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CHANGING COMPARATIVE ADVANTAGE IN THAI AGRICULTURE

by

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RÉSUMÉ

Au cours de la dernière décennie, deux faits majeurs ont frappé l'agriculture thaïlandaise : d'abord, la chute brutale (jusqu'en 1988) des prix mondiaux qui a touché les principaux produits agricoles exportés par la Thaïlande, ensuite, la diminution de la surface des terres arables par exploitant agricole.

Pendant cette période, l'économie thaïlandaise a subi un ralentissement du taux de croissance du PNB réel et une augmentation du niveau de pauvreté, premier cas du genre depuis 1963, année où les statistiques sur la pauvreté devinrent disponibles. La coïncidence de ces deux faits économiques importants et leur impact négatif sur l'agriculture a fait croire que l'un était responsable de l'autre. Ce document examine la validité de cette conviction en utilisant un modèle appliqué d'équilibre général, (le THAM-2).

Les simulations démontrent que les effets conjugués des changements survenus dans le secteur de l'agriculture ont profondément marqué l'économie thaïlandaise. A elle seule, une libéralisation du prix du riz aurait permis une croissance réelle du PNB de 2 ou 3 pour cent et, si les politiques économiques avaient été maintenues après 1982, la croissance du PNB aurait été entre 2 et 4 pour cent. Dans le modèle, une mise en relief de la cadence d'expansion des terres a un résultat identique sur le PNB. Il semble que les effets simulés aient influencé le niveau du PNB, plus que son rythme de croissance.

Cependant, que ce soit dans le secteur des prix ou dans celui de l'expansion des terres, les simulations fournissent un résultat surprenant, car il apparaît que tous les facteurs déjà cités n'ont qu'un très faible impact sur la répartition des revenus. Il est curieux que la plupart des explications antérieures sur la détérioration des revenus se réfèrent à la baisse des produits de base. De nombreux observateurs espèrent que le prochain lot de données sur la répartition des revenus sera plus optimiste -- d'autant plus que le prix des produits de base est reparti à la hausse depuis deux ans. Les résultats des simulations indiquent que cet espoir serait tout à fait déplacé.

Les simulations montrent que les changements intervenus dans l'agriculture ont un impact d'une portée beaucoup plus importante sur l'économie, que sur son rôle dans le PNB. Pourtant, le rôle **relatif** de cet impact dans l'économie n'est que légèrement dépendant des facteurs qui viennent d'être examinés. Si l'on considère la croissance relativement élevée de l'économie thaïlandaise, ces changements structurels provoqués par la progression du niveau des revenus et du schéma de la demande semblent avoir eu l'influence la plus déterminante.

SUMMARY

Two key developments affected Thai agriculture in the last decade: the precipitous decline (until 1988) in world prices for the major agricultural items exported by Thailand, and the decline in the amount of cultivable land available for each agricultural worker.

During this same period the Thai economy has experienced a slowdown in the rate of growth of real GDP and an increase in the extent of poverty, the first time this has happened since statistics on poverty became available in 1963. As these economy-wide developments and the adverse changes specific to agriculture coincided, it came to be widely believed that the one is the cause of the other. This paper sets out to examine the validity of this belief, using an applied general equilibrium model (the THAM-2).

The simulations indicate that the effect of the agriculture-associated changes on the Thai economy can be quite substantial. Liberalization of rice alone will increase real GDP by 2 to 3 per cent. Had the world rice price not declined, but the policies maintained intact, the increase in GDP in the post-1982 period would have been between 2 to 4 per cent. In the model boosting the rate of land expansion has a similar impact on GDP. The simulated effects appear to have influenced the level of GDP more than its growth rate.

A surprising result is that the simulation indicates that all the developments cited above, whether on the price side or on the land expansion side, appears to have very little impact on income distribution. It is surprising in that a great deal of past explanation for the deterioration of the income distribution has rested on the decline of commodity prices. Many observers have pinned their hopes that the next batch of data on income distribution will show a rosier picture -- inasmuch as commodity prices have recovered in the last two years. The results indicate that that hope would be misplaced.

It appears from these simulations that changes in agriculture still have a significant multiplier impact on the economy, despite its much diminished role in the GDP. Its **relative** role in the economy, however, is only slightly affected by the factors we have examined. Given the relatively high growth rate of the Thai economy structural shifts due to increase in income levels and the pattern of demand appear to have been the more powerful influence.

PREFACE

In the context of its research on Changing Comparative Advantages in Food and Agriculture, the OECD Development Centre in 1986-89 undertook a series of country studies focusing on macroeconomic and international interactions with agriculture. In addition to this study of Thailand, research was conducted on China, Pakistan, Argentina, Brazil, Mexico, Ethiopia and Ghana. A synthesis of these country studies has been conducted by Sartaj Aziz, and is available as a Development Centre Study.

The purpose of the country studies has been to draw broad policy conclusions which are relevant to policy makers within the country concerned and elsewhere. This study of Thailand is exemplary and provides insights which are relevant to Thai policy makers and a wider audience.

In order to grapple with economy-wide developments, the authors have constructed a computable general equilibrium model. This facilitates the analysis of the interaction of macroeconomic and other determinants -- principally the land frontier and international market developments -- on agricultural performance, while simultaneously providing a perspective on the impact of agricultural performance on Thailand's remarkable macroeconomic record.

The study shows that the exploitation of unused forest land has influenced the level of growth, and that this has offset the impact of declining world commodity prices on GDP. Neither land expansion nor international price movements appear however to have affected income distribution directly; increases in poverty in the 1980s reflected the slowdown in the whole economy (from 9.6 per cent in the 1970s to 5.0 per cent in the first half of the 1980s). Such a slowdown may have been avoided if trade liberalisation (which is estimated to increase GDP by 2 per cent) or land expansion (which has a similar impact on GDP) had been implemented.

By providing a model which is able to mimic the actual history of the various exogenous variables and policies affecting Thai agriculture and its macroeconomic interactions, the authors have developed a powerful policy tool. The analytical approach and the policy insights of their exercise will, we trust, be of interest to a wide audience.

Louis Emmerij
President, OECD Development Centre
Paris, February 1991

I. INTRODUCTION

Thailand is predominantly an agrarian society. Nearly two-thirds of the labour force earn a major portion of their income from agricultural activity. Between 1960 and 1980 the sector grew at 4.9 per cent per annum, and although growth has slackened somewhat in the 1980s, for reasons which we will discuss below, it still remains high at 4 per cent.

Around 1980, the role played by the agricultural sector underwent a transformation, which has had profound consequences for the macro economy and the distribution of incomes and the incidence of poverty. This change was associated with two developments. One was the decline in the rate in which new land was cultivated--by far the most important cause of agricultural growth in the 1960s and the 1970s. The other was the severe decline in world agricultural prices in the first half of the 1980s, which had a significant impact on Thai agriculture, the sector of the economy that is most susceptible to low world prices. As poverty in Thailand is primarily a rural phenomenon, it is frequently asserted that the absolute level of poverty increased between 1981 and 1985, the first time since such data began to be collected in 1963.

It is the purpose of this paper to try to examine the developments mentioned above and determine whether they are actually linked to the consequences attributed to them. A decline in the availability of new and cultivable land would naturally affect Thailand's comparative advantage in agriculture. Changes in world agricultural prices, on the other hand, have to be analysed in the context of tax and pricing policies that could theoretically blunt or enhance the effect of the exogenous price movements on the comparative advantage of Thai agriculture. For this purpose, THAM-2, a general equilibrium model which emphasizes the agricultural sector in Thailand is used.

The next section of this paper provides a brief description of the agricultural sector and major government interventions. This is followed by a brief description of the THAM-2 model and the specification of the base run. Sections 4, 5 and 6 discuss the three sets of simulations and their results. The final section provides a summary of the findings.

II. MAJOR FACTORS AFFECTING THAI AGRICULTURE

1. Dynamics of the Agricultural Sector

One fundamental fact explains the high growth rate of Thai agriculture: an availability of new land for agricultural use. Between 1950 and 1978 Thailand was probably the only Asian developing country in which land area per agricultural worker actually increased, as forests were felled and brought under cultivation (see Figure 1).

A number of factors combined to make this possible. The first was the postwar malaria eradication programme, which made it possible for farmers to settle in what had been formerly uninhabitable land. In most cases, this was in upland areas that were initially used to cultivate maize, the first of the postwar boom crops. The second factor was the introduction of the tractor, which made it possible to cultivate upland areas without having to wait for rain. The use of tractors increased the size of a farm which one family could cultivate, thus augmenting the rate of expansion somewhat. The third factor was the rapid expansion of the road network beginning in the late 1950s, which made the marketing of the products of the land economical.

The rapid increase in agricultural production was probably a major factor explaining the high growth rate of the economy, which expanded at an annual rate of 7.4 per cent between 1960 and 1980, but which slowed down somewhat to 7 per cent per year between 1980 and 1987. Accompanying a rapid growth in incomes, there was a decline in the share of agriculture in the gross domestic product (GDP) from about 24 per cent in 1970 to about 15 per cent in 1987 (Table 1).

The pattern of growth in Thai agriculture associated with the expansion of cultivated land is an important factor explaining changes in composition of crops. The share of value-added of rice in total crop production which in turn comprised approximately three quarters of total agricultural production (see Table 2), declined from 48 per cent to 37 per cent between 1970 and 1987, while the share of upland crops--most of which are exportables--expanded correspondingly.

2. Policies Towards Agriculture: Sector Policies

Government policies towards agriculture (particularly towards rice) in the postwar period have gradually evolved from penalising agriculture towards a more neutral stance. Because of the export orientation of Thai agriculture, the most convenient instruments were border measures. There were no less than three different impositions on rice exports: the rice premium, an export duty and a requirement that exporters sell a proportion of their rice exports to the government at below-market prices. In addition, during most of the period there was a quantitative restriction on exports, ostensibly to create a cartel of exporters. The combined impact of all these measures kept domestic rice prices well below, sometimes as much as 50 per cent below, world prices. Another result of these measures was that real domestic price of rice (particularly after 1965) was largely stabilized.

A similarly heavy burden was placed on rubber exports through a variable export tax which at times rose to 25 per cent of the world price. Maize was subjected to a different sort of intervention aimed at ensuring supplies for the Japanese and Taiwanese markets. However, the net impact of this intervention was quite small. Cassava exports were completely free until a voluntary export restraint agreement with the European community in 1980 led to heavy doses of intervention aimed at keeping the exports below the agreed figures.

Sugarcane is a special case, for Thai sugar has been protected since the early postwar period when it was imported. The protection continued even after Thailand became one of the world's major sugar exporters. Sugarcane growers--dominated by very large growers--are extremely well organised while the concentration of the milling industry facilitates measures which, in effect, require the mills to tax domestic consumers in order to subsidize exports.

With the exception of sugar and cassava, the trend in the 1980s was toward a reduction of these interventions. In the case of rice this could be interpreted as a response to falling world prices. Domestic price stabilization would have required much of the export burden to be removed in any case. However, it would be incorrect to interpret the gradual elimination of export taxes from 1982 to 1986 as a continuation of the previous policy of price stabilization because the reversal of price trends in 1987 did not lead to a reimposition of these taxes. A significant change appears to have taken place in the political economy of agricultural price policies sometime in the 1970s. Political trends which began to shift in favour of farmers and away from urban consumers were followed by actual changes in policies whose impact began to be felt in the 1980s (Siamwalla and Setboonsarng 1989).

3. Policies towards agriculture: Macro policies

As is now well known, the returns to a particular sector will be affected not only by own-sector policies, but by policies towards other sectors and by general macroeconomic policies (Krueger, Schiff and Valdes 1987). Thai agriculture is no exception. The import substitution policies, in effect since the early 1960s, led to an implicit taxation of the unprotected tradable sectors of which agriculture is the main component and therefore not penalised. In our earlier calculations (Siamwalla and Setboonsarng 1989), a figure equivalent to an export tax of about 10 per cent for all tradable agriculture was found for most of the period 1960-1985.

In addition to the import substitution policies, agriculture could have been adversely affected by poorly designed macroeconomic policies. By and large, Thai macroeconomic management has always tended to be conservative with the result that inflation has been kept well under control. The nominal exchange rate for the baht with respect to the dollar, for example, was maintained at the rate of between 20 to 21 baht for a remarkable length of 27 years (1954-1981), without any need for major foreign exchange controls and import restrictions other than through import tariffs.

This fairly high standard of macroeconomic management began to falter in the late 1970s and early 1980s. An easy access to commercial bank loans, the installation of a government with an expansive philosophy and the habit of tying the baht to the dollar led to a decision to finance the second round of oil price increases by the treasury, instead of passing on the burden to the economy. Consequently, after foreign indebtedness soared, there was an inevitable period of adjustment imposed by the International Monetary Fund (IMF). The adjustment period began in 1982, but by the time world oil prices dropped in 1986, most of the painful measures had been taken. Thailand was in some respects better placed than other developing countries in that the loan-financed spending binge began later (late 1970s), and it adopted the IMF-imposed measures with less reluctance. By 1986, Thailand was poised for the boom in which its growth rate reached double-digit levels in the last three years of the 1980s.

The impact of these macroeconomic factors on agriculture was felt largely through the changes in exchange rates, or rather, agriculture suffered to some degree from the government's delay in making exchange rate adjustments. The baht was devalued *vis-à-vis* the dollar by 10 per cent in 1981, which turned out to be insufficient, and in any case was soon negated by the revaluation of the dollar *vis-à-vis* other currencies. A second devaluation of 15 per cent followed in 1984. Although at the time of the devaluation, the currency was to be tied to a basket of currencies, when the dollar began to decline in the middle of 1985, the basket was adjusted to be mostly dollars, in effect equivalent to a third devaluation which exceeded the first two by a substantial margin. Although these three devaluations have helped Thai agriculture (they apparently have had an even more dramatic impact on manufactured exports), the failure to adopt adjustment policies in the period between 1980 and 1984 caused it great harm.

III. THAM-2 MODEL AND SIMULATION SPECIFICATIONS

This section provides a brief description of the model and the three basic scenarios. Specific references for different parts of the model are referred to in the discussion.

1. General Description of THAM-2

THAM-2 (Thai Agricultural Model version 2) is an applied general equilibrium model of the Thai economy which emphasizes the agricultural sector. This model has been developed at the Center for World Food Studies since 1977 as part of the effort of the International Institute of System Analysis (IIASA). Therefore, it has the basic features of the IIASA type model. The model is designed for evaluating the medium- and long-term impacts of government policies.

There are two main components in the model: the supply component and the exchange component. The supply component is further divided into the production activity with a lagged price adjustment (most agricultural commodities) and the production activity where output is adjustable within a year (most non-agricultural products).

The output produced by both types of production activities are brought to the market. The exchange component of the model describes how each market clears. This includes the influence of government policies on the market clearing mechanism both directly (e.g. commodity-specific policies) and indirectly (macro-economic policies).

a. Regions and commodities

To represent the variations in agricultural production in Thailand, the country is divided into 5 main regions: Northeast, North, Central, South and Bangkok. For each region, 20 agricultural commodities, one tradable non-agricultural and one non-tradable non-agricultural commodity are recognised. The agricultural commodity and traded non-agricultural commodity market are cleared at the national level. Each non-tradable non-agricultural commodity is produced and consumed within the region. Therefore, there are 26 markets to be cleared in the model: 21 at the national level and one in each of the five regions (See Appendix A).

In what follows, what will be termed as the four major commodities are rice, sugar, cassava and rubber.

b. Actors and Their Behaviour

There are three main groups of actors in the model: the producers, household groups and government:-

Producers. Producers are atomistic profit maximizers of each commodity, responding to the prices lagged by one year. For each region, a separate linear programming model describes their production plan and, consequently, the resource allocation within it. Resources are allocated between activities to produce commodities under a given technology for the purpose of maximization of the farm's net revenue.²

The production of the non-agricultural commodities is based on the capacity of that particular sector which is, in turn, determined by its capital stock and investment.

Household categories. In each region, except Bangkok, households are classified into six categories: three classes of agricultural households (small, medium and large farmers) and three classes of non-agricultural households (low, middle and high income). The agricultural households of the North and the Central regions, are each further divided into two sub regions: Upper North and Lower North; Central Plain and East-West Region. Bangkok has no agricultural households. Thus, there are 33 categories of households in the model (See Appendix A).

Each category of households earn its income from the ownership of a factor of production.³ The consumption and investment expenditure on each commodity by each class of households depends on its income. A fixed budget share is assumed in the present version of the model.⁴

A commodity produced in one region can either be consumed directly in a region or sold to other regions, depending on its price. For tradable commodities, the market is cleared at the national level. For the non-tradable non-agricultural commodities, the price will be adjusted within the region. The adjustment in the price of commodity will affect the income of the class that produces and sells that commodity. This change in income will effect the consumption and investment expenditures on commodities consumed by this class of households and consequently the income and consumption of other households.

Government. The government earns its income from taxes and uses the revenue for public consumption and investment. The behaviour of the government is such that if the revenue falls short of expenditures, the first line of action is to borrow from abroad. Once this reaches a ceiling, the government will resort to increased taxes as a second line of defence. If this is still insufficient, the government will cut its expenditures.

The behaviour of these three groups of actors defines the behaviour of the market clearing mechanism in the economy. Nationally, a commodity is allocated to its end uses: intermediate usage, investment and final demand, according to the price level of that product in each location. This implies that each commodity in the model has only one clearing price.

The national market links with the international markets through imports or exports. The world price of tradable commodities is taken as given (the small-country assumption). The world price, together with the exchange rate will then determine the clearing price that equilibrates the national market for that commodity. This clearing price will determine the price of each commodity in each region and at each level: producer intermediate usage and final consumer prices.

In clearing the market, the model allows each commodity to switch from one price regime to another, e.g. from import regime to autarky and to export, or the reverse.

The set of clearing prices which brings about equilibrium in all markets is the solution of the model. The model is set up as a nonlinear program in which the

economy is maximizing total revenue subject to world prices, household budget, government budget and balance of payment constraints.

2. The 1978 Social Accounting Matrix

The basic set of information for the model is a social accounting matrix (SAM). Data were available to construct a SAM for 1978. The allocation of farm income to each farmer household group is based on the pattern of land holding reported in the Agricultural Census of 1978. The non-farm income and expenditure pattern and farmers' expenditures are based on the information from the 1975-1976 Socioeconomic Survey. (The description of the 1978 SAM can be found in Kennes and van Veen, 1988 and 1987.)

3. Base Run

Once the model is calibrated to reproduce the base year SAM (1978), actual values for all exogenous variables for 1978-1988 are used to simulate the behaviour of the economy during that period. This is the first part of the base run. It is found that there are short-run fluctuations in some economic variables (e.g. balance of payment and foreign borrowing) that the model cannot pick up. This leads to some discrepancies between the results from the base run and the values actually observed. However, the base run is able to predict changes in direction in the medium term. This suggests that the strength of the model is in providing medium-term impact.

The second part of the base run is the simulation to 1995. For this simulation, forecasts of exogenous variables from other studies are used. Thus the World Bank commodity price forecasts for 1990 and 1995 are used in the base run. These prices are adjusted to the same definition used in the THAM-2.

To facilitate discussion of the results of this model, five aggregate variables are inspected.

Aggregate price index. This is the Laspeyres index of the nominal farm-gate price of all agricultural commodities in the model, with 1978 as the base year. In other simulations the 1978 figure in the base run is still used as the base for the index.

Figure 2 shows that for the base run the price index increases rapidly from 1978 to a peak in 1981 and declines slightly until 1985. The nominal price of agriculture products then rises steadily until 1995 except for a drop in 1990.

Aggregate output index. This is a Laspeyres index of total agricultural products with 1978 (base run) as 100. The base run indicates this index increases steadily from 1978 to 1995. During the 1981-1985 period when the price of agricultural products declines, the growth rate appears to be smaller but is still positive (see Figure 2).

Trade deficit. The trade balance is the difference between the values of exports and imports. Thailand has a negative trade balance (trade deficit) throughout the period. The larger number here thus shows an increase in trade deficit. The trade deficit index in Figure 2 shows that the deficit drops in 1981 when the world prices of

most agricultural product rise in the world market. Since 1981, the deficit increases steadily. This coincides with the general decline in the world commodity prices. There are two exceptions in 1985 and 1987 when agricultural commodity prices were favourable.

Gross domestic product index (GD). The value in year t of this index is the real value of GD in year t divided by real GD in 1978. There is a relatively more rapid rate of growth of GD during recent years (See Figure 2).

Income distribution. Income distribution is depicted by the ratio of real income of each household group to that of national average. There is an increase in the absolute real income of each household group. At the same time, there is a steady decline in the ratio between the real income of each farm household to the national average. This indicates that there is a steady decline in relative income among farm households in all regions (Figure 3). This implies an increase in this index among the non-farm households. There is a steady increase even for the poor household group in Bangkok. By 1995, the poor group in Bangkok is close to the national average while small farmers in the Northeast, the poorest household group, has about one quarter of the national average (Figure 4).

Within each region, the relative income of the poorer households, both farm and non-farm, declines relative to that of the higher income group.

4. Specification of the Simulations

In order to gain insight into the change in the comparative advantage of the Thai agricultural sector in the long run, it is important to understand the role of three major factors: government policy, world prices and increase in cultivated land. The next three sections of this paper describe the specification of three main simulations:

Liberalization of four major agricultural commodities. To simulate the impact of government intervention on the four major crops, all trade barriers for each commodity are abolished for all periods. In general, the traded world price of each commodity is used as its border price.⁵ Quantitative control measures are also abolished. For rice, the export premium, export duty and rice reserve requirement are all abolished. For rubber, both the export duty (which is *ad valorem*) and the *cess* (which is a specific tax) are abolished. For sugar, the two-price system under which consumers subsidize losses in exports is abolished. Domestic production and consumption are now determined by world prices. For cassava, aside from removing the export subsidy to the non-EC market, its world price is also changed from the base run. It is assumed here that the EC, the main trading partner for the cassava trade, has also abolished its Voluntary Export Restraint (VER) on Thai cassava. As a result of these two actions, the price of cassava drops to about one-third⁶ (Setboonsarng and Tyers, 1988). This change affects the world price of cassava starting in 1982 when the Voluntary Export Restraint (VER) was imposed. In doing the simulation, we examine the impact of liberalization of each commodity individually, as well as a simultaneous liberalization.

Disallowing the decline in world prices. The Thai agricultural sector is very much exposed to the world market. This simulation aims to analyze the impact of the general decline in the world commodity prices, particularly after 1981. For the simulation, the world prices of four major crops: rice, rubber, coarse grain and sugar are held, constant at the 1980-82 average price, between 1978-1988. After 1988, the

forecast world prices are used. Therefore, the effect of constant world prices is relevant only during 1978-1988.

Note that the cassava price has not been held constant in this simulation. This is mainly due to the fact that since 1985 Thailand has had an export subsidy under the Voluntary Export Restraint (VER) which causes a divergence between the trade prices received from the EC and non-EC markets. Specification of a constant world price becomes complicated.

Keeping the rate of expansion of cultivated land constant. Expansion of cultivated area was a major factor that supported growth in agriculture, especially during 1960s and 1970s. Since 1978, there has been a decline in the cultivated area per agricultural worker (TDRI, 1987). This decrease in the availability of cultivated area affected the structure of the agricultural sector during 1980s. This impact is expected to be more pronounced in the future.

In this simulation, the rate of expansion of cultivable land in 1978-1995 is allowed to increase at the same rate of that between 1971-1974. The simulated result will yield the level of production, prices, etc., if the land constraint had remained unchanged. The result of the land restriction can then be calculated. For the specification of this simulation, the maximum cultivated area for three types of land, lowland, upland A and upland B are allowed to increase at the 1971-1974 rate. Utilization of this land is determined by technical and economic factors.

The trade liberalization of the four major crops is also simulated under the assumption of constant world prices and expansion of cultivated land to discern the cross effects of government policy.

IV. ABOLITION OF TRADE INTERVENTIONS IN MAJOR CROPS

The impact of liberalization of these four commodities, individually and together is evaluated by comparing the result from each liberalization simulation run to the base run. The results are presented as an index of the base year and rate of change from the base run in Tables 3 to 10 (at the end the paper). Figures 5 to 10 graphically show the percentage deviation from the base run for 6 variables (aggregate price index, agricultural output index, export index, trade deficit, GD and real income of the farm households) for each simulation.

1. Rice Liberalization (Simulation II)

Since the export tax on rice depresses domestic prices, its abolition increases the farmgate price of rice by about 56 per cent in 1978 and 1981. Since 1982 it increases by about 5-7 per cent. There is a sharp difference because since 1982 there has been a considerable liberalization of the rice trade and therefore the difference between the simulated run and the base run is relatively small.

The increase in the price of rice induces an expansion of its output. The expansion around the Central Plain area is relatively greater because of its proximity to the port. This induces a decrease in the production of sugarcane. The aggregate price and output indices, however, go up after the liberalization of rice.

The increase in income induces a higher consumption of meat. Although there is an increase in the production of coarse grains, domestic consumption increases faster and takes away some coarse grains from exports. Thus the exports of coarse grains decrease slightly. To match this increase in the use of energy-based feed, its complementary input, protein feed, which is already in deficit, is augmented. For example, there is an increase in the import of soybean meal.

Imports of other meats which are more costly to produce domestically increase. The import of bovine meat increases as much as one third in some years. This impact is large for each particular sector but the affected sectors are small and the impact on the economy as a whole is limited. The big item is the import of tradable non-agricultural products which comprise a 20 per cent share of the GD. The rise in income stimulates the consumption of the tradable non-agricultural sector by as much as 3-6 per cent. This increase contributes significantly to a trade deficit (over 20 per cent during 1979-83 and 17-20 per cent during 1984-95).

The overall impact of liberalization is positive. GD increases (relative to the base run) by 1.5-4 per cent during 1978-84 and 2-2.5 per cent during 1985-95. Real income per capita increases by 6-8 per cent during 1978-84 and about 6 per cent during 1985-95 as a result of trade liberalization. The liberalization also benefits farmers in the Central Plain; their real income improves relative to the national average real income. Non-farm households in the Northeast are slightly worse off while Bangkok gains more than all other household groups.

2. Rubber Liberalization (Simulation III)

As a result of the abolition of the export tax and the cess, the price of rubber at the border and at the farmgate increase by about 10-22 per cent. Rubber is a tree crop and its production response lags behind price changes. The output of rubber

starts to respond to price changes only in 1981. The repercussion on palm oil, is very small.

There is an increase in the export of rubber. However, the trade deficit increases by about 8 per cent during 1978-81, for the same reason as that discussed under the simulation of rice liberalization. From 1982, the trade deficit increases by about 2 per cent when rubber is liberalized. As for overall welfare, the GDP increases by 0.1 per cent.

3. Sugar Liberalization (Simulation IV)

Because sugar producers are supported by an implicit tax on consumers, without the intervention, both the farmgate price of sugarcane and the retail price of sugar decrease. This price change induces a decrease in its production (about 10 per cent in 1980-81, 30 per cent in 1984-85, 45 per cent in 1986-88 and about 25 per cent in 1989-95) and an increase in domestic consumption. These two factors lead to a significant drop in exports of sugar.

Most of the land withdrawn from sugar production goes into rice production which is an export crop. There is also a slight increase in the production of protein feed, which is an import commodity. The increase in exports of rice plus the decrease in imports of protein feed contribute towards an improved balance of trade.

Sugarcane farmers are usually "large" farmers. The decrease in their income reduces their consumption. Since a higher proportion of their expenditures are allocated to tradable non-agricultural products, the decrease in their income led to a decrease in the consumption of tradable non-agricultural products and consequently a decrease in their imports. This leads to a decrease in the trade deficit, ranging from about 20 per cent in 1979 to 1 per cent in 1990.

In terms of the overall impact, there is a slight decrease in GD (about 0.4-0.6 per cent) because of the abolition of the support on sugar. The real income per capita declines by about 1 per cent. In terms of income distribution, farm households in the East-West region become relatively worse off compared to the national average. Households in the rest of the economy gain slightly.

4. Cassava Liberalization (Simulation V)

Prior to 1985, the export control system on cassava was equivalent to a 2-4 per cent divergence between the world trade price and the border price. Without this intervention, the border price increases and consequently its farmgate price also

increases. Since 1985, the Voluntary Export Restraint (VER) prevents the world price from falling and makes the price of cassava higher than without VER. This leads to a low cassava price in Thailand. Between 1986-1995, the farmgate price of cassava falls by 22-29 per cent after liberalization.

The increase in the price of cassava prior to 1985 (relative to the protected level) induces an increase in its output and export. However, after 1985 the price of cassava falls and consequently, also the output of cassava. Cassava output decreases by about 15-29 per cent. Since all cassava produced is exported, the

decline in cassava exports directly affects total export earnings.

Average income per capita also declines. The decrease in income leads to a decrease in imports of tradable non-agricultural products. This effect overwhelms the effect of the reduction in cassava exports; resulting in an improvement in the balance of trade, but in aggregate, the GD still declines by about 1 per cent.

In terms of income distribution, the result shows that real per capita income decreases for all income classes, except for the large farmers. Therefore, income distribution is worse when the cassava intervention is removed. It should be noted here, however, that the impact arises from the abolition of the CAP in the EC, rather than a change of government policy in Thailand.

5. All Four Crops Liberalized (Simulation VI)

The effect of simultaneously liberalizing all four crops is the same as liberalizing each individual commodity⁷: increases in the prices of rice and rubber and decreases in the price of sugar and cassava received by the farmer. This is because the world prices of these commodities are fixed. However, there is a slight difference of its magnitude due to the change in processing and transportation cost which are non-tradable goods associated with each commodity. In the aggregate, there is an increase in the prices of agricultural products after liberalization.

The production adjustment is more interesting. The higher price of rice and lower prices of sugar and cassava after liberalization stimulate an increase in rice production that is greater than just removing its own export tax. Rice replaces sugarcane, especially in the East-West region. The output of sugar decreases even more than in the case of own liberalization. The effect of cassava liberalization is felt only after 1984 when the VER and export quota system are abolished. Its effect on sugarcane is small. The output of sugarcane does not drop as much compared to the earlier period. The production of rubber increases more than in the case of its own liberalization after 1984. This is due to the expansion of rubber cultivation in the East-West region.

There is an increase in the GDP which can be roughly divided into three periods 1978-84, 1985-88 and 1989-95. The impact of liberalization is greatest in the first period when GDP increases by about 1-4 per cent. The GDP improves by 1.2-1.6 per cent during the second period and by only 0.4-1.2 per cent during the third period.

There is a general improvement of real income per capita across household groups. However, there is only a small change in term of change in income distribution.

The rate of change in GD from each of the liberalization runs in Figure 9 shows that rice liberalization has the largest positive impact. Liberalization of sugar and cassava has a negative but not large impact on GDP. Liberalization of rubber has a small negative effect on GDP.

In terms of income distribution, farm households in the East-West region are worse off because of the lower prices of sugarcane and cassava. Farmers in the South are better off because of the rubber liberalization. In the aggregate, Central Plain farmers benefit considerably during the earlier period (1978-81). However, the

gains from liberalization are about equal for all farm households, about an 8-9 per cent increase in real income compared to the base run case. The gains by the farmers are at the expense of the non-farm households, especially households in Bangkok.

The increase in income induced by liberalization stimulates the increase in the consumption of meat and tradable non-agricultural products. The increase in the demand for meat stimulates its production, especially commercial poultry. The expansion of commercial poultry increases the demand for animal feed, e.g. coarse grains and protein feed. Since coarse grains are exportable and protein feed is an importable, this increase in domestic consumption had an adverse effect on the balance of trade. However, a more important factor in the worsening the balance of trade is the increase in the imports of tradable non-agricultural products.

The combined impact from intervention shows that the government is shifting the emphasis away from export trade controls. However, there is increased control of imported commodities, for example, the import of soybean meal.

It should be noted that there are indirect interventions in the agricultural sector that are not included in this analysis. Trade policies for the non-agricultural sector (e.g. import tariffs of the manufacturing sector) and general macro policies (monetary and fiscal) have a negative and even larger impact on the agricultural sector than direct agricultural policies (see Siamwalla and Setboonsarng, 1989).

Although agricultural output expands throughout this period, its share continues to decline. There is a change in the composition of the agricultural sector that requires government attention. One particular trend is the increase in the share of the livestock sector in response to the increase in income and degree of urbanization. The livestock sector will require more attention in the next decade to take advantage of the sector's relative strength in Thailand. The increase in livestock production demands more animal feed. There is an increase in domestic consumption of coarse grains and in imports of protein feeds. The competitiveness of livestock production in Thailand lies in coarse grains, not protein feed. Given the rapid increase in the demand for coarse grains, Thailand is moving up rapidly along its supply curve and slowly eroding its competitiveness in livestock production. Beef imports are already increasing; exports of poultry will give way to domestic consumption because of increases in income.

V. SIMULATING THE EFFECTS OF WORLD PRICE DECLINE

The decline of the world commodity market after 1981 influenced not only the agricultural sector but the rest of the economy. To evaluate the impact of declining world prices, two simulations have been done, one with existing government interventions and one without. World prices are held constant only for 1978-88. After 1988, the forecasted world prices are used.

The effect of the decline in the world prices of agricultural commodities on Thailand during 1978-88 can be determined by comparing the result of the first simulation with the base run result. By comparing the result of the second run to the base run, the impact of trade liberalization can be seen when world prices are held constant. The results from these two simulations are presented in Figures 11-15.

1. Constant World Prices With Existing Intervention (Simulation VII)

The constant average 1980-82 prices for all four major products are higher than their existing prices. The price of rice increases by about 10 per cent in 1982 and 61 per cent in 1986 when world prices are held constant. However, the world price of rice becomes higher than this constant level in 1989.

The price of coarse grains fluctuates more widely than the price of rice. At constant 1980-82 prices, the farmgate price of coarse grain is 24 per cent higher than its actual price in 1982. The difference becomes larger after 1984. In 1986, the difference is 127 per cent. However, the actual world prices started to rise after the drought in the United States in 1987 and by 1989 the actual world prices were greater than the average of 1980-82 prices.

Given the existing protective scheme for sugar, at a constant world price of exported sugar, the farmgate price in 1982 is 20 per cent lower than the world price. This price difference is greatest in 1985 (77 per cent). Then it tapers off until 1989 when the world price becomes higher than the average of 1980-82 prices.

The price of rubber shows the same pattern as rice and coarse grains; the difference being large during 1985-87. However, as the world price increases because of the growing need for natural rubber, this difference becomes very small in 1988.

With higher prices, the output of each commodity rises. However, this simultaneous increase in prices makes the relative change become smaller, especially of rice, coarse grains and sugarcane. For example, in 1986 the price of rice increases by 61 per cent. Its output in 1987 increases by only 6.7 per cent. This is because the price of coarse grains increases by 127 per cent in 1986. Hence it is able to attract resources away from rice production. The output of coarse grains increases by 20 per cent in 1987. In the South, the production of rubber even declines in spite of the increase in its price during 1985-88. Rice cultivation is able to attract labour from tapping rubber trees because the price of rice increases by 61 per cent compared to a 30 per cent increase in the price of rubber. However, in the aggregate there is an increase in the output.

The increase in agricultural output leads to an increase in exports. The balance of trade also improves considerably because of the rise in exports. The trade deficit decreases by 33-53 per cent.

It is interesting to note that when compared with the simulation in the previous section, it is found that at constant world prices there is a decline in the trade deficit but when the country simply liberalizes, the trade deficit becomes larger. This is because at constant world prices the traded price increases, i.e. Thailand has better terms of trade. In the case of liberalization, Thailand still gets the same world price but there is a reallocation of tax revenue from the government to farmers. As the farmers have a higher marginal propensity to import, the trade deficit increases.

The expansion of output leads to an increase in GDP. GDP is shown to increase by 3-5 per cent during 1985-88 if world prices remain constant at the 1980-82 level. Real income per capita increases by about 1-2 per cent. This implies that the distribution of benefits from the increase in the prices of agricultural products is unevenly distributed.

2. Constant World Prices Without Government Intervention (Simulation VIII)

At constant world prices and without government intervention, the prices of rice and rubber increase even more than in Simulation VII and the prices of sugarcane and cassava drop relative to that simulation.

These price changes induce a further increase in rice production. Coarse grain production falls from the previous case because rice is now more attractive. The output of sugar, which shows a small increase in the previous case, falls below the base run level without the protection of the government. The output of cassava falls as much as 28 per cent without the VER and no government control.

The increase in the export of rice still helps to improve the balance of trade. The level of trade deficit is reduced by 19 per cent in 1986 compared to the previous case where the reduction is 53 per cent.

For the economy as a whole, if world prices are kept constant trade liberalization is preferable to the existing system of intervention. With liberalization, the increase in GD is about double what it would be with existing intervention. Real income of farmers is also higher without intervention.

In summary, it has been shown that the decline in the world prices has had a substantial impact on the Thai economy. This decline reduced the revenue from exports as well as the income of farmers. Government intervention has been reduced during this period of low agricultural prices. This reduces the impact of government policies during the low-price period.

VI. EFFECTS OF INCREASING CULTIVABLE LAND

In the two simulations which follow, the rate at which land has been converted to potentially cultivated area for each type of land is at the same rate as in 1971-75. In some regions, particularly the upland area in the East-West region, the increase is greater than others because there is more land that can be used for cultivation. The Central plain, on the other hand, has very little land area that can be turned into new cultivable land.

Two simulation runs are discussed here, with and without government interventions. The results of the simulations are given in Figures 17-22.

1. Increasing Cultivable Land With Existing Interventions (Simulation IX)

There is an increase in the production of cassava and kenaf in the East-West region as there is more land available in this region. The output of cassava increases 6 per cent in 1979 and rises more than 30 per cent from 1981 to 1995. The production of kenaf also increases by 30-40 per cent during the same period. The increase in the production of coarse grains fluctuates between 5 to 17 per cent during 1983-95. Production of rice also increases 2-5 per cent. The rise in production of exportable crops like rice, cassava and coarse grains, increases their exports.

The increase in availability of land increases the real income per capita for almost all classes of household. The real income per capita for the whole country increases by about 2.6-3.2 per cent during 1983-95. Higher real per capita income induces an increase in the consumption of all goods and services. There is an increase in the demand for higher-valued food products, e.g. meat, vegetables and fruits. Since most fruits and vegetables are produced and consumed domestically, an increase in demand increases their prices and induces an increase in their production. To increase the production of meat, the derived demand for animal feed, both coarse grains and protein feed grows considerably. The increase in the production of coarse grains is partly absorbed locally. Therefore, exports do not appear to increase very much. The increase in the demand for protein feed also encourages an increase of its imports.

The increase in the consumption of tradeable non-agricultural products induced by the increase in income makes the trade balance improve only slightly (6-8% during 1980-1982 and 0.6-0.8% during 1986-1995) or even worsening it slightly (0.6-1.4% in 1985-1986).

In aggregate, there is an increase in the GD by 2-4 per cent when more land is available. Although real income per capita is higher than the base run for all income groups, the households in the South and Bangkok are relatively worse off because their income does not increase as fast as other household groups.

2. Increased Cultivable Land Without Government Intervention (Simulation X)

Without trade restrictions world prices and farmgate prices of the four major commodities will change. The availability of land permits an increase in the production of a commodity whose price increases -- notably rice. The production of rice increases by 10-15 per cent from the base run. This is about twice as large as the case with the existing intervention. The production of sugar declines by 10-50 per cent. There is less cassava production compared with the case when there is government intervention and the CAP in the EC.

There is a large increase of rice exports. However, there is also an increase in imports of protein feed and bovine meat because of the increase in their demand. With the increase in imports of tradable non-agricultural products, the trade deficit is greater than when there is no policy change.

GDP increases by 4-10 per cent, about twice the increase than when there is government intervention. This is because more of the potentially cultivable land is put into use. Cultivating more land without a better incentive system is shown to have limited value.

In terms of income distribution, farm households are relatively better off than the non-farm households. Farmers particularly in the East-West and Northeast regions, are shown to benefit less without government intervention because in liberalization the price of cassava drops considerably and makes it becomes less profitable to till the additional land.

These two simulations show that increasing the cultivated land is an important factor that stimulates growth in the agricultural sector. These results also shed light on the impact of the stagnation of cultivated area. The simulation results suggest that if the existing policy is maintained, income of farm households will decline and the disparity of income will increase between farm and non-farm households and between urban and rural households. With lower income the domestic demand for higher value food items like meat, fruits and vegetables will also decline.

VII. IMPLICATIONS OF THE SIMULATION RESULTS

The discussion of the nine simulations in the previous sections focuses on the result of each run. To highlight the implications of these runs, the three basic simulations, the liberalization of all four crops, the results of holding world prices constant and maintaining of the rate of increase of cultivable land are first compared and then its implications for comparative advantage is discussed.

1. Comparing effects of the three base simulations

Aggregate price index. The aggregate price index and its rate of change from the base run for the three simulations is given in Table 3. The rate of change in Figure 23 shows that increasing the area of cultivated land has a relatively small impact on prices, liberalizing the four major crops has a small negative impact, and keeping world prices constant has a large positive impact during 1982-88. Given the way we have set up the problem, this result comes as no surprise. However, these price shifts lead to other consequences which are now discussed.

Aggregate output index. The aggregate output index and rate of change from the base run is given in Table 4. Figure 24 shows that increasing the area of cultivated land has the largest impact on the aggregate production of agricultural products. Keeping world prices constant and liberalization of the four crops will not affect aggregate output indices greatly because substitution among crops tends to offset its effect.

The simulation in which the area of cultivated land is increased suggests that a decrease in the availability of land erodes the comparative advantage of crop production. Livestock (particularly poultry and pork) and fruit and vegetable production, which use less land, actually stand to gain from limits on available land.

Exports. The index of export value and its rate of change from the base run is given in Table 5. Figure 25 shows that the value of exports drops after liberalization. This is caused by the decrease in the price and quantity of cassava exports. Exports increase most significantly under constant world prices because the increase in its price also induces the increase in the quantity of exports. Exports rise steadily in the case of increasing the area of cultivated land.

Balance of Trade The index of the value of exports and its rate of change from the base run is given in Table 6. Figure 26 shows that the balance of trade improves only for the case of constant world prices. The increase in exports when there is an increase in cultivated land does not improve the trade balance. This is because the increase in income induced an increase in imports of meat and tradable non-agricultural products.

Incomes. Real GDP and its percentage deviation from the base run is given in Table 7. Figure 27 shows that the impact of constant world prices is the largest. The decline in the supply of land is the second most important cause of the decline in GDP. Government intervention has the smallest negative impact on GDP. Since GDP is closely associated with household income, this result suggests that the decline in the world prices and the exhaustion of the land frontier keep down the growth of the household income. In 1986, the worst year, GDP declined by 5 per cent because of the decline in prices, 3.2 per cent because of lack of new land and 1.3 per

cent because of government intervention.

Farm income is affected more than the average income. Non-farm households are relatively better off, especially Bangkok's. The disparity of income increases in all cases, but not by a great deal.

2. Changing Comparative Advantage

The base run result shows that the share of agricultural sector will continue to decline as the industrial sector maintains its high growth rate and the agricultural sector grows less rapidly. By 1995, the share of agricultural sector will be reduced to about 10 per cent.

Since industry is one single tradable non-agricultural sector in this model, it is not possible to trace the impact of specific industrial sector policy on the agricultural sector.

Within the agricultural sector, the production of livestock is gaining in importance. On the demand side, the increase in incomes and degree of urbanization increase the demand for meat. The expansion of neighbouring economies has also given rise to an increase in the demand for meat and other livestock products. Because of an inadequate supply of animal feed, imports of meat by these countries is also expanding. Thailand has been able to export poultry and eggs to Japan and Hong Kong. This increase in foreign demand also plays an important role in absorbing the increase in the supply of livestock products from Thailand.

On the supply side, the production of the livestock sector is well supported by the availability of feed, particularly maize. The animal feed industry which started in the early 1970s had become well established by the end of that decade. The development of this industry became a new engine of growth in the livestock sector. The low price of feed grains during 1970s and 1980s has also contributed towards the success of the animal feed and livestock sector in Thailand.

The increase in income also gives rise to an increase in the consumption of fruits and vegetables.⁸ This in turn leads to increases in their prices, consumption and production. To meet the rapid increase in their demand, the organisation of the production is improved to take advantage of the larger market.

These two major changes in the agricultural sector, the development of the livestock sector and the increase in demand for fruits and vegetables, will be a challenge for the farmers during the next decade.

As the economy grows and population increases, the increase in the domestic demand for agricultural product increases. As more resources are used to meet this domestic demand, Thailand will become less export oriented. Some of these items will have to be imported because they cannot be produced at a competitive cost or production is limited by some technical constraints.

Government policy will also change to regulate the new structure of agricultural trade. With an increase in imports, it is expected that tariff protection will feature more importantly for agriculture in the future.

VIII. CONCLUSIONS

The result in the base run simulation suggests that in the future the share of the agricultural sector will fall gradually and that by 1995 it will be only about 10 per cent of GDP. This is because the agricultural sector grows less rapidly than the rest of the economy.

In the past, Thailand depended on an availability of land in producing both rice and feed grains (e.g. maize, sorghum and cassava pellets). These products found ready international markets because of the growth in population and income in the neighbouring countries. Thai agriculture grew steadily because of these two factors, while the government taxed the export of these commodities as a source of revenue.

During the past decade, as land became less accessible, production in the agricultural sector started to shift to higher-valued products, e.g. livestock, fruit and vegetables. The simulation results shows that the decline in the availability of land does have a negative impact on the economy. It reduced the GDP by as much as 3.5 per cent in 1986. This decrease was not larger because the slower growth of cultivable land is partly offset by the increase in its productivity, especially when it is shifted to higher value products like fruits and vegetables.

The decrease in world prices of agricultural commodities caused greater harm. In the world market, there was an increase in protectionism in agriculture, especially among the developed economies during the past decade. These policies led to a drop in world prices of agricultural products during the 1980s. The decline in international prices caused a decrease in the GDP by as much as 5 per cent in 1986. The effect on income distribution is even more significant.

Government policies used to play a relatively important role in controlling exports of agricultural commodities. But during 1980s, the decrease in the world prices and a change in the political environment led to a lowering of the export tax on almost all agricultural products. The government has become more sympathetic to agriculture. There has been a decrease in the export taxes on agricultural output and at the same time an increase in the import tariffs. The trend is toward an increase in agricultural subsidies and a higher level of protection for agricultural imports.

This study does not try to examine the impact of non-agricultural sector policies and macroeconomic policies on the agricultural sector. These interventions may prove to be more important than commodity-specific policies. There is a tendency for the impact of indirect government interventions to become more important in the future as the share of the agricultural sector shrinks and macro policies are directed towards assisting the non-agricultural sector.

Because of the importance of the world agricultural prices for Thai agriculture, the future structure of this sector depends partly on trends in protectionism in the world commodity market. However, the rapid increase in domestic incomes will play a more important role in the next decade in determining the share of the agricultural sector in Thailand. The agricultural sector will become more oriented towards the domestic market. Less feed grain and livestock products will become available for export.

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APPENDIX

ACTORS AND COMMODITIES IN THAM-2

A. CLASSIFICATIONS OF ACTORS (33 ACTORS)

1. Northeast: Farmer: small, medium , large
Non-farm: poor, medium, rich
2. North: Upper North: Farmer: small, medium , large
Lower North: Farmer: small, medium , large
Non-farm: poor, medium, rich
3. Central Plain:Central: Farmer: small, medium, large
East and West:Farmer: small, medium, large
Non-farm: poor, medium, rich
4. South: Farmer: small, medium , large
Non-farm: poor, medium, rich
5. Bangkok: Non-farm: poor, medium, rich

B. COMMODITIES IN THE EXCHANGE (26 COMMODITIES)

1. Wheat
2. Rice
3. Coarse grains
4. Fats and oil
5. Protein feeds
6. Sugar
7. Bovine meat
8. Pork
9. Poultry and eggs
10. Dairy products
11. Vegetables,legumes & starchy roots
12. Cassava
13. Fruits
14. Fisheries
15. Alcoholic beverages
16. Cotton
17. Hides

B. COMMODITIES IN THE EXCHANGE (26 COMMODITIES) contd.....

18. Kenaf
19. Tobacco
20. Rubber
21. Tradable non-agricultural products
22. Untradable non-agricultural Northeast
23. Untradable non-agricultural North
24. Untradable non-agricultural Central
25. Untradable non-agricultural South
26. Untradable non-agricultural Bangkok

TABLE 1
SHARES OF MAJOR SECTORS IN GDP
(PERCENT OF 1972 MARKET PRICE)

| YEAR | AGRICULTURE | INDUSTRY | SERVICES |
|------|-------------|----------|----------|
| 1970 | 23.63 | 27.70 | 48.67 |
| 1975 | 21.58 | 29.59 | 48.83 |
| 1980 | 17.70 | 32.99 | 49.31 |
| 1985 | 17.05 | 32.19 | 50.76 |
| 1987 | 14.58 | 33.90 | 51.53 |

Note: Includes mining and quarrying, manufacturing, construction, electricity and water supply, and simple agricultural processing products.

Includes transportation and communication, wholesale and retail trade, banking, insurance and real estate, ownership of dwellings, public administration and defence, services and agricultural services.

Source: National Income Accounts, NESDB.

TABLE 2
FIVE MAJOR CROPS IN GD
(PERCENT OF 1972 MARKET PRICE)

| CROPS | 1970 | 1975 | 1980 | 1985 | 1987 |
|--------------|-------|-------|-------|-------|-------|
| PADDY | 47.84 | 41.11 | 37.74 | 35.24 | 32.71 |
| RUBBER | 5.13 | 5.07 | 5.75 | 6.59 | 9.26 |
| CASSAVA | 3.51 | 5.20 | 8.37 | 7.87 | 7.02 |
| SUGARCANE | 1.78 | 3.42 | 1.41 | 3.92 | 4.13 |
| COARSEGRAINS | 4.95 | 5.39 | 5.12 | 6.72 | 3.52 |
| OTHER | 36.78 | 39.81 | 41.60 | 39.66 | 43.35 |

Source: National Income Accounts, NESDB.

TABLE 3

AGGREGATE PRICE INDEX FOR AGRICULTURAL PRODUCTS

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1995 |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| BASE RUN | 100.0 | 136.5 | 160.0 | 172.0 | 171.4 | 172.8 | 171.6 | 169.6 | 183.9 | 198.3 | 224.0 | 247.9 | 234.3 | 321.6 |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | |
| RICE | 115.7 | 144.8 | 176.8 | 200.9 | 176.7 | 177.3 | 174.4 | 174.0 | 187.2 | 202.0 | 228.8 | 254.0 | 239.5 | 325.4 |
| SUGAR | 100.1 | 138.9 | 158.2 | 171.2 | 169.3 | 168.6 | 164.6 | 164.6 | 178.4 | 191.4 | 218.6 | 242.6 | 229.2 | 319.1 |
| CASSAVA | 100.2 | 130.3 | 160.8 | 179.5 | 169.9 | 172.8 | 171.7 | 168.4 | 181.8 | 195.6 | 221.3 | 244.8 | 230.2 | 319.7 |
| RUBBER | 101.2 | 138.3 | 162.6 | 173.8 | 173.0 | 174.0 | 173.0 | 170.4 | 184.8 | 199.5 | 225.7 | 248.7 | 235.0 | 324.2 |
| ALL 4 CROPS | 117.2 | 149.4 | 177.9 | 202.8 | 175.2 | 174.6 | 170.0 | 167.8 | 181.4 | 194.3 | 224.6 | 246.4 | 231.9 | 321.2 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTION | 100.0 | 136.5 | 157.0 | 167.0 | 182.3 | 183.4 | 181.2 | 191.8 | 209.8 | 222.5 | 231.5 | 247.6 | 234.3 | 321.8 |
| WITHOUT | 117.2 | 149.4 | 173.0 | 182.8 | 202.6 | 202.6 | 202.5 | 220.7 | 233.9 | 247.7 | 250.2 | 248.2 | 234.8 | 319.9 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTION | 100.0 | 136.7 | 155.2 | 182.4 | 171.5 | 174.4 | 172.6 | 171.7 | 185.5 | 199.0 | 225.8 | 250.5 | 236.1 | 330.4 |
| WITHOUT | 117.2 | 144.5 | 182.3 | 211.6 | 169.1 | 177.9 | 173.1 | 169.1 | 182.2 | 196.0 | 226.0 | 248.5 | 233.8 | 330.1 |
| (PERCENTAGE CHANGE FROM BASE RUN/LIBERALIZATION RUN) | | | | | | | | | | | | | | |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | |
| RICE | 15.7000 | 6.0806 | 10.5000 | 16.8023 | 3.0922 | 2.6042 | 1.6317 | 2.5943 | 1.7945 | 1.8659 | 2.1429 | 2.4607 | 2.2194 | 1.1816 |
| SUGAR | 0.1000 | 1.7582 | -1.1250 | -0.4651 | -1.2252 | -2.4306 | -4.0793 | -2.9481 | -2.9908 | -3.4796 | -2.4107 | -2.1380 | -2.1767 | -0.7774 |
| CASSAVA | 0.2000 | -4.5421 | 0.5000 | 4.3605 | -0.8751 | 0.0000 | 0.0583 | -0.7075 | -1.1419 | -1.3616 | -1.2054 | -1.2505 | -1.7499 | -0.5908 |
| RUBBER | 1.2000 | 1.3187 | 1.6250 | 1.0465 | 0.9335 | 0.6944 | 0.8159 | 0.4717 | 0.4894 | 0.6051 | 0.7589 | 0.3227 | 0.2988 | 0.8085 |
| ALL 4 CROPS | 17.2000 | 9.4505 | 11.1875 | 17.9070 | 2.2170 | 1.0417 | -0.9324 | -1.0613 | -1.3594 | -2.0171 | 0.2679 | -0.6051 | -1.0243 | -0.1244 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTION | 0.0000 | 0.0000 | -1.8750 | -2.9070 | 6.3594 | 6.1343 | 5.5944 | 13.0896 | 14.0837 | 12.2037 | 3.3482 | -0.1210 | 0.0000 | 0.0622 |
| WITHOUT | 0.0000 | 0.0000 | -2.7544 | -9.8619 | 15.6393 | 16.0367 | 19.1176 | 31.5256 | 28.9416 | 27.4833 | 11.3980 | 0.7305 | 1.2505 | 0.404 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTION | 0.0000 | 0.1465 | -3.0000 | 6.0465 | 0.0583 | 0.9259 | 0.5828 | 1.2382 | 0.8700 | 0.3530 | 0.8036 | 1.0488 | 0.7682 | 2.7363 |
| WITHOUT | 0.0000 | -3.2798 | 2.4733 | 4.3393 | -3.4817 | 1.8900 | 1.8235 | 0.7747 | 0.4410 | 0.8749 | 0.6233 | 0.8523 | 0.8193 | 2.7709 |

NOTE: THIS IS A LASPEYRES INDEX, USING 1978 AS THE BASE YEAR.

TABLE 4
AGGREGATE OUTPUT INDEX FOR AGRICULTURAL PRODUCES

| YEAR | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1995 |
|--|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| BASE RUN | 100.0 | 112.2 | 117.3 | 122.1 | 125.7 | 129.0 | 133.9 | 141.5 | 147.5 | 150.0 | 158.1 | 164.3 | 172.6 | 181.4 |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | |
| RICE | 100.0 | 112.1 | 117.7 | 123.5 | 128.1 | 130.8 | 137.4 | 141.5 | 148.9 | 151.7 | 160.0 | 165.6 | 174.1 | 182.5 |
| SUGAR | 100.0 | 112.2 | 117.0 | 121.7 | 125.7 | 128.9 | 133.3 | 139.5 | 146.1 | 150.1 | 156.7 | 164.6 | 171.5 | 178.9 |
| CASSAVA | 100.0 | 112.2 | 115.7 | 120.6 | 126.2 | 129.1 | 133.9 | 141.6 | 147.6 | 149.9 | 157.2 | 163.7 | 171.7 | 178.4 |
| RUBBER | 100.0 | 112.3 | 117.3 | 122.1 | 125.9 | 129.0 | 134.1 | 141.7 | 147.5 | 150.0 | 157.3 | 163.8 | 171.9 | 181.0 |
| ALL 4 CROPS | 100.0 | 112.4 | 117.5 | 123.0 | 128.5 | 130.3 | 135.4 | 141.2 | 148.1 | 152.0 | 157.7 | 165.5 | 171.8 | 178.4 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 100.0 | 112.2 | 117.3 | 122.0 | 125.7 | 129.5 | 136.1 | 139.9 | 148.0 | 153.4 | 161.3 | 164.7 | 172.0 | 180.7 |
| WITHOUT INTERVENTIONS | 100.0 | 112.4 | 117.5 | 123.1 | 127.9 | 132.5 | 139.3 | 143.9 | 152.1 | 156.8 | 165.1 | 170.3 | 174.3 | 180.2 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 100.0 | 113.7 | 120.2 | 124.6 | 131.1 | 134.7 | 140.5 | 148.2 | 155.3 | 157.4 | 167.3 | 172.4 | 180.3 | 186.4 |
| WITHOUT INTERVENTIONS | 100.0 | 113.9 | 119.6 | 126.6 | 133.6 | 135.9 | 142.1 | 147.1 | 155.3 | 158.0 | 166.1 | 172.3 | 178.8 | 184.2 |
| (PERCENTAGE CHANGE FROM BASE RUN/LIBERALIZATION RUN) | | | | | | | | | | | | | | |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | |
| RICE | 0.0000 | -0.0891 | 0.3410 | 1.1466 | 1.9093 | 1.3953 | 2.6139 | 0.0000 | 0.9492 | 1.1333 | 1.2018 | 0.7912 | 0.8691 | 0.6064 |
| SUGAR | 0.0000 | 0.0000 | -0.2558 | -0.3276 | 0.0000 | -0.0775 | -0.4481 | -1.4134 | -0.9492 | 0.0667 | -0.8855 | 0.1826 | -0.6373 | -1.3782 |
| CASSAVA | 0.0000 | 0.0000 | -1.3640 | -1.2285 | 0.3978 | 0.0775 | 0.0000 | 0.0707 | 0.0678 | -0.0667 | -0.5693 | -0.3652 | -0.5214 | -1.6538 |
| RUBBER | 0.0000 | 0.0891 | 0.0000 | 0.0000 | 0.1591 | 0.0000 | 0.1494 | 0.1413 | 0.0000 | 0.0000 | -0.5060 | -0.3043 | -0.4056 | -0.2205 |
| ALL 4 CROPS | 0.0000 | 0.1783 | 0.1705 | 0.7371 | 2.2275 | 1.0078 | 1.1202 | -0.2120 | 0.4068 | 1.3333 | -0.2530 | 0.7304 | -0.4635 | -1.6538 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 0.0000 | 0.0000 | 0.0000 | -0.0819 | 0.0000 | 0.3876 | 1.6430 | -1.1307 | 0.3390 | 2.2667 | 2.0240 | 0.2435 | -0.3476 | -0.3859 |
| WITHOUT INTERVENTIONS | 0.0000 | 0.0000 | 0.0000 | 0.0813 | -0.4669 | 1.6884 | 2.8804 | 1.9122 | 2.7009 | 3.1579 | 4.6925 | 2.9003 | 1.4552 | 1.0090 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 0.0000 | 1.3369 | 2.4723 | 2.0475 | 4.2959 | 4.4186 | 4.9291 | 4.7350 | 5.2881 | 4.9333 | 5.8191 | 4.9300 | 4.4612 | 2.7563 |
| WITHOUT INTERVENTIONS | 0.0000 | 1.3345 | 1.7872 | 2.9268 | 3.9689 | 4.2978 | 4.9483 | 4.1785 | 4.8616 | 3.9474 | 5.3266 | 4.1088 | 4.0745 | 3.2511 |

NOTE: THIS IS A LASPEYRES INDEX, USING 1978 AS THE BASE YEAR.

TABLE 5
INDEX OF EXPORTS (1978=100)

| YEAR | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1995 |
|--|---------|---------|---------|----------|---------|---------|---------|----------|---------|---------|---------|---------|---------|----------|
| BASE RUN | 100.0 | 165.8 | 209.3 | 248.5 | 197.2 | 197.7 | 190.0 | 201.1 | 208.1 | 201.3 | 257.3 | 286.7 | 260.4 | 372.0 |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | |
| RICE | 107.0 | 172.1 | 219.1 | 271.1 | 203.1 | 199.3 | 202.3 | 184.0 | 205.7 | 198.0 | 260.4 | 287.0 | 259.2 | 356.1 |
| SUGAR | 100.0 | 163.3 | 207.8 | 247.2 | 195.8 | 196.6 | 189.2 | 180.1 | 206.7 | 203.7 | 254.0 | 287.6 | 250.9 | 365.6 |
| CASSAVA | 99.7 | 170.4 | 209.0 | 245.6 | 194.9 | 199.5 | 191.4 | 200.3 | 207.2 | 196.9 | 249.4 | 278.6 | 247.2 | 352.2 |
| RUBBER | 98.2 | 163.8 | 207.9 | 248.1 | 198.0 | 196.5 | 188.9 | 200.6 | 206.7 | 199.7 | 251.8 | 282.3 | 255.3 | 365.2 |
| ALL 4 CROPS | 105.3 | 168.2 | 217.1 | 270.0 | 202.1 | 194.8 | 186.9 | 178.9 | 201.1 | 192.2 | 246.6 | 277.5 | 236.6 | 327.0 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 100.0 | 165.8 | 201.3 | 221.6 | 237.9 | 244.0 | 255.6 | 283.3 | 315.9 | 310.9 | 322.3 | 287.8 | 256.4 | 364.5 |
| WITHOUT INTERVENTIONS | 105.3 | 168.2 | 208.7 | 231.5 | 253.8 | 261.3 | 276.3 | 323.1 | 337.0 | 336.1 | 348.0 | 295.7 | 242.1 | 317.2 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 100.0 | 171.0 | 223.5 | 265.0 | 211.1 | 215.7 | 207.8 | 227.7 | 230.5 | 222.1 | 293.5 | 327.3 | 294.6 | 406.5 |
| WITHOUT INTERVENTIONS | 105.3 | 171.2 | 232.3 | 287.4 | 216.1 | 211.8 | 211.5 | 195.5 | 216.1 | 207.9 | 277.8 | 308.0 | 262.3 | 353.4 |
| (PERCENTAGE CHANGE FROM BASE RUN/LIBERALIZATION RUN) | | | | | | | | | | | | | | |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | |
| RICE | 7.0000 | 3.7998 | 4.6823 | 9.0946 | 2.9919 | 0.8093 | 6.4737 | -8.5032 | -1.1533 | -1.6393 | 1.2048 | 0.1046 | -0.4608 | -4.2742 |
| SUGAR | 0.0000 | -1.5078 | -0.7167 | -0.5231 | -0.7099 | -0.5564 | -0.4211 | -10.4426 | -0.6728 | 1.1923 | -1.2825 | 0.3139 | -3.6482 | -1.7204 |
| CASSAVA | -0.3000 | 2.7744 | -0.1433 | -1.1670 | -1.1663 | 0.9105 | 0.7368 | -0.3978 | -0.4325 | -2.1858 | -3.0703 | -2.8253 | -5.0691 | -5.3226 |
| RUBBER | -1.8000 | -1.2063 | -0.6689 | -0.1610 | 0.4057 | -0.6070 | -0.5789 | -0.2486 | -0.6728 | -0.7948 | -2.1376 | -1.5347 | -1.9585 | -1.8280 |
| ALL 4 CROPS | 5.3000 | 1.4475 | 3.7267 | 8.6519 | 2.4848 | -1.4669 | -1.6316 | -11.0393 | -3.3638 | -4.5206 | -4.1586 | -3.2089 | -9.1398 | -12.0968 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 0.0000 | 0.0000 | -3.8223 | -10.8249 | 20.6389 | 23.4193 | 34.5263 | 40.8752 | 51.8020 | 54.4461 | 25.2623 | 0.3837 | -1.5361 | -2.0161 |
| WITHOUT INTERVENTIONS | 0.0000 | 0.0000 | -3.8692 | -14.2593 | 25.5814 | 34.1376 | 47.8331 | 80.6037 | 67.5783 | 74.8699 | 41.1192 | 6.5586 | 2.3246 | -2.9969 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 0.0000 | 3.1363 | 6.7845 | 6.6398 | 7.0487 | 9.1047 | 9.3684 | 13.2273 | 10.7641 | 10.3328 | 14.0692 | 14.1611 | 13.1336 | 9.2742 |
| WITHOUT INTERVENTIONS | 0.0000 | 1.7836 | 7.0014 | 6.4444 | 6.9273 | 8.7269 | 13.1621 | 9.2789 | 7.4590 | 8.1686 | 12.6521 | 10.9910 | 10.8622 | 8.0734 |

TABLE 6

BALANCE OF TRADE

| YEAR | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1995 |
|--------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|
| BASE RUN | -22537.0 | -17369.0 | -24102.8 | -21891.3 | -32168.8 | -49325.5 | -57159.1 | -64106.3 | -63070.8 | -79652.5 | -78785.1 | -89609.9 | -98864.0 | -92432.9 |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | |
| RICE | -24092.2 | -23762.4 | -34141.4 | -37161.4 | -40496.1 | -59544.3 | -65871.7 | -78742.0 | -72033.1 | -91958.6 | -93180.5 | -106505.3 | -116999.8 | -117022.8 |
| RUBBER | -22591.0 | -13691.5 | -23628.3 | -20801.9 | -31619.9 | -45612.8 | -51430.5 | -59593.2 | -54025.3 | -70669.2 | -73325.5 | -84124.0 | -97973.0 | -90872.5 |
| SUGAR | -22722.6 | -10102.8 | -24330.1 | -22779.2 | -31172.0 | -49720.2 | -56809.2 | -63532.9 | -61416.8 | -78127.0 | -78079.3 | -87903.0 | -98231.7 | -91040.7 |
| CASSAVA | -23803.2 | -19392.4 | -26447.0 | -23598.8 | -32830.1 | -50526.0 | -58601.2 | -65137.3 | -64231.2 | -81107.9 | -81701.4 | -91301.6 | -100530.8 | -96261.2 |
| ALL 4 CROPS | -25469.5 | -22296.3 | -36421.4 | -38136.5 | -40888.4 | -58575.4 | -64402.2 | -73222.4 | -66481.8 | -86224.5 | -90827.1 | -102173.0 | -116975.5 | -117701.1 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | -22537.0 | -17369.0 | -26294.6 | -30871.3 | -19450.4 | -35947.0 | -38358.2 | -37943.9 | -30181.8 | -49430.8 | -59645.8 | -89794.3 | -100197.7 | -93701.7 |
| WITHOUT INTERVENTIONS | -25469.5 | -22296.3 | -37773.6 | -42840.0 | -32479.3 | -49530.8 | -52596.4 | -56152.7 | -51284.6 | -67989.5 | -78221.6 | -103731.6 | -120268.7 | -121469.7 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | -22537.0 | -16388.4 | -22132.8 | -20899.6 | -30398.5 | -50006.9 | -57539.1 | -63760.5 | -62609.3 | -79945.3 | -78199.1 | -90147.3 | -100614.9 | -90017.4 |
| WITHOUT INTERVENTIONS | -25469.5 | -21594.8 | -35296.4 | -37067.5 | -40122.2 | -59713.4 | -64424.0 | -75915.1 | -68293.4 | -89303.4 | -91921.8 | -105493.4 | -120512.9 | -119081.3 |

TABLE 6.1
INDEX OF TRADE DEFICIT (1978=100)

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1995 |
|--|---------|----------|---------|---------|----------|----------|----------|----------|----------|----------|----------|---------|---------|---------|
| BASE RUN | 100.0 | 77.1 | 106.9 | 97.1 | 142.7 | 218.9 | 253.6 | 284.4 | 279.9 | 353.4 | 349.6 | 397.6 | 438.7 | 410.1 |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | |
| RICE | 106.9 | 105.4 | 151.5 | 164.9 | 179.7 | 264.2 | 292.3 | 349.4 | 319.6 | 408.0 | 413.5 | 472.6 | 519.1 | 519.2 |
| SUGAR | 100.2 | 60.8 | 104.8 | 92.3 | 140.3 | 202.4 | 228.2 | 264.4 | 239.7 | 313.6 | 325.4 | 373.3 | 434.7 | 403.2 |
| CASSAVA | 100.8 | 44.8 | 108.0 | 101.1 | 138.3 | 220.6 | 252.1 | 281.9 | 272.5 | 346.7 | 346.4 | 390.0 | 435.9 | 404.0 |
| RUBBER | 105.6 | 86.0 | 117.3 | 104.7 | 145.7 | 224.2 | 260.0 | 289.0 | 285.0 | 359.9 | 362.5 | 405.1 | 446.1 | 427.1 |
| ALL 4 CROPS | 113.0 | 98.9 | 161.6 | 169.2 | 181.4 | 259.9 | 285.8 | 324.9 | 295.0 | 382.6 | 403.0 | 453.4 | 519.0 | 522.3 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 100.0 | 77.1 | 116.7 | 137.0 | 86.3 | 159.5 | 170.2 | 168.4 | 133.9 | 219.3 | 264.7 | 398.4 | 444.6 | 415.8 |
| WITHOUT INTERVENTIONS | 113.0 | 98.9 | 167.6 | 190.1 | 144.1 | 219.8 | 233.4 | 249.2 | 227.6 | 301.7 | 347.1 | 460.3 | 533.6 | 539.0 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 100.0 | 72.7 | 98.2 | 92.7 | 134.9 | 221.9 | 255.3 | 282.9 | 277.8 | 354.7 | 347.0 | 400.0 | 446.4 | 399.4 |
| WITHOUT INTERVENTIONS | 113.0 | 95.8 | 156.6 | 164.5 | 178.0 | 265.0 | 285.9 | 336.8 | 303.0 | 396.3 | 407.9 | 468.1 | 534.7 | 528.4 |
| (PERCENTAGE CHANGE FROM BASE RUN/LIBERALIZATION RUN) | | | | | | | | | | | | | | |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | |
| RICE | 6.9000 | 36.7056 | 41.7212 | 69.8249 | 25.9285 | 20.6944 | 15.2603 | 22.8551 | 14.1836 | 15.4499 | 18.2780 | 18.8632 | 18.3269 | 26.6033 |
| SUGAR | 0.2000 | -21.1414 | -1.9645 | -4.9434 | -1.6819 | -7.5377 | -10.0158 | -7.0323 | -14.3623 | -11.2620 | -6.9222 | -6.1117 | -0.9118 | -1.6825 |
| CASSAVA | 0.8000 | -41.8936 | 1.0290 | 4.1195 | -3.0834 | 0.7766 | -0.5915 | -0.8790 | -2.6438 | -1.8959 | -0.9153 | -1.9115 | -0.6382 | -1.4874 |
| RUBBER | 5.6000 | 11.5435 | 9.7287 | 7.8270 | 2.1023 | 2.4212 | 2.5237 | 1.6174 | 1.8221 | 1.8393 | 3.6899 | 1.8863 | 1.6868 | 4.1453 |
| ALL 4 CROPS | 13.0000 | 28.2750 | 51.1693 | 74.2533 | 27.1198 | 18.7300 | 12.6972 | 14.2405 | 5.3948 | 8.2626 | 15.2746 | 14.0342 | 18.3041 | 27.3592 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 0.0000 | 0.0000 | 9.1674 | 41.0917 | -39.5235 | -27.1357 | -32.8864 | -40.7876 | -52.1615 | -37.9457 | -24.2849 | 0.2012 | 1.3449 | 1.3899 |
| WITHOUT INTERVENTIONS | 0.0000 | 0.0000 | 3.7129 | 12.3522 | -20.5623 | -15.4290 | -18.3345 | -23.2995 | -22.8475 | -21.1448 | -13.8710 | 1.5218 | 2.8131 | 3.1974 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 0.0000 | -5.7069 | -8.1384 | -4.5314 | -5.4660 | 1.3705 | 0.6703 | -0.5274 | -0.7503 | 0.3679 | -0.7437 | 0.6036 | 1.7552 | -2.6091 |
| WITHOUT INTERVENTIONS | 0.0000 | -3.1345 | -3.0941 | -2.7778 | -1.8743 | 1.9623 | 0.0350 | 3.6627 | 2.7119 | 3.5808 | 1.2159 | 3.2422 | 3.0250 | 1.1679 |

TABLE 7

INDEX OF GROSS DOMESTIC PRODUCT (1978=100)

| YEAR | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1995 |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| BASE RUN | 100.0 | 106.6 | 114.1 | 124.0 | 122.7 | 138.2 | 149.4 | 161.2 | 175.1 | 189.9 | 207.3 | 224.3 | 241.9 | 274.2 |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | |
| RICE | 101.3 | 108.3 | 117.5 | 129.0 | 126.7 | 142.3 | 154.1 | 164.6 | 178.9 | 194.3 | 212.6 | 229.8 | 247.9 | 281.0 |
| SUGAR | 100.0 | 106.2 | 113.9 | 123.2 | 122.7 | 138.4 | 148.8 | 159.5 | 173.9 | 188.6 | 205.4 | 222.4 | 239.3 | 271.2 |
| CASSAVA | 100.0 | 106.0 | 113.1 | 122.1 | 122.3 | 138.1 | 149.0 | 160.7 | 174.1 | 188.4 | 205.4 | 222.2 | 239.4 | 270.6 |
| RUBBER | 99.9 | 106.6 | 114.2 | 124.1 | 122.9 | 138.3 | 149.4 | 161.3 | 175.1 | 189.8 | 207.0 | 224.0 | 241.6 | 273.8 |
| ALL 4 CROPS | 101.3 | 107.8 | 117.5 | 128.6 | 126.9 | 142.5 | 152.8 | 163.8 | 177.6 | 192.6 | 209.8 | 226.9 | 243.9 | 275.5 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 100.0 | 106.6 | 113.4 | 121.4 | 125.6 | 142.6 | 154.9 | 168.7 | 184.1 | 198.5 | 213.9 | 227.1 | 244.1 | 275.9 |
| WITHOUT INTERVENTIONS | 101.3 | 107.8 | 116.7 | 125.1 | 130.3 | 147.7 | 160.3 | 175.3 | 190.1 | 204.9 | 220.9 | 235.2 | 251.7 | 283.2 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 100.0 | 107.4 | 117.1 | 125.6 | 126.2 | 142.5 | 153.9 | 166.6 | 180.9 | 195.8 | 214.5 | 232.1 | 249.6 | 282.5 |
| WITHOUT INTERVENTIONS | 101.3 | 109.7 | 119.5 | 130.7 | 131.8 | 147.4 | 158.6 | 169.3 | 183.5 | 199.0 | 217.5 | 234.9 | 251.7 | 284.3 |
| (PERCENTAGE CHANGE FROM BASE RUN/LIBERALIZATION RUN) | | | | | | | | | | | | | | |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | |
| RICE | 1.3000 | 1.5947 | 2.9798 | 4.0323 | 3.2600 | 2.9667 | 3.1459 | 2.1092 | 2.1702 | 2.3170 | 2.5567 | 2.4521 | 2.4804 | 2.4799 |
| SUGAR | 0.0000 | -0.3752 | -0.1753 | -0.6452 | 0.0000 | 0.1447 | -0.4016 | -1.0546 | -0.6853 | -0.6846 | -0.9165 | -0.8471 | -1.0748 | -1.0941 |
| CASSAVA | 0.0000 | -0.5629 | -0.8764 | -1.5323 | -0.3260 | -0.0724 | -0.2677 | -0.3102 | -0.5711 | -0.7899 | -0.9165 | -0.9362 | -1.0335 | -1.3129 |
| RUBBER | -0.1000 | 0.0000 | 0.0876 | 0.0806 | 0.1630 | 0.0724 | 0.0000 | 0.0620 | 0.0000 | -0.0527 | -0.1447 | -0.1337 | -0.1240 | -0.1459 |
| ALL 4 CROPS | 1.3000 | 1.1257 | 2.9798 | 3.7097 | 3.4230 | 3.1114 | 2.2758 | 1.6129 | 1.4278 | 1.4218 | 1.2060 | 1.1592 | 0.8268 | 0.4741 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 0.0000 | 0.0000 | -0.6135 | -2.0968 | 2.3635 | 3.1838 | 3.6814 | 4.6526 | 5.1399 | 4.5287 | 3.1838 | 1.2483 | 0.9095 | 0.6200 |
| WITHOUT INTERVENTIONS | 0.0000 | 0.0000 | -0.6809 | -2.7216 | 2.6793 | 3.6491 | 4.9084 | 7.0208 | 7.0383 | 6.3863 | 5.2908 | 3.6580 | 3.1980 | 2.7949 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | |
| WITH INTERVENTIONS | 0.0000 | 0.7505 | 2.6293 | 1.2903 | 2.8525 | 3.1114 | 3.0120 | 3.3499 | 3.3124 | 3.1069 | 3.4732 | 3.4775 | 3.1831 | 3.0270 |
| WITHOUT INTERVENTIONS | 0.0000 | 1.7625 | 1.7021 | 1.6330 | 3.8613 | 3.4386 | 3.7958 | 3.3578 | 3.3221 | 3.3229 | 3.6702 | 3.5258 | 3.1980 | 3.1942 |

TABLE 8
INCOME INDEX OF SMALL FARMER HOUSEHOLDS (RATIO TO NATIONAL AVERAGE)

| YEAR | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1995 | 2000 |
|--------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| BASE RUN | 0.48 | 0.43 | 0.40 | 0.35 | 0.34 | 0.31 | 0.29 | 0.28 | 0.26 | 0.26 | 0.26 | 0.24 | 0.22 | 0.23 | 0.21 |
| NORTHEAST | 0.48 | 0.39 | 0.38 | 0.33 | 0.37 | 0.31 | 0.32 | 0.31 | 0.30 | 0.29 | 0.30 | 0.27 | 0.25 | 0.26 | 0.23 |
| UPPER NORTH | 0.58 | 0.71 | 0.62 | 0.56 | 0.64 | 0.56 | 0.56 | 0.53 | 0.51 | 0.48 | 0.50 | 0.49 | 0.44 | 0.39 | 0.32 |
| LOWER NORTH | 0.80 | 0.73 | 0.70 | 0.63 | 0.61 | 0.55 | 0.56 | 0.53 | 0.48 | 0.50 | 0.54 | 0.53 | 0.48 | 0.43 | 0.12 |
| CENTRAL | 0.69 | 0.76 | 0.89 | 0.77 | 0.74 | 0.67 | 0.68 | 0.63 | 0.56 | 0.66 | 0.58 | 0.63 | 0.53 | 0.58 | 0.50 |
| EAST-WEST | 0.53 | 0.40 | 0.39 | 0.34 | 0.33 | 0.34 | 0.34 | 0.30 | 0.30 | 0.29 | 0.30 | 0.26 | 0.25 | 0.28 | 0.21 |
| SOUTH | | | | | | | | | | | | | | | |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | | |
| NORTHEAST | 0.49 | 0.42 | 0.39 | 0.35 | 0.32 | 0.31 | 0.29 | 0.27 | 0.26 | 0.26 | 0.26 | 0.24 | 0.22 | 0.22 | 0.24 |
| UPPER NORTH | 0.52 | 0.36 | 0.37 | 0.35 | 0.33 | 0.31 | 0.32 | 0.31 | 0.29 | 0.29 | 0.30 | 0.27 | 0.25 | 0.25 | 0.26 |
| LOWER NORTH | 0.61 | 0.74 | 0.62 | 0.57 | 0.60 | 0.56 | 0.56 | 0.53 | 0.51 | 0.48 | 0.51 | 0.50 | 0.45 | 0.39 | 0.38 |
| CENTRAL | 0.98 | 0.67 | 0.71 | 0.68 | 0.54 | 0.54 | 0.54 | 0.53 | 0.46 | 0.50 | 0.63 | 0.54 | 0.48 | 0.43 | 0.13 |
| EAST-WEST | 0.75 | 0.75 | 0.86 | 0.78 | 0.68 | 0.66 | 0.63 | 0.62 | 0.58 | 0.61 | 0.53 | 0.60 | 0.48 | 0.54 | 0.54 |
| SOUTH | 0.60 | 0.42 | 0.40 | 0.36 | 0.34 | 0.35 | 0.34 | 0.30 | 0.31 | 0.30 | 0.30 | 0.26 | 0.25 | 0.29 | 0.25 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | | |
| NORTHEAST | 0.48 | 0.43 | 0.40 | 0.35 | 0.34 | 0.31 | 0.29 | 0.28 | 0.28 | 0.26 | 0.25 | 0.24 | 0.22 | 0.23 | 0.21 |
| UPPER NORTH | 0.48 | 0.39 | 0.38 | 0.33 | 0.37 | 0.31 | 0.32 | 0.31 | 0.30 | 0.29 | 0.29 | 0.27 | 0.25 | 0.26 | 0.23 |
| LOWER NORTH | 0.58 | 0.71 | 0.61 | 0.56 | 0.66 | 0.58 | 0.57 | 0.56 | 0.57 | 0.53 | 0.55 | 0.50 | 0.44 | 0.38 | 0.32 |
| CENTRAL | 0.80 | 0.73 | 0.71 | 0.62 | 0.65 | 0.57 | 0.57 | 0.55 | 0.53 | 0.51 | 0.55 | 0.51 | 0.48 | 0.43 | 0.12 |
| EAST-WEST | 0.69 | 0.76 | 0.88 | 0.75 | 0.82 | 0.70 | 0.68 | 0.71 | 0.63 | 0.65 | 0.57 | 0.62 | 0.53 | 0.57 | 0.50 |
| SOUTH | 0.53 | 0.40 | 0.35 | 0.36 | 0.37 | 0.33 | 0.33 | 0.33 | 0.32 | 0.30 | 0.29 | 0.27 | 0.25 | 0.28 | 0.21 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | | |
| NORTHEAST | 0.48 | 0.43 | 0.39 | 0.36 | 0.34 | 0.31 | 0.30 | 0.28 | 0.27 | 0.27 | 0.28 | 0.26 | 0.25 | 0.24 | 0.21 |
| UPPER NORTH | 0.48 | 0.38 | 0.35 | 0.38 | 0.36 | 0.29 | 0.32 | 0.31 | 0.29 | 0.29 | 0.29 | 0.26 | 0.25 | 0.25 | 0.22 |
| LOWER NORTH | 0.58 | 0.74 | 0.65 | 0.71 | 0.70 | 0.60 | 0.58 | 0.55 | 0.55 | 0.50 | 0.50 | 0.49 | 0.44 | 0.39 | 0.31 |
| CENTRAL | 0.80 | 0.75 | 0.67 | 0.67 | 0.61 | 0.56 | 0.56 | 0.52 | 0.48 | 0.54 | 0.58 | 0.53 | 0.48 | 0.49 | 0.42 |
| EAST-WEST | 0.69 | 0.79 | 0.86 | 0.83 | 0.73 | 0.72 | 0.71 | 0.66 | 0.62 | 0.68 | 0.61 | 0.66 | 0.52 | 0.63 | 0.46 |
| SOUTH | 0.53 | 0.41 | 0.37 | 0.36 | 0.31 | 0.33 | 0.33 | 0.28 | 0.29 | 0.28 | 0.29 | 0.26 | 0.24 | 0.27 | 0.20 |

TABLE 9
INCOME INDEX OF ALL FARMER HOUSEHOLDS (RATIO TO NATIONAL AVERAGE)

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1995 |
|--------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| BASE RUN | 0.50 | 0.52 | 0.50 | 0.44 | 0.43 | 0.39 | 0.37 | 0.34 | 0.32 | 0.31 | 0.31 | 0.29 | 0.26 | 0.25 |
| NORTHEAST | 0.54 | 0.52 | 0.53 | 0.48 | 0.51 | 0.42 | 0.42 | 0.40 | 0.38 | 0.37 | 0.37 | 0.35 | 0.32 | 0.31 |
| UPPER NORTH | 0.67 | 0.87 | 0.88 | 0.83 | 0.86 | 0.74 | 0.72 | 0.67 | 0.64 | 0.60 | 0.61 | 0.58 | 0.52 | 0.49 |
| LOWER NORTH | 0.91 | 1.03 | 1.03 | 0.99 | 0.94 | 0.82 | 0.78 | 0.72 | 0.65 | 0.64 | 0.70 | 0.64 | 0.55 | 0.48 |
| CENTRAL | 0.86 | 0.87 | 1.00 | 0.98 | 0.92 | 0.84 | 0.84 | 0.78 | 0.73 | 0.79 | 0.76 | 0.79 | 0.73 | 0.73 |
| EAST-WEST | 0.62 | 0.53 | 0.53 | 0.47 | 0.42 | 0.41 | 0.43 | 0.38 | 0.36 | 0.36 | 0.36 | 0.32 | 0.29 | 0.31 |
| SOUTH | | | | | | | | | | | | | | |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | | | | | | |
| NORTHEAST | 0.52 | 0.54 | 0.50 | 0.46 | 0.42 | 0.39 | 0.36 | 0.33 | 0.31 | 0.31 | 0.31 | 0.29 | 0.25 | 0.24 |
| UPPER NORTH | 0.61 | 0.54 | 0.55 | 0.52 | 0.49 | 0.41 | 0.41 | 0.39 | 0.38 | 0.36 | 0.37 | 0.34 | 0.32 | 0.31 |
| LOWER NORTH | 0.72 | 0.89 | 0.91 | 0.89 | 0.84 | 0.73 | 0.70 | 0.66 | 0.63 | 0.59 | 0.60 | 0.57 | 0.52 | 0.48 |
| CENTRAL | 1.15 | 1.14 | 1.15 | 1.19 | 0.94 | 0.82 | 0.78 | 0.73 | 0.64 | 0.63 | 0.72 | 0.66 | 0.56 | 0.49 |
| EAST-WEST | 0.95 | 0.89 | 1.03 | 1.03 | 0.92 | 0.79 | 0.74 | 0.72 | 0.68 | 0.73 | 0.70 | 0.75 | 0.66 | 0.69 |
| SOUTH | 0.73 | 0.61 | 0.60 | 0.53 | 0.43 | 0.44 | 0.45 | 0.40 | 0.38 | 0.38 | 0.38 | 0.34 | 0.30 | 0.34 |
| WORLD PRICE EFFECTS | | | | | | | | | | | | | | |
| NORTHEAST | 0.50 | 0.52 | 0.50 | 0.44 | 0.43 | 0.40 | 0.37 | 0.35 | 0.34 | 0.33 | 0.31 | 0.29 | 0.26 | 0.25 |
| UPPER NORTH | 0.54 | 0.52 | 0.53 | 0.48 | 0.51 | 0.43 | 0.42 | 0.41 | 0.41 | 0.38 | 0.37 | 0.35 | 0.32 | 0.31 |
| LOWER NORTH | 0.67 | 0.87 | 0.88 | 0.82 | 0.88 | 0.77 | 0.74 | 0.73 | 0.72 | 0.67 | 0.64 | 0.58 | 0.52 | 0.49 |
| CENTRAL | 0.91 | 1.03 | 1.03 | 0.96 | 0.99 | 0.90 | 0.86 | 0.84 | 0.81 | 0.77 | 0.73 | 0.64 | 0.55 | 0.48 |
| EAST-WEST | 0.86 | 0.87 | 1.00 | 0.93 | 0.99 | 0.93 | 0.88 | 0.90 | 0.86 | 0.89 | 0.80 | 0.80 | 0.72 | 0.71 |
| SOUTH | 0.62 | 0.53 | 0.48 | 0.47 | 0.48 | 0.44 | 0.44 | 0.44 | 0.42 | 0.39 | 0.36 | 0.32 | 0.29 | 0.31 |
| LAND EXPANSION EFFECTS | | | | | | | | | | | | | | |
| NORTHEAST | 0.50 | 0.52 | 0.49 | 0.46 | 0.44 | 0.40 | 0.38 | 0.34 | 0.33 | 0.33 | 0.32 | 0.30 | 0.26 | 0.25 |
| UPPER NORTH | 0.54 | 0.53 | 0.50 | 0.54 | 0.52 | 0.43 | 0.42 | 0.41 | 0.38 | 0.37 | 0.38 | 0.35 | 0.32 | 0.31 |
| LOWER NORTH | 0.67 | 0.88 | 0.84 | 0.90 | 0.87 | 0.75 | 0.72 | 0.68 | 0.65 | 0.61 | 0.62 | 0.58 | 0.53 | 0.49 |
| CENTRAL | 0.91 | 1.03 | 0.97 | 1.03 | 0.93 | 0.81 | 0.77 | 0.71 | 0.64 | 0.63 | 0.69 | 0.63 | 0.55 | 0.54 |
| EAST-WEST | 0.86 | 0.86 | 0.97 | 1.03 | 0.93 | 0.85 | 0.85 | 0.80 | 0.75 | 0.81 | 0.77 | 0.82 | 0.72 | 0.79 |
| SOUTH | 0.62 | 0.53 | 0.51 | 0.49 | 0.40 | 0.40 | 0.41 | 0.37 | 0.35 | 0.35 | 0.34 | 0.31 | 0.28 | 0.31 |

TABLE 9 Contd.....

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1995 |
|-------------|-------|-------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|
| II. - I. | | | | | | | | | | | | | | |
| NORTHEAST | 2.00 | 2.00 | 0.00 | 2.00 | -1.00 | 0.00 | -1.00 | -1.00 | -1.00 | 0.00 | 0.00 | 0.00 | -1.00 | -1.00 |
| UPPER NORTH | 7.02 | 2.00 | 2.05 | 4.00 | -2.00 | -1.03 | -1.03 | -1.03 | 0.00 | -0.97 | 0.00 | -0.97 | 0.00 | 0.00 |
| LOWER NORTH | 5.03 | 1.94 | 3.02 | 5.96 | -2.01 | -0.94 | -2.01 | -1.01 | -1.01 | -1.01 | -0.94 | -1.01 | 0.00 | -1.01 |
| CENTRAL | 24.02 | 11.01 | 12.01 | 20.02 | 0.00 | 0.00 | 0.00 | 1.00 | -1.00 | -1.00 | 2.00 | 2.00 | 1.00 | 1.00 |
| EAST-WEST | 9.03 | 1.98 | 3.01 | 4.99 | 0.00 | -4.99 | -10.06 | -6.02 | -4.99 | -6.02 | -6.02 | -4.04 | -7.05 | -4.04 |
| SOUTH | 10.97 | 8.00 | 7.01 | 6.01 | 1.05 | 3.04 | 1.98 | 1.98 | 1.98 | 1.98 | 1.98 | 1.98 | 0.99 | 2.98 |
| III. - I. | | | | | | | | | | | | | | |
| NORTHEAST | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 2.00 | 2.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| UPPER NORTH | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.97 | 0.00 | 0.97 | 2.97 | 1.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| LOWER NORTH | 0.00 | 0.00 | 0.00 | -1.01 | 1.94 | 3.02 | 1.94 | 6.03 | 8.04 | 6.97 | 3.02 | 0.00 | 0.00 | 0.00 |
| CENTRAL | 0.00 | 0.00 | 0.00 | -3.00 | 5.01 | 8.01 | 8.01 | 12.01 | 16.02 | 13.01 | 3.00 | 0.00 | 0.00 | 0.00 |
| EAST-WEST | 0.00 | 0.00 | 0.00 | -5.07 | 6.97 | 8.94 | 3.96 | 12.04 | 12.99 | 9.98 | 3.96 | 0.95 | -1.03 | -1.98 |
| SOUTH | 0.00 | 0.00 | -5.02 | 0.00 | 6.01 | 3.04 | 0.99 | 6.01 | 5.95 | 2.98 | 0.00 | 0.00 | 0.00 | 0.00 |
| IV. - I. | | | | | | | | | | | | | | |
| NORTHEAST | 0.00 | 0.00 | -1.00 | 2.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 2.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| UPPER NORTH | 0.00 | 0.97 | -2.97 | 5.99 | 1.03 | 0.97 | 0.00 | 0.97 | 0.00 | 0.00 | 1.03 | 0.00 | 0.00 | 0.00 |
| LOWER NORTH | 0.00 | 0.94 | -3.95 | 6.97 | 1.01 | 1.01 | 0.00 | 1.01 | 1.01 | 0.94 | 1.01 | 0.00 | 1.01 | 0.00 |
| CENTRAL | 0.00 | 0.00 | -6.01 | 4.00 | -1.00 | -1.00 | -1.00 | -1.00 | -1.00 | -1.00 | -1.00 | -1.00 | 0.00 | 6.01 |
| EAST-WEST | 0.00 | -1.03 | -3.01 | 4.99 | 0.95 | 0.95 | 0.95 | 1.98 | 1.98 | 1.98 | 0.95 | 2.92 | -1.03 | 6.02 |
| SOUTH | 0.00 | 0.00 | -1.98 | 1.98 | -1.98 | -0.99 | -2.05 | -0.99 | -0.99 | -0.99 | -2.05 | -0.99 | -0.99 | 0.00 |

TABLE 10
INCOME INDEX OF BANGKOK HOUSEHOLDS (RATIO TO NATIONAL AVERAGE)

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|--------------------------|------|------|------|------|------|------|------|------|------|
| BASE RUN | | | | | | | | | |
| LOW | 0.59 | 0.61 | 0.68 | 0.73 | 0.78 | 0.81 | 0.82 | 0.85 | 0.86 |
| MEDIUM | 1.28 | 1.31 | 1.47 | 1.57 | 1.67 | 1.72 | 1.76 | 1.82 | 1.84 |
| HIGH | 3.20 | 3.25 | 3.58 | 3.82 | 4.04 | 4.17 | 4.25 | 4.40 | 4.45 |
| LIBERALIZE 4 MAJOR CROPS | | | | | | | | | |
| LOW | 0.56 | 0.59 | 0.67 | 0.70 | 0.79 | 0.81 | 0.83 | 0.86 | 0.87 |
| MEDIUM | 1.20 | 1.27 | 1.44 | 1.51 | 1.69 | 1.74 | 1.79 | 1.83 | 1.87 |
| HIGH | 3.01 | 3.14 | 3.51 | 3.65 | 4.08 | 4.19 | 4.29 | 4.40 | 4.46 |
| WORLD PRICE EFFECTS | | | | | | | | | |
| LOW | 0.59 | 0.61 | 0.69 | 0.74 | 0.76 | 0.79 | 0.81 | 0.82 | 0.83 |
| MEDIUM | 1.28 | 1.31 | 1.47 | 1.59 | 1.63 | 1.69 | 1.74 | 1.75 | 1.77 |
| HIGH | 3.20 | 3.25 | 3.60 | 3.85 | 3.95 | 4.07 | 4.20 | 4.22 | 4.26 |
| LAND EXPANSION EFFECTS | | | | | | | | | |
| LOW | 0.59 | 0.61 | 0.68 | 0.73 | 0.78 | 0.80 | 0.82 | 0.85 | 0.86 |
| MEDIUM | 1.28 | 1.31 | 1.46 | 1.56 | 1.67 | 1.71 | 1.75 | 1.83 | 1.84 |
| HIGH | 3.20 | 3.24 | 3.58 | 3.79 | 4.03 | 4.13 | 4.23 | 4.38 | 4.42 |

1 Notes

Net revenue from all the production activities is the objective of the agricultural production unit. Maximization of farm net revenue can be stated as:

$$\max \sum_{\kappa} W_{\kappa} X_{\kappa} \quad \dots\dots(1)$$

$$A_{\nu\kappa} X_{\kappa} \leq r_{\nu} \quad ; \nu = 1, \dots, Y^*$$

$$X_{\kappa} \geq 0 \quad ; \kappa = 1, \dots, K$$

where W_{κ} is the weight of activity κ in the objective function

X_{κ} is level of activity κ

$A_{\nu\kappa}$ is the coefficients of resource, r_{ν} , used in activity κ .

Total expenditure of household (m'_j) is the total income (m_j) minus savings (s_j), income tax (f_j) and investment (i_j). They are defined as follows:

Expenditure: $m'_j = m_j - s_j - f_j$

Savings: $s_j = \sigma_j (m_j - f_j)$

Income tax: $f_j = \Gamma m_j$

Investment: $p_i i_j = \Xi_{ij} (m_j - f_j) + p_i \cdot l_{ij}$

where l_{ij} is the quantity of investment goods i purchased by household j ,

i_j is the committed investment,

σ_j is the saving rate,

Γ is the fixed direct tax rate,

Ξ_{ij} is the marginal investment rate.

Consumption is specified as follows:

$$p_i \cdot c_{ij} = \tau m'_j$$

where p_i is the retail price of commodity i ,

c_{ij} is the quantity of commodity i consumed by household class j ,

m'_j is the total expenditure of household j ,

τ is a vector of fixed budget share.

In this model, "border price" is defined as the world price plus (or minus) tariffs.

Only the reduction in the price of cassava was taken from the Setboonsarng and Tyers' study. The change in prices of other commodities caused by the change in policy was not taken into consideration here.

The result of the four crops liberalization are shown in Figures 23-27 in Section VII.

Most of the production of these two sectors is consumed domestically. As demand increases prices become higher. The higher prices induce greater production and discourage consumption. However, there will still be increases in production and consumption.