investment expenditure, decreasing the tariff rates in line with the GTAP computed changes (scenario 1) would be better than over-reducing them in as in scenario 2.

In all simulations except scenario 5, trade liberalisation improves the terms of trade. The Rupiah appreciates against the US$ in scenarios 1,3, 4 and 6 to enforce the trade balance, which in all the simulations is exogenously set not to change. This appreciation tends to reduce import prices and to increase import volumes. In scenarios 2 and 5, Indonesian tariff elimination generates a real depreciation and an increase in the import price index. However, the duty paid import price index decreases by 5.06 and 7.07 per cent in these two scenarios respectively, larger decreases than in the other scenarios because of their bigger tariff shocks. The import

volume increases more when Indonesia eliminates tariffs than if it alters tariffs on the basis of the GTAP simulation results.

On the export side, given unchanged domestic prices, the appreciation of the Rupiah against the US$ will increase the export price and make the export products less competitive with other countries than before trade liberalisation. The world price for Indonesian products will be relatively higher than before. This is apparent under trade liberalisation by the APEC developed countries, eg. with scenario 4 and 6. With no reduction in Indonesia's tariffs (scenario 6), a small increase in the export price index is associated with a decrease in export volume. However, with Indonesia reducing its tariffs (scenario 4), the export price index increases by 0.1 per cent and export volume still increases only by 1.9 per cent (less than the import volume). Under full APEC trade liberalisation scenario 1, the export price index decreases and the export volume increases more than the impact of APEC developed countries trade liberalisation in scenario 4. Elimination of the trade barriers in all APEC countries reduces the import price index of the importing countries more than the increase of the export price associated with appreciation of Rupiah (in US$) from Indonesia. A small change in export price index is also affected by the type of trade liberalisation in this simulation, which only reducing the tariff and non tariff barrier without changing the export tax/subsidy.

When the same Indonesian tariff change scenario is applied with the different versions of trade liberalisation, the impacts of trade liberalisation are generally in the same direction, with the impact of APEC trade liberalisation being more positive or less negative than the impacts of trade liberalisation by only the APEC developed countries. On the other hand, for a given version of trade liberalisation, the different scenarios for Indonesia's response generates quite different impacts. Therefore, when Indonesia has the freedom to choose its tariff responses to trade liberalisation by other countries, the decisions are important. The appropriate Indonesian tariff response to altered world import and export price depends on the objectives of the Indonesian government.

### *3.2.3 Impacts of Trade Liberalisation on the Sectoral Variables*

The impacts of trade liberalisation on domestic output, export volume and import volume for each of the 35 sectors are reported in Table 5. for the two cases of full APEC trade liberalisation (scenario 1) and liberalisation by the developed countries only (scenario 4), respectively. To see the potential benefits of freeing up trade, the following analysis is focused mainly on the first case and estate crops sector.

Within the agricultural sector, almost all estate crops expand their outputs. Of these, tea expands the most. Trade liberalisation tends to decrease the capital cost and increase the fob price, which encourages investment and the production of these traditional export commodities. Investment in tea is more attractive than in other estate crops in terms of its first harvest and economic life. Tea needs only 3-4 years to be ready for harvest, compared to 8 years for coconuts, and 4-5 years for palm oil, coffee, cocoa and cloves. The economic life of a tea plantation is as much as 60 years, which is longer than other estate crops such as rubber (30 years); coconut (50 years); and coffee and cocoa (40 years) (Spillane, 1992). It is not clear from the data whether this contributes to tea's high primary factor cost component. These advantages are sensible reasons for estate crop growers to investment in tea production. How much, if

at all, the advantage of early harvest and long economic life contributes to the increase in tea production following trade liberalisation is unclear. Because of tea's early harvest and long life, the capital value of tea plantations relative to their current earnings is relatively high. However, the model does not properly capture capital in the form of productive trees or biological assets. Research into better representation of capital in perennial estate crops as in Dee's forestry model (Dee, 1991) would seem desirable.

Tea also experiences a large increase in exports (43 per cent) and somewhat less in imports (20 per cent). Based on the 1990 Input-Output Table, the greater portion of the total sales of tea is for the intermediate input industry usage (56 per cent), namely tea processing, followed by export sales (34 per cent) and consumed by households directly (10 per cent). The efficiency of the tea processing industry largely determines whether the tea is destined for export or for local processing. If improvements could easily be made in the efficiency of local tea processing, Indonesia could gain more added value from its tea industry.

Rubber, palm oil and coffee also experience increases in output and exports. Amongst the estate crops, in fact amongst all sectors, rubber experiences the largest percentage increase in exports. However, the increase is not a big amount in terms of value because the export sales share of rubber is only 7 per cent, namely 60.5 billion Rupiah compared to 922.8 billion Rupiah of total sales of rubber. Most of the rubber production (93 per cent of total sales) is used as an intermediate input for other industries. Therefore, its relatively small increase in production (6 per cent) can be complemented by a large increase in imports (24 per cent) to fulfil the intermediate demand of rubber.

APEC trade liberalisation also has positive impacts on the palm oil sector, with moderate increases in output, exports and imports. Indonesia is the second largest producer of palm oil in the world after Malaysia. In 1996, the palm oil world production was 10.4 million tons, of which Indonesian had a 27 per cent share, compared to Malaysia's 51 per cent share (Seng, 1997). Under trade liberalisation, given the availability of suitable land, and the suitability of its climate, Indonesia's planted area and production of palm oil are expected to expand. Similar but smaller expansions also occur for coffee.

The positive impacts of APEC trade liberalisation on the output of most estate crops does not translate into an expansion of the estate crops processing sector. In most cases, the estate crops processing sector experiences a reduction in output and an even bigger fall in export volume. One of the estate-processing products produced from palm oil and coconut oil is cooking oil, which is classified as one of the nine essential commodities for Indonesian consumers. Government policy has attempted to ensure that the supplies of cooking oil are both adequate in quantity and supplied at an affordable price for domestic consumers (Tomich, 1992) by applying an export tax on palm oil (as a main intermediate input of cooking oil). However, the consumer benefits from the tax are not economically significant because cooking oil is of limited importance in the household budget (Larson, 1996). The government has the option either of continuing with the export tax on palm oil in order to meet the domestic demand or to reduce this export tax to increase exports of palm oil. The results suggest that when the export tax of palm oil is retained (as in the simulation), the estate crops processing sector (which consists mainly of cooking oil processing)

cannot thrive under trade liberalisation and vice versa for the palm oil production sector. The results show that without changes in technology, Indonesia's comparative advantage lies more in palm oil production than in processing.

Table 5. The Impact of all APEC Country's Trade Liberalisation and APEC Developed Country's Trade Liberalisation on Industry's Output, Exports and Imports using the 1990 Database (Percentage Change from Base)

| No | Sector | All APEC Countries | | | APEC Developed Countries | | |
|---|---|---|---|---|---|---|---|
| | | Output | ExportVolume | ImportVolume | Output | ExportVolume | ImportVolume |
| 1 | Paddy | 0.21 | -4.21 | 0 | 0.04 | -2.49 | 0 |
| 2 | Maize | -0.11 | -4.21 | 13.58 | -0.08 | -2.49 | -7.17 |
| 3 | CerOthGrain | -3.45 | -4.21 | 0.69 | -2.16 | -2.49 | 0.39 |
| 4 | RootCrop | 0.84 | -4.21 | 15.04 | 0.5 | -2.49 | 19.94 |
| 5 | Beans | -0.33 | -4.21 | 10.15 | -1.17 | -2.49 | 14.39 |
| 6 | VegFruit | 0.48 | -4.21 | 20.34 | -0.02 | -2.49 | 26.67 |
| 7 | Rubber | 6.38 | 112.8 | 23.75 | 3.79 | 71.14 | 34.61 |
| 8 | Sugarcane | -5.46 | -4.21 | 0 | -3.14 | -2.49 | 0 |
| 9 | Coconut | -1.64 | -4.21 | 36.75 | -1.31 | -2.49 | 45.76 |
| 10 | OilPalm | 7.24 | 37.55 | 22.97 | 6.1 | 28.17 | 38.56 |
| 11 | Coffee | 1.71 | 22.69 | 0 | 2.1 | 20.29 | 0 |
| 12 | Tea | 10.48 | 42.58 | 19.75 | 7.85 | 32.08 | 34.15 |
| 13 | OthEstate | 5.6 | 27.45 | 32.77 | 3.65 | 23.81 | 41.08 |
| 14 | OthAgr | -0.15 | -4.21 | 7.58 | -0.55 | -2.49 | 22.26 |
| 15 | Livestock | 0.85 | -4.21 | 14.2 | -0.01 | -2.49 | 0.98 |
| 16 | Forestry | 4.25 | -4.21 | 35.52 | 1.62 | -2.49 | 25.39 |
| 17 | Fishery | 0.43 | -4.21 | 14.48 | -0.05 | -2.49 | 0.16 |
| 18 | CoalOthMin | 1.7 | 3.4 | 4.74 | 0.74 | 2.7 | 2.85 |
| 19 | OilGas | 2.51 | 4.07 | 9.85 | 0.49 | 0.65 | 1.99 |
| 20 | LivProc | 0.79 | -4.21 | 14.67 | -0.35 | -2.49 | 19.09 |
| 21 | FoodProc | 0.51 | -4.21 | 5.88 | 0.28 | -2.49 | 0.31 |
| 22 | FishProc | -2.55 | -9.65 | 0.55 | -0.87 | -3 | 0.73 |
| 23 | EstateProc | -6.04 | -27.57 | 5.64 | -3.44 | -13.97 | 3.39 |
| 24 | Rice | 0.21 | -4.21 | 10.57 | 0.04 | -2.49 | 0.12 |
| 25 | OthFoodProc | 0.09 | -4.21 | 4.7 | -0.18 | -2.49 | 1.21 |
| 26 | BevTob | 1.98 | 23.36 | 17.07 | 0.24 | 8.12 | 20.75 |
| 27 | TxtLthr | -3.08 | -6.83 | 0.58 | 3.23 | 7.39 | 5.32 |
| 28 | WoodPrd | 6.34 | 9.53 | 24.65 | 2.79 | 4.41 | 20.88 |
| 29 | Chemical | -1.28 | -4.21 | 2.05 | -1.04 | -2.49 | 1.85 |
| 30 | Fertiliser | 3.24 | 17.06 | 5.61 | 1.49 | 8.25 | 3.6 |
| 31 | Pesticide | 2.9 | 15.79 | 2.91 | 1.58 | 8.99 | 2.11 |
| 32 | MinMet | 2.87 | 22.14 | 5.6 | 0.81 | 6.86 | 1.79 |
| 33 | OthManufac | 0.63 | 6.54 | 3.09 | 0.35 | 8.29 | 1.37 |
| 34 | TradTrans | 1.59 | -4.21 | 6.79 | 0.43 | -2.49 | 2.97 |
| 35 | Service | 1.29 | -4.21 | 6.92 | 0.35 | -2.49 | 3.05 |

These results suggest that the resource based processing sectors are not competitive enough to sustain the positions they had prior to APEC trade liberalisation. Agricultural processing would be left behind without the support. Many believe it is beneficial for Indonesia to pay more attention to develop the agricultural processing sector because this would provide increased local demand for the products of the agricultural sector. For example, Sunderlin (1999) argues that the agricultural sector and the agricultural processing sector provide an attractive option to solve the problems of the monetary crisis because they are relatively independent of the importing input, provide basic needs commodities and absorb a large number of

employees. Although the results obtained here do not support this, the results are based on assumptions and these need to be kept in mind.

The results of full APEC and APEC developed countries trade liberalisation will be different for two reasons. First, the price and tariff shocks are different. Second, the time period over which capital accumulates is different. Compared to the impacts of full APEC liberalisation, the changes in output, exports and imports of the various commodities under the more limited trade liberalisation are generally of the same sign, though smaller in magnitude when the change is positive and larger when negative. The traditional export commodities from the resource based sectors, including the estate crops sub-sector, also still expand output and export volumes.

## 4. CONCLUSION AND POLICY IMPLICATION

The macroeconomic results for Indonesia can be summarised as follows. For a given tariff rate change scenario, the impacts of the two cases of trade liberalisation are found to be generally in the same direction. The impacts of full APEC trade liberalisation are more positive (or less negative) than the impacts of trade liberalisation by only the APEC developed countries. Indonesia gains more if she precisely eliminates the implied barriers existing after trade liberalisation by other APEC members than if she under-adjusts or over-adjusts. Furthermore, Indonesia benefits from participating in trade liberalisation, even if other developing countries do not participate, though the effects are small. The results suggest the Indonesian government needs to avoid over-reductions in tariff barriers if it seeks development focussed on increasing investment and on increasing private consumption.

The impacts of full APEC trade liberalisation on Indonesia are varied with the estate crops being amongst the biggest gainers in terms of industry output. Amongst traditional export industries, tea is the most experience increases in exports. Indonesia's comparative advantage appears to lie with producing and exporting raw primary products rather than in processing them. Regardless of the reason for the differences, these industries have an interest in seeing full APEC trade liberalisation rather than the more limited liberalisation. It is beneficial for Indonesia to pay more attention to develop the agricultural processing sector.

## 5. REFERENCES

Adams, P. D., Huff, K.M., McDougall, Pearson, R.K.R and Powell, A.A.(1997), *Medium- and Long-Run Consequences for Australia of an APEC Free-Trade Area: CGE Analyies using the GTAP and Monash Models,* Unpublished paper, Centre of Policy Studies and IMPACT Project, MONASH University, Melbourne.

Anderson, K., Dimaranan, B., Hertel, T. and Martin, W. (1996), *Asia-Pacific Food Markets and Trade in 2005: A Global, Economy-Wide Perspective* , Special Report, Pacific Basin Economic Council, Honolulu.

Anderson, K., Pangestu, M. (1997), *Structural Changes in a Reforming World Economy: Implications for Indonesia's Food and Non-Food Sectors*. Paper presented in The Second Workshop of the ACIAR Indonesia Research Project on Agriculture, Trade and Environment, Centre for Agro-Socioeconomic Research, Bogor, 7-8 July.

Bank Indonesia (1993/1994, 1994/1995 and 1995/1996*), Report for the Financial Year*, Bank Indonesia, Jakarta.

Dee, P. (1991), *Modelling Steady State Forestry in a Computable General Equilibrium Context*, Working Paper no. 91/8, National Centre for Development Studies, ANU, Canberra.

Erwidodo (1995), *Liberalisasi Perdagangan dan Sektor Pertanian di Indonesia (Trade Liberalisation and Agricultural Sector in Indonesia)*. Centre for Agro-Socioeconomic Research, Bogor, Indonesia.

Erwidodo and Feridhanusetyawan (1997), *Indonesia's Agriculture: Facing the APEC and WTO*, Paper presented in AARES Post Conference Workshop: Linkages between Agricultural Production, Trade and the Environment: Case Studies of Indonesia and China, Gold Coast, January.

Hertel, T.W. (ed.) (1997), *Global Trade Analysis: Modeling and Applications*, Cambridge University Press, Cambridge.

Hertel, T.W and Tsigas, M.E. (1997), *Structure of GTAP in Global Trade Analysis: Modelling and Application*, Cambridge University Press, Cambridge.

Horridge, J., Parmenter, B.R. and Pearson, K.R. (1993), 'ORANI-F: A General Equilibrium Model of the Australian Economy', *Economic and Financial Computing* 3, 71-137, Summer.

Huff, K.M, McDougall, R., Pearson, K.R. and Powell, A.A (1995), *Medium-run Consequences for Australia of an APEC Free Trade Area: CGE Analyses Using The GTAP and Monash Models*, Paper presented to the Pan-Pacific Conference XII, Dunedin, New Zealand, May 29-June 1.

Larson, D.F. (1996), *A Review of the Palm Oil Sub-sector in Indonesia*, International Economics Department, Commodity Policy and Analysis Unit, World Bank, Washington DC.

McDougall, R and Hertel, T.W. (1997), 'Data Base Summary: Macro Data', Chapter 2 in *Global Trade, Assistance and Protection: the GTAP 3 Data Base*, edited by Robert A. McDougall, Center for Global Trade Analysis, Purdue University, Purdue.

Murtough, G., Mai, Y. H., Zheng, S. and Vanzetti, D. (1994), *APEC Trade Liberalisation Post-Uruguay Round*, Paper presented to The Conference of Economists, Queensland, 25-28 September.

Oktaviani, R. (2000), *The Impact of APEC Trade Liberalisation on Indonesian Economy and Agricultural Sector*, Unpublished PhD thesis, submitted for examination in the Department of Agricultural Economics, The University of Sydney.

Seng, C.C. (1997), *Future Trends of Crude PalmOil Production in Major Producing Regions and the Relative Position of Palm Oil in the World Market of Oils and Fats*, Paper presented at the 22nd World Congress and Exibition of the International Society for Fat Research (ISE), September 8-12, 1997, Kualalumpur, Palm Oil Research Institute of Malaysia (PORIM) homepage, http://porim.gov.my/homepage96/p4av4n1.html, 8 March 1999.

Spillane, J.J. (1992), *Tea: Iimportant Functions in the Indonesian Economy*, Kanisius, Yogyakarta, Indonesia.

Strutt, A. (1997), *On Modelling Structural Change in Indonesia: 1992-2020*, Working Paper No. 97/13, ACIAR Indonesia Research Project.

Sunderlin, W. D. (1998), *Between Danger and Opportunity: Indonesia's Forest in an Era Of Economic Crisis and Political Change*, September 11, 1998, http://www.cgiar.org/cifor, 8 March 1999.

Tomich, T. P. (1992), 'Survey of Recent Developments', *Bulletin of Indonesian Economic Studies* 28(3), 3-39.

Trewin, R., Rosegrant, M. and Erwidodo (1995), *Analysis of Growth and Stabilisation Policies for the Indonesian Livestock Sector - A Linked Modelling Approach*, Paper presented at the 38th Annual Conference of the Australian Agricultural Economics Society, University of Western Australia, Perth, February.

Walmsley, T. L. (1998), *Long-Run Simulation with GTAP: Illustrative Results from APEC Trade Liberalisation* , GTAP Technical Paper No. 9, Department of Economics, Monash University, Melbourne.