Impact of Trade Liberalization on Indonesian Food Crops

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Abstract: This paper presents a multimarket food crop supply/demand model for Indonesia and assesses the impact of food crop trade liberalization using the model. The results indicate that a trade liberalization policy would generate substantial net benefits to society because gains to consumers from reduced food expenditures are larger than losses in farm revenues. The net import bill for food commodities increases with trade liberalization due to increased demand for the liberalized commodities. However, because of the strong cross effects from price changes on the production and consumption of other crops, increases in the import bill are moderated. Increases in import expenditures for food due to liberalization are small relative to total export earnings. The results suggest that Indonesia should reduce protective trade barriers for food crops and move towards trade liberalization. Given government concerns with farm income and with potential adjustment problems in the process of liberalization, a possible alternative to full trade liberalization would be to permit free trade in food crops but to institute a moderate import tariff on the most highly protected commodities: soyabeans, sugar, and wheat. Full trade liberalization generates larger net welfare gains than free trade with moderate tariffs. However, a moderate tariff on soyabeans, wheat, and sugar combined with free trade would reduce the degree of distortion of incentives to producers relative to current policies and would rationalize the current system of import controls and regulated transfer pricing that encourages inefficient rent seeking in the distribution of these commodities.

Introduction

Government policy has been a key factor in the rapid growth of the Indonesian agricultural sector over the past decade. Since 1978, the agricultural sector has grown at the rate of 4.3 percent in real terms, while the food crop sector has grown at 5.4 percent over the same period. The largest contribution has been from growth in rice production, which has been achieved in significant part due to government policies, including investment in irrigation and research, extension programmes for new technologies and inputs, favourable input pricing policies, and stabilization of rice prices.

The government has also heavily influenced prices of the other important food crops, particularly soyabeans, sugar, and wheat, through control of imports and intervention in domestic markets. Intervention in maize and cassava markets has been less pronounced. Control of imports of soyabeans and sugar has been used to maintain domestic prices of these commodities far above world prices. For many years, domestic wheat prices were subsidized by the government, but, in recent years, domestic prices of wheat have also moved above world prices. Government objectives in exercising control over prices have included price stabilization, provision of incentives to boost domestic production and farm income, and reduction in foreign exchange costs of food imports.

However, trade protectionism to maintain domestic prices above world prices may entail large costs to the economy. Trade policies that protect some commodities at the expense of others may cause resources to shift from more efficient production activities to less efficient ones. Protective trade policies also penalize consumers through increased domestic prices. Removal of trade restrictions may result in more efficient allocation of resources in production and may increase consumer welfare to a greater degree than producer income is reduced, resulting in net welfare gains to society.

In this paper, the impact of food commodity trade liberalization policies on crop production, farm revenues, consumer food expenditures, and import expenditures is analyzed using a multimarket food crop supply/demand model. The model is briefly outlined, government price policies for major food crops are described, and key impacts of liberalization are presented. General conclusions are then discussed.

Multimarket Supply/Demand Model of the Indonesian Food Crop Sector

In this section, the multimarket food crop demand/supply model is briefly presented. A detailed description of the structure and operation of the model is given in Rosegrant *et al.* (1987, chap. 5). The simplified structure of the food crop supply/demand model is presented in Figure 1. The key components of the model are supply, demand, and government policy.
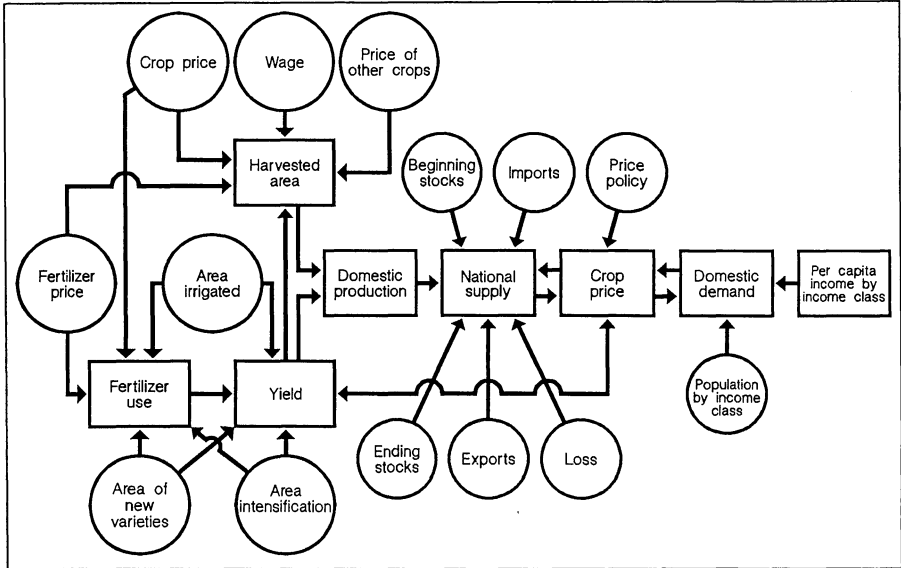

Figure 1—Simplified Structure of the Food Crop Supply/Demand Model

Supply. Total production of five food crops—rice, maize, cassava, soyabeans, and sugar—is determined by fertilizer demand functions, yield response functions, and area response functions estimated for Java and off Java. Fertilizer demand for each crop is estimated as a function of expected crop price, fertilizer price, technology shift variables (such as percentage use of modem varieties, percentage of area irrigated, and percentage of area under intensification programmes) and trend (which represents the effect of unmeasurable technological shift variables). Crop yields are estimated as a function of fertilizer use, technology shift variables, and lagged yield. Area harvested is estimated as a function of expected crop revenues, expected revenues of competing crops, and lagged area. The specification and estimation of the response functions are discussed below.

Demand. Per capita demand for six food crops (including wheat, which is not produced domestically) is estimated as a function of per capita consumption expenditures, own prices of the crops, and prices of complementary and substitute food commodities. Demand functions are estimated for different income classes and regions. Demand functions for maize and soyabean for feed and a demand function for consumption of home maize production are also specified.

Government policy. The impacts of government pricing and investment policies are assessed by specifying the level of investment in irrigation, market intervention policies in support of food crop prices, and government fertilizer subsidies. Under any specified set of policies, area, yield, production, consumption, supply/demand balances, farm revenue, food expenditures, and import expenditures can be projected to the year 2000.

The model can be simulated by fixing import levels and generating market-clearing domestic prices or by fixing domestic prices and generating market-clearing import levels. In determining market clearing prices or imports, Indonesia is treated in the model as a large country in the world rice trade. The world price is, therefore, a function of net Indonesian imports, with the world price increasing as imports increase.

Data and Estimation Procedures

Provincial area, yield, technology, and price data from the Central Bureau of Statistics for 1969-85 were aggregated on a regional basis, including East, Central, and West Java, North Sumatera, other Sumatera, South Sulawesi, other Sulawesi, and other Indonesia. Provincial fertilizer use for total food crops was taken from PUSRI *[reference not provided—eds.]*. Allocation of total fertilizer use to individual crops was based on the annual Survey of Agriculture.

The time series data for the three regions on Java were then pooled, as were the data for the five regions off Java. This procedure permitted estimation of separate supply response relationships on and off Java, while providing for an adequate number of observations for estimation of the functions. Regional dummy variables were included in the area and yield functions, and the functions were estimated using ordinary least squares.

A large number of studies of food demand parameters in Indonesia have been completed. This study, therefore, did not undertake a full-fledged attempt to econometrically estimate a complete set of demand parameters. Instead, the model relies largely on a synthesis of existing studies to develop a set of own- and cross-price and income elasticities for rice, maize, soyabean, cassava, sugar, and wheat.

The elasticities of demand for rice are based on econometric estimates using 1981 SUSENAS *[reference not provided—eds.]* data. These estimates of rice demand parameters from cross-sectional data represent long-run elasticities. The estimated elasticities for rice were thus adjusted downwards to obtain short-run elasticities appropriate for use in the model.

For other crops, already completed demand studies were reviewed (Teklu and Johnson, 1986; and Dixon, 1982). The relationships between rice demand parameters and nonrice demand parameters from these studies were then used to make proportional adjustments from the rice demand parameters to develop estimates of the demand parameters for the other crops. Demand elasticities for all crops are disaggregated by region and income class.

Price Policy for Food Crops

The government has actively intervened in domestic rice markets, maintaining ceiling prices for consumers and farm level floor prices for producers. These have generally been successfully defended through control of imports and domestic open market operations. Rice price policy has resulted in stabilization of domestic prices relative to volatile world prices but has not been highly protective. Between 1972 and 1986, the nominal protection rate was negative in 8 years and positive in 7 years. In 1986, despite historically low world rice prices, the nominal protection rate was only 14 percent.

Intervention in maize and cassava markets has been minimal. Although the government guarantees a floor price for maize, actual farm prices are usually above it. The government occasionally sells domestic or imported maize to dampen seasonal price rises and reduce feed costs. Nominal protection of maize has generally been slightly negative, with domestic prices below world prices. Cassava is essentially freely traded, with domestic prices formed relative to the f.o.b. price to the EC.

Soyabeans have historically enjoyed a high rate of price protection in Indonesia in order to encourage domestic production. From 1984 to 1986, the average nominal protection rate for soyabeans was 40 percent. This policy has tended to shift land from more efficiently produced crops, such as maize and cassava, to soyabeans. Wheat imports and distribution

are under the control of BULOG, the national logistics agency, which sells wheat grain to the three existing flour mills at a government-determined "surrender" price and regulates sale of the flour at wholesale to licenced distributors at a fixed price. In addition to controlling the prices of grain to the mills and wholesale prices of flour, BULOG determines the fee structure of mills. The fee structure permits the mills to recover handling and processing costs plus a "reasonable" profit.

In the 1970s and early 1980s, the government's wheat pricing policy generally entailed a substantial subsidy, with BULOG surrendering wheat to the mills at less than the c.i.f. cost of the wheat. In recent years, with the rapid decline in world wheat prices, domestic prices have moved above the world price. In 1985 and 1986, the domestic price of wheat averaged about 20-30 percent above world prices.

The government uses control of domestic production and marketing of sugar and control of imports to fix domestic sugar prices. In addition to area quotas at the farm level, the government has a monopoly on procurement, marketing, and distribution of sugar. BULOG purchases all sugar from mills at government-determined prices, and sets wholesale and retail prices based on the ex-mill price, marketing costs, and "reasonable profit margins" at wholesale and retail levels. This pricing system has been used to protect the sugar industry at rates as high as 200 percent in 1985, and, in 1986, the nominal protection rate was still at 75 percent following devaluation.

Impact of Trade Liberalization

The multimarket food crop demand/supply model was used to examine the impact of trade liberalization for food crops. Key results are presented here for three scenarios: a base run with domestic prices fixed at average 1984-86 levels, so that the structure of protection is maintained; full trade liberalization for the six crops, with prices phased over a five-year period to World Bank projected 1995 world prices; and trade liberalization combined with a 20 percent import tariff on soyabeans, wheat, and sugar. Summary results of the trade liberalization scenarios are compared in Table 1 to base run results. In addition to the effects of liberalization on farm revenue, consumer food expenditures, and net import expenditures for food, the table summarizes the impact on rice production, prices, and imports, because of the importance of these to Indonesian policy makers. Detailed results for the alternative trade liberalization scenarios are presented in Rosegrant et al. (1987, chap. 7).

The results summarized in Table 1 show that trade liberalization and the reduction in the domestic price of importable commodities to world price levels generate large gains for consumers, while causing smaller losses for producers. For example, under full trade liberalization for the three crops, consumer expenditures are projected to decline by Rp813,000 million in 1995, while farm revenues decline by Rp577,000 million. Farm revenues decline because of the drop in farm prices of the importable commodities that are domestically produced. However, these price changes also induce a shift into other crops, particularly maize and cassava, partially offsetting the loss in farm revenue. Production of nonrice crops actually increases due to trade liberalization. Beneficial adjustments in cropping patterns to changes in prices are probably somewhat understated because not all crops are covered in the model. Therefore, the degree to which farm revenues decline due to liberalization may be overstated. Despite this possible overestimation of farm revenue losses, benefits to consumers from trade liberalization are substantially larger than estimated farm revenue losses.

The net import bill for food commodities increases as demand for wheat, sugar, and soyabeans increases and production, particularly of soyabeans, declines. However, because of the substantial cross effects in production and consumption, the increase in the net import trade bill is moderated. The drop in the price of soyabeans, wheat, and sugar, combined with stable cassava prices and slightly increasing maize prices, causes a decline in domestic demand for maize and cassava and boosts their production, generating increased exports,

Table 1—Summary of Key Results from Trade Liberalization Scenarios

	Base Run: Fixed Domestic Prices	Trade Liberalization for Food Crops	Trade Liberalization with 20-percent Import Tariff on Soyabeans, Wheat, and Sugar
1990:			
Domestic wholesale rice price (Rp/kg)	348	338	344
Paddy production (1,000 t)	42,543	42,503	42,644
Other crop production (1,000 t)	22,839	23,099	22,938
Rice imports (1,000 t)	125	-44	25
Cost of food imports (Rp1,000 million)	930	1,051	972
Net farm revenue (Rp1,000 million)	8,655	8,104	8,424
Consumer food expenditures (Rp1,000 million)	12,578	11,827	12,303
1995:			
Domestic wholesale rice price (Rp/kg)	348	344	349
Paddy production (1,000 t)	47,657	47,331	47,608
Other crop production (1,000 t)	25,951	26,264	26,078
Rice imports (1,000 t)	91	-79	-26
Cost of food imports (Rp1,000 million)	1,157	1,363	1,219
Net farm revenue (Rp1,000 million)	9,874	9,369	9,724
Consumer food expenditures (Rp1,000 million)	14,146	13,390	13,943

which partially offset the direct impact on the import bill. The projected increase in import expenditures for food commodities, at most Rp234,000 million in 1995 under full trade liberalization, is less than 1 percent of total Indonesian export earnings.

The impact of trade liberalization on the rice sector is small. The slight initial decline in the price of rice (about 5 percent) due to liberalization, together with the more rapid decline in prices of the other commodities, induces a shift in demand from rice to these commodities, particularly wheat. This causes a slight drop in rice imports, prices, and production, causing, in turn, a partially offsetting recovery in demand for rice. A new equilibrium in the rice market is reached at slightly lower levels of rice prices, production, and consumption.

Conclusions

This paper has briefly presented a multimarket food crop supply/demand model for Indonesia and assessed the impact of food crop trade liberalization using the model. The results indicate that a trade liberalization policy would generate substantial net benefits to society. The government of Indonesia should reduce protective trade barriers for food crops and move towards trade liberalization.

Given government concerns with farm income and with potential adjustment problems in the process of liberalization, a possible alternative to full trade liberalization would be to permit free trade in food crops but to institute a moderate import tariff on soyabeans, wheat, and sugar, which are currently the most highly protected food commodities. As shown in Table 1, a moderate tariff policy results in smaller net gains from trade liberalization, but the negative impact on net farm revenues is also reduced, and the increase in the import bill is slowed. Import tariffs on these commodities also generate significant government revenues through a relatively progressive tax, since consumption of soyabeans, wheat, and sugar is higher among high income groups.

Full trade liberalization generates larger net welfare gains than a policy of free trade with moderate tariffs. However, a moderate tariff on soyabeans, wheat, and sugar, combined with free trade, would reduce the degree of distortion of incentives to producers relative to current policies and would rationalize the current system of import controls and

regulated transfer pricing that encourages inefficient rent seeking in the distribution of these commodities.

Note

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References

Dixon, J.A. (1982) *Food Consumption Parameters and Related Demand Parameters in Indonesia: Review of Available Evidence*, Working Paper No. 6, Rice Policies in Southeast Asia Project, International Food Policy Research Institute, Washington, D.C., USA.

Rosegrant, M.W., Kasryno, F., Gonzales, L.A., Rasahan, C., and Saefudin, Y. (1987) "Price and Investment Policies in the Indonesian Food Crop Sector," report submitted to the Asian Development Bank, International Food Policy Research Institute and CAER, Washington, D.C., USA.

Teklu, T., and Johnson, S. (1986) "Preliminary Analysis of Demand Parameters for Indonesia," Iowa State University, Ames, Iowa, USA.

DISCUSSION OPENING—*David W. Skully* (Economic Research Service, US Department of Agriculture)

The secondary effects of liberalizing wheat, soyabean, and sugar trade in Indonesia—substitution in production and consumption—can be significant, as the paper demonstrates with respect to Indonesian rice production and use. Clearly, our understanding of the possible consequences of liberalization is enhanced by models that incorporate off-diagonals.

All of us who are involved in measuring government intervention in agriculture and assessing the impacts of liberalization face some yet unresolved issues. Two of these are tangential to Rosegrant's paper. The first problem is, how does one know if a policy is protectionist? At its inception, Indonesia's wheat policy subsidized millers and consumers; during the base run of this paper, however, world prices were low and millers were paying above the world price for wheat. Does this mean that the policy is protectionist?

Any policy that attenuates variations in world prices could be alternatively protectionist and subsidizing, depending on the border price. If a policy is rule governed (no discretion), one can calculate a mathematical expectation of the producer or consumer bias of the rule for a given distribution of world prices. Such a technique would allow us to distinguish ephemeral protection from essential protection.

A second issue concerns the often favourable terms of payment developing countries face when importing agricultural commodities. Indonesia imports much of its wheat from the USA at below-market credit rates. The foreign exchange opportunity cost of such imports is exceptionally low, and, by this opportunity cost criterion, the Indonesian government would not have difficulty pricing "protectively" in the domestic market (and capturing rent). This issue is pervasive when trying to identify the bias of LDC intervention. If full liberalization occurs among the OECD nations, will such exports still be available?

GENERAL DISCUSSION—*Philippe Burny, Rapporteur* (Faculté des Sciences Agronomiques de l'État, Belgium)

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The first remark from the floor concerned the projection results. The differences between the three scenarios—fixed domestic prices, trade liberalization, and 20 percent import tariff—were much less important than expected, or so the verbal presentation indicated (effects on domestic prices, on farm income, on consumer expenditures, etc.). In reply, Rosegrant said that was so because the projection results included the cross-commodity effects (e.g., when the price of rice falls, farmers produce more other crops and exports increase, so rice exports decline but other exports increase). Another point concerned the possible regional implications of that trade liberalization. Rosegrant answered that the main shifts could be seen in the production of sugar and cassava.

On the impact of trade liberalization on rural employment, Rosegrant said that it was not a point of particular interest in his study, but that he will attempt to work on it more thoroughly because it is an important consequence. Concerning the way he dealt with the problem (of assuming trade liberalization instead of the fixation of domestic prices) Rosegrant answered that Indonesia has succeeded in achieving self-sufficiency for rice and so a change in policy can occur. One can take agricultural products one by one to see what happens when the usual policy is removed. Rosegrant also added that trade liberalization would avoid high costs within the Ministry of Agriculture (complicated import control).

Participants in the discussion included R.R. Barichello, A. Siamwalla, F. Tarrett, and A. Valdés.