

Report No. 6801-TH

Thailand: Agro-Industrial Diversification: Issues and Prospects

October 21, 1987

Country Operations Division
Country Department 2
Asia Region

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CURRENCY EQUIVALENTS

As of May 1987

Baht = US\$0.0390
Baht 25.618 = US\$1.00

Fiscal Year

October 1 to September 3

Weights and Measures

1 hectare (ha) = 2.47 acres = 6.25 rai

List of Acronyms

BAAC	=	Bank for Agriculture and Agricultural Cooperatives
BOI	-	Board of Investment
BOT	=	Bank of Thailand
DCP	-	Department of Cooperative Promotion
DOA	-	Department of Agriculture
DOAE	-	Department of Agricultural Extension
FPO	-	Fiscal Policy Office (in MOF)
IFCT	-	Industrial Finance Corporation of Thailand
KTB	-	Krung Thai Bank
LNO	-	Lam Nam Oon
MBK	-	Mah Boonkrong Group of Companies
MOAC	-	Ministry of Agriculture and Cooperatives
MOF	-	Ministry of Finance
NESDB	-	National Economic and Social Development Board
OAE	-	Office of Agricultural Economics
O&M	-	Operation and Maintenance
RID	-	Royal Irrigation Department
Thai-JACC	-	Joint Agricultural Consultative Corporation
WUG	-	Water User Group
WUO	-	Water User Organization

THAILANDAGRO-INDUSTRIAL DIVERSIFICATION
ISSUES AND PROSPECTSTable of Contents

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FOREWORD

The preparation of this report benefitted greatly from the assistance provided by the Royal Thai Government. In particular, the authors would like to thank officials in the NESDB, the Ministry of Agriculture and Cooperatives, the Ministry of Finance, the Ministry of Commerce, the Ministry of Industry and the Bank of Thailand for their help in providing data and explanations concerning agro-industry.

The report was prepared by a Bank Mission which visited Thailand from September 8 to September 27, 1986. The mission led by Mr. R. Bonnel comprised of Mrs. Lazarus (IFC); Messrs. M. Joshi, C. Lewis, C. Teng, S. Thada-Thamrongvech (World Bank); and P. Brimble and A. Zola (Consultants). The report was discussed with the Government of Thailand in August 1987.

EXECUTIVE SUMMARY

1. Compared to other developing countries, Thailand's agro-industry is a remarkable success story. This is all the more impressive given the background of depressed world export markets and growing protectionism. There are four reasons for past success. First, Thai farmers have demonstrated an ability to respond quickly to changes in market conditions. Second, Thai farmers, processors and merchants have provided the capital, technical and marketing expertise required to turn market potential into real economic achievement. Third, government investment was focussed on infrastructure development, particularly road and irrigation facilities, and the breeding of improved crop varieties (especially irrigated rice and corn). And fourth, the Government has largely avoided counter-productive efforts to displace private initiative.

2. This policy framework has made it possible for Thailand's agro-industrial sector to evolve rapidly in response to changes in world demand. This is reflected in the rapid growth of Thailand's nontraditional exports, and particularly seafood and fish products, which in 1986 became Thailand's main agro-industrial exports.

The Challenge for the Future

3. Thailand's agricultural growth has been severely affected by the 1980-86 sharp decline in world agricultural prices and the increased import barriers affecting some of the agricultural exports. Nevertheless, Thailand's recent successes in "nontraditional" export markets indicate that Thailand has the potential to increase its agricultural growth by better exploiting existing market opportunities for nontraditional commodities. But how to achieve this objective is a matter of considerable debate. This report attempts to contribute to the current debate by focusing mainly on the potential for increasing the production of agro-industrial crops. As a consequence, the Report discusses the main problems encountered by agrobusiness in research, production, processing and marketing with a view to identifying government's role in addressing them.

4. Based upon a review of 21 nontraditional commodities that were selected for investigation in collaboration with the National Economic and Social Development Board, the Report's main conclusion is that Thailand has as excellent potential for increasing the production of several nontraditional agro-industrial commodities in irrigation command areas. For this reason, most of the Report's recommendations are directed towards improving the use of existing irrigation command areas. Since irrigation areas currently cover only a small percentage of the total agricultural land, there is also a need to improve the income of farmers in rainfed areas. Although the Report does not address explicitly this issue, some of the report's recommendations would lead to increase farmers' income in non-irrigated areas. The most important one concerns the livestock sector where there is a need to remove current restrictions on private sector activities and develop farming systems which would be integrated with livestock.

5. Since opportunities also exist for Thailand to increase the production of traditional and nontraditional crops by capturing new markets and increasing domestic processing, it would be highly beneficial for farmers' income to implement policies that have neutral effects among commodities rather than policies that would only promote new commodities at the expense of traditional ones. Moreover, experience in Thailand and elsewhere shows that government decision-makers are rarely successful at picking "winners" in terms of new products with particularly high potential or old products lines which should be preserved. A promising approach would thereby consist of removing current market constraints and establishing with the private sector the policy framework and infrastructure needed to increase agro-industrial growth and thereby farmers' income.

Agro-industrial Diversification

6. Currently, besides external market constraints affecting exports, the most important domestic constraints are:

- (a) the lack of crop varieties that are adapted to the specific requirements of export markets and processors;
- (b) the irrigation infrastructure which is not well suited to the cultivation of non-rice crops;
- (c) the low level of agricultural yields which often result in high production costs; and
- (d) limited incentives for domestic processing and production of several commodities due to government restrictions on private investment.

7. To address these constraints the Report identifies five areas where government measures would be crucial for increasing the range and amount of nontraditional commodities produced in Thailand. These measures concern institutional changes; investment in research, extension and irrigation, agricultural intensification; and the system of incentives. They are discussed in the following paragraphs.

8. Institutional Changes. The objective of these changes would be to improve government support services in order to facilitate private sector initiatives to cultivate agro-industrial crops. Specific measures would include: (i) increasing the coordination among government agencies as well as between government agencies and the private sector; and (ii) strengthening linkages between farmers and processors by promoting contract farming for the cultivation of high value crops. These measures would mainly concern agricultural research and extension and irrigated areas as discussed below.

9. Agricultural Research and Extension. To develop the varieties needed for export markets and domestic processing, private and government research will have to increase. However, it will take time before the recommended increase in government expenditures on new commodities produces results that would be useful to farmers. To compensate for this lag, the Government may want to diffuse the agronomic knowledge being generated by

successful farmers and private firms to other farmers. This policy, which is being applied by the Department of Agricultural Extension (DOAE), would make it possible for DOAE to accelerate the identification and selection process of new crop varieties. Key measures would be to set up demonstration plots for new commodities, carry out applied research in farmers' fields, and closely associate private firms which would be processing the new commodities to field tests and trials.

10. Irrigation Infrastructure. In order to increase the supply of nontraditional crops, the amount and consistency of water delivery in irrigation command areas will have to improve. This would require an increase in government investment to modernize the main canals, and if economically justified, to install a tertiary irrigation network for non-rice crops in selected parts of a given irrigation project area. For equity reasons and to recover the investment and maintenance costs of the modernization program, the Government may want to levy water charges.

11. As a complementary measure the Report recommends that institutional changes be carried out in the irrigation project areas. To initiate such changes, the Report suggests that a policy statement outlining the role of each government agency operating in irrigation command area be prepared at the ministerial level. Such an exercise would involve the Ministry of Agriculture and Cooperatives, the National Economic and Social Development Board, and the Joint Public-Private Sector Consultative Committee. The objectives of this policy statement would be to indicate the respective roles of the various ministerial departments involved in irrigation areas and the support services they could provide to the private sector. As discussed in greater detail in the Report, these services should be differentiated according to the regional level of economic development. As a first step, the Report recommends to clarify the current situation of Water User Associations and Water User Groups by assigning to the Royal Irrigation Department (RID) the task of setting-up Water User Organizations (WUOs) in irrigation command areas and providing a clear link between WUOs and the management of water. A second area which would continue to require government assistance is farmers' training concerning in-field and on-farm water management, which could be organized by the Department of Agricultural Extension through the Community Development Department. Finally, a close working relationship would have to be established between the private sector and RID engineers. Its objectives would be to determine which sites would be chosen for the production of specific crops and guarantee water delivery to selected areas within project sites. As argued in the Report, the implementation of these measures would result in the effective promotion of contract farming and would strengthen linkages between farmers and processors.

12. Agricultural Intensification. Removing constraints that are hindering a shift in production to higher value crops would help improve farmers' income. Equally important would be the implementation of measures that would lead to higher yields and increase the competitiveness of these new commodities in world markets. To achieve this, there is a need not only to increase the availability of high-yielding seeds and develop technology packages adapted to Thailand's soil and climate, but also to increase the incentives for farmers to adopt the resulting yield-increasing technology. In

the past such incentives were lacking due to the lack of a consistent supply of irrigation water during the dry season, the high cost of fertilizer, farmers' limited access to institutional credit, the structure and level of tariffs on exports and imports, and specific constraints on private sector investment. Besides the modernization of selected irrigation command areas, measures for increasing agricultural yields would, therefore, have to be focussed on (i) increasing the availability and reducing the cost of modern inputs, (ii) improving the system of incentives; and (iii) removing investment constraints.

13. Improving the availability and/or reducing the cost of modern inputs would result in greater incentives to increase yields and greater competitiveness of nontraditional commodities. The relevant measures concerning the main inputs are discussed below.

- (a) Seeds. To increase the availability of high quality seeds, there is a need to clarify the respective roles of the Department of Agricultural Extension and the private sector. Since the late 1970s Thailand's private sector has played an increasingly important role in the production and multiplication of improved seeds for maize and sorghum, and more recently for sunflower, vegetables and fruits. In order to exploit the private sector's potential for seed production, the Government may want to (i) give to the private sector the main responsibility for seed multiplication and distribution with adequate certification and government regulation to ensure that quality standards are maintained; and (ii) set the price of seeds produced by the Department of Agricultural Extension (DOAE) at a level which will not discourage the private sector from producing seeds. For the immediate future the Government may want to review the role of the 21 seed multiplication centers which are being created by DOAE since their planned output would appear to be quite high. In specific cases such as the Chiang Mai vegetable seed senter, the Government may want to rent out part of the facilities-- which would otherwise remain unused--to the private sector.
- (b) Fertilizers. Thailand's low level of fertilizer consumption is primarily due to the high cost of fertilizer vis-a-vis the value of incremental production. To induce farmers to adopt a higher input management system which will allow the yield of improved seeds to increase up to their full potential, the cost of fertilizers will have to be lowered. To achieve this, the Report recommends the promotion of single nutrient fertilizers which are cheaper and more cost-effective than the compound fertilizers currently used.
- (c) Rhizobium. The rhizobium bacteria is a critical input needed for the cultivation of soybeans in new areas; but the supply of rhizobium from the Department of Agriculture in Bangkok is often limited, critically affecting output in some areas. To address this constraint, the Report recommends that consideration be given to having the private sector produce the rhizobium bacteria.

- (d) Agro-industrial credit. Improved access to credit is required for the financing of processing plants and the purchase of modern inputs by farmers. So far, access to credit has been limited by:
- (i) ceilings on lending interest rates which have resulted in credit rationing and the exclusion of high-risk borrowers, such as farmers without land collateral; and
 - (ii) the specialization of financial institutions which has limited intermediation.
- To address these constraints, the Report recommends first eliminating ceilings on lending interest rates; this would afford less creditworthy borrowers access to commercial banks instead of having to borrow from the informal sector at much higher interest rates; and second, enlarging the role of the Bank for Agriculture and Agricultural Cooperatives (BAAC) so that BAAC would mobilize rural savings and lend to the whole agro-industrial sector rather than to agriculture only.

14. Incentive Policy Changes. In the past, export taxation on rice and rubber lowered domestic prices and farmers' incentives to adopt yield-increasing technology. In recent years, partly to offset the decline in world market prices, the Government has greatly reduced these taxes, which was a significant step towards raising farmers' income. To further increase their income, the Government has allowed the private sector to create a commodity exchange through which forward contracts in maize would be traded. This would generate daily market clearing prices which farmers could use as a reference for selling their crops, and which banks would apply for valuing stocks held as collateral for lending. This latter consequence would lead to increased commodity-based lending by commercial banks, and would make it possible for farmers to hold stocks rather than having to sell their crops at a low price after harvest as is frequently the case. In terms of priority, the Government has supported the creation of a commodity exchange for maize, because forward contracts in maize are already traded informally among some Thai exporters. At a later stage the Government may want to include rice and cassava pellets among the commodities traded on the exchange.

15. While the proposed creation of a commodity exchange would be important for facilitating exports of traditional commodities, there is a need to address market constraints which are specific to nontraditional commodities. They include: (i) the small domestic market size for most commodities; and (ii) the structure of incentives for exports and imports.

16. Due to the currently small domestic demand for nontraditional commodities, the implementation of a systematic import substitution policy for new field crops does not appear promising as it would lead to the imposition of high tariff rates and a relatively small increase in output. For these reasons, the main thrust of the required policy changes would be to increase incentives for export. To achieve this, there is a need to reduce the level and variability of effective protection rates across the whole agricultural and manufacturing sector in order to decrease the bias towards production for the domestic market.

17. Pending a general tariff reform, there are a number of measures the Government may want to implement. First, it is recommended that the Ministry of Commerce continues to reduce the reliance on quantitative restrictions on imports--such as on soybean meal and palm oil--and replacing them within ad valorem tariffs when some protection is still desired. Second, steps should be taken to reduce the number of specific rates that exist either on their own or in tandem with ad valorem rates. In some cases, the ad valorem rates resulting from the specific rates are very high and impact more on low value than high value products, which often accounts for high negative rates of protection. And third, there is a need to increase the uniformity of nominal tariffs so as to harmonize levels of effective protection rates.

18. Constraints on Private Sector Investment. Among the new commodities that could be produced in Thailand, livestock (pork and beef) would seem to have excellent prospects. However, in order for Thailand to better exploit its potential the Government may want to remove current restrictions preventing private sector investment in slaughterhouses, and develop an integrated livestock-farming model adapted to small farmholders. As had happened in other countries, expansion of livestock activities (pork and cattle) would lead to an increase in the demand for feed grains, which may be sufficient to offset the current decline in Thailand's per capita consumption of rice which has sowed to lower farm incomes.

Improved Access to International Markets

19. Removing constraints to diversification and implementing policy changes to raise agricultural yields would lead to increased agro-industrial production. Given the currently limited domestic market for several non-traditional commodities, the extent to which output will rise will, however, be largely determined by the growth of exports. To increase exports government measures are needed to improve Thailand's competitiveness in international markets and access to these markets. These measures would also be important for traditional commodities such as rice, maize and cassava. They would be focussed on: (i) increasing Thailand's access to limited international markets; (ii) improving quality control; and (iii) export promotion.

20. Limited International Markets. A specific area in which the Government may want to work more actively to increase Thailand's access to world markets is in response to the reality of protectionism in world markets, especially for rice and cassava. This is a legitimate role of Government in light of the clear market distortions which protectionism imposes. The Government may want to formulate a strategy to improve Thailand's bargaining position on agricultural protectionism with its trading partners. This strategy would be important for participating in the forthcoming GATT round. Key measures would include:

- (a) the development of an "early-warning" information system that would protect Government from being caught unaware by new protectionist measures;
- (b) the promulgation of clear-cut regulations for counter-trade transactions and state trading. Experience in other countries

indicates that this is not an area where Government should play a direct role given its lack of marketing experience, but Government could develop with the private sector a strategy for selling to countries who prefer to buy through monopoly state trading companies; and

- (c) a review of the import prohibitions affecting Thai agro-industrial products. This would particularly concern Japan--where imports of a number of fruits from Thailand are prohibited under the Japanese Quarantine Act--and the US where imports of Thai fresh fruits and vegetables are prohibited due to USDA regulations.

21. Quality Control. Due to insufficient incentives for quality control and the lack of quality standards, Thailand has lost several export markets. These losses can be attributed to the lack of effective mechanisms for enforcing trade contracts and the resulting failure of domestic markets to fully transmit existing price differentials for quality products from exporters and processors to farmers. In order to improve the transmission of such incentives, the Report recommends strengthening linkages among farmers, processors and exporters. Specifically, in the case of rice, maize and tapioca pellets, this would be achieved through the recommended creation of a commodity exchange so that contracts can be enforced. This would result in increased incentives to invest in post-harvest technology such as maize-drying equipment and adequate warehouses in order to meet the stipulated product quality. In the case of nontraditional high-value commodities, the recommended promotion of contract farming would also result in increased incentives for farmers to meet the product quality needed by processors.

22. For high-value commodities and other nontraditional commodities, the Report also recommends modernizing the domestic produce marketing chain. This would be important given the linkages between the modernization of retailing and better organization of rural production and quality control. To this end, foreign investors with needed marketing, managerial and technical expertise should be encouraged to invest in food retailing, rather than prevented from doing so under the Alien Business Act. This would provide exporters with an access to well packaged and good quality produce.

23. Another means of improving the quality of nontraditional commodities would be to establish quality standards. While standards for several products are prepared by the Thai Industrial Standards Institute and other government agencies, they do not seem well adhered to. This is an area where the Government could play a role by establishing export standards for major nontraditional exports, provided these standards are agreed upon in cooperation with domestic producers and the countries to which the products are to be exported.

Export Promotion Measures

24. While measures directed at improving Thailand's access to international markets should go far towards increasing exports, there is also a need to improve export competitiveness by increasing access to duty-free inputs and the range of financial and trade services available to exporters.

25. In order to increase the access of direct and "indirect" exporters to duty-free inputs, the Report recommends improvement in the drawback procedure and the introduction of a domestic letter of credit (DLC). Implementation of the former would require the calculation of physical input coefficients (PHICs) to estimate the inputs used directly and indirectly in the manufacturing of exports. To maximize the benefits that could be obtained from the implementation of the PHIC system, the Report recommends that it be implemented jointly with the DLC system. This could be carried out in a pilot project which would provide refunds of import duties, exemption from indirect taxes, and export credit. In addition, to facilitate new exporters' access to preshipment export finance, the Government may want to set up a Preshipment Export Finance Guarantee Fund (PEFG).

26. In view of the difficulty and cost of obtaining access to foreign markets, the Government may also want to facilitate the operations of foreign trading companies in Thailand as well as the expansion of domestic trading companies. At present, the 1972 Alien Business Law prohibits foreign companies from doing business in Thailand on a commission basis. This prevents Thailand's products from being sold through buying offices set up by foreign companies.

Increased Income from Off-Farm Activities

27. The implementation of the aforementioned recommendations would help increase farmers' agricultural income. Nevertheless, and despite agro-industrial diversification, it is inevitable that agriculture's share in employment will continue to fall. For this reason, a complementary policy to increase sources of off-farm income which already account for about 50% of farmers' income is important. One means of achieving this would be to implement policies which would lead to greater employment in industry. A second one would be to give agricultural workers, and particularly the children of current farmers, the skills they need for alternative employment since they are the ones most likely to leave the agricultural sector. This means that human resource investments in rural areas are a top priority.

THAILAND

AGRO-INDUSTRIAL DIVERSIFICATION: ISSUES AND PROSPECTS

I. INTRODUCTION

1.1 In recent policy statements, especially those related to the preparation and issuance of the Sixth National Development Plan (1987-91), considerable emphasis has been given to the potential of nontraditional agricultural and food processing activities. In addition to soaking up resources left unused as a result of the weakening situation of traditional agricultural products, these activities are seen as a way of simultaneously alleviating diverse problems such as unemployment, balance of payments deficits (both via export activities and the increased use of domestic versus imported inputs), and overcrowding in the urban areas of Bangkok.

1.2 The importance placed by the National Economic and Social Development Board (NESDB) on the agro-industry sector was reflected in the fact that a special working group was established to prepare more detailed guidelines for promotion of the agro-industry sector. The main problems were seen to involve inefficiencies in market mechanisms or supply networks, inadequacies in the levels of technology and relevant research and development, protectionism in export markets and limitations of market size for many products, and weaknesses in coordination between the various agencies involved in the agro-industry sector. In order to structure the development of work programs, agro-industries were divided into three main groups: (a) existing agro-industries such as canned pineapples, canned meat and seafood, and wood products; (b) those agro-industries with a currently limited industrial processing in Thailand such as rice, rubber, and tapioca; and (c) agro-industries with a development potential such as processed and canned vegetables and fruits (excluding pineapple), herbs and spices, certain vegetable oils, and fibre from fast growing trees.

1.3 Specific work plans were prepared for the three groups of products mentioned above. Virtually all the product specific work plans identify two main problem areas, one related to the supply of raw materials in terms of quality, suitability, and availability, and the other related to the quality and suitability of the final product either for domestic or export markets. In order to address the former, the main recommendations involve the promotion of R&D to identify new and better species, and improved raw material production techniques; the encouragement of farmer groups and cooperatives; and the improvement of lines of communication between farmers and agribusinesses to ensure better planning and production according to needs. To address the latter, recommendations are made to promote the development of improve packaging techniques; to stimulate the expansion of entrepreneurship among small and medium scale producers; and to encourage marketing research. For the second group of products, those with limited agro-processing, specific attention is given to promoting R&D to identify new and alternative uses for the basic raw materials. For the third group of products, those with high development potential and mostly concentrated in processed food products, considerable

emphasis is given to the importance of identifying and promoting products for which export markets exist.

1.4 While the detailed studies and numerous recommendations appear to be very comprehensive and address most of the crucial constraints facing the agro-industry sector, there is still a need to further define the respective role of Government and the private sector in the agro-industrial diversification process. There exist considerable differences of opinion about this issue among Thai policy makers and industrialists, ranging from those advocating very interventionist and protectionist policies to those proposing a more supportive, yet essentially hands-off approach.

1.5 The purpose of this report is to contribute to the current debate concerning government role in agro-industry. While the coverage of the report is very broad, the report does not intend to offer a complete analysis of the agro-industrial sector. The primary focus of the report is to analyze how agro-industrial growth could be increased, and to indicate what role, if any, the Government should play in this process. As a consequence, the report discusses the main problems encountered by agribusiness in research, production, processing and marketing only to the extent that the Government has a role to play in addressing them.

1.6 Outline of the Report. The main issues concerning agro-industrial diversification and the recommended government strategy are outlined in Chapter II. The main theme of that chapter is that despite current appearances stemming from a low growth rate, Thailand agro-industrial sector is a remarkable success story. For this reason, the Government would have to tread a difficult path to ensure that government intervention to promote commodity diversification does not destroy an already efficient system. In the past the main role of the Government has been to provide the basic infrastructure such as roads and irrigation, whereas the private sector has been the key agent for the identification and cultivation of nontraditional crops. Since this system has worked quite well, efforts should be made to strengthen it and build upon the impressive capability of the Thai agro-industrial sector.

1.7 A promising strategy would be for Government to identify the underlying causes for the problems facing the agro-industry sector, and design a general policy approach to specifically address these causes rather than a set of agro-industry specific policies that imply to some extent that Government has an advantage in "picking the winners." The former approach is consistent with the idea of the Government creating a generally favorable economic environment within which private sector entrepreneurs will be more clearly able to identify profitable opportunities, regardless of the sector. In the event that more detailed, sector specific policies are required, either due to the inherent nature of the activities or to considerations of political economy (i.e., income distribution and regional development), such policies should be carefully substantiated and designed in the least interventionist way possible to take maximum advantage of the private sector's comparative advantage in identifying profitable activities.

1.8 The implementation of this strategy will require Government to implement three broad sets of policies. The first one would be to carry out

institutional changes so as to better clarify the responsibility of each government agency currently involved in agro-industrial diversification and improve the coordination between the public and the private sector. Key areas of action would concern (a) strengthening government support services operating in irrigation command areas; (b) increasing agricultural research on nontraditional commodities; and (c) clarifying the role of Government and private sector in seed production. The second policy would be directed at removing the key physical constraint on diversification, namely the current design deficiencies of existing irrigation command areas. Since most of Thailand's irrigation infrastructure is operated by the Royal Irrigation Department, the responsibility for modernizing the current system lies with the Government. These two sets of policy actions concerning institutional changes and investment are discussed in Chapter III. The last set of policy reforms is focussed on removing general constraints to agro-industrial growth and improving Thailand's access to international markets, taking into account increased protectionism. These reforms are analyzed in Chapter IV. They concern the structure of incentives (exchange rate, trade and investment incentives), and marketing and financial policies. In view of the high supply price elasticity of Thailand's agro-industrial products,^{1/} improvements in trade, investment incentives, marketing and financial policies affecting the private sector would seem to have a high pay-off.

1.9 Finally, an analysis of Thailand's production and marketing potential for selected traditional and nontraditional commodities is included in Annexes 1 and 2. This analysis was carried out at the request of the National Economic and Social Development Board in order to identify current constraints and define a government program to promote commodity diversification in order to increase agro-industrial growth. The list of new commodities analyzed in Annex 2 does not intend to be exhaustive and to include all commodities that seem promising for Thailand. Rather, it is meant to complement the already large list of marketing and production studies prepared for the implementation of the Sixth National Development Plan.

1.10 Despite their importance the report does not address two issues, namely fertilizers and income distribution. Fertilizer is obviously a key input for agricultural production, but in view of the complexity of the current issues it was felt that fertilizer could not be adequately discussed in this report. The second issue--namely income distribution--arises from the recent decline in agricultural income and the promotion of diversification as a way of improving rural incomes. The general thread of the report is that although diversification will increase farmers' income, there is no guarantee that it would improve the relative income distribution. And in fact, as argued in Chapter II, diversification may well lead to increased agricultural labor migration. For this reason, any program to support agro-industrial diversification would have to take into account that labor has to be trans-

1/ An example of this price response is shown by the high percentage volume increase in exports of frozen chicken (71%) and canned seafood products (55.3%) in 1986 following the appreciation of the yen with respect to the baht.

ferred out of agriculture as development proceeds. Hence, policies will have to be designed so as to give the agricultural labor force the skills needed for alternative employment either in rural or urban activities, and to promote efficient industrial growth since a large part of the agricultural labor force will have ultimately to be employed in the industrial sector. Since such policies would exceed the scope of the present report, they are not explicitly discussed in this report.

II. OVERVIEW OF THE DIVERSIFICATION ISSUES

2.1 As outlined in Section A, the current challenge facing Thailand is how in the present context of generally depressed agricultural prices and increased protectionism to increase farmers' income. In order to answer that question and define the role of Government in agro-industry, it is useful to summarize past agro-industrial trends. Since the historical evolution of the sector has been analyzed in greater detail for the preparation of the Sixth Development Plan (1987-91), only the main trends are outlined in this chapter with a view to identifying the issues that need to be addressed by Government. The recommended government strategy for addressing these issues is discussed in Sections B, C and D. As indicated in these sections, rural income could increase as a result of (a) a shift in production towards high value crops and livestock activities; (b) increased agricultural yields for traditional and nontraditional crops; (c) improved access to export markets; and (d) increased industrial growth to create off-farm activities and facilitate agricultural labor migration.

A. The Challenge facing Thailand's Agro-Industrial Sector

2.2 The Thai economy experienced rapid growth during the decade of the 1970s, with real GDP increasing at a rate of 6.2% from 1970 to 1975 and 7.5% from 1975 to 1980 (see Table 1, Statistical Annex). This growth was largely accounted for by the exceptional performance of the manufacturing sector which grew at a rate in excess of 10% during the period. As a result of this rapid growth, the structure of the Thai economy changed considerably, with the manufacturing sector's share in GDP increasing from 15.5% in 1970 to 20.7% in 1980, largely at the expense of the agricultural sector, the share of which fell from 32.1% to 24.9% over the same period. As the economy moved into the 1980s, however, overall GDP growth fell substantially to an annual average rate of 5.3%. This largely resulted from a marked slowdown in the industrial sector growth averaging only 5.4% annually from 1980 to 1985. This immediately halted the significant structural change towards manufacturing with the manufacturing share of GDP remaining at its 1980 level of around 21%.

2.3 By comparison with the agricultural growth achieved in 1965-73 (5.2% p.a. in constant prices), Thailand's agriculture performed poorly in 1973-84 (3.7% p.a. in constant prices). However, since a similar decline was also recorded for other middle income LDCs,^{2/} it would appear that worldwide causes rather than purely domestic factors account for the fall in Thailand's agricultural growth rate. Indeed, compared to a sample of some 80 countries Thailand has done exceedingly well: during both the 1965-73 and 1973-84

^{2/} The real agricultural growth rate of middle income LDCs dropped from 3.6% in 1965-73 to 2.7% p.a. in 1973-84 in constant prices. See World Development Report, 1986, Table 2, p. 182.

periods Thailand has remained among the top one sixth of performers. No other country has managed to consistently remain in this group.^{3/}

2.4 Despite this good international performance Thailand's agriculture faces a difficult challenge, the nature of which is indicated by comparing the first to the second column of Table 2.1. As shown by the first column, the growth rate of agricultural GDP in constant prices rose slightly in 1980-85 compared to 1975-80, but was 1.7 percentage points below that of the sixties. The second column of Table 2.1 reveals a more pessimistic story. It shows that the real income of farmers,^{4/} which grew in the sixties by 4.3% p.a. in real terms, actually declined by 2.7% p.a. in 1980-85. This suggests that the current challenge faced by Thailand's agriculture is not so much how to increase the growth rate of output, but how to raise the real income of farmers.

Table 2.1: RATES OF GROWTH OF AGRICULTURAL GDP AND AGRICULTURAL INCOME IN REAL TERMS, 1960-85
(Percent per annum)

	Agricultural GDP in constant prices	Domestic terms of trade between agriculture and other sectors <u>/a</u>	Agricultural Income in real terms <u>/b</u>
1960-70	5.5	-1.2	4.3
1970-75	5.2	+4.7	9.9
1975-80	3.2	-0.3	2.9
1980-85	3.8	-6.5	-2.7

/a Deflator of agricultural value added divided by the deflator of value added of nonagricultural sectors.

/b Agricultural GDP in constant prices plus the annual percentage rate of change in the domestic terms of trade between agriculture and other sectors.

Source: Mission estimates.

3/ During the 1965-73 period ten countries out of a total sample of eighty countries (including developed countries) experienced a higher growth rate than Thailand. In 1973-84, the corresponding ratio was 15 out of 91 countries. However, no country among the ten best performers in 1965-73 was included among the fifteen best performers in 1973-84. This data was computed from World Development Report, Table 2, pp. 182-83, World Bank, 1986.

4/ Defined as the agricultural GDP in current terms deflated by the nonagricultural implicit price deflator calculated from GDP series. Deflating by the consumer price index gives similar results.

Options for Increasing Agricultural Incomes

2.5 Options for increasing farmers' incomes would consist of (a) increasing domestic agricultural prices; (b) removing constraints to agro-industrial diversification; (c) implementing policy changes and investments that would lead to higher agricultural yields; and (d) creating off-farm activities. The corresponding government policies are outlined in the following paragraphs.

2.6 In recent years, partly to offset the decline in world market prices, the Government has reduced export taxes on rice and rubber.^{5/} Since these taxes depressed domestic prices and lowered farmers' incentives to adopt yield-increasing technology, the reduction of these taxes was a significant welfare-improving policy change.^{6/} In the case of rice various price support schemes have been implemented by Government in 1981-86. So far these schemes have had little impact on domestic prices due to limited budgetary and financial resources and they have not seriously disrupted rice exports.^{7/} This is certainly a positive aspect of government policy, but Thailand as a major exporter of rice will have little alternative but to let the new, lower, international prices be fully reflected in domestic prices. Attempting to maintain domestic prices above border prices would hinder the natural diversification process that is already well advanced and lower the real income of Thailand for the following reasons. First, resources which would have produced commodities with a higher value in terms of border prices would remain in their current activities. Second, by maintaining the domestic price of rice above the world price the cost of food consumption would increase. For a country such as Thailand where food accounts for a large share of consumers' budgets, this policy would result in a substantial welfare loss, particularly for the poorest consumers. And finally, attempting to raise farmers' income by increasing rice prices would result in high fiscal cost and limited benefit to farmers. This would be so because the price support would

5/ In 1985-86, the Government suspended the export duty on rice and the rice export premium.

6/ This reflects the greater impact of export taxes on domestic prices. For an analysis of this point, see Thailand: Pricing and Marketing Policy for Intensification of Rice Agriculture, pp. 17-18, Report No. 4963-TH, September 1984.

7/ In 1984-85 paddy purchased under the market intervention scheme of MOAC amounted to 67,000 tons and paddy bought under the paddy pledging program launched by BAAC amounted to 91,000 tons. By comparison total paddy output was 20 million tons. In 1985-86 the sums involved were increased, but actual paddy purchase was small. In 1986, export licensing requirements for rice were lifted. This made it possible for Thailand exporters to adjust the composition of exports towards lower quality rice in response to world market demand (see Annex 1, paras. 7-8). This adjustment indicates that export licensing and the requirement to hold a certain amount of stocks had a depressing effect on rice exports.

induce farmers to increase output, which in turn would depress prices unless offset by larger government outlays. At the same time, the net benefit per farmer would decline since proportionately more inputs would be used to increase output on marginal land. The net result of the two trends would be a declining benefit-cost ratio over time.

2.7 For these various reasons attempting to increase the domestic price of paddy through price support schemes is unlikely to be a successful policy. However, there are alternative measures that would increase farmers' income. First, the Government may want to establish a commodity exchange through which forward contracts in maize, rice and tapioca pellets would be traded (see Chapter IV, Section C). This would help increase the efficiency of domestic markets in transmitting price information from foreign markets and domestic processors to farmers, and would enable farmers to hold stocks after harvest rather than selling them at a low price. As a result, farmers' income would be higher.

2.8 Another policy to increase farmers' income would be to facilitate the on-going diversification process towards higher value commodities. This would enable Thailand's farmers to take advantage of favorable world price and market prospects for nontraditional commodities. Thailand's diversification process and the role of Government in facilitating such a process are discussed below.

B. Agro-Industrial Diversification

2.9 Agricultural Diversification. Overall, agricultural growth in Thailand has resulted in a well diversified production structure with some 23 commodities accounting from 1 to 5% of agricultural value added (Table 2.2). The main trend illustrated by Table 2.2 has been rice's declining share in agricultural value added from 30.6% in 1970-74 to 22.3% in 1984-85. Most other crops' shares have not increased much, with the exception of sugarcane, and to a lesser extent, fruits and vegetables. The key characteristic of the past diversification process has been that it was a natural adjustment process by the private sector in response to market forces.

Table 2.2: SHARES OF AGRICULTURAL COMMODITIES IN AGRICULTURAL GDP
(as % of agricultural value added in current prices)

	1970-74	1980-81	1984-85
<u>Crop /a</u>	<u>72.2</u>	<u>74.5</u>	<u>73.0</u>
Paddy	30.6	26.2	22.3
Rubber	3.9	4.3	5.1
Coconut	0.8	0.8	0.8
Sugarcane	3.0	8.7	9.3
Maize and sorghum	4.7	4.2	4.6
Groundnut	1.0	1.0	0.7
Mung bean	1.2	0.9	1.4
Castor bean	0.2	0.7	0.1
Soy bean	0.7	0.4	0.6
Cassava	2.9	4.8	3.5
Tobacco	1.7	3.4	2.1
Cotton	0.7	1.0	0.5
Kenaf, jute and ramie	1.9	0.5	0.8
Kapok	0.4	0.2	0.2
Sesame	0.2	0.2	0.1
Garlic, onion, shallot, chilli	5.0	2.0	2.6
Vegetables	2.4	2.7	4.1
Fruits	10.4	12.7	13.7
Other crops	0.4	0.5	0.5
<u>Livestock</u>	<u>11.8</u>	<u>12.8</u>	<u>13.4</u>
Cattle and buffaloes	3.4	3.3	4.1
Swine	2.7	3.5	3.4
Hens, duck and other poultry	3.3	3.0	2.6
Eggs	2.3	2.9	3.0
Others	0.1	0.1	0.3
<u>Fisheries</u>	<u>10.0</u>	<u>7.0</u>	<u>6.9</u>
Marine fish	7.7	4.6	4.6
Freshwater fish	2.3	2.4	2.3
<u>Forestry</u>	<u>6.0</u>	<u>5.7</u>	<u>6.7</u>
<u>Total Value Added /a</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

/a Totals may not add up due to rounding-up errors.

Source: NESDB.

2.10 Among the factors promoting diversification, the heavy taxation of rice in the seventies has played a major role by lowering the domestic price of rice relative to that of other crops by nearly 35%.^{8/} Such a structure of prices provided incentives to farmers to increase nonrice output relative to rice, which is what happened. In addition, the taxation of rice output lowered the incentives for farmers to adopt input-intensive techniques of cultivation and high yielding varieties; and despite the high social rate of return to rice research, much of the results generated by Thailand's rice research centers were not used by farmers.^{9/} This is in contrast to maize where the domestic price was close to the world price and where research and extension played a key role. The contrast between rice and maize highlights the importance of price incentives in inducing farmers to adopt the worthwhile output of agricultural research. In recent years, however, the Government has reduced the export taxation of rice and rubber.

2.11 Among the positive elements responsible for commodity diversification, the high profitability of nonrice crops (Table 2.3) and the efficiency of the agricultural marketing system have been crucial. As has been widely documented in a number of studies,^{10/} domestic producer prices were regularly adjusted on the basis of Bangkok FOB prices by middlemen--weekly in the case of rice--and profit margins were quite small. In addition, direct market intervention by Government was limited as the Government did not have an effective institutional mechanism to directly support farmgate prices. As a result, the domestic structure of agricultural production generally reflected Thailand's comparative advantage, and evolved accordingly overtime.^{11/}

2.12 In the livestock sector the situation has been different, however. High expansion rates were recorded for poultry, eggs and dairy products, but the swine and cattle subsectors experienced one of the lowest rates of growth among agricultural commodities.^{12/} An important factor accounting for this

8/ Since World War II and until 1982 rice export taxation has averaged 35% of FOB value. See: Gerald O'Hara and Vinh Le-se, The Supply and Welfare Effects of Rice-Pricing Policy in Thailand, World Bank Staff Working Paper No. 714, 1985.

9/ This is indicated by a recent study which shows that research and extension activities were statistically insignificant in explaining rice output growth, but highly significant in accounting for the growth of maize output. See: R.E. Evenson and Suthad Setboonsarng, Research, Extension, Literacy and Productivity Growth in the Agricultural Sector in Thailand, 1986.

10/ See, for example, Peter K. Pollak, Agricultural Markets and Marketing in Thailand, IBRD 1980 and the NESDB Pricing and Marketing Study, 1981.

11/ This is indicated by the high growth rates of value added recorded for agricultural commodities, and by their sharp variations over time (see Table 4, Statistical Annex).

Table 2.3: NET RETURNS OF CROPS TO FARMERS
(Average 1984/85)

	Yield (kg/rai)	Price (B/kg)	Gross returns (B/rai)	Produc- tion cost (B/rai)	Net return (B/rai)
Traditional Crops /a					
Rice	346	2.89	999	927	23
Cassava	2,504	0.57	1,427	986	441
Rubber /b	66	14.11	926	-	-
Maize	370	2.27	840	642	198
Sugarcane	7,255	0.40	2,902	1,689	1,213
Kenaf	177	4.94	876	855	21
Tobacco (Virginia)	174	43.11	7,518	-	-
Nontraditional Crops					
Pineapple	3,753	1.50	5,630	3,961	1,668
Mungbeans	105	6.45	679	588	90
Sorghum	181	2.54	460	387	73
Kapok	150	8.28	1,244	-	-
Groundnuts	204	6.19	1,261	1,176	85
Soybeans	178	6.26	1,112	977	135
Cotton	191	10.63	2,026	1,940	36
Sesame	103	11.31	1,169	780	389
Oil palm	1,555	1.39	2,161	-	-
Coconut	567	2.77	1,670	-	-
Chilli	1,989	10.53	20,942	11,380	9,561
Shallot/onions	1,371	8.98	12,313	-	-
Garlic	652	24.02	15,366	9,653	5,713
Tomato	2,086	1.25	2,607	1,938	1,444
Cucumber	15,000	1.00	15,000	7,598	11,765
Mustard	2,946	5.97	17,590	4,438	13,152
Cabbage	1,937	3.00	5,811	5,357	455
Longbean	569	8.02	4,566	3,729	837
Cashew nut	350	14.00	4,893	1,476	3,417
Sunflower /c	300	6.68	2,004	1,000	1,004
Strawberries /d	2,500	6.68	2,004	1,000	7-20,000

/a The distinction between traditional and nontraditional crops is the one used by NESDB.

/b Includes senile rubber area of which only 40% is actually tapped and immature rubber area.

/c 1981/82 data.

/d Mission estimates.

Source: Ministry of Agriculture and Cooperatives.

result was that the private sector has been allowed to operate freely and to profit from the introduction of hybrid chicken in Thailand, whereas the operations of the private sector in the cattle and swine subsector have been controlled and restricted, mainly by the 1959 Animal Slaughtering and Meat Sale Control Act. Yet, the promotion of livestock activities (pork and cattle) probably offers the best potential for increasing Thai farmer's income (see Annex 2, paras. 62-68).

2.13 Agro-processing Diversification. The contribution of agro-processing to manufacturing growth is shown in Table 2.4 and Graph 1. According to both a narrow definition of agro-processing (food, beverages and tobacco), and a broader one which includes leather, wood, furniture, paper and rubber products, agro-processing grew consistently slower than the manufacturing sector. This was reflected in a quasi-general decline of each subsector's share in manufacturing value added from 1970-74 to 1984-85. Overall, the share of agro-industrial products, defined broadly, fell from 45.7% of manufacturing value added in 1970-74 to 34.2% in 1984-85 (Table 2.4). Since 1980, the structural decline of the agro-processing sector leveled off somewhat, but this was due more to the much weaker performance of other manufacturing subsectors, notably heavy industry, than to an improved performance of agro-industrial activities. It is also evident from Table 2 (Statistical Annex) that the agro-processing sector, and all its components, exhibited growth rates which fluctuated tremendously from year to year, perhaps reflecting the inherently risky nature of such activities and their vulnerability to shifts in world commodity prices.

2.14 Although the above scenario does not paint an altogether rosy picture of the contribution of the food processing sector in terms of overall growth rates, there is evidence that Thailand has a comparative advantage in the food processing sector. Indeed, Nishimizu and Page (1986) ^{13/} show that food processing, as well as textiles, printing and publishing, and other resource-based activities such as footwear, leather products, furniture, and rubber products, experienced total factor productivity growth that was higher than "world" rates and exhibited competitive domestic resource costs of less than unity. This implies that Thailand's food processing sector improved its competitive position relative to the world during the period covered by the study (1963 to 1970). Furthermore, the more recent successes in world markets of a number of Thai agro-products suggest that Thailand continues to be an efficient producer of agro-industrial products.

2.15 Export Markets. Thai agricultural export successes of the 1960s and

^{12/} Over the 1970-85 period the respective growth rates of value added in constant prices were 6.8% p.a. for poultry, 10.3% p.a. for eggs and 14.8% p.a. for dairy products, but only 2.0% for the swine and cattle subsector.

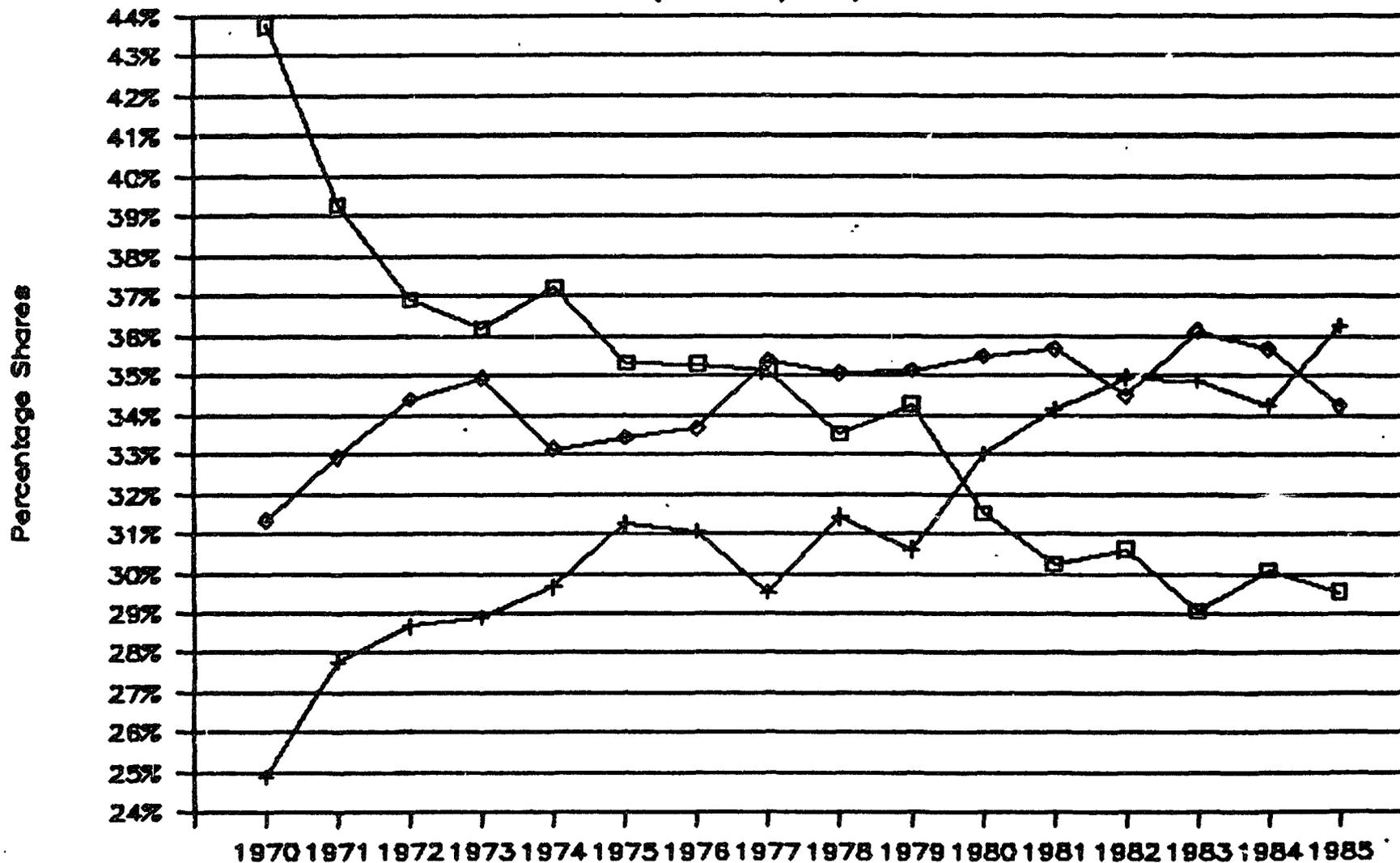
^{13/} Nishimizu, M. and Page, J.M. Jr., Productivity change and dynamic comparative advantage, Review of Economics and Statistics, Vol. 68, No. 2, May 1986, pp. 241-247.

Table 2.4: GROSS DOMESTIC PRODUCT ORIGINATING FROM MANUFACTURING

	Growth rates in % p.a. in 1972 prices			Shares as % of current value added		
	1970-75	1975-80	1980-85	1970-74	1980/81	1984/85
Food	5.7	6.4	6.8	20.5	15.0	13.0
Beverages	2.0	12.0	3.6	9.1	7.4	9.3
Tobacco and snuff	7.5	6.0	-0.7	8.8	6.1	6.1
Subtotal agro-industrial products (narrow defini- tion)	<u>5.1</u>	<u>7.8</u>	<u>4.2</u>	<u>38.4</u>	<u>28.6</u>	<u>28.4</u>
Leather, leather products and footwear	6.9	-0.6	10.9	0.7	0.4	0.5
Wood and cork	5.2	-2.6	4.3	2.7	2.3	1.7
Furniture and fixtures	-2.7	5.7	9.2	1.2	0.9	0.9
Paper and paper products	13.3	24.6	4.2	0.8	1.2	1.1
Rubber and rubber products	19.3	12.3	-2.7	1.9	2.1	1.6
<u>Total Agro-Industrial Products (Broad Defini- tion)</u>	<u>5.7</u>	<u>7.9</u>	<u>3.6</u>	<u>45.7</u>	<u>35.5</u>	<u>34.2</u>
Nonagro-industrial products	13.2	12.3	6.2	54.3	64.5	65.8
<u>Total Manufacturing Value Added</u>	<u>9.6</u>	<u>10.5</u>	<u>5.4</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

Source: NESDB.

Graph 1
 Shares of Manufacturing GDP
 (at 1972 prices)



□ Agroprocessing
 + Light Ind.
 ◇ Heavy Ind.
 (Food, beverages, tobacco)

1970s have been concentrated in "commodity" products where importers buy on the basis of price and where standardized quality controls are easily met. Examples include the grains, shrimps and canned pineapples. For these sorts of products, Thai exports hinge on price competitiveness and the size of the overall international market. But Thailand has been less successful in specialty-product markets which are individually small but large in aggregate. However, these products are likely to become much more important in the future as indicated by the recent evolution of agro-industrial exports which highlights two contrasting trends: the first one is the stagnation of traditional agro-industrial exports from \$2,852 million in 1980 to \$2,760 million in 1986; and the second one is the increasing value of nontraditional agro-industrial exports from \$828 million in 1980 to \$1,720 million in 1986 (Table 2.5). The difference between these two trends is not new: in the seventies exports of nontraditional agro-products were also increasing at a faster rate than traditional agro-products. What is new is the decline in the dollar value of traditional agro-industrial exports--which is mainly due to falling export prices^{14/}--and the sharp increase in fishery and seafood exports, which in 1986 became Thailand's first agro-industrial export, largely because of a rapid increase in exports to Japan. By order of importance, the main items were: canned seafood (\$416 million), frozen and dried squids (\$186 million), frozen shrimp (\$167 million) and frozen fish (\$83 million).

2.16 To a large extent, Thailand's diversification process is the result of the generally better price performance of nontraditional commodities relative to the evolution of the world market prices of traditional commodities. This can be seen by comparing Table 1 in Annex 1 to Table 1 in Annex 2. Domestically, this structure of prices was reflected in the low farm incomes generated by the cultivation of most traditional crops compared to nontraditional commodities (as defined by NESDB, see Table 2.3).

^{14/} The exception is cassava exports which are subject to EEC's quota. The fact that Thailand's share in world's exports of food and nonfood agriculture increased in 1980-84 does not suggest that trade barriers were increasingly discriminating against Thailand. For more details on protectionism, see: Thailand: Growth with Stability, A Challenge for the Sixth Plan Period, A Country Economic Report, Vol. II, pp. 18-28, World Bank report, June 1986.

**Table 2.5: SELECTED PRINCIPAL AGRO-INDUSTRIAL EXPORTS
(US\$ Millions)**

	1980	1982	1985	1986
<u>Traditional Agro-Industrial Products</u>	<u>2,852</u>	<u>3,286</u>	<u>2,452</u>	<u>2,760</u>
Rice	953	979	829	773
Tapioca products	727	859	551	727
Rubber	603	413	500	575
Maize	357	362	284	352
Sugar	145	562	230	276
Tobacco leaves	67	111	58	57
<u>Nontraditional Agro-Industrial Products</u>	<u>828</u>	<u>1,058</u>	<u>1,295</u>	<u>1,720</u>
Crops, fruits and vegetables	262	343	364	367
Fishery and Seafood products	321	421	587	875
Animal products	39	76	68	137
Other agro-processed products	206	218	276	341

Source: Table 5, Statistical Annex.

2.17 Thailand's past export successes and the high level of financial returns offered by nontraditional commodities are important elements in assessing the desirability of further promoting agro-industrial diversification. Another key consideration is the size of world markets for nontraditional commodities. The reason for this is that due to currently limited domestic demand (see Table 2, Annex 2), the increase in Thailand's production of nontraditional commodities would mainly depend on export growth.

2.18 Information on the potential market sizes of some of Thailand's nontraditional agro-industrial products is provided in Table 2.6. This table shows that world exports of nontraditional commodities are large when aggregated by product categories such as: fishery products (\$16 billion), fresh and processed vegetables (\$7.1 billion), and processed fruits and juices (\$7.1 billion). These are also large exports when compared to the world export market for rice (\$3.8 billion), Thailand's main traditional export. However, a crucial characteristic is that markets for a specific commodity (within a larger product category) are rather small. This indicates that dynamic promotion of nontraditional commodities could result in excess supply and sharp fall in export price. This risk is particularly important for

**Table 2.6: MARKET SIZES OF SELECTED NONTRADITIONAL
AGRICULTURAL COMMODITIES, 1984**
(Amounts in US\$ million)

	World	Developing countries	Thailand	
			Exports	% of world
Mungbeans	...	...	75	...
Soybeans	7,144	1,646	0.8	0.0
Coarse grains /a	14,221	2,219	400/b	2.8
Sesame seeds	246	244	9	3.6
Sunflower seeds	792	58	0.0	0.0
Spices excluding pepper	409	335	12	2.9
Pimento	130	90	2	1.6
Cocoa, brazil and cashew nuts	564	493	0.6	0.1
Coconut oil	1,009	926	3.8	0.4
Palm oil	2,624	2,510	6.2	0.2
Groundnuts	578	336	2	0.4
Orchids	...	...	21	...
Vegetables	7,118	2,192	25.4	0.4
Fresh vegetables excluding tomatoes	2,736	657	6.9	0.3
Fresh tomatoes	999	329	0.5	0.05
Prepared and preserved vegetables	2,579	872	17	0.7
Dried vegetables	811	346	1	0.1
Fruits			197	
Fresh fruits of which:			23	...
Bananas	1,476	1,377	0.9	0.0
Mangoes	...	...	1.3	...
Papayas	...	...	2.9	...
Longan	...	...	9.0	...
Fresh berries	293	19	0.0	0.0
Prepared and preserved fruits	4,534	2,709	149	3.3
Fruits or vegetable juices	2,560	1,693	11	0.4
Fisheries	15,955	7,118	633	4.0
Of which:				
Fish, fresh, chilled or frozen	5,621	1,743	44.5	0.8
Fish dried, salted or smoked	900	757	5.2	0.6
Crustaceans and mollusks (fresh, frozen, dried)	5,272	1,682	256	4.9
Fish products and preparations	2,004	1,305	159	7.9
Crustacean and mollusk products and preparations	794	431	103	13.2
Meals	1,034	504	63	6.1
Meat Products	14,626	2,036	61	0.4
Of which: Boneless chicken	...	...	61	...
Swine (meat)	3,453	349	...	...

/a 1983 data.

/b Mainly maize (\$365 million) and sorghum (\$34 million).

Source: FAO data.

speciality items such as asparagus, strawberries, gherkins, etc... Nevertheless, it can be avoided provided domestic production of new crops would be initiated only once a market for them has been established. This requirement will in general dictate a strong private sector involvement in the promotion of nontraditional commodities.

2.19 As shown by Table 2.6, Thailand's exports of nontraditional commodities consist of a large variety of different items. This reflects Thailand's success in finding small market niches for nontraditional products. In the past these niches were found through private sector initiatives in identifying markets and selecting the type of crops to be grown. Usually the cultivation techniques were traditional and involved low cost inputs. An example of this is provided by the exports of so-called minor commodities which amounted to about \$100 million in 1984 (excluding fruits and vegetables),^{15/} or mungbean exports (\$56 million in 1986). Recently a second type of commodity has become quite successful in Thailand. Unlike the traditional minor crops, these new commodities require more modern production techniques and are the result of prior agro-industrial research and continued adaptive research by private firms in collaboration with farmers.

2.20 Prospects for the production, marketing and processing of new agro-industrial commodities in Thailand are analyzed in more detail in Annex 2.^{16/} The general conclusion is that although presently unexploited market opportunities are rare, Thailand has the potential to expand its world market share for several commodities, particularly in view of the already noticeable changes in Thailand's comparative advantage, rising labor costs in Thailand's main competitors such as Taiwan and recent world-wide exchange rate adjustments in 1986. Among the commodities investigated for this report, the most promising ones include some field crops, seeds, processed fruits and vegetables, and particularly aquaculture and seafood products, and pork.

2.21 The outlook for continued growth of nontraditional commodities will be determined, however, by Thailand's ability to overcome constraints currently encountered. They include:

- (a) The lack of varieties adapted to the requirements of exporters and domestic processors. The required varieties, particularly in the case of fruits and vegetables, are different from the ones currently

^{15/} These were: Job's tears, ricebean, blackbean, dried beans, castor oil, kapok, ginger, chilis, tamarind, seedlac and sticklac, stellac, cotton seed meal, cotton seed, orchids and unworked feathers.

^{16/} This summary is based on a more detailed report prepared by Hawaiian Agromics covering twenty one commodities which were selected for investigation out of a list of 199 commodities, in consultation with NESDB. Criteria used in the selection of these commodities included: (a) potential for export and/or import substitution; (b) potential for value added processing; (c) linkages to the agro-industrial sector; and (d) availability of data.

produced for local consumption.

- (b) The irrigation infrastructure of the irrigation command areas which is not well suited to meet the irrigation requirements of nonrice crops during the dry season.
- (c) The lack of an adequate supply of raw agricultural material of consistent quality. To develop such a supply would generally require the strengthening of linkages among farmers, processors and exporters.
- (d) Low produce quality due to poor post-harvest technology and inadequate storage facilities. This makes it difficult for exporters to meet the quality standards demanded by foreign markets.
- (e) High domestic prices. Currently, Thailand's domestic prices of several nontraditional commodities are above world market prices, partly due to high protection. To increase Thailand's competitiveness in these markets will require the achievement of higher yields and a change in the structure of incentives for imports and exports.
- (f) Difficult access to institutional credit, partly because of farmers' lack of the collateral (land title) required by banks. This makes it difficult for farmers to buy the modern inputs required for increasing yields and Thailand's competitiveness in export markets.
- (g) The high risk of investing in agro-industry as indicated by the business failures of several agri-businesses during the last decade.

Government Role in Agro-Industrial Diversification

2.22 Recommendations: Given the proven dynamism of Thailand's entrepreneurs in identifying market niches abroad and of Thailand's farmers in responding to market incentives, the private sector will have to play the major role in the selection, production and marketing of nontraditional commodities. This indicates that Government has only a limited role to play in identifying and promoting the nontraditional crops.

2.23 These considerations are particularly relevant to the current government diversification program concerning rice and cassava. Although diversification towards nonrice crops in the North and Northeast during the dry season would seem to be economically justified, such evidence is lacking in the case of the Chao Phya river basin in the central plains (see Annex 1 para. 5). For this reason, the decision to diversify production in the Chao Phya should be left to the private sector and should not be encouraged through subsidies on seeds and credit. In the case of cassava, a similar recommendation also applies. At present tapioca prices, profitable substitution possibilities may be non-existent and the likelihood of success of the current government cassava substitution program is slim (see Annex 1, paras. 14-17). A more promising policy would be to auction off the export quota rights for cassava at the beginning of the season. The proceeds

generated by the sale of the rights to export to the EEC could in turn be used to finance the recommended increase in government research on nontraditional commodities.

2.24 Despite the above-mentioned limitations on the direct role of Government in identifying and promoting specific nontraditional crops, the Government has a role to play. This role would be to remove current distortions and constraints which prevent an efficient growth of nontraditional commodities. To address these constraints, the government strategy would consist of:

- (a) implementing institutional changes to better assign specific functions to government agencies operating in irrigation command areas and clarify the respective role of the Government and the private sector in research and seed production (see Chapter III, Sections A and B);
- (b) increasing government investment in irrigation and agricultural research on selected nontraditional commodities. The availability of a modern irrigation system would increase the supply of nontraditional crops, while government research on nontraditional crops would help develop new varieties required for export markets (See Chapter III, Sections B and C);
- (c) strengthening farmer-processor linkages through the promotion of contract farming for high value crops in irrigated areas. This would facilitate the transfer of technology from firms to farmers, lead to the cultivation of improved varieties adapted to the needs of processors, and ensure a more efficient sharing of agro-industrial risks (See Chapter III, Section D);
- (d) implementing policy changes to remove existing distortions. Such changes particularly concern the livestock sector, exports and agro-industrial credit (See Chapter IV, Sections A, B, and D); and
- (e) improving Thailand's access to highly competitive and often protected international markets (See Chapter IV, Section C).

2.25 Facilitating the shift in production to higher value crops would help improve farmers' income. A complementary policy would be for Government to implement measures that would result in higher agricultural yields. The resulting agricultural intensification process and government role are described below.

C. Intensification of Agricultural Production

2.26 Agricultural Labor Productivity Growth (defined here as the growth of agricultural value added per worker) can be broken down into two components as shown in Table 2.7: the percentage change in land productivity and the percentage change in cultivated areas per worker.^{17/} These indicators point out that in the 1960s the main source of labor productivity growth was the expansion in cultivated areas per worker rather than land productivity growth.^{18/} Since land could be occupied without any other cost than labor for clearing the land, expansion in output to meet increased external demand could be achieved by putting additional land into cultivation using traditional cultivation techniques. As a result, the generation and the use of yield-increasing technology was not essential and was rather unattractive from the farmers' point of view.^{19/} By using relatively inexpensive inputs and factors of production, farmers have minimized the adjustment costs involved in shifting from one crop to another and have been able to meet changes in foreign demand with great flexibility.

^{17/} By definition, value added per worker is equal to value added divided by cultivated areas multiplied by cultivated areas per worker. By total differentiation, the percentage change in labor productivity can be expressed as the sum of the percentage change in land productivity plus the percentage change in the land-labor ratio.

^{18/} Labor productivity in Table 2.6 is calculated as value added by major crops and livestock divided by total agricultural employment. The definition of value added excludes the value added by minor crops and the definition of employment includes the labor force engaged in fishery activities. However, using different definition for land, labor and value added did not significantly alter the nature of the trends illustrated in Table 2.6.

^{19/} Among twelve Asian and Pacific countries Thailand had the lowest average nutrient consumption in kg/ha of N, P₂O₅ and K₂O in 1983-84. See: Agrochemicals News in Brief, ESCAP/FAO/UNIDO, p. 9, September 1986.

**Table 2.7: EVOLUTION OF LAND AND LABOR PRODUCTIVITY
IN CROPS AND LIVESTOCK, 1960-85**
(Average annual percentage rates in constant prices)

	1960-70	1970-80	1980-85
Labor productivity <u>/a</u>	2.9	2.1	2.9
Land productivity <u>/b</u>	0.5	1.3	1.5
Land per worker <u>/c</u>	2.4	0.8	1.4

/a Value added in crops and livestock divided by total employment in agriculture. By definition the percentages indicated on this line are equal to the sum of the percentages on lines b and c.

/b Value added in crops and livestock divided by cultivated areas for the major crops.

/c Cultivated areas for the major crops divided by employment in agriculture.

Source: Mission estimates.

2.27 The Transition Process. Recently, however, the pattern of growth has started to change. The first change occurred in the 1970s when the rapid expansion in cultivated areas (3.2% p.a.) was accompanied by a shortage of labor during the rainfed cropping season. This led to a rapid growth in agricultural machinery, and particularly small single-farm tractors and large 70 hp tractors performing contract plowing services in upland areas. A key element in this process was the dominant role of the private sector.^{20/} Local producers successfully manufactured new agricultural machinery,^{21/} and farmers financed their acquisition through hire-purchase schemes reflecting commercial interest rates rather than government subsidies as in some other countries. This process was reflected in the rapid expansion of the private capital stock

20/ See Hans P. Binswanger, Agricultural mechanization: A Comparative Historical Perspective, World Bank, Operational Policy Staff, Report No. ARU 1, October 1982.

21/ Simple locally-designed two-wheel power tillers became available in the mid-1960s and were manufactured locally with great success. By contrast the Ministry of Agriculture devoted considerable resources to the invention of a locally-adapted power tiller, the iron buffalo, which went into production, but failed commercially.

in agriculture by 5.2% p.a. in constant prices in the 1970s.^{22/} It is particularly noteworthy that such a growth occurred despite capital market distortions affecting agricultural credit and the high taxation of the agricultural sector which discriminated against investment in agriculture. However, such a process was made possible by the rapid increase in agricultural income that occurred in the early 1970s. To a large extent, this was due to rises in agricultural prices as well as commodity diversification.

2.28 Somewhat surprisingly diversification and the associated shift from low to higher value added crops were not always accompanied by a parallel change from traditional to more modern cultivation techniques. In most cases the expansion in the output of new crops was carried out using low cost inputs and fairly traditional techniques. This indicates that the low yields recorded for nearly all crops in Thailand were not the result of a lack of innovation or dynamism on the part of the Thai farmers; on the contrary, they reflected the farmers' response to the low price of land and the relatively high price of modern inputs such as fertilizers.^{23/}

2.29 The second change is more recent and gradual. It is due basically to the slowdown in the expansion of cultivated areas to 2.6% p.a. in 1980-85.^{24/} Although the continued increase in cultivated areas implies that contrary to what is often assumed, Thailand has not reached its land frontier, it also indicates that expansion in cultivated areas is no longer a widely available option for increasing output. As a consequence, yield-enhancing technology such as fertilizers and improved seeds is becoming a critical factor for agricultural production. To some extent the increased demand for modern inputs is shown by the acceleration in the rate of growth of fertilizer consumption from 10.9% p.a. in the seventies to 12.2% in 1980-84 at the same time that the growth rate of agricultural value added fell. Another indication is the expansion of the commercial production and distribution of seeds by private firms since the late 1970s (see Annex 2 para. 14). At an

^{22/} Private capital stock in agriculture grew by 1.7% p.a. in real terms in the sixties and by 5.2% in the seventies according to unpublished Bank of Thailand estimates.

^{23/} Among twelve Asian and Pacific countries, Thailand had the lowest paddy to fertilizer (N) nutrient price ratio and the lowest average nutrient consumption in kg/ha. See: Agrochemicals News in Brief, September 1986. The role played by the relative prices of the factors of production in influencing the pattern of technological innovation has been documented for a number of countries and is not unique to Thailand. See: Yujiro Hayami and Vernon Ruttan, "Agricultural Development, an International Perspective." The John Hopkins University Press: Baltimore, 1985.

^{24/} Cultivated areas for the major crops grew by 3.9% p.a. in the sixties, 3.2% in the seventies and 2.6% in the 1980-85. However, these estimates do not include cultivated areas for other crops which may give an overall different result.

aggregate level the effect of yield-increasing technology is shown by the increase in the rate of growth of land productivity from 0.5% p.a. in the sixties to 1.5% p.a. in 1980-85, and the general rise in yields that occurred for nearly all commodities between the 1970s and the first half of the 1980s.^{25/} These results suggest that technological progress, in addition to commodity diversification, has become an important factor accounting for land productivity growth.

Policies for Yield Intensification

2.30 The intensification of agricultural production is now emerging as the key issue for Thailand's agricultural sector. This follows for two reasons. First, the world market prices for Thailand's traditional commodities (with the exception of rubber and sugar) are expected to remain in real terms below their 1985 levels. Hence without substantial productivity improvements to reduce costs, agricultural real incomes are unlikely to rise. And second, the domestic prices of several of the new nontraditional commodities produced in Thailand are above world market prices (see Annex 2). This implies that the pace at which technological innovation will be applied will largely determine Thailand's competitiveness in world markets.

2.31 Key elements in the achievement of productivity increases will be (a) the modernization of Thailand's irrigation infrastructure; (b) the availability of single nutrient fertilizers at world market prices; (c) the adaptation of improved seeds to Thailand's soils and climate; (d) increased agro-industrial research; (e) improved access to institutional credit; and (f) better sharing of agro-industrial risks. Provided the corresponding action program would be implemented by Government, farmers would have higher incentives to intensify production. This would lead to a fall in the production costs of nontraditional commodities, and increase Thailand's competitiveness in world markets and the elasticity of supply of agricultural commodities.^{26/}

2.32 Irrigation Infrastructure. A key reason for the past successes of Thailand's agriculture is that farmers have been able to respond quickly to new changes in international demand by bringing new land into cultivation. However, this source of growth will be reduced in the future as inexpensive new land (encroached forest reserves) will no longer be readily available for the cultivation of new crops. As a result, expansion of new crops would, unlike in the 1970s, have to take place on already cultivated land. But due

^{25/} See Table 7, Statistical Annex.

^{26/} This occurs because the underlying constraint on output expansion (namely the low elasticity of traditional inputs such as land) is alleviated by the use of modern inputs which have a high elasticity of supply. An example of this effect is provided by the rapid increase in the production of hybrid chicken and the 71% volume increase in frozen chicken exports in 1986 following a change in the baht/yen exchange rate. By contrast, production of native chicken has increased much more slowly.

to the irrigation requirements of nontraditional crops, increased cultivation of nonrice crops in irrigation command areas will require a modernization of the irrigation infrastructure (see Chapter III, Section C).

2.33 Fertilizers. As indicated by the analysis of constraints affecting agricultural production (see Annex 2), agro-industrial diversification in Thailand will greatly depend on the increased use of improved seeds for increasing farm yields and production. But the relatively high cost of complementary inputs (fertilizers and credit) has not induced farmers to adopt a higher input management system which would have allowed the yield of improved varieties to increase up to their full potential.

2.34 While partly attributable to the small proportion of reliably irrigated areas, Thailand's low level of fertilizer consumption is primarily due to the high cost of fertilizer vis-a-vis the value of incremental production. On the cost side, compound fertilizers have been promoted at the expense of less costly single-nutrient fertilizers, and there has been an unnecessary proliferation of brand name fertilizers which may result in high profit levels at the wholesale/importation level and high prices at the farmgate. Government policy changes to address these issues are not discussed in this report, given their complexity, but they are certainly crucial to the intensification of agricultural production.

2.35 Seeds. Government role in improved seed breeding and multiplication has been rapidly expanding since 1975. Currently, the Department of Agricultural Extension (DOAE) is concentrating on seven types of seeds, namely rice, maize, sorghum, mungbean, groundnut, soybean and cotton, which are produced either directly by DOAE or by farmers recruited by DOAE to produce seeds under contract. So far over B 2 billion have been invested in the construction of twenty seed multiplication centers managed by DOAE, which may turn out to be one of the largest government seed networks in the world. Two more centers are planned at Sukhothai for soybean, cotton, legumes and vegetable seeds, and at Pattalung for rice, maize and legumes. This expansion raises important issues concerning the respective role of the private and public sectors in seed distribution, seed pricing and the regulation of the seed industry.

2.36 Recommendations. In order to better exploit Thailand's private sector potential for seed production (see Annex 2, paras. 14-15), the respective roles of DOAE, DOA and private firms should be clarified. Although it is likely that DOA and DOAE will continue to play the most important role in the research and production of improved stock seed, the long-term objective would be to give to the private sector the main responsibility for seed multiplication and distribution with adequate certification and government regulation to ensure that quality standards are maintained.

2.37 A measure which would facilitate the expansion of the private seed industry would be to improve the seed pricing policy of DOAE. At present, the cost of seeds produced by farmers under contract with DOAE is on average twice as high as the commercial cost of seeds produced by private firms, and most DOAE seeds are sold at prices well below production cost (Table 2.8). It is, therefore, essential to implement a full and accurate costing of seeds produced by DOAE, and to set the price of DOAE seeds at a level which will not

discourage the private sector from expanding its participation in the seed producing industry. For the immediate future there is a need to review the role of the twenty one seed multiplication centers which are being created by DOAE since their planned output would appear to be quite high. In specific cases such as the Chiang Mai vegetable seed center, the Government may want to rent out part of the facilities--which would otherwise remain unused--to the private sector.

Table 2.8: COSTS AND PRICES OF SEEDS, 1983
(in baht per kg)

	<u>Cost of seeds</u>		<u>Price of seeds</u>	
	DOAE	Private firms	DOAE	Commercial
Rice	6.9	4.04	5.5	5.5
Corn	6.55	3.12	6.5	12 (42 <u>/a</u>)
Sorghum	6.88	3.5	5.0	42.5 <u>/a</u>
Soybean	12.72	7.73	15	16
Mungbean	15.78	7.52	15	16
Peanuts	16.55	8.47	15	16

Note: /a Hybrids.

Source: Chiang Mai University and Chulalongkorn University, Agricultural Employment: Creation and the Improvement of the Quality of Agricultural Commodities for Increasing Income and Export Earnings (Northern Region), Vol II, p. 6.51, November 1985.

2.38 Agro-industrial Research. At the research level, improved varieties apparently exist for a number of nontraditional field crops and vegetables, but there is a need to develop relevant technology packages for these nontraditional crops (see Annex 2). The fact that this is a key issue for agro-industrial diversification is shown by the experience of Thailand's agro-industrial firms. In nearly every case firms that were successful were the ones which had built up their own agronomic knowledge and carried out pre-production trials over an extended period of time. Failure to do so by investing in adaptive research prior to starting production on the firm's own plantation or through contract farming with farmers has frequently, if not always, resulted in the firm's bankruptcy. This indicates that an important issue for commodity diversification is the generation of a relevant technology package.

2.39 To achieve this objective, there are several measures the Government could implement. They include:

- (a) improving the coordination of agro-industrial research between the private and public sector. This would include establishing

demonstration plots for nontraditional commodities in response to private sector needs, and better linking field research conducted by DOA/DOAE to market demand (see Chapter III, Section B);

- (b) implementing the recommended seed policy. This would induce Thai private firms to expand their agro-industrial research and develop a technology package for improved high yielding seeds; and
- (c) promoting contract farming for high value crops in irrigation command areas. This would lead private firms to develop a technology package and transfer it to farmers.

2.40 Agricultural Credit. An important consequence from the required yield intensification is that the greater use of modern inputs will involve greater cash outlays by farmers. This is to be expected not only as a general consequence of yield intensification, but also because nontraditional commodities tend to be intensive in their use of modern inputs. This is particularly the case for fish and shrimp farming, poultry and swine raising for which commercial inputs can amount up to 80% of production cost. In the past the farm sector has been able to finance a rapid increase in agricultural investment but this was accomplished in the context of rapidly rising agricultural prices in real terms, which is not likely to occur in the near future. This indicates that if modern inputs are to be purchased in greater quantity, the access to formal agricultural credit must be improved (see Chapter IV, Section D). Among several other measures, this would require improvements in the current land titling programs so that farmers can meet the legal requirements insisted upon by commercial banks for lending to them.

2.41 Agro-industrial Risks. Relatively large annual price variations usually accompany commodity diversification towards specialty-products with limited world markets. For the new, nontraditional commodities, the greater use of cash inputs by farmers in the context of fluctuating prices would result in increased risk at the farm level. As indicated by the experience of several African countries, fixing minimum producer prices in order to reduce farmers' risk would involve high costs and, inevitably, prevent the establishment of efficient linkages between farmers and agro-processing plants. More efficient alternatives would be to (a) establish a commodity exchange through which forward contracts in rice, maize and cassava pellets would be traded (see Chapter IV, Section C); and (b) promote contract farming for high value speciality crops (see Chapter III, Section D). Both policies would result in a more efficient sharing of the high risks inherent to agro-industry.

D. Commodity Diversification and Labor Migration

2.42 Increased agro-industrial diversification and agricultural intensification will help improve farmers' income derived from agricultural activities. But as indicated by the high share of non-farm income (about 50%) in total farm cash income, increasing off-farm activities and industrial growth would also be highly beneficial for farmers' income. The importance of these latter policies for farmers' income is discussed below.

2.43 Labor Productivity Growth. Agricultural labor migration is a normal consequence of economic growth, and in conjunction with industrial growth it has been one of the major factors accounting for the growth of labor productivity in agriculture. This can be seen by comparing the evolution of agriculture's share in employment to that of labor productivity. As indicated by Table 2.6, the share of agriculture in total employment fell sharply from 82.4% in 1960 to 73.0% in 1975, but since then it has declined much more slowly reaching 69.7% in 1984. Over the same period, the evolution of labor productivity in agriculture followed a similar pattern, i.e. it increased rapidly in 1960-75 at a rate even faster than that of industry and services, but it failed to rise in 1975-80. The apparent correlation between the growth rate of agricultural labor productivity and the evolution of agriculture's share in employment suggests that agricultural labor migration plays a major role in determining the growth of agricultural labor productivity. Since ultimately agricultural labor migration is linked to the extent to which jobs are created in industry and services, the stagnation of agricultural labor productivity in 1976-84 would appear to be strongly related to insufficient job creation in nonagricultural sectors.

Table 2.9: EMPLOYMENT BY SECTOR, 1960-85
(in %)

	1960	1975	1984
Agriculture	82.4	73.0	69.7
Industry	4.3	9.0	10.7
Services	13.3	18.0	19.6
<u>Total</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

Source: Mission estimates.

**Table 2.10: RATES OF GROWTH OF VALUE ADDED
PER WORKER BY SECTOR**
(Percent per annum in constant prices)

	1960-75	1975-84
Agriculture	4.2	0.0
Industry	2.6	2.4
Services	3.8	2.3

Source: Mission estimates.

Note: Estimates of growth rate of value added per worker should be considered with caution as the definition of labor force in agriculture has changed over the years.

2.44 The importance of industrial growth in influencing agricultural growth is revealed by a cross-sectional analysis of developing countries. In Thailand as in Indonesia, Malaysia and the Philippines, both industry and agriculture have grown at a high rate. This contrasts with the low-growth complementarity of industry and agriculture observed in some other countries. For the world as a whole, some countries have managed to have high industrial growth and low agricultural growth, but very few countries have achieved high agricultural growth with low industrial growth. This result suggests that although specific agro-industrial policies can be expected to increase agricultural income, it is only through the implementation of overall sound industrial and financial policies that a high agricultural growth rate would be achieved. In the case of Thailand, the most important macroeconomic policy instruments that have a strong impact on agro-industrial growth include the exchange rate, the structure of the protection system (and the related issue of export oriented vs. import substitution policies), investment incentives and credit policies (see Chapter IV).

2.45 Diversification and Labor Migration. In contemplating the formulation of specific agro-industrial policies it is useful to bear in mind that the long-run historical perspective points to further decreases in the share of agriculture in income and employment. This long-run trend is the consequence on the one hand of a fall in the share of food consumption in GDP as per capita income rises, and on the other hand of increases in agricultural labor productivity. As a result, continued labor migration from agriculture will continue to be an inescapable feature of Thailand's economic development. But contrary to what seems to be one of the underlying rationales of the current agro-industrial diversification policy, crop diversification is unlikely to significantly slow down labor migration for two reasons.

2.46 The first reason is that due to the decline in the price of Thailand's traditional commodities during the first half of the eighties, farmers have suffered a substantial loss in earnings. Although farmers' income could be increased by cultivating new agricultural commodities instead of traditional crops, this option remains limited to a minority of Thailand's farmers. This conclusion follows from the current structure of employment in agriculture. In 1980 the labor force employed in rice, maize, rubber and cassava amounted to about 13.8 million. By contrast, the labor force engaged in the cultivation of fruits, vegetables, livestock, fisheries and other field crops amounted to only 1.6 million. Such numbers indicate that the additional amount of labor likely to be employed through the expansion of nontraditional commodities would be small, and smaller than the number of rice farmers who may decide to change activities in view of the low return to rice cultivation. In addition, since the most promising commodities are items such as fisheries, aquaculture, poultry and livestock, farmers who could benefit from an expansion of these activities may not be the same ones who are currently affected by the fall in the prices of traditional commodities. For these farmers, relevant alternatives would be to engage in off-farm activities or migrate.

2.47 The second reason which would lead commodity diversification to result in increased labor migration is technological progress. As indicated by the analysis of the production potential of some new commodities in Annex 2, crucial requirements for increased agricultural diversification are that: (i) a relevant technological package for the cultivation of new seeds be developed; and (ii) the production costs of new commodities be lower. Basically, these requirements point to the need for greater technological progress in agriculture. But depending on the underlying characteristics of market demand for these new agro-industrial products, greater technological progress may lead to reduced agricultural employment (although farmers' income would rise). This is particularly likely to happen for commodities the exports of which are a small proportion of output and whose price elasticity of domestic demand is low. These conditions may apply to fruits and vegetables, and some feedgrains crops.

2.48 For these various reasons it is quite likely that agricultural labor migration will continue in the future, and may even be accelerated by commodity diversification. This, of course, does not mean that agricultural diversification should not be facilitated (since it would result in increased farmers' income); but this implies that an important complementary policy of agricultural diversification would be to increase possible sources of off-farm income. One means of achieving this is to implement policies which would lead to greater employment in industry. Generally, such policies tend to be export-oriented. A second means would be to give agricultural workers, and particularly the children of current farmers, the skills they need for alternative employment since they are the ones most likely to leave the agricultural sector. This would require improving education and training in rural areas, the level of which is generally much below urban areas. Such emphasis is also important for agro-industrial diversification. As previously mentioned, greater diversification will require increased technological progress in agriculture, but this will be facilitated if formal education and training in rural areas are improved.

III. GOVERNMENT INVESTMENT AND SUPPORT SERVICES FOR AGROBUSINESS DIVERSIFICATION

3.1 Low commodity prices for Thailand's traditional commodities in international markets and their impact on farmgate prices have caused the Thai Government to search for alternative nontraditional commodities. As indicated in Chapter II, the Thai agricultural sector has already undergone a substantial diversification process. Notwithstanding the success of certain Thai products, several agro-industrial ventures have failed and the impact of the nontraditional commodities on employment and value added has been limited. To increase the importance of new commodities for the agricultural sector will require (i) improvement of government support services and programs to bring about increased agricultural yields and investment by the private sector; (ii) increased government investment in irrigation and agricultural research to increase the supply of new commodities; (iii) a strengthening of linkages among farmers, processors and exporters to improve technology transfer and consistency in product quality; and (iv) the reversal of policies which prevent the adoption of yield-improving technologies and private sector investment in agro-processing.

3.2 These measures do not imply a radical change in the manner agro-industrial development takes place in Thailand. Nevertheless, the corresponding government initiatives cannot be pursued on a broad front. Focussed attention is needed to implement first the reforms that are most likely to have the greatest impact. For this reason, the measures discussed in Sections A and B of this chapter concern only a subset of a more general program to improve government support services, i.e. those that are important for the new nontraditional commodities. Similarly, Section C of this chapter is focussed on irrigation command areas because (i) the potential for diversification appears to be the best in these areas; and (ii) Government intervention would have the greatest impact on diversification in these areas. Section D discusses the various institutional arrangements possible for the cultivation of new crops, but is focussed on contract farming because it would best lead to a strengthening of linkages among farmers, processors and exporters for some of the new crops. Finally, general policy changes which affect the adoption of yield-improving technology and private investment in agro-industry are discussed in Chapter IV rather than in this chapter because they would also be quite important for traditional commodities.

A. Promotion Framework

3.3 Although the preparation of specific work plans for agro-industrial products by Government has led to the formulation of comprehensive recommendations in the Sixth National Development Plan (see Chapter I), there is still a need to further define the respective role of Government and the private sector in the agro-industrial diversification process. As indicated in Chapter II, Thailand's agro-industrial successes were due to the fact that (a) the Government has largely avoided counter-productive efforts to displace private initiative; (b) Thai merchants and investors have provided the capital, technical and marketing expertise required to turn market potential into real economic achievement; and (c) there were no major constraints

affecting the most important factors of production (land and labor). To some extent, the challenge now facing Thailand is to ensure that the same principles continue to apply for the nontraditional commodities.

3.4 MOAC Policy Statement. The most clear-cut policy statement to date related to agribusiness promotion in irrigation projects has come from the Ministry of Agriculture and Cooperatives (MOAC). Its origin was in the need to establish a framework within which a Thai multinational firm (Charoen Pokphand) would operate a high technology rice production program in the Mae Klong irrigation project. The MOAC policy statement was drafted by NESDB, MOAC and RID in January 1985 with a revised announcement issued in April 1985 (See English translation in Annex 3). This is the only known statement linking production and agro-industrial investment issued by the Thai Government.

3.5 The MOAC statement is a significant first step toward raising public sector awareness of the need to define government role in irrigation command areas (defined as areas where the irrigation infrastructure is managed by the Royal Irrigation Department (RID)), and identify specific support services which would be provided to private firms. As listed in the MOAC statement, government role would be to:

- (a) provide assistance so that the necessary facilities for crop production e.g., credit, fertilizer and insecticides are available;
- (b) provide technical officers for the training of participating farmers;
- (c) provide research plots in collaboration with private enterprises;
- (d) provide an irrigation system which is appropriate for the project area;
- (e) select farmers for the project and establish water user groups, and/or other agricultural organizations;
- (f) provide publicity to the project and collect data. This includes preparation of report on production and marketing situations, the irrigation system and the appropriate area for the cultivation of each crop in the project area; and
- (g) coordination of signing of contract agreements between farmers and private enterprises.

3.6 The MOAC policy statement had, however, a limited impact partly because it was not widely distributed to RID project directors in irrigation command areas and to other government agencies involved in agro-industries. In addition, the policy statement failed to assign specific agro-industrial tasks to identifiable government agencies. Instead, a more comprehensive document could have been issued providing detailed assignments to specific agencies which would have ensured that the tasks outlined in the policy statement would have been carried out.

3.7 As a result of these shortcomings RID was left to contend with the implementation of that policy statement. However, RID has traditionally viewed its role as that of constructing and managing irrigation infrastructure, and felt that the promotion of agribusiness was best left to other government agencies. As a result, RID has not so far played a major role in the promotion of agro-industrial crops in irrigation command areas. Yet, the role of RID will have to evolve as the increased cultivation of nonrice crops in irrigation command areas will require improved coordination among government agencies as well as between the private sector and government agencies involved in irrigation command areas.

3.8 There are six agricultural service agencies responsible for supporting crop production in irrigation projects, namely the Office of Agricultural Economics (OAE), the Department of Agriculture (DOA), the Department of Agricultural Extension (DOAE), the Royal Irrigation Department (RID), the Department of Cooperative Promotion (DCP), and the Land Consolidation Office (LCO). Each of these agencies is responsible for one or more aspects of irrigated agriculture production support. The policies of each agency have tended to stress independence, rather than interdependence; action, rather than interaction; and policy implementation rather than program responsiveness to local conditions. The result has been a duplicity of efforts and lack of focus on solving problems which need to be addressed.

3.9 To improve coordination among these government agencies, a policy framework for government intervention in agro-industry should be developed at the ministerial level. Such an exercise would involve various agricultural agencies, the National Economic and Social Economic Development Board, and the Joint Public-Private Sector Consultative Committee.

3.10 Role of the Joint Public-Private Sector Consultative Committee. The Joint-Public Sector Consultative Committee (Joint Committee) was established in June 1981 for the purpose of addressing urgent economic problems facing Thailand. The original Committee consisted of Thailand's three major private sector institutions: the Board of Trade; the Association of Thai Industries; and, the Thai Bankers Association. The public sector was eventually included in the grouping to form the Joint Committee with the Prime Minister serving as chairman of the Joint Committee, and NESDB acting as the secretariat. This structure is paralleled at the provincial level with the governor serving as the chairman of the Provincial Joint Committee, and the provincial planning office providing secretariat services.

3.11 The Joint Committee has taken several actions to promote the development of agro-industries in irrigated areas since its creation in 1981. The most important ones have included the following:

- (a) The establishment of Thai-JACC (Joint Agricultural Consultative Corporation) with assistance from USAID for the purpose of promoting joint venture operations between Thai and American companies. The most significant achievement of Thai-JACC has been to arrange for two firms to produce and process tomatoes on a pilot basis at the Lam Nam Oon Irrigation Project in Northeast Thailand. The pilot project was operated by Heinz (U.S.) and a Thai registered firm

called Chung-Ching Holdings Co., Ltd. Other joint ventures being promoted by Thai-JACC include the processing of dairy products; seafood for freezing; and cultivation of temperate climate crops.

- (b) The Joint Committee has instructed the Ministry of Agriculture and Cooperatives (MOAC) to prepare a framework for having private sector investors operate in irrigation command areas. The announcement outlined the responsibilities of government agencies and private enterprises investing in irrigation command areas. It has resulted in private firms' interventions in the Mae Klong and Lam Nam Oon irrigation projects and the Sukhothai groundwater project. In all cases, the approach used was a comprehensive production-marketing program as prescribed in the MOAC announcement.

3.12 The issues considered and the actions taken by the Joint Committee demonstrate the importance attached by the members of the Committee to the agro-industrial sub-sector. Furthermore, the responses of the agencies instructed to take action to alleviate specific problems have been relatively quick and positive, which suggests that the Joint Committee could play a useful role in the formulation of government policies towards agro-industry. Areas where the Joint Committee could exercise such a role include:

- (a) Sponsoring the holding of commodity-specific workshops, whereby Government and private sector representatives concerned with specific agro-industries could meet and work toward establishing private sector cooperation. Separate half or whole day workshops could be held for food processors, oil extractors, sugar refiners, rice millers, and others.
- (b) The national level Joint Committee could consider instructing concerned government agencies to prepare area development plans for selected irrigation command areas. An important aspect of these plans would be a package of services which would support irrigated agricultural production and agro-industrial development (see Section B). These plans would specify which agro-industrial tasks would be assigned to government agencies. Agencies with principal roles in preparing an area development plan and operating promotional activities include: the Bank for Agriculture and Agricultural Cooperatives (BAAC), the Royal Irrigation Department, the Department of Agriculture, the Department of Agricultural Extension, the Ministry of Commerce, and the Community Development Department.
- (c) The Joint Committee could take an active role in promoting the development potential of selected irrigation command areas by highlighting those areas. Workshops and committee meetings could be organized at irrigation project sites with facilities available for such gatherings. The publicity and media coverage generated by Joint Committee activities would expose the host site to the public and provide an opportunity for private sector participants to visit different irrigation projects, and make them more aware of their production potential.

3.13 In developing a promotion framework for agribusinesses in irrigation command areas, it is crucial to bear in mind that there is no universal model that can be applied to all irrigation projects. This is particularly the case in view of the unequal level of agro-industrial diversification achieved in various irrigation command areas. Since the purpose of government intervention in agro-industry is to elicit greater private sector investment, the Government would have to ensure that the objective of promoting agro-industrial diversification does not lead government agencies to displace private sector initiatives. This consideration indicates that the support services provided by government agencies in irrigation command areas to promote agribusiness should be differentiated according to the regional level of economic development.

3.14 Recommendations. As discussed in greater detail in the following sections, the key role of Government in irrigation command areas where a diversified agro-processing base exists would consist in (i) providing a modern irrigation infrastructure; (ii) creating Water User Organizations; and (iii) promoting contract farming for high value crops. In other irrigated areas, mainly in the least developed regions of the North and the Northeast, the Government may want to provide more intensive support services in addition to the three functions just mentioned above. These services would be made available to private firms and farmers during a temporary period (three to five years) in order to promote private sector investment in irrigation command areas. These support services would consist in: (i) providing research plots where research on new agro-industrial commodities would be conducted by DOA/DOAE in collaboration with the private firms involved in irrigation command areas; (ii) providing agricultural extension services, and particularly technical officers for the training of farmers participating in a production program organized by private firms; (iii) providing credit to farmers to support the adoption of new technology, particularly through BAAC lending; and (iv) assisting firms in the selection of farmers, for example through BAAC. In view of the difficulty of implementing the recommended institutional changes and investment, the Government may want to proceed gradually by first initiating changes in a few pilot irrigated areas, as is its stated intention.^{1/}

3.15 Although the promotion framework discussed in this section has so far only concerned irrigation command areas, a number of recommendations made throughout the report would lead to diversification outside irrigation command area.

3.16 The first and most important measure would be to promote livestock activities (pork and cattle) (see Annex 2, paras. 62-68). This would result in the expansion of the domestic feed industry, and therefore in increased

^{1/} Consideration was being given to replicate the Lan Nam Oon model (see Annex 4) in the following irrigation projects: Yam Lai Hoy Kong; Songkhla in the South; Mae Wang-Kew Lom/Lampang in the North; and Khok Kratiem/Lopburi in the Center.

cultivation of new feed grains such as red hybrid sorghum. As indicated by the experience of other countries (see Chapter IV, Section A), such indirect effects may be quite important for increasing total cereal production. Cattle expansion would be particularly attractive for the Northeast which has few diversification options, and for small farmers provided a farming system incorporating livestock could be developed. This is an area where the Livestock Department of MOAC could play a useful role.

3.17 To achieve this, a number of constraints must be addressed. First, there is a need to launch a program to prevent and eradicate foot-and-mouth disease. This would require a sharp increase in the production of vaccines by the Department of Livestock, since the current vaccine production is too low to vaccinate all cattle.^{2/} Second, as indicated by the rapid development of the poultry sector and its successful control of potential health problems, a key ingredient for improvements in the livestock sector would be to facilitate investments by private firms in modern slaughterhouses and development of contract farming. Key measures to that effect would be to (i) repeal the Animal Slaughter and Meat Trade control Act of 1959; (ii) allow free domestic trade in livestock and remove current zonal restrictions on meat trade; and (iii) remove current restrictions (prohibitions or licensing) on exports of swine and/or meat. Under this new framework, there would still be a need for veterinary inspections for animal diseases and sanitary inspections of slaughterhouse, but they would be carried out respectively by the Department of Livestock and the Ministry of Health. To protect against animal disease epidemics, controls on the meat trade would be imposed only upon evidence of an animal disease epidemic in a specific area. These controls would be decided by the Livestock Department. Finally, there is a need to improve forage during the dry season. One possible solution would be for farmers to set aside a small piece of land for animal feed production and to supplement this with appropriate animal feed stuff. This approach has been successfully applied in a livestock cooperative in Northeast Thailand, but its commercial viability (without subsidies) would have to be further investigated. In addition, the use of processing byproducts such as molasses in foodstuff would also have to be explored. In view of the importance of these constraints for small farmholders, the Government may want to further examine these issues.

3.18 The second measure relevant for agro-industrial diversification would be to further promote fish and shrimp farming. These are areas where the Department of Fisheries is already quite active and where markets exist (see Annex 2, paras. 54-60).

^{2/} At present, the Livestock Development Department can produce only 10-12 million doses annually for the prevention of the foot-and-mouth disease. It has approved a project to increase production up to 40 million doses, but this would be sufficient to vaccinate only 70% of the animals.

B. Agricultural Research and Extension Services

3.19 As analyzed in Annex 2 there are few cases where production of nontraditional agro-industrial commodities could be rapidly increased in the short run without any change in the current profitability and risk of production. Increased cultivation and domestic processing of new commodities would therefore require either lower product price and/or higher product quality so as to stimulate market demand. But this in turn can be achieved only through a series of "mini green revolutions" for the new agricultural commodities, which would require increased agricultural research. Agricultural research expenditures in Thailand have in fact increased from 0.5% of agricultural GDP in 1975 to 0.75% in 1984, which would seem justified in view of the high social rate of return on agricultural research in Thailand (72% in 1974-79).^{3/} Important issues that remain to be addressed are: (a) the allocation of government funds among commodities; and (b) the role of the private and public sectors in agricultural research.

Agricultural Research

3.20 Since accumulated knowledge plays in determining where additional research effort could have the greatest pay-off, it is difficult to define a universally valid rule for the optimal commodity allocation of resources in agricultural research. Nevertheless, there are reasons to expect that in the long-run the percentage allocation of research expenditures should be roughly similar to the relative economic importance of agricultural commodities. This implies that theoretically the share of research expenditures in the value of output would be the same for each commodity.^{4/}

3.21 To provide a comparison between the implications of the model outlined above and actual allocation of research expenditures, one would need an estimate of government and private sector expenditures. In the absence of data on total research expenditures, Table 3.1 shows the comparison between the percentage allocation of government research expenditures by commodity. This table shows that several commodities of large economic importance are receiving minimal government research attention. Excluding the traditional export crops where the private sector would be expected to play a role (sugarcane, tobacco, rubber and cassava), government research would seem to be particularly low for vegetables, fruits and livestock. However, it should be

^{3/} The social rate of return on agricultural research was estimated to be 72% in 1974-79. See Robert E. Evenson and Suthad Setboonsarng, op. cit.

^{4/} Such a result is obtained if (a) output is produced under constant returns to scale and research is a separable production input; and (b) the probability of discovery is a function of research and is the same for each crop. It then follows that research expenditures are proportional to the value of output and the proportionality factor is the same for all commodities. This rule, however, remains indicative as it does not take into account other factors affecting the profitability of research such as the elasticity of demand for agricultural commodities.

Table 3.1: GOVERNMENT RESEARCH EXPENDITURES BY COMMODITY,
AND COMMODITY SHARES IN AGRICULTURAL GDP, 1984

	<u>Agricultural research/a</u>	<u>% allocation</u>	<u>Share of</u>	<u>Research</u>
	<u>Million</u>	<u>of commodity</u>	<u>commodity</u>	<u>as % of</u>
	<u>baht</u>	<u>research</u>	<u>in agricul-</u>	<u>agricul-</u>
			<u>tural GDP</u>	<u>tural GDP</u>
<u>Commodity Research</u>				
<u>Crop</u>	<u>497.2</u>	<u>51.4</u>	<u>73.2</u>	<u>0.35</u>
Rice	96.4	10.0	23.0	0.22
Cotton	-	-	0.4	-
Corn/sorghum	24.8	2.6	4.4	0.29
Sugarcane	20.9	2.2	9.8	0.11
Tobacco	5.0	0.5	2.0	0.13
Kenaf	n.a.	n.a.	0.4	n.a.
Rubber	75.1	7.8	4.9	0.79
Mulberry	20.1	2.1	n.a.	n.a.
Vegetables	2.7	0.2	5.8	0.02
Ornamental	0.7	0.0	n.a.	n.a.
Oil crops <u>/b</u>	n.a.	n.a.	0.6	1.40/ <u>c</u>
Root crops <u>/d</u>	6.4	0.7	4.2	0.08
Other field crops <u>/e</u>	104.2	10.8	3.1	1.60
Other tree <u>/f</u>	64.9	6.7	15.2	0.22
Other research <u>/g</u>	76.0	7.8	-	-
<u>Livestock</u>	<u>30.8</u>	<u>3.2</u>	<u>13.6</u>	<u>0.11</u>
<u>Fisheries</u>	<u>308.8</u>	<u>31.9</u>	<u>6.8</u>	<u>2.35</u>
Marine fish	64.0	6.6	} 4.7	} 1.80
Coastal	100.7	10.4	}	}
Freshwater	144.1	14.9	2.1	3.6
<u>Forestry</u>	<u>13.0</u>	<u>13.5</u>	<u>6.3</u>	<u>0.10</u>
<u>Commodity Total</u>	<u>966.8</u>	<u>100.0</u>	<u>100.0</u>	<u>0.50</u>
<u>Noncommodity Research /h</u>	<u>510.2</u>	<u>-</u>	<u>-</u>	<u>0.26</u>
<u>Total Agricultural Research</u>	<u>1,477.0</u>	<u>-</u>	<u>-</u>	<u>0.76</u>

/a Research expenditures from Rungruang Isarangkura, Thailand and the CGIAR Centers, a Study of Their Collaboration in Agricultural Research, p. 40, 1986, World Bank.

/b Mainly field beans.

/c 1981 data.

/d Mainly cassava.

/e Various field crops which cannot be separated.

/f Includes cocoa, coffee and fruits.

/g Pathology, entomology and chemistry.

/h Includes research on farming systems, agro-economics, agro-industries and environment.

taken into account that private research is quite important for some new nontraditional agro-industrial commodities. Overall, the apparent lack of research for these commodities may thus be less than implied by Table 3.1. By contrast, fishery research expenditures are high as a percentage of value added (2.35%). But this is a recent phenomenon (in 1979 research expenditures amounted to 0.9% of value added in fisheries) due to a rapid increase of research on coastal fisheries. Since during the 1980-86 period seafood exports rose rapidly, the expansion of fishery research would seem to be in response to market demand.

3.22 In contemplating the role of government research, it is important to take into account that although the public good attributes of research makes public support of agricultural research socially desirable, it does not follow that all research should be conducted in government institutions. This conclusion follows from the composition of the social benefits derived from agricultural research. If the benefits consist mainly of an increase in producer's surplus, producers will have a financial interest in carrying out their own research program or financing the activities of a research institute. The conditions for this to happen are that the price elasticity of demand be high and the number of firms involved in processing a particular crop be small.^{5/} These characteristics apply to some of Thailand's traditional export crops such as tobacco and sugar but they do not apply to most grain crops which are cultivated by a large number of farmers and processed by a large number of firms. Under these conditions, the Government would have to play the major role in financing and carrying out research.

3.23 The respective role of the Government and the private sector is more complex for the nontraditional crops. First, in the case of commodities which are mainly consumed at home, one would expect that most of the benefits of technological progress would be transmitted to consumers through lower prices so that private firms may not find it profitable to engage in research or varietal improvement. This would argue in favour of increased government research for fruits and vegetables. For the other crops which would mainly be exported, the export market may be too small to justify a private firm's research, but this is not always the case since several Thai agro-industrial firms have their own research plots and programs. As a general rule, greater involvement of private firms in research concerning the new agro-industrial commodities is beneficial because firms are in contact with market demand and can identify research areas which look promising. In order to improve linkages between research and market demand, the Government may want to improve effective information linkages among university research centers, DOA and private firms.

5/ Reasons for these conditions are the following: if the price elasticity of demand is high, technological progress will result in a moderate decline of commodity prices and firms will capture most of the benefits of research; and if there are a large number of firms involved in processing, the contracting costs of setting up a cooperative research program would be high and research may not take place.

3.24 Implications of biotechnology. In the past Thailand's private firms have tended to concentrate their research effort in the development of improved agricultural machinery because there was a strong market demand for it. But as indicated by the growing size of the commercial corn seed industry in Thailand (see Annex 2, paras. 14-15) there is an emerging demand for commercial seeds and hybrid seeds. In this context new developments stemming from recent advances in biotechnology--mainly improved plant genetics--have stimulated large private investment in plant-related biotechnology in the US and other industrial countries. Although it is still early to judge the implications of this trend, a new agricultural revolution may emerge from biotechnology because it offers techniques that promise to be faster and more precise than traditional plant breeding techniques.

3.25 Research results derived from biotechnology could be important in three areas: livestock, industrial or plantation crops, cereal grains and legumes, and roots and tubers. Livestock applications are the more advanced and are being made in the form of growth hormones, and particularly new vaccines.^{6/} The second area of application concerns industrial and plantation crops. This is an area where the private sector could play a major role as hybridization makes it possible for private firms to capture a share of the profits from varietal improvement. It is thus a natural area for private sector involvement. Access to this technology could be achieved by Thailand through joint ventures and promotion of foreign investment.^{7/} The third area of application--cereal grains and legumes--faces severe technical problems as the development of hybrids is complicated and costly.^{8/} Nevertheless, research is advancing rapidly for corn, rice and tomatoes.

3.26 Recommendations. There are currently about ten private seed companies which carry out active varietal improvement programs, and about the same number of seed companies which do not have any programs, but may have one in the future. This potential could be used by the Government to develop agronomic knowledge and technology transfer to farmers. At present private firms can obtain the breeding materials developed by DOA, and this policy should be pursued as this will help the local seed companies establish their own breeding programs.

^{6/} For example new vaccines have been produced at ILRAD in Kenya, and they could lead to major improvements in animal health.

^{7/} An example of this is provided by Unilever which is cooperating with the Malaysian palm oil industry to produce a high yielding palm oil using tissue culture.

^{8/} A tomato high in solids (DNAP-9) was developed by DNA Plant technology, a US firm, for the Campbell Soup Company. By manipulating leaf cell from an existing variety through cell culture, the DNAP-9 was developed in three years rather than the usual seven years.

3.27 As discussed in Chapter II, Section B, expectations are that the commercial production of nontraditional crops, especially fruits and vegetables, will continue to expand throughout the next decade. But any effort to modernize the production, processing, packaging, and marketing of non-traditional commodities, in particular fruits and vegetables, requires that the Government begin with upgrading basic agricultural research. Among the targets of the agricultural research program operated by the Department of Agriculture (DOA), the development and introduction of improved vegetable seed varieties and accelerated fruit breeding techniques should receive increased attention. In order to improve linkages with market demand, this research program should be in direct response to the needs of private sector processors and exporters. In irrigation command areas, this could be achieved by setting up test plots and demonstration fields in cooperation with private firms planning to introduce new crops. More generally, in order to improve information linkages with the private sector and promote closer working relationship, DOA may want to organize crop specific public-private workshops.

3.28 For reasons discussed in Annex 2 (paras. 22-45), the Government may also want to give special attention to both the Farming Systems Research Institute and the Post-Harvest Technology Institute. Key action would include accelerating the work of the Farming Systems Research Institute in irrigation command areas in order to identify cropping patterns and farm management systems most appropriate to the cultivation of high value horticulture crops for export. In order to derive full benefits from such a program, the research of the Farming Systems Research Institute would need to be closely coordinated with that of the Post-Harvest Institute. Of special importance is research on technologies of post-harvest handling which play major roles in determining the marketability of commodities. A post-harvest management program might include the following items: (i) identification of fruits and vegetables to be harvested; (ii) methods of detaching, collecting and cleaning; and (iii) field grading and packing of fruits. It would also be important to introduce economic appraisal to the techniques found to be appropriate by DOA, in order to ensure financial and economic viability of recommended technologies. Overall, the target of the agro-economic research would be the establishment of quality standards and control procedures to insure increased fresh and processed fruit and vegetable exports.

Agricultural Extension Services

3.29 A national agricultural extension system has been in operation in Thailand employing the training and visit approach for less than ten years. This system is a significant improvement on its predecessor, which was understaffed, underfinanced, and lacked any identifiable priorities. The system now operating is linked, however, too closely to guidelines established in Bangkok. Frequently the result is an inflexibility on the part of local extension staff, and a lack of response to local needs. Until now, most of DOAE's resources have been allocated to the control of pests and diseases affecting rice. This emphasis was justified by the importance of rice for Thailand's agricultural sector. But exports of nontraditional products have increased rapidly and fish and seafood products have now become Thailand's main agro-industrial export. This raises the issue of whether more attention to nontraditional commodities should be given by DOAE in their extension services.

3.30 As previously mentioned, one of the key issues for the further development of Thailand's nontraditional agro-industrial commodities is the organization of a consistent supply of raw materials that would meet the needs of processors and consumers. These are areas where the private sector would have to play a leading role because markets would have first to be identified before production can begin. In addition, since government research on fruits and vegetables has been relatively small (see Table 3.1), it would take some time before the recommended increase in government expenditures would produce worthwhile research results which could be transmitted by DOAE to farmers. To offset this lag, one solution might be for DOAE to transmit the research results generated by successful farmers and firms to other farmers. This policy--which is now being applied by DOAE--would be quite relevant to the fruits and vegetables sector where private firms and farmers have already conducted their own adaptive research program.

3.31 As indicated by the rapidity with which Thai farmers have increased the output of new, profitable commodities, risk aversion or lack of information about market demand do not seem to be important constraints. But lack of agronomic knowledge concerning the cultivation of new crops may be a more general phenomenon. In this area DOA and DOAE could play a role. The underlying rationale for this role comes from the notion that in agriculture like in industry there is a learning-by-doing process with significant production externalities and social benefits not fully captured by private producers. In industry this process leads to a fall in production costs as output and productive experience accumulates overtime. In agriculture, the learning-by-doing process is different because the accumulation of productive experience is a function of the time passed since the initiation of production. As a consequence, since elapsed time rather than accumulated output determines agronomic knowledge, efficient government policy would entail the earliest possible establishment of demonstration plots and not a subsidy to production. For this reason, policies such as subsidizing the use of improved seeds or providing agricultural credit at a subsidized rate to stimulate the production of new agro-industrial commodities would not seem to be first-best policies in Thailand's case.

3.32 Recommendations. Key measures to increase the production of nontraditional commodities would be to:

- (a) set up demonstration plots for new commodities;
- (b) carry out applied research in farmers' fields; field tests and trials should also include water applications so that recommendations include minimum water requirements; and
- (c) closely associate private firms which would be processing the new commodities to field tests and trials.

3.33 In view of the difficulty of correctly assessing market demand before starting any substantial production program, it is important that any production targets set by DOAE for the new crops it intends to promote remain modest. Since most new agro-industrial crops tend to have rather small markets, there is a clear risk that excessive DOAE promotion could result in

oversupply and farmers' income losses. Current examples of this possibility may include sunflower which is being promoted by DOAE on a large scale.

3.34 To increase the relevance of the extension advice provided in irrigated areas, training for DOAE field staff assigned to irrigated areas may be needed to re-orient them to the potentials of irrigated agriculture. Staff training is especially important in areas which have been predominantly rainfed (the Northeast) or mono-cropped (sugar cane in Mae Klong and rice in Phitsanulok). The most important aspects of training for agricultural extension officers are (i) in-field and on-farm water management; (ii) the DOAE's strategy in meeting local private sector raw material needs; and (iii) quality control and proper post-harvest handling at the farm level. These subjects are basic to agricultural extension operations in irrigation command areas and could easily be adapted to the fortnightly training program of the Department of Agricultural Extension.

C. Irrigation Command Areas

3.35 Although some new minor crops could be cultivated outside irrigation command areas, production of most new agro-industrial crops is likely to be concentrated in irrigation command areas for three reasons. The first one is that prospects for wet season diversification are very limited since farmers prefer to grow rice in the wet season to guarantee their food supply, and wet season water is excessive for upland crops in most irrigated areas. Second, although upland crops need less water than rice, they also require good water control. As a result, the potential for crop diversification is generally confined to areas with access to water during the dry season, which are generally located in irrigation command areas. The second reason is that new agro-industrial crops that look promising for Thailand are quite technology and input intensive; but the full potential of the new inputs required for their cultivation can only be achieved if water availability is sufficient and controlled.

3.36 Regions where new agro-industrial crops could be grown are areas where there are adequate water supply and ready access to agro-industrial processing facilities. These conditions apply to the North, particularly the Phitsanulok irrigation command area, irrigated areas of the Northeast, and the Mae Klong irrigation command area. The Northern region with favorable climatic and agronomic conditions, and with farmers already familiar with cultivating many of the nontraditional crops under both rainfed and irrigated conditions, offers promising opportunities for increased nontraditional crop production. In particular, the Phitsanulok irrigation area has access to processing facilities in the North around Chiang Mai and Lampang as well as relatively easy access south to the Bangkok region. The Northeast with much of the physical infrastructure in place (irrigation works, roads, etc.) also has the potential for increased nontraditional crop production, but the lack of diversified agro-industrial development in the Northeast limits the number of crops that may be cultivated without also promoting the establishment of processing facilities. Within the Central Plains, many upland crops (sugar-cane is the major crop) are currently cultivated in the Mae Klong irrigation project area. As can be observed from Table 3.2, the Mae Klong irrigation

project has the widest variety of crops due primarily to its suitable ecological conditions and its proximity to processing factories of the Bangkok region. But for nearly all irrigation command areas included in Table 3.2, further agro-industrial diversification will require that investments and/or increased operation and maintenance expenditures are incurred to improve the use of existing irrigation infrastructure.

3.37 Over the past twenty years the Government of Thailand has made impressive, and often costly, investments in irrigation projects. But despite the availability of water in the dry season for large parts of the irrigation command areas, farmers have been slow to accept this relatively cost-free input and increase dry season cropping. Overall, this situation seems to be more prevalent in the Northeast than in the North, partly because farmers in the Northeast, unlike farmers in the North, were not already familiar with irrigated agriculture. Main factors responsible for lack of dry season cropping would seem to be:

- (a) the design of the irrigation infrastructure which, although satisfactory for the water requirements of rice, does not ensure a consistent supply of water during the dry season; and lack of budgetary funds for operation and maintenance of the irrigation infrastructure;
- (b) lack of necessary institutional arrangements; and
- (c) shortage of labor during peak periods of dry-season cultivation in some irrigated areas.

These three factors are discussed in the following paragraphs.

3.38 Irrigation Infrastructure.^{9/} The current irrigation system was designed mainly to meet the water requirements of rice. As a result, the dominant irrigation objectives were simply to spread wet-season water more widely and to provide drainage in rice-growing areas. This system, although satisfactory for rice cultivation, does not ensure a steady water flow in the distribution system, and particularly in the tertiary irrigation facilities (i.e. below the farm turnouts) during the dry season. As a result, crop diversification is affected due to (a) insufficient canal capacities and water control for dry season irrigation; (b) the inability of farm turnouts to deliver adequate supply; and (c) the irrigation infrastructure designs which require that, with the exception of the Northern Chao Phaya, all control structures be manually operated. As a consequence, changes in settings take substantial time, and ensuring that the required amount of water is delivered is difficult since often there are no automatic measuring devices. These design deficiencies are important constraints to the cultivation of agro-industrial crops under a high input/high yield regime since, unlike rice which requires a constantly saturated soil, upland crops need alternate wetting and

^{9/} For more details see Thailand, Irrigation Subsector Review, April 1986. World Bank Report No. 5847-TH.

drying, overwetting being as effective in reducing yield as too little water.

3.39 With the development of dry season cultivation in irrigated areas, the inability of the irrigation system's traditional designs and technology to provide the degree of water control needed for the cultivation of agro-industrial crops has become more apparent. Both the ditches and dikes program of the 1960s, followed by the land consolidation program in the 1970s sought improved water control mainly by upgrading the tertiary delivery facilities. These programs, however, have had limited success because they placed insufficient emphasis on improving the main and lateral canals. As a result, water delivery to the tertiary systems did not improve greatly.

3.40 Although surplus dry season irrigation water is available in a few irrigation projects, the availability of water during the dry season has been the main factor determining dry season cultivation, and therefore the extent of crop diversification. The importance of water for dry season cultivation is indicated by Table 3.2. This table shows that for most irrigation projects located in the North cultivated areas are nearly equal, and sometimes exceed the size of the areas that are irrigated during the dry season. To increase dry season cultivation will, therefore, require an increase in the water available at the farm level.^{10/} However, increased cultivation of agro-industrial crops would not necessarily require the construction of additional water reservoirs; it could be achieved by increasing the current efficiency of water use which is low on some irrigation projects. For example, only 30% of the Phitsanulok project area was irrigated during the 1986 dry season, mainly because the best overall water efficiency that can be achieved with existing designs is only about 35%. But irrigated areas could increase by about 11,000 ha if water efficiency were to reach 50%. Measures to achieve this would involve a modernization of the existing irrigation infrastructure and increased O&M expenditures.

3.41 Modernization of the Irrigation Infrastructure. To improve the reliability and timing of water deliveries at the farm turnouts, the great majority of existing irrigation projects would have to be modernized. Such a program would include the upgrading of main canals. Since the investments required for modernizing the main canals are the same for rice and nonrice crops, agricultural flexibility would be maintained in the sense that farmers would be in a position to grow rice during the wet season, and increase the cultivation of nonrice crops during the dry season.

3.42 In addition to the modernization of the main canals, it may be economically justified to install tertiary irrigation network and carry out on-farm developments (OFD) for nonrice crops in selected cases. However, the costs of intensive tertiary irrigation systems and OFD for nonrice crops are

^{10/} For a discussion of the available options which include water transfer from the Mae Klong to the Chao Phya, construction of the Kaeng Sua Ten dam on the Yom river and groundwater development, see Thailand, Irrigation Subsector Review, op. cit.

Table 3.2: PLANTED AND IRRIGATED AREAS IN SELECTED IRRIGATION PROJECTS: CROP YEAR 1984/85
(in ha)

Project area	Wet-season rice	Planted areas in dry-season crops							Irrigated areas during the dry season		
		Rice	Field crops	Vegetables	Sugarcane	Orchard	Woodlot	Fish-pond		Total	
Northeast Region	182,412	138,744	8,312	1,751	494	-	-	-	-	10,557	...
Nong Wai/Nam Phong	48,400	30,651	4,126	280	179	-	-	-	-	4,585	...
Lam Nam Oom	32,480	31,054	2	525	63	-	-	-	-	590	10,080
Lam Pao	50,400	29,456	12	231	58	-	-	-	-	301	...
Huai Luang	16,009	12,800	63	253	138	-	-	-	-	454	...
Lam Dom Noi	24,000	23,941	1,477	409	56	-	-	-	-	1,942	...
Lam Praploeng	11,123	10,842	2,632	53	-	-	-	-	-	2,685	...
Northern Region	602,423	338,684	62,555	41,575	37,510	32,293	15,334	13,573	2,805	201,491	...
Lam Takong	22,000	20,406	6	5,291	1,792	-	-	-	-	7,089	...
Mae Taeng	23,000	20,000	824	9,680	2,412	-	-	-	-	12,916	9,600
Mae Faek	11,200	9,920	22	3,453	2,095	-	-	-	-	5,570	4,800
Mae Ping Kao	7,200	6,464	667	1,268	2,239	-	-	-	-	4,174	4,800
Mae Kuang	45,488	9,600	0	880	811	-	-	-	-	1,691	2,800
Kew Lomm	24,480	19,584	1,280	2,272	1,402	160	-	-	-	5,114	6,400
Phitsanulok	97,000	87,750	26,300	423	195	-	-	-	-	26,918	26,300
Mae Klong	389,106	164,960	33,456	18,308	26,564	32,133	15,334	13,573	2,805	142,173	...
Total	784,835	477,428	70,867	43,326	38,004	32,293	15,334	13,573	2,805	216,202	...

Source: Royal Irrigation Department, 1986.

twice as high as for rice, and the irrigation designs are different. For these reasons, it seems unlikely that the construction of tertiary irrigation network and OFD for nonrice crops covering an entire irrigation command area would be economically justified. Nevertheless, such investment could be carried out in selected parts of a given irrigation project.

3.43 In the past, the imposition of water charges has proved difficult, partly because the characteristics of the irrigation infrastructure did not make it possible to meter water consumption. However, in the context of the proposed modernization program water charges could be levied in order to help finance its investment and operation and maintenance costs.

3.44 Operation and Maintenance (O&M). A complementary policy for improving water efficiency would be to increase O&M in some irrigated areas. In irrigated areas served by traditional irrigation infrastructure, the technical limitations of the system are such that increases in O&M are unlikely to bring performance up to the required levels for the cultivation of agro-industrial crops. In these project areas, main-system deficiencies must first be addressed through a modernization program. But, in the newer irrigation projects such as Phitsanulok, Lam Pao and Mae Klong, better water control could be achieved if resources for O&M were increased. At the tertiary level, however, O&M is the responsibility of farmers. Improvements will, therefore, depend on the development of effective water user organizations (see para. 3.45) which, in conjunction with improvements in irrigation infrastructure would lead to better use of existing irrigation facilities. The importance of private sector involvement for the efficient management of irrigation systems is documented by several experiences worldwide which showed substantial increases in cropping intensity as a result of institutional changes.^{11/}

3.45 Water User Organizations (WUOs). Linked to the modernization of the irrigation system is the proper management of water at the farm level. Farmers should be able to operate on-farm ditch and dike irrigation infrastructure to some minimum level of capability. This is best accomplished through the organization of Water User Organizations (WUOs). There are currently four broad types of WUOs in Thailand, namely (i) traditional irrigation associations in the Peoples' Irrigation Projects in the North that have existed for 700 years; (ii) Peoples' Irrigation Associations which administer farmer-owned projects; (iii) Water User Associations in national projects constructed and maintained by RID; and (iv) Water User Groups (WUGs) under the responsibility of the Cooperatives Promotion Department in land consolidation areas. Currently, the status of the WUGs in irrigation command areas is ambiguous because the relationship among the WUG, the local cooperative and the water supply is unclear. For this reason, the Government may want to clarify the current situation by: (a) providing WUOs with a clear

11/ See: Norman Upholl, Ruth Meinzer-Dick, Nancy St. Julien, Improving Policies and Programs for Farmer Organization and Participation in Irrigation Water Management, December 1985, Department of Government, Rural Sociology and Regional Planning Cornell University.

legal status; (b) allowing a wide flexibility in determining the size and composition of WUOs; and (c) assigning to RID the task of organizing WUOs in irrigation command areas and providing a clear link with the management of irrigation water. The importance of having effective water users' groups is shown in Thailand by the improvements in cropping intensity reported for the Nong Wai Irrigation project,^{12/} and the expansion of agro-industrial crops in the Lam Nam Oon Irrigation Project despite unfavorable soil conditions due to salinity problems. These improvements are noteworthy because both projects are located in the Northeast, reportedly Thailand's poorest region.

3.46 Institutional Changes. One of the most important institutional changes would be to provide government support services in irrigation command areas by employing an area development approach. The purpose of such an approach would be to coordinate at the project level all the services needed to support agro-industrial diversification. Area development plans are usually difficult to implement since they require effective leadership at the project level, and a willingness on the part of the cooperating agencies to vest project-area representatives with sufficient authority for committing resources in a decentralized area plan. Since RID controls the irrigation infrastructure and one of the most important inputs--water, has strong implementation capabilities and resources, and is in close contact with farmers in irrigation command areas, RID would have to play a key role to make the area development concept operational.

3.47 To enhance the area development approach for organizing production in irrigation command areas, several new public sector services would have to be developed. First, the Office of Agricultural Economics with other government agencies should strive to develop and institutionalize a data management system (data collection, organization, and dissemination) at the local level. Currently, little information is available on prices, areas under cultivation, yield figures, production, etc., in specific irrigation command areas, but it is at this level that such information is crucial for private firms. In addition to collecting and organizing data of this type, presentation and dissemination of data should also be given increased attention, and it should be used to support any public relations effort to gain the participation of private sector traders, processors and/or investors in the project area.

3.48 The second area which would continue to require government assistance is training for farmers which could be organized by DOAE through the Community Development Department, and include trainers from several agencies operating in the irrigation command area. The emphasis of the training would be on in-field and on-farm water management; organization,

^{12/} Cropping intensity was reported to have risen from 50% in 1981 to 95% in 1983 in a 900 ha area (where technical assistance was provided) of the Nong Wai Project. See: G.N. Kathpalia, the Nong Wai Irrigation Project, Thailand, OdI, Irrigation Management network, network paper 10c, November 1984.

management, and operation of water user groups; and water delivery scheduling.

3.49 The third component of the package of production support services is the delivery and management of irrigation water. For this, a close working relationship would have to be established between private sector representatives who are organizing managed production program and RID engineers responsible for system operations at the project site. The objectives of such collaboration would be to:

- (a) determine which sites would be chosen for the production of specific crops;
- (b) determine the crop water requirements; and
- (c) guarantee water delivery to selected areas within projects sites.

Without such cooperation and assistance, potential investors or production management firms would hesitate to try to organize any raw material supply program in an irrigation command area.

3.50 Shortage of Labor During the Dry-Season. Data obtained from the Ministry of Agriculture and Cooperatives show that except for sugarcane and pineapple, most nontraditional crops such as tomatoes, mustard, garlic, cucumber, chilli, cashew nut, etc. now provide net returns to farmers in excess of Thailand's major traditional crops such as rice, maize, cassava, and kenaf (See Table 2.3 in Chapter II, Section B). While the figures are merely indicative, they illustrate that monetary incentives for cultivating most nontraditional crops exist.

3.51 These results suggest that the cultivation of nontraditional crops could lead to significant income increase. However, one important characteristic of the specialty crops that are being cultivated under contract farming in irrigated projects such as Lam Nam Oon in the Northeast is that they typically require a large amount of labor during a brief period. For example, the cultivation of hybrid tomato seeds on a plot of 0.5 rai (0.08 ha) requires the employment of four workers in addition to two household members for a period of one month during which pollination is carried out. Since some members of agricultural households in the Northeast typically migrate to the southern or central region during the dry season, farmers remaining in irrigated areas had to hire extra labor from nearby villages for the cultivation of tomato seeds. This process has so far been feasible because dry season cultivation is still limited in the Northeast so that labor is available. Large increase in the cultivation of specialty crops during the dry season would, however, require a decline in labor seasonal migration. Based on the current net return generated by the cultivation of specialty crops in the Lam Nam Oon project, it would appear that monthly earnings currently exceed the ones obtainable through labor migration. Nevertheless, it seems likely that labor migration would not be reduced unless the current reliability of water supply during the dry season is increased. This is required to reduce the

risks that dry season crops would be ruined because of the unexpected lack of dry season water, and to induce labor to remain in irrigated areas during the dry season.

3.52 Recommendations. To facilitate agro-industrial diversification in irrigation command areas, the Government may want to:

- (a) modernize the main canals in irrigation projects with a potential for agro-industrial diversification; in addition, intensive irrigation networks and on-farm development, if economically justified, should be carried out in selected parts of irrigation command areas;
- (b) levy water charges to cover the investment costs and recurrent expenditures on operation and maintenance of the recommended investment program; these charges would be important for equity reasons since farmers in irrigated areas already have high income;
- (c) create Water User Organizations that would be organized by RID in irrigation command areas; and
- (d) implement an area development approach so as to coordinate at the irrigation project level the services provided by various government agencies; the plans should encompass as needed and determined by local conditions the Department of Agriculture, the Department of Agricultural Extension, the Central Land Consolidation Office, and other government agencies dealing with credit, land titling, etc.

3.53 Infrastructure, training and institutional changes are the three principal components of the new operational framework for area development of irrigation command areas. The management and interaction of these components should foster an environment conducive to agro-industrial investment. At this time, RID is searching for policy alternatives and programs it can implement with the same sense of confidence it has had in the past. RID's important position at the field and infrastructure level and its ability to mobilize manpower and production support resources make it a key, if not the most important agency, in any configuration of public sector intervention schemes.

D. Management of Raw Material Supplies

Models of Supply Management

3.54 The traditional system of commodity trading has operated successfully for Thailand's traditional export crops which have found, until recently, ready outlets, and were of satisfactory quality for the target markets. Nontraditional agro-industrial commodities, however, are in competition with US, Taiwanese, and Japanese products in terms of price, quality, and packaging. This competition requires a different approach to production and marketing than provided by traditional marketing systems. Because of the added dimension of competing with experienced producers of high value industrial food crops in overseas markets, any managed production system should be more efficient and more quality conscious than the traditional production/

marketing system. This implies that in order for Thailand to more fully develop its potential to produce, process, and export tropical fruits, vegetables, and selected field crops, new production and marketing systems need to be developed to produce a consistent supply of quality raw material. However, any new managed production program should include the objectives of the traditional production/marketing system with which farmers and rural traders are familiar. That is, a fair distribution of profits and acceptable profit margins, as well as a familiarity with buying procedures and an element of trust. Consistent supplies of high quality produce and fair profit margins are therefore goals to be pursued through any managed production system. Currently, these goals are met to different degrees by three different systems: (a) spot market purchases; (b) nucleus-plantation; and (c) contract farming.

3.55 Traditional Production/Marketing System. This system is centered on the middleman function, with producers usually selling ungraded produce to the highest bidding middleman. The middleman ordinarily has an arrangement with one or more processing facilities to provide a minimum quantity of ungraded raw material to them. In addition to marketing farmers' produce, middlemen are often involved in production-in-kind credit whereby they provide farm inputs such as fertilizer, etc. which are repaid at harvest time. Except in isolated cases, middlemen are not involved in technology transfer to farmers.

3.56 Although this traditional system has worked well in Thailand for commodities such as grains, it is not well suited to meet the processing requirements of fruits and vegetables. These requirements follow from the high cost of constructing the plants required for processing the "new" agro-industrial commodities. For such investments, exclusive reliance on spot market raw material procurement would be unwise because firms would not have access to raw materials at a guaranteed price and they would not be in a position to control the quality and quantity of the raw materials offered to them by farmers. For these nontraditional agri-processors, spot market purchases are usually used only to supplement raw material needs in the event of supply shortfall or to fill extra orders.

3.57 Nucleus Plantations. Large scale commercial farms, or plantations, have not been significant in Thailand's agriculture production, partly because large tracts of land have been difficult to obtain. As a result, a different model of plantations farming has been used in Thailand, involving production on a nucleus estate in conjunction with contract arrangements with nearby smallholders. By obtaining a portion of raw material needs from the company-owned plantation, processors are no longer dependent entirely on outgrowers' output and market prices, and they have some control over their raw material supplies. Since the plant, research facilities, and managerial staff are located in the estate, the company can monitor the quality of its produce better, and ensure that application of farm inputs are in accordance to company's policies. The company-owned plantation, for example, frequently serves as a source of high quality plant materials for farmers producing agricultural commodities for the processing facility. The processor also frequently carries out research on its own plantation which includes tests and trials related to fertilizer applications, pesticides, weeding, and spacing of commodities to be purchased from smallholders. The plantation thus can serve as a source of technology transfer to smallholders.

3.58 Despite these positive elements, the nucleus plantation model does not appear well suited for increasing the production of nontraditional crops in Thailand. Several reasons support this conclusion. First, nucleus estates are located predominantly in the Southern Region where traditional tree crops such as rubber and oil palm, and pineapple are grown. Generally, these crops are less labor intensive than other agricultural commodities and permit large-scale application of farm inputs (fertilizers, fungicides, pesticides, etc.). But, nontraditional crops such as hybrid seeds, tomatoes, asparagus, and others that require high technology are more labor intensive, which makes it difficult to achieve substantial economies of scale. These crops are, therefore, less suitable for nucleus plantation operations. The potential of nucleus plantation for increased nontraditional crop production is also limited by the difficulty of obtaining large tracts of land in Thailand. Foreign ownership of land is not permitted and land leases from the Department of Forestry are limited to approximately 10,000 rai per company. Aside from the Department of Forestry land, securing large pieces of land would necessitate purchasing land cultivated by small landowners, with possible adverse social and political consequences if the farmers are "forced" to sell out. Furthermore, landowners without full title to their land--which is frequently the case in Thailand--would have no legal right to sell or mortgage their land. Finally, companies are frequently reluctant to invest in nucleus estates because of the large capital required for the initial investment of land purchase, community village development, land preparation, and for establishing the processing plant. For these various reasons, the nucleus plantation model does not appear attractive for nontraditional crops.

3.59 Contract Farming. The most difficult aspect of any managed production program is the organization, management, and control of smallholders. This applies particularly to Thai farmers who have selected crops which are suitable for local conditions but require minimum maintenance and labor input, and, therefore, hesitate to experiment with new techniques requiring costly inputs. This implies that the introduction of any new production/marketing system will be successful only if smallholders are offered guarantees that the new system provides more benefits than the old; and if the risks involved in the cultivation of new crops under a high input regime are reduced as much as possible for the farmers. These two requirements are areas where contract farming has a definite advantage over traditional methods of production and marketing. Contract farming is essentially a business arrangement between the producers (farmers, cooperatives) and the processor of raw materials, which determines the production and the price at which a specific commodity would be supplied by producers to the processing plant.^{13/} In essence, this form of managed production is a way of allocating the risks of production and marketing between the firm and the outgrowers. The outgrowers assume the risk of production whereas the firm offers a price guarantee based upon the quality of produce provided, and a guaranteed market.

^{13/} Contract farming could also involve the middleman, but this form of contracting resembles spot market purchase. Contract farming as discussed here implies that processors contract directly with the farmers.

3.60 Contract growing is an attractive arrangement for sharing agro-industrial risks which are quite high, particularly for new commodities. It also offers other advantages since it leads firms to provide a comprehensive package of services in a coordinated way, thereby addressing two important constraints for agro-industrial diversification. The first one stems from the fact that rural services, which are required for agro-industrial diversification, are handled by a large number of government agencies. This had made it difficult to coordinate their activities concerning agricultural credit, extension services and input supply. The second constraint comes from current budgetary restrictions which may prevent Government from increasing its support services for agro-industry. However, these two constraints would be alleviated if firms would provide a package of services to farmers consisting of: (i) inputs (seeds, fertilizer, pesticides); (ii) transport and marketing; and (iii) extension services and technology transfer.

3.61 Under contract farming firms could provide seeds, fertilizer and pesticides. In order to increase their incentives to do so, government policy in these areas will have to be modified (see Chapter II, paras. 2.33-2.37). In some cases, firms could also extend credit to farmers in the form of agricultural inputs, and obtain its repayment directly when they purchase the crop from farmers.^{14/} This is already being done in several cases in Thailand to overcome farmers' difficult access to institutional credit when they lack the required land title (see Chapter IV, Section D). Cash credit, however, is not provided because of the possibility of farmers using it for other purposes than input financing. Extending credit to farmers is a costly solution which increases the agro-industrial risk borne by firms. A preferable solution would be to modify current credit policy to increase bank lending. In cases where farmers can have access to BAAC credit, BAAC could provide credit together with other inputs like it is already doing in several projects.

3.62 The second function private firms would play would be to provide transport and marketing services. Since farm sizes are small and scattered, coordination in purchasing farm commodities and delivering them to the factory is essential. This can be achieved by locating private firms' purchasing stations in farm areas and/or providing transportation allowances to farmers. But for specialty crops, the amounts involved are small and can easily be delivered to the factory by farmers.

3.63 The third function--provision of extension services and transfer of technology--is the most crucial one for agro-industrial diversification, but currently only certain types of firms are engaged in this activity. The reason for this is that firms will transfer agricultural technology and provide extension services to farmers only if they can capture the resulting benefits (better product quality, higher yield, etc.). This situation usually requires one or several of the following conditions to hold: (a) the commodity cannot be consumed as fresh produce; (b) the processing plant is the main

^{14/} Commercial banks usually do not lend directly to farmers, often because farmers do not have a collateral in the form of a legal land title. See Chapter IV, Section D.

outlet for the unprocessed produce;^{15/} and (c) the cost of building a processing plant is large.^{16/} Examples where extension services are provided by private firms (processing plant or input supplier) include tobacco and sugarcane for traditional crops, and high value specialty items and hybrid chickens for nontraditional commodities. In the cultivation of hybrid fruit and vegetable seeds, farmers are dependent on firms' proprietor information (seed varieties, cultivation methods, and input mix) and market outlets. As a result, farmers are confined to selling their produce to firms that introduce the crops, and firms have a financial incentive to provide extensions services by hiring visible and well trained extension officers who have nearly daily contact with producers.

3.64 In cases where firms are not the sole potential buyer of the agro-industrial commodity, farmers have an incentive to break their sale contract when the market price rises above the price stipulated in their contract with the processing plant. Although contracts are legally binding, firms do not choose to have them enforced through courts because of adverse social and political consequences. To reduce the risks of contract defaults, companies generally guarantee a minimum purchase price in the contracts. The minimum price is determined from companies' test plots and negotiated between the farmers and the firm. For some of the financially stronger companies, the minimum price is set to ensure that farmers' returns for the new crop exceed returns to other crops. Nevertheless, to remain competitive with other buyers, often firms have to purchase near or at market price even though it exceeds the contracted price. Exactly how many firms can afford to follow such a strategy is unknown.

Potential for Managed Production Programs for Commodity Groups

3.65 Field Crops. This group includes processed edible oil and grain crops. For field crops, the variety of seed used is a principal production factor, the requirement being that the variety must be appropriate to the target market. For example, the US market prefers a large, white sesame seed, which brings a low price in the Thai market; while the Thai market demands a small black sesame seed. A second case in point is that of groundnuts. Demand is high in Thailand and other Asian markets for roasted groundnuts. Yet, over the last ten years a high oil content variety has been promoted in the irrigated areas of the Northeast. Demand for the promoted variety of

^{15/} This occurs for example in the case of commodities which must be processed within a short time of being harvested.

^{16/} As stressed by Siamwalla, if investment costs are high it becomes more costly for entrepreneurs to compete for raw material supplies by setting up new processing plants and inducing farmers to break their contracts with existing processors. See Ammar Siamwalla, "Farmers and Middlemen: Aspects of Agricultural Marketing in Thailand," Economic Bulletin for Asia and the Pacific, Vol. 28, No. 1, pp. 38-50, June 1978.

groundnuts is low, with only the trash nuts going to oil extractors, while better quality nuts are processed and blended with higher quality nuts used for roasting and cooking.

3.66 Post-harvest handling is a second important factor in the production and processing of field crops. Crops in this group are highly susceptible to spoilage and contamination as a result of high moisture content. For most of the field crops with high export potential, sun-drying by the farmer is the most efficient and practical method of preventing toxic contamination. Strict control over post-harvest handling at the farm level by field staff is required to insure quality standards are maintained. Self-policing by members of producers groups has been successful in insuring proper post-harvest handling. However, the large number of traders operating in any concentrated production area tends to provide producers with many selling options. Traders who are purchasing for local markets will frequently purchase without regard to quality at competitive prices, and farmers, who seem to be always in need of cash, take the opportunity to sell, without drying, often in violation of a written contract. Thus, quality control is sacrificed and producers in the area discredited in the eyes of any potential middleman or processor hoping to organize production.

3.67 For traditional field crops characterized by the existence of many marketing channels, improvement in post-harvest handling and quality could be achieved by creating a commodity exchange through which forward contracts would be traded (see Chapter IV, Section C). As a consequence of the enforceability of forward contracts through the commodity exchange, traders and processors would have an incentive to invest in post-harvest technology to meet the required product quality; and farmers would be faced with a price structure that would reflect the market value of higher quality products. This would induce farmers to develop the production of the commodities that are in demand. Initially, trading on the exchange would be limited to maize, rice and tapioca, but it could be extended later on to other grains.

3.68 For the other field crops, a managed production program can be developed. Several successful examples of such programs already exist in Thailand. A variation of the supervised production program would involve an arrangement in which the contracting firm becomes more involved with producers' farm operations so as to reduce the risk that farmers would sell their field crops to other buyers. Under that scheme the firm would still operate a full-service supervised production program for the specific crop/crops in which it is interested, but it would also extend advisory and marketing services to include other crops and/or livestock coming from producers' farms. Using extension personnel and technical field staff, the processor could assist farmers to improve the management of their farms through the preparation of simple farm plans. Cropping patterns would be planned so as to cultivate non-photosensitive varieties of rice in at least part of the irrigated areas. This would make it possible to harvest that area early enough to permit the preparation of seedlings (for horticultural crops) or begin land preparation in the area of the irrigated paddy to be planted in field crops during the dry season. The processor would generally be in a position to arrange for market outlets for other crops produced by his contract farmers. This would provide farmers who are harvesting their non-photosensitive

varieties of rice earlier than non-contract farmers, with a ready outlet for that rice. Similar arrangements could be made by the processor for other commodities produced by the contract farmers. Credit and other services could later be expanded if farmer response was positive and a strong production/processing relationship developed.

3.69 Industrial Food Crops. This group of crops includes vegetables and fruit crops, and specialty items such as strawberries for processing. Because the volume of strawberries produced in Thailand is small at this point in time, only small quantities are processed, and no firm has yet organized production for processing. The principal constraint to organizing strawberry production for processing at this time is the high price of fresh strawberries in Thai markets, which induces farmers to sell on the fresh market rather than to a processing factory. A similar constraint affects the expansion of contract farming for pineapple and tomatoes. As a result, the marketing system most widely used for these crops involves a quota-middleman, but contracts between processors and local middlemen have not always been kept, as traders have tended to sell produce to the highest bidder and/or have quota contracts with more than one processor. For example, one large international firm processing pineapple reported having more than 150 quota contracts, of which only 60 had met the terms of their contracts. Various approaches are being employed to increase the production of vegetables. Contract farming would seem to hold a good prospect in irrigation command areas for these crops.

3.70 Tree Crops. An example of a managed production program for tree crops is the cashew production program that is undertaken by the Mah Boonkrong (MBK) group in collaboration with the Bank for Agriculture and Agricultural Cooperatives (BAAC) and several land settlement agencies of the Thai Government. MBK provides seedlings, extension support, a guaranteed market and a price guarantee to producers. It also guarantees the yield per tree. The MBK extension agents make recommendations for cash crops which can be intercropped with the cashews, and MBK assists with marketing arrangements for those cash crops (other than cassava). MBK also has a small nucleus estate, where seedlings are produced, production research is conducted, and cashews are provided to potential exporters as samples of future produce to be available through MBK from smallholders.

3.71 Two factors are crucial to any managed production of tree crops. A long-term credit program must be arranged through the BAAC, which has considerable experience in the field, or through commercial banks. This program should provide sufficient long-term credit for tree crop cultivation and maintenance, as well as short-term credit to support the cultivation of cash crops. Secondly, a cash crop program should be developed such that vacant space between trees is being used by the farmer. The cash crop program would require extension marketing components, perhaps related to some other crop needed by the local processor. Both banana and papaya can be used as intercrops, much as they are used in present cropping patterns.

Promotion of Contract Farming

3.72 The extension of contract farming for nontraditional commodities involves several types of action on the part of private firms and the Government. The first action has to be initiated by the private sector. It basically involves the identification of crops and the financial commitment to carry out adaptive research and provide extension services. The importance of adaptive research and extension services for the cultivation of new agro-industrial crops is clearly shown by the failure of several agro-industrial firms in Thailand.^{17/} The most frequent mistake has been to assume that once a processing factory has been established and a demand for raw materials created, production will be generated according to the quality norms stipulated in the contract. Production of quality produce will not occur spontaneously. An agronomical approach adapted to local conditions has to be developed by private firms and local farmers have to be educated to grow crops with which they have no previous experience. For such a process to take place, firms must be able to recover their initial expenditures in research, training, extension, etc., through the price at which crops are purchased under contract, and farmers must be provided with guarantees that the new crops will be as profitable as the old ones.

3.73 Overall, the identification of crops and the promotion of contract farming will involve a process of trials and errors as there is no definite criteria that guarantee the suitability of contract farming for all nontraditional commodities. For this reason, failures will occur and Government must allow them to occur as part of the normal functioning of a private sector economy.

3.74 Recommendations. The discussion of Government's role in contract farming is focused in the following paragraphs on irrigation command areas because (i) new crops likely to be cultivated during the dry season in irrigation command areas would be high value specialty crops, which are well suited to cultivation under contract farming; and (ii) as argued earlier it is in these areas that agro-industrial diversification could proceed further through a better use of existing irrigation water. The most important action on the part of the Government to promote contract farming in irrigation command areas would be to improve the existing irrigation infrastructure, initiate the required institutional changes (Water User Organizations) and increase government research expenditures on selected nontraditional commodities (see Section B). As suggested in Section A, these measures could be part of a promotion framework which would be described in an MOAC policy statement for irrigation command areas. This statement would enable irrigation project directors and other MOAC field directors to mobilize existing resources at the local level to promote the cultivation of nontraditional crops through contract farming.

^{17/} Recent ones include the Chiang Mai food complex in the North; the Sime-Darby peanut oil processing plant in the Nam/Phrae area; the Lablae food processing factory in Khon Kaen; and food processing factories in Tao Ngoi and Laharnsai in the Northeast, and in Kanchanaburi.

3.75 An important characteristic of contract farming is that the selling price of crops under contract would have to remain below the price the crop may fetch if sold to private traders. If this was not the case, firms would not have an incentive to transfer technology to farmers or provide them with a guaranteed market. For this reason, the setting-up of government marketing programs for nontraditional crops would be disruptive if government agencies would purchase these crops at a price higher than the one stipulated in the contracts between firms and farmers.^{18/}

3.76 As with any crop promotion schemes, there is a need to inform farmers of the existence of new crop management programs involving contract farming. Both farmer meetings and radio addresses could be used to encourage participation and explain all aspects of contract farming to farmers. Meetings could be arranged by local officials in irrigation command areas with the objective of indicating to participants the individuals responsible for each phase of implementation, and the penalties that would be applied in case of contract violation such as reduction in next season production quotas or cancellation of contract by the processing plant. To ensure that farmers' adherence to the crop management program will last, firms will also have to provide services to farmers. Elements which have been shown to influence farmers' adherence to contracts include: frequency of visits of field staff, availability of transport services, location of buying points and timeliness in buying.

3.77 Although these measures would help increase contract compliances and induce firms to provide a complete package of services (inputs, extension services, and credit) to farmers, the cost of delivering such a package of services may exceed the firm's physical and financial capability. In such cases--likely to occur in the poorest regions such as the Northeast--the Government may want to provide more intensive support services during a temporary period to promote private sector involvement in irrigation command areas which are currently underutilized. An example of such an approach is provided by the Lam Nam Oon irrigation project in the Northeast (see Annex 4) where RID played an active role in promoting private sector involvement in agro-industry. This role has now resulted in five private firms beginning production of agro-industrial crops through contract farming. Since the irrigation facilities were already in place in Lam Nam Oon but were underutilized during the dry season, they were basically sunk costs. In such a context, the provision of government support services to the private sector in one of the poorest areas of the country was probably a justified additional investment. However, an important feature of the Lam Nam Oon model is that the provision of intensive government support services to private firms would be limited in time (three to five years), and after that, such services would be assumed by private firms.

^{18/} These interventions are frequently motivated by the notion that middlemen exploit farmers by offering them too low a price for their produce. So far, the evidence has been the opposite, namely that Thailand's marketing system is rather efficient in the sense that the producer price amounts to a high share of the export price.

IV. MACROECONOMIC POLICIES AND INCENTIVES FOR AGRO-INDUSTRIAL INVESTMENT

4.1 As indicated in Chapter II, Thailand's agribusiness is a world-class success story. This is all the more impressive given the background of depressed export markets and growing protectionism. The key to past success is threefold. First, Thai farmers have demonstrated an ability to respond quickly to changing incentives. Second, there has been no major constraints affecting the availability of the key factors of production (capital, labor, technical and marketing expertise). And third, the Government has implemented generally sound macroeconomic policies and has largely avoided counter-productive efforts to displace private initiatives. These are important lessons which motivate the importance given in this chapter to economic, marketing and financial policies which have a major influence on agro-industrial growth.

4.2 This chapter starts by summarizing the main changes in the composition of food consumption resulting from per capita income growth. These changes, discussed in Section A, have important implications for macroeconomic policies and particularly the structure of protection of the domestic market. Due to the currently limited demand for processed food, acceleration of agro-industrial growth will largely depend on (i) the development of new linkages between agri-processing and farmers, such as the expansion of feed grains and other livestock feed for cattle and pork; (ii) a change in the structure of incentives to increase the export orientation of several agro-industrial subsectors; and (iii) improved access to international markets. The corresponding government measures are discussed in Sections B and C of this chapter.

4.3 The expansion of production of nontraditional agro-industrial commodities will also require investment in agricultural research, post-harvest technology and adequate marketing infrastructure; the purchase by farmers of new agricultural inputs to produce the new commodities; and the construction of processing plants which are costly and often require access to foreign technology and foreign partners. Measures to improve the cost and access to capital are thus important for agro-industrial diversification. They are discussed in Section D.

A. Changes in the Demand for Food

4.4 The main factor affecting the consumption of food is well known from Engel's law. It concerns the decline in the share of food in consumption as a result of per capita income growth. In parallel with this trend, the composition of food consumption usually shifts away from direct consumption of cereals towards consumption of commodities such as meat, fish, dairy products

and fruits which have higher income elasticities.^{1/} These changes tend to support the trends already noted in Thailand's exports from traditional to nontraditional commodities.

4.5 In Thailand's case the most important changes are concentrated in the cereal subsector, and particularly rice, since the per capita consumption of rice has declined in the seventies. This trend may continue in the eighties and result in the growth of the domestic demand for rice being determined mainly by population increases. Prospects for other cereals--mainly coarse grains--may be brighter but the realization of this potential would depend on policy changes as discussed below.

4.6 To analyze the demand for coarse grains, it is necessary to separate it into its two components, namely the direct demand for grains which are consumed as food, and the indirect demand stemming from feed uses. The reason for this distinction is that these two components do not display the same growth over time. At low income level, cereals are consumed directly as food and provide the main source of calorie intake. As a result, per capita consumption rarely exceeds 200 kg per year. At higher income levels, the direct per capita consumption of cereals is much lower, but cereals are also consumed indirectly in the form of meat. The important outcome of the change from direct cereal consumption to indirect cereal consumption is that the total per capita consumption of cereals increases up to 550 kg per year as in Europe or 850 kg per year as in the US.^{2/}

4.7 The overall consequences as concerns income elasticities are summarized in Table 4.1. This table shows that although the income elasticity of the direct demand for cereals as food falls from 0.23 to -0.06 as income rises, the income elasticity of the total demand for cereals increases from 0.17 to 0.35, mainly because of the much higher income elasticity of demand for feed grains.

^{1/} Nevertheless, income elasticities are still below one. In the case of Thailand they were estimated to range as follows depending on the income class: pork: 0.7 to 0.5; beef: 0.6 to 0.3; fresh water fish 0.7 to 0.2; chicken: 0.3 to 0.4; seawater fish: 0.5 to 0.3; chillies: 0.4 to 0.15; sugar: 0.4 to 0.2. See: Trairatvorakul Prasarn, Food Demand and the Structure of the Thai Food System, 1981. MA Thesis, Harvard University.

^{2/} The reason for this is that the conversion of cereals into animal proteins carried out in cattle and poultry is rather inefficient. Typically, the conversion ratios range from 2:1 to 7:1 for beef.

Table 4.1: INCOME ELASTICITIES OF THE DEMAND FOR CEREALS, 1968-80

	Total demand for grains <u>/a</u>	Demand for cereals as food	Demand for cereals as feed
Low income LDCS	0.17	0.23	0.75
Middle income LDCs	0.25	0.18	0.63
Developed countries	0.35	-0.06	0.53

/a Total demand besides food and feed also includes waste and other uses, such as seed, industrial, etc.

Source: Derived from Pan A. Yotopoulos, Middle-Income classes and Food Crises: The "New" Food-Feed Competition; Economic Development and Cultural Change, Vol. 34 No. 3, April 1985, p.47.

4.8 These trends have clear implications for Thailand's cereal subsector. They indicate that (i) the expected decline in the per capita consumption of rice could be offset by a rapid increase in the per capita demand for feed grains; and (ii) the main source of growth of the domestic demand for cereals would come from feed grains. This conclusion, however, depends on the implementation of several key measures in the livestock sector (pork and cattle) (see Chapter III, paras. 3.16-3.17). These measures would lead to an increase in the domestic production of quality beef--for which there is a domestic demand--and in exports of pork meat (See Annex 2, paras. 62-68). The results would be to stimulate the output of feed grains and diversification towards new grains such as red hybrid sorghum which Thailand has the potential to develop.

4.9 Other trends that are important for Thailand concern the expected increase in the domestic consumption of processed food. But since the share of food in consumption expenditures would decline over time, the net likely outcome is for the processed food subsector to grow at a slower rate than manufacturing (as has been the case so far, see Chapter II para. 2.13). Possibilities for offsetting this trend exist, but in view of Thailand's limited domestic market for processed food (stemming in part from Thailand's abundant supply of fresh food), any significant expansion of the subsector will only take place through export expansion rather than import substitution.^{3/} As a result, the impact of various macroeconomic policies on the incentives structure facing export activities is particularly important for the food processing sector. This is examined in the following section under three categories: the general macroeconomic policy and trade policies;

3/ This was certainly the case for the four major success stories of recent years namely canned pineapple, canned tuna fish, frozen fowl and shrimps.

export promotion policies; and the specific investment incentives offered by the Board of Investment.

B. Macroeconomic, Trade and Investment Policies.

4.10 At the macro level government policies have an effect on the incentive structure through the effects of macroeconomic imbalances on the "real exchange rate" or the relative price of tradeables to nontradeables.^{4/} In addition to providing a "subsidy" to the use of capital, thereby increasing the capital intensity of profitable projects, an overvalued exchange rate also reduces the competitiveness of sectors producing tradeables--both for export and for the domestic market. In this regard the macroeconomic policy stance of the Government may well have significant effects on a sector such as agro-industry which heavily relies on export markets.^{5/} From the point of view of this sector, the steady appreciation of the baht vis-a-vis the yen and other European currencies as the US\$ strengthened in the early 1980s posed severe difficulties with regard to competitiveness in world markets. The problem was alleviated considerably in November 1984 when the baht was devalued by some 15% against the US\$ and the exchange rate system changed from being pegged to the US dollar to being determined on the basis of a basket of currencies.

4.11 Thailand's industrialization process essentially began in the early 1960s. The first few plans focussed the Government's attention primarily on the provision of the required economic infrastructure and the promotion of private sector investment. Towards the end of the 1960s, the Government began to more actively pursue import-substitution policies primarily via the use of trade taxes to protect domestic industry. The protectionist trends continued into the 1970s, albeit with some shift of emphasis away from consumer goods towards intermediate goods and raw materials. Increasing trade deficits in the early 1970s prompted the Government to devote more attention to export promotion policies in the Third Development Plan period (1972-1976). As the trade deficits persisted into the late 1970s and early 1980s, the export promotion policies took on more urgency and the Government placed considerable emphasis both on export promotion and on restructuring domestic industry with a view to increasing the use of domestic resources, improving levels of efficiency and productivity and enhancing the quality of industrial technology.

4.12 Major government institutions involved in the formulation of trade policies are the Ministry of Finance with regard to the establishment of the

^{4/} The discussion of macroeconomic policy is kept purposely brief here as a more detailed analysis is available in a recent Bank report entitled Thailand, Growth with Stability, A Challenge for the Growth Plan Period, A Country Economic Report, 1986, op. cit.

^{5/} This is shown by the high share of food exports in output value. However, the implicit ratio of exports to output (57.2% in 1985) is only indicative as the classification of commodities is not the same for exports as for output.

overall tariff structure, the BOI with its special surcharges on imports of promoted products, the Ministry of Commerce with regard to the quantitative control of imports and exports, and the Ministry of Health with regard to quality controls on imports of food products. On the industrial side, in addition to the NESDB, the other major actors involved in the formulation and implementation of industrial policy are the Board of Investment (BOI) and the Ministry of Industry (MOI). The former is primarily responsible for providing incentives to medium to large scale investment projects and acting as the contact point for foreign investors contemplating or undertaking investment activities in Thailand. The latter, on the other hand, deals mainly with the small scale sector, providing a wide range of technical, management, marketing, and financial assistance designed to help to overcome the multitude of problems and disadvantages faced by such enterprises, many of which result from an incentive structure biased in favor of large scale activities.^{6/}

4.13 The extent to which trade and industry policies have created an economic environment that is conducive to industrial development in general, and agro-processing growth in particular is dealt with below.

The System of Protection

4.14 Import Tariffs. In general, as is shown in Tables 4.2 and 7 (Statistical Annex), the nominal rates of protection provided to the agro-processing sector are considerably higher than those provided to any other major category. This is partly a result of generally high ad valorem tariff rates, especially on processed food products with higher value-added, but it is accentuated by the fact that many products in the sector face specific rates which frequently result in very high equivalent ad valorem rates.^{7/} However, the tariff structure facing agro-industrial products is not affected to a great extent by the numerous product specific exemptions that are prevalent in other sections of the code and which considerably complicate the

^{6/} The MOI presently has no section dealing specifically with agro-industry although many of the training and technical assistance programs of its Department of Industrial Promotion (DIP) impact on such activities due to the fact that they are oriented towards small and medium scale industries. At the present time, the DIP is concentrating on improving its manpower resources and reorganizing its internal structure in order to carry out its tasks more effectively. In time, the DIP and the Department of Commercial Relations of the Ministry of Commerce could well combine activities to provide an effective integrated assistance package to small and medium scale export activities involving marketing, management, financial, and technical elements.

^{7/} Many products in the agro-processing sector have both an ad valorem and a specific rate associated with them. The rate with the higher revenue yield is the one that is actually applied. In the event that the specific rate dominates the already high ad valorem rate the resulting ad valorem equivalent is quite unpredictable and often very high. See the average tariff for preserved fruits and vegetables in Table 4.2 for example. These unpredictable specific rates which impact more on low value than high value products should be abolished and replaced with ad valorem rates alone.

Table 4.2: INDICATORS OF NOMINAL PROTECTION AT THE
INPUT-OUTPUT SECTOR LEVEL - 1981-85
(%)

Input-output sector	Sep 1981	Mar 1983	Oct 1984	Nov 1984	Apr 1985
Overall average	32.5	34.7	34.9	31.8	35.4
Nonagriculture primary products	7.0	9.4	9.2	8.3	10.3
Nonagro-business manufacturing	36.8	37.9	38.1	34.7	38.0
Agriculture	31.0	33.0	33.8	30.8	35.3
of which:					
Paddy	36.0	39.6	39.6	36.0	45.0
Maize	11.0	12.1	12.1	11.0	14.0
Other cereals	23.7	23.8	23.8	21.6	32.2
Cassava	50.0	55.0	55.0	50.0	60.0
Other root crops	38.8	42.6	42.6	38.8	46.3
Beans and nuts	72.0	59.1	64.6	58.7	65.9
Vegetables	33.2	37.5	42.5	38.6	46.4
Fruits	83.7	88.6	94.8	86.2	93.4
Sugarcane	30.0	33.0	33.0	30.0	40.0
Coconut	64.0	64.3	64.3	58.5	69.5
Oil palm	30.0	33.0	33.0	30.0	35.0
Kenaf and jute	30.0	33.0	33.0	30.0	30.0
Crops for text. & mat.	26.6	28.4	28.4	25.8	27.0
Tobacco	60.0	66.0	66.0	60.0	60.0
Coffee and tea	53.3	58.7	58.7	53.3	53.3
Rubber	0.0	0.0	0.0	0.0	0.0
Other agric. products	23.7	26.3	29.5	26.8	32.8
Cattle & buffalo	2.0	5.9	5.9	5.3	6.7
Swine	1.5	4.4	4.4	4.0	5.0
Other livestock	22.3	24.5	24.5	22.3	25.8
Poultry	10.0	11.0	11.0	10.0	13.3
Poultry products	0.5	0.6	0.6	0.5	0.5
Silk farming	10.0	11.0	11.0	10.0	10.0

Table 4.2: (cont'd)

Input-output sector	Sep 1981	Mar 1983	Oct 1984	Nov 1984	Apr 1985
Agro-processing	44.9	50.5	50.7	46.1	49.4
of which:					
Slaughtering	14.1	18.9	18.9	17.1	21.3
Canning & pres. meat	66.0	67.1	67.1	61.0	61.0
Dairy products	25.2	21.0	21.0	19.2	22.2
Pres. fruit & vegetable	97.3	117.6	118.9	108.1	111.1
Pres. fish & seafood	32.2	34.6	36.1	32.9	38.1
Coconut/palm oil	12.2	11.6	11.6	11.0	13.7
Animal & vegetable oil	14.8	21.1	21.1	19.2	22.8
Rice milling	18.0	25.3	25.3	23.0	27.5
Tapioca milling	45.0	49.5	49.5	45.0	50.0
Grinding of maize	30.0	33.0	33.0	30.0	40.0
Flour	32.1	36.8	37.2	33.8	46.4
Bakery products	80.0	78.6	78.6	71.5	75.0
Noodles	76.2	104.9	104.9	95.4	95.4
Sugar	39.6	41.8	41.8	38.0	41.3
Confectionary	51.0	53.6	53.6	48.7	51.2
Ice	21.0	24.2	24.2	22.0	22.0
Monosodium glutamate	60.0	66.0	66.0	60.0	60.0
Coffee & tea processing	57.1	62.9	62.9	57.1	57.1
Other food products	41.9	45.2	45.2	41.1	43.0
Animal feed	0.0	11.0	11.0	10.0	10.0
Distilling & spirits	88.5	98.8	98.8	89.8	104.6
Breweries	66.0	66.4	66.4	60.3	53.7
Soft drinks, etc.	42.8	49.3	49.3	44.8	44.8
Tobacco processing	60.0	66.0	66.0	60.0	60.0
Tobacco products	52.0	58.3	58.3	53.0	54.0

Note: - The nominal rates were calculated as the numerical average of the 6-digit nominal rates corresponding to the respective input-output categories. There have been very few changes since April 1985 so those rates correspond closely to the present ones.

- All sector averages are unweighted averages of the respective input/output sectors.

Sources: Customs tariff of Thailand, various issues; April 1985 emergency decree on customs tariff.

interpretation and implementation of such sections of the code. The major tariff adjustment in the 1980s specifically affecting agro-processing involved a reduction in late 1982 of the ad valorem rates on processed food items from 80% to 60%. However, given the dominance of specific rates in many of these sectors, the reductions were not completely felt. Other than that specific measure, the fluctuations in nominal duties over the period resulted from general measures such as the 10% surcharge that was in force from October 1982 to October 1984, and the across-the-board increase in tariff rates in April 1985.

4.15 Another factor affecting the tariff rate structure comes from the import duty surcharges BOI is empowered to impose on imports that it sees as competing with the production of promoted companies. Some 16 products are presently covered by such surcharges which range from 5 to 45% of CIF value. However, partly due to the already high nominal rates of protection on most agro-processing products and partly to the fact that most promoted agro-processed firms are export oriented, only one product in the food processing sector, namely fatty acids under BTN 15.10, faced a surcharge as of October 1986. The remainder of the surcharges currently in effect are concentrated in the chemical and engineering sectors.

4.16 Table 9 (Statistical Annex) provides a summary of nominal tariff rates on selected nonagricultural inputs into the agro-industry sector. In general, the rates are somewhat lower than those on processed food products but are still significant,^{8/} especially in the case of metal containers which face rates of 30% or more. These rates reflect the efforts of the Government to promote the respective activities, as do the very high rates on vans and pickups and related parts. However, it should be noted that any export oriented activity, and especially those promoted by the BOI, should be able to obtain refunds of virtually all duties paid on imported material inputs and machinery used in producing exports.

4.17 Effective Protection. In order to obtain a better idea of the incentive effects of tariff rates on the generation of value-added in the agro-processing sector, the effective rates of protection from 1981 to 1985 are presented in Table 4.3. It is important to note that these calculations were made on the assumption that many of the agro-processing sectors were export oriented and accordingly faced a nominal protection on their output of zero.^{9/} Therefore, the difference between the price obtained for the output and the world price was effectively zero except in the event that there was an export duty in which case it was negative. For all the sectors that were classified as import oriented, the level of effective protection that was provided for their domestic activities was very high due to the often prohibitive nominal rates on many processed food products. In any event, it is evident that the high and variable nominal rates on outputs translate into

^{8/} 20% on agricultural machinery, 30% on small tractors and 5% on larger tractors.

^{9/} For a list of these sectors see Table 4.3, footnote.

Table 4.3: EFFECTIVE RATES OF PROTECTION - 1981-86
(%)

Sector	Input/ output code(s)	Sep 1981		Mar 1983		Oct 1984		Nov 1984		Apr 1985	
		VAWP	UNWGTEd	VAWP	UNWGTEd	VAWP	UNWGTEd	VAWP	UNWGTEd	VAWP	UNWGTEd
Agriculture	1-23	10.9	25.1 (27.2)	11.3	25.6 (27.3)	12.2	26.5 (28.9)	11.0	24.0 (26.3)	13.2	28.0 (29.4)
Other primary products	25-40 less 30	5.7	5.0 (9.0)	7.9	7.2 (9.8)	8.4	7.5 (11.0)	7.6	6.8 (10.0)	10.7	10.5 (12.4)
Other manufacturing	67-134 less 127 plus 172	53.6	77.4 (133.8)	50.2	67.4 (92.2)	49.8	65.3 (81.7)	44.5	57.0 (66.8)	51.9	66.3 (69.6)
Agro-processing	42-66	24.7	115.4 (218.3)	30.3	139.0 (266.8)	32.3	138.0 (266.1)	28.7	130.3 (264.9)	32.8	135.2 (264.4)
of which:											
Slaughtering	42		46.0		59.0		59.0		52.0		70.0
Canning & pres. meat	43		166.0		152.0		152.0		134.0		123.0
Dairy products	44		38.0		26.0		26.0		24.0		28.0
Pres. fruit & vegetable	45		-25.0		-26.0		-27.0		-25.0		-26.0
Pres. fish & seafood	46		-13.0		-14.0		-14.0		-13.0		-14.0
Coconut palm oil	47		-4.0		-5.0		-5.0		-5.0		-3.0
Animal & vegetable oil	48		-4.0		16.0		12.0		10.0		18.0
Rice milling	49		-21.0		-22.0		-13.0		-13.0		-13.0
Tapioca milling	50		-4.0		-4.0		-4.0		-4.0		-3.0
Grinding of maize	51		-5.0		-5.0		-6.0		-5.0		-5.0
Flour	52		89.0		117.0		114.0		99.0		164.0
Bakery products	53		407.0		358.0		338.0		276.0		272.0
Noodles	54		494.0		999.9		999.9		999.9		999.9
Sugar	55		-3.0		-3.0		-3.0		-3.0		-3.0
Confectionary	56		84.0		88.0		88.0		78.0		80.0
Ice	57		24.0		27.0		27.0		24.0		27.0
Monosodium glutamate	58		157.0		177.0		177.0		152.0		152.0
Coffee & tea processing	59		77.0		85.0		85.0		77.0		77.0
Other food products	60		59.0		67.0		65.0		59.0		60.0
Animal feed	61		-13.0		9.0		8.0		7.0		5.0
Distilling & spirits	62		138.0		157.0		155.0		138.0		168.0
Breweries	63		81.0		80.0		79.0		72.0		76.0
Soft drinks, etc.	64		62.0		73.0		72.0		65.0		66.0
Tobacco processing	65		999.9		999.9		999.9		999.9		999.9
Tobacco products	66		56.0		64.0		64.0		58.0		62.0
Overall Average		27.9	66.7 (140.2)	27.9	66.4 (140.4)	28.5	65.3 (136.7)	25.5	59.0 (131.3)	30.0	65.9 (132.0)

- Notes: (1) Effective rates of protection represent the potential incentive effects of the protective structure and were calculated according to the Corden method using input coefficients from the 1980 input-output table.
- (2) The following input/output sectors were treated as export or nontradable sectors with nominal rates of zero for calculations of effective rates of protection: 1, 2, 4, 14, 16, 32, 33, 34, 36, 45, 46, 49, 50, 51, 55 and 95.
- (3) Numbers in parentheses represent standard deviations.
- (4) VAWP - Using 1980 value-added in world prices as weights.
- (5) UNWGTEd - Simple numerical averages.

an effective protection structure with very high levels of dispersion with standard deviations of more than 200% in all years, and hence distortionary impacts on resource allocation. The dispersion of the effective rates in fact increased during the 1980s as the general measures that were taken primarily to increase revenue tended to impact more upon the already high nominal rates of protection on the outputs of the sector than on its inputs which faced relatively low rates.

4.18 While it is clear that the nominal tariff structure provides significant protection to food processing activities supplying the domestic market, the fact that such markets are generally small implies that the distortionary cost of the protective structure within the agro-processing sector itself was less than would have been expected based on the high absolute levels and wide rates of dispersion of the effective protection rates. But benefits have also been quite limited as domestic markets for processed food do not offer that much scope for expansion. Given that the main markets for processed food products are export ones, the major issue concerning the tariff structure has been the overall anti-export bias of the existing tariff structure. This bias has provided substantial disincentives to the movement of resources into export sectors which, in the absence of export subsidies, face effective protection levels at best equal to zero. These disincentives have been accentuated by the recent rise in the average nominal protection rate on agricultural products from 30.8% in 1984 to 35.3% in 1985. These factors alone may explain to some extent the relatively poor performance of the food processing sector as discussed in Chapter II.

4.19 Specific food processing subsectors which are strongly discriminated against by the current structure of protection are the ones with negative effective protection rates (EPR) namely, preserved fruit and vegetable (-26%), preserved fish and seafood (-14%), palm oil (-3%), rice milling (-13%), tapioca milling (-5%), grinding of maize (-5%) and sugar (-3%) (Table 5.3). As indicated in Annex 2, Thailand has a good potential for increasing the production of preserved fruits and vegetables, preserved food and seafood, and palm oil, but the current structure of incentives is not conducive to such a result.

4.20 To increase the production of selected new crops, the Government is considering whether to replace imports by local production. But due to the currently small domestic demand for these crops, the implementation of a systematic import substitution policy for new field crops such as wheat, sunflower, etc. does not appear promising as it would lead to the imposition of high tariff rates.^{10/} Such a policy would engage Thailand in the production of crops in which it may not have any comparative advantage; and as had happened for soybean, it may result in the domestic price exceeding the world market price with obvious adverse affects on domestic users.

^{10/} In the case of wheat, for example, the import tariff rate was doubled in April 1985. Wheat is now promoted by DOAE as a dry season crop in the North. For information on the domestic market size of selected nontraditional crops, see Table 2, Annex 2.

4.21 A specific area where a reform of the protection system appears urgently needed is the oil seed and feed grain subsector. Since the markets for these crops are tightly interconnected, a specific trade policy cannot be implemented separately for each crop. As a consequence, the Government would have two alternatives. The first one would be to examine in detail the relationships between final demand and production of each crop (existing and new ones such as sunflower, red sorghum, etc.). This is likely to indicate that the prices of oil seeds and feed grains would have to be related to the price of soybean. But since the domestic price of soybean is currently about 35% above world market price, the domestic prices of competing crops would have to be above border prices if cultivation is to take place. These crop prices might also require additional tariff protection on the processed product to compensate the final users (feed industry and vegetable oil) for the increased costs of the inputs. As a result, the net effect of such a policy would be to protect some firms which have high costs relative to their foreign competitors, and to penalize businesses for which Thailand might have comparative advantages but which would become unprofitable because of the increased input cost resulting from trade policy. One such example is pork since imposing high tariff and import restrictions on feed grains and oil seeds would increase the production cost of livestock feed. Unless duty free access to feed imports were allowed, the increased cost of feed would have a large impact on the profitability of the pork subsector because feed costs usually amount up to 80% of the total production cost of pork. The extent to which Thailand could become an efficient export of pork meat is, therefore, largely related to the protection granted to oil seeds and feed grains.

4.22 The second alternative policy would be to reduce current distortions. This would include: eliminating quantitative restrictions on the import of livestock feed and vegetable oils, in particular soybean meal and palm oil; reducing the high tariff rates on feed grains and oil seeds such as soybeans, groundnuts, etc.; and more generally, reducing the high variation among tariff rates on agricultural products as well as agro-processed products.

4.23 Import Controls and Licensing. Under the 1979 Export and Import Act, the Ministry of Commerce may impose import licensing requirements on a number of agricultural products. The majority of such controls are enforced with the stated purpose of protecting domestic producers and enabling them to obtain a "reasonable" price for their output. In general, the Ministry of Commerce will grant licenses for the import of products that are not domestically available but will not consider price differences as a reason for permitting imports of controlled products. As in the case of export controls, few products have been added to the list in recent years and there is an explicit policy in the Ministry of Commerce to reduce the reliance on such controls, partly in order to conform to GATT regulations. Perhaps more relevant for the imports of processed food products, few of which are covered by import controls, are the cost and delays associated with obtaining licenses from the Food and Drug Administration in the Ministry of Health. Such licenses are required for the import of virtually all food products and, in some cases, pose even more significant barriers to imports than the already high nominal tariff rates.

4.24 Recommendations. In terms of exchange rate policy, the Government should continue to carefully monitor movements in real exchange rate to ensure that Thailand's competitiveness vis-a-vis its regional competitors is not adversely affected by exchange rate movements abroad, and adjust the basket of currencies accordingly. This flexibility in exchange rate policy is also important to complement any general trade policy reform.

4.25 In view of the high substitution in consumption among agricultural products and processed food, the main thrust of the required trade policy reforms should be concentrated on reducing the level and variability of effective protection rates across the whole agricultural and manufacturing sector, thus reducing the bias towards production for the domestic market. This could perhaps be achieved by increasing the uniformity of nominal tariffs, and especially by reducing the very high rates that characterize many processed food products. In addition to reducing the anti-export bias, this would put more pressure on agribusiness firms producing for the domestic market to increase their levels of efficiency.

4.26 While these general measures should go far towards remedying the present high incentives given to producing for the domestic market, there will still be some scope for rationalization of the protective structure for agro-industry products. In particular, it is strongly recommended that the Ministry of Commerce continue to reduce the reliance on quantitative restrictions on imports of agricultural products; removing them when redundant or no longer necessary to protect domestic activities and substituting them with ad valorem tariffs when some protection is still desired.^{11/} Similar steps should be taken to reduce the number of specific rates that exist either on their own or in tandem with ad valorem rates.

4.27 In some cases, the ad valorem rates resulting from the specific rates are very high and impact more on low value than high value products. Such a result accounts for the high negative effective protection rate on fruits and vegetables. These specific rates should be abolished and replaced with ad valorem rates. These reforms would make the agro-industry protective structure much more transparent and reduce the scope for discretionary treatment of imports.

4.28 A further measure that should be taken to improve the treatment of food product imports and increase the level of competition in the domestic market for such products involves the streamlining of the procedures of the Food and Drug Committee of the Ministry of Health. Particular emphasis should be placed on reducing the time and cost that is currently associated with obtaining the licenses that are required to import virtually all food products.

^{11/} An example of this type of policy is the recommendation that the import control on soybean meal that was cited earlier be replaced with an ad valorem tariff. This would reduce the likelihood of severe impacts on prices of domestic shortages in the event of delays in granting import licenses by the Ministry of Commerce.

4.29 In terms of the non-agricultural inputs into the agro-industry sector, especially those of cans, packaging materials, and miscellaneous chemical inputs, two main issues need to be addressed. Firstly, efforts to promote the domestic growth of such activities by providing high levels of protection and/or guaranteed markets should be examined in light of the effects of such protection on the costs and outputs of the domestic user of the protected products. In the case of domestically produced aluminum sheet, for example, users claim that the single promoted company still cannot produce to a standard or a price that will enable them to produce cans of sufficient quality to compete in export markets. Secondly, the present domestic sales tax system which is levied in a cascading manner at each stage of fabrication and hence forces firms to either incur extra costs by subcontracting or by vertically integrating in an inefficient way, should be rationalized and eventually replaced by a value-added tax.^{12/}

Export Promotion Measures

4.30 Export Taxes and Controls. Following the removal or reduction of several export taxes in 1985, notably on tanned hides, articles of wood, inedible fish products, and rice in 1986, few products continue to be subject to the imposition of export duties. In the agro-industry sector, the main products that still must pay such duties include latex and sheet rubber, wood and sawn wood, and raw silk yarn. In addition, exports of a number of products primarily in the less processed part of the agro-industry sector, are subject to business taxes ranging from 1.5 to 2%. Such products, include maize, sorghum, beans, castor seeds, jute, and kenaf, cassava products, molasses, cotton, fresh, chilled or frozen aquatic animals and sugar. Export controls by the Ministry of Commerce under the Export and Import Act B.E. 2522 of 1979, ranging from complete bans to the monitoring of exports, continue to be enforced on a number of agricultural products, but they have remained relatively constant since the early 1980s. The main rationales for such controls include preventing domestic shortages (jute seed, castor seed); promoting orderly exports in terms of quality and quantity (longan, marine products); and complying with multilateral agreements (sugar and cassava). These export controls do not appear to be a major problem area, particularly with the recent removal of export controls on maize and rice.

4.31 Agro-industrial products face intense competition in the world export markets. An environment to enable these industries to export on a competitive basis is thus highly essential. Since these requirements equally apply to all exports, there is no reason to implement a specific export promotion package which would be limited only to agro-industrial exports. For this reason, the following discussion of export promotion measures should be understood as applying to all exports. These measures concern: (a) the creation of a domestic letter of credit; (b) the establishment of a system of

^{12/} As a temporary measure, pending the introduction of VAT system, the business tax on all inputs into export products was reduced to 1.5% in 1987.

preshipment export finance; and (c) improvements in the refunds of duties on imported inputs.

4.32 The domestic letter of credit (DLC) is the domestic counterpart of the international letter of credit received by exporters.^{13/} Its function is as follows: On the basis of an international letter of credit received by an exporter, the commercial bank of the exporter would open a DLC which would be given to the local firm producing for the exporter. This process can in turn be repeated for other indirect suppliers of local firms, which would receive successive DLCs. An important advantage of such a system is that it helps identify indirect exporters (producers of intermediate products which supply exporters) at every stage of production. This automatic identification is important because it can be used for channeling preshipment export packing credit, refunding duties on imported inputs and exempting indirect exporters from domestic taxes on intermediate inputs. However, to avoid abusive use of the DLC system only an irrevocable DLC must be allowed. A purchase order issued by exporters to producers cannot be used as a substitute.

4.33 Preshipment Export Finance Guarantee Fund (PEFG). Since commercial banks may not be willing to grant preshipment export credit to new customers, the full implementation of the DLC system may require the Government to set up a Preshipment Export Finance Guarantee Fund.^{14/} The purpose of this Fund would be to protect commercial banks against the risk that exporters would not repay the preshipment export loan.^{15/} In the current context, the Government may want to increase the size of the recently created Export Guarantee Fund (B 160 million) so as it could play the role of the recommended PEFG.

4.34 Refund of Import Duties. An important measure to improve exporters' competitiveness is to ensure duty free access to imported inputs. The implementation of such a measure would require Government to calculate physical input coefficients (PHIC) to estimate the inputs used directly and indirectly in the production of exports.^{16/} Several advantages would be obtained if the

^{13/} For further details see: Thailand's Manufactured Exports; Key Issues and Policy Option; World Bank report No. 5670-TH, December 1985.

^{14/} At present BOT rediscount facility amounts to about B 30 billion. Assuming that the same ratio as in Korea (12 times) would apply, about B 2.5 billion would be needed to set up a Preshipment Export Guarantee Fund. This Fund would be subscribed by Government and all financial institutions.

^{15/} This fund is to be distinguished from an export credit insurance which is designed to protect against the risk that importers would not repay postshipment export loans.

^{16/} Input coefficients should be calculated in physical terms rather than in monetary terms (as done under the current drawback scheme) in order to follow a GATT's rule that only physically incorporated inputs in exports are entitled to tax refunds.

DLC and the PHIC systems are implemented simultaneously. First, without a DLC system, only direct exporters and possibly first stage indirect exporters (which can be identified by direct exporters) would obtain a refund of import duties; other indirect exporters would not. Second, without a DLC system indirect suppliers would not be easily identified. To do so would require the computation of PHICs for both imported and local inputs so that exporters can be exempted from indirect taxes levied on their purchases of local inputs. By contrast, the simultaneous implementation of a DLC and PHIC system makes it necessary to calculate PHIC only for imported inputs since the DLC would specify the actual purchase of local inputs.

4.35 Recommendations. Calculation of physical input coefficients (PHIC) is already being carried out by the NESDB, the FPO and the Department of Customs for the most important export products such as textiles, clothing and canned food. Although the computation of such coefficients does not present much difficulty at the technical level, the benefits that could be obtained from the implementation of the PHIC system alone would be greatly improved if the PHIC and DLC systems were implemented jointly. For this to take place, a decision must be taken by Government so that the joint implementation of the DLC and PHIC systems can be coordinated. Once the calculation of PHIC is completed, all the various coefficients should be published in a book and used as the only source of information for tariff refunds. Nevertheless, the physical input coefficients should be revised occasionally to account for technological changes, and exporters should be allowed to request a revision of the coefficients. Since it is the intention of the Government to use the estimated PHICs for administering all the duty-free import schemes, the duty drawback scheme of the Customs Department may need to be consolidated with the duty exemption scheme of BOI.

4.36 In view of the need to provide a leadership role in setting up a DLC system, it is recommended that a small unit staffed with highly qualified professionals be created in BOT. BOT has already initiated a DLC pilot project concerning BOI--registered trading companies, and it intends to gradually extend it to other export activities. To benefit fully from the DLC system, it is recommended that the pilot project not only provides for export credit, but also refunds of import duties, exemption from domestic indirect taxes, and pre-shipment export finance guarantee. This would require increased inter-agency coordination owing to the highly interdependent nature of various measures. To facilitate the transition exporters should be offered a choice between the existing scheme and the DLC system. Measures should also be considered for reducing the unusually high rates charged currently for opening DLCs (i.e. about 0.29% per month compared with 0.04% per month for international LCs).

4.37 Private exporters are facing serious difficulties with payment arrangements for agricultural exports to certain markets. The problem is scarce foreign exchange resources among important buyers for traditional exports as well as potential markets. This makes exports to the Middle East and Africa often difficult. There is no simple solution to this constraint--giving government organized credit or trade guarantees to buyers that cannot pay is certainly not desirable--but government policy changes could improve the situation. One such modification would be for Government to give permiss-

ion for trade finance-oriented overseas banks to open new or expand existing operations in Thailand. This is particularly important with respect to increasing the ability of Thai exporters to use a wider range of financial institutions for confirming international letters of credit (limiting the number of international banks able to provide such services merely reduces the amount of country risk which Thai exporters as a whole can absorb)

BOI Investment Incentives

4.38 The BOI was established in 1960 in order to implement a new investment promotion act that was passed in that year. The law essentially empowered the newly established institution to offer various fiscal incentives to promoted firms. The promotion law was amended several times during the 1960s and the 1970s, generally increasing the privileges granted to promoted firms and extending them to firms located in four Investment Promotion Zones.^{17/} Current tax benefits available through the BOI include:

- corporate income and dividend tax holidays for between 3 and 8 years;
- special deductions from taxable income for: a proportion of incremental export earnings; transport, utilities and infrastructure expenditure by firms in Investment Promotion Zones; carried forward losses; and fees relating to goodwill, copyright, etc.;
- exemption of import duties and business taxes on: approved machinery imports; and imported and local raw materials, especially for export projects;
- exemption of duties and business taxes on export sales; and reduced business taxes on sales of goods produced in Investment Promotion Zones; and
- temporary tariff surcharges or bans to prevent unfair competition from imports.

4.39 To provide structure to its operations, the BOI maintains a rather broad list of activities that are eligible for promotion at any particular time comprising the following six major groups: agricultural products and commodities; minerals, metals and ceramics; chemicals and chemical products; mechanical and electrical equipment; other products; and services. The list is periodically revised when the BOI deems that a particular activity no longer requires promotion in which case it will be deleted or temporarily suspended from the list, or that a particular activity should be added to the list. However, in addition to simply identifying activities eligible for promotion, the list also specifies particular conditions that are required for each type of activity regarding such characteristics as size, export levels,

^{17/} These zones include districts in Chiang Mai, Khon Kaen and Nakhon Ratchasima, and Songkhla province.

and ownership. There has been considerable criticism concerning the somewhat arbitrary nature with which the BOI adds or suspends activities from the list and imposes specific conditions for activities on the list. In addition, it is frequently not clear in which category a project should be classified, something which is particularly worrying when the conditions attached to each category are very different.

4.40 The BOI and Agro-industry Activities. From 1960 to 1985, some 432 projects were granted promotion certificates by BOI, but only 281 projects were actually implemented (Table 4.4). The table also shows that the percentage of such projects receiving promotion certificates that commenced operations was lower in agro-industry than that in most other sectors, another indicator of the more risky nature of agribusinesses. Table 4.5 presents selected characteristics of a set of 733 BOI promoted firms surveyed from 1980 to 1982. It is very evident that food processing firms perform better regarding many more of the policy goals of the BOI than other manufacturing activities. In particular, they export more than others in terms of export per employee and exports to total sales, and use significantly lower percentages of imported raw materials as compared to total raw materials (only 16% versus almost 70% for other manufacturing activities). While the other manufactured goods category employed more workers per firm, indications were that food processors used less capital intensive methods (with a total asset to employment ratio of B 454,000 compared to B 598,000 for other manufactures). Although it was not possible to calculate exactly the capital equipment to employee ratio for other manufacturing activities, Table 4.5 shows that the ratio for food processing is significantly lower than the average for all manufacturing.

Table 4.4: NUMBER OF BOI-PROMOTED PROJECTS BY TYPE OF ACTIVITY
1980-85

Type of activity	Projects granted promotion certificates		Project starting operations	
	Number	Share (%)	Number	Share (%)
Agricultural products and commodities	432	20.4	281	19.4
Minerals, metals, & ceramics	254	12.0	195	13.5
Chemicals & chemical products	157	7.4	107	7.4
Mechanical & electrical equipment	258	12.2	174	12.0
Other products	562	26.6	354	24.5
Services	451	21.3	335	23.2
<u>Total</u>	<u>2,114</u>	<u>100.0</u>	<u>1,446</u>	<u>100.0</u>

Note: Some agro-industry related projects are included under the other products and services categories (see Table 10, Statistical Annex).

Source: Office of the Board of Investment.

Table 4.5: SELECTED RATIOS OF BOI-PROMOTED FIRMS /a

Sector	Total	Capital	Imported/	Total	Raw
	Assets/ Employ.	Equip./ Employ. ('000	TotExports/ Sales/ Employ. baht)	Exports/ Employ.		Sales (%)
Manufacturing	572	154	867	1922.14	60.33
Foods	454	96	826	2884.60	16.45
Beverage	1,386	231	684	00.00	0.00
Other	598	n.a.	875	1729.61	69.77
Agriculture and Fishing	243	60	485	3777.33	0.21
Mining	351	178	757	1327.43	0.00
Services	962	182	940	3638.67	48.00
<u>Total</u>	<u>589</u>	<u>155</u>	<u>862</u>	<u>2024.01</u>	<u>59.48</u>

/a Data obtained from pooling questionnaires returned to the BOI by promoted firms in 1980-82

Source: Industrial Management Co., Ltd. (1984).

4.41 As of November 30, 1986, the BOI offered promotional privileges to investors producing agricultural products and commodities that were defined in such a way as to cover virtually any activity involving the processing of agricultural products. The investment cost of agricultural projects considered by BOI for promotion ranges from B 1 million (excluding the cost of land) in the case of livestock raising to B 80 million in the case of milk powder production, with most categories falling between B 2 and 10 million. However, many of the categories relating to potential projects are rather general, resulting in ambiguous classifications of potential projects. In addition, there have been many complaints that the size and/or export conditions for particular activities are excessive. This no doubt partially explains the absence of projects in some categories such as slaughterhouses (See Table 10, Statistical Annex).

4.42 In addition to general industrial estates a number of agro-industry related services are eligible for promotion, including crop drying and silo facilities, modern rice milling, modern packaging of fruits and vegetables for export, grading facilities for agricultural products, disinfection services for products to be exported and most recently, agricultural export zones. These categories reflect the BOI's efforts to address some of the issues seen as being constraints to agro-industry exports, especially problems of quality, packaging, and obtaining good quality raw materials. However, few projects

have yet commenced in these categories. This is probably partly due to the stringent size and ownership restrictions on these activities ^{18/} although agro-industry export zones were only recently added to the list.

4.43 New BOI Policy Initiatives towards Agro-industry. There appear to be six main areas in which the BOI has already undertaken or is considering new special measures relating to agro-industry: namely agro-industry zones, agro-industry export zones, the promotion of large plantations and integrated farms, the promotion of slaughterhouses, and a general revision of the investment promotion law.

4.44 An idea that has been under consideration for some time concerns the designation of special zones for agro-industry development. These areas would be identified on the basis of their perceived potential for agro-industrial development (although it is not clear how they would be actually determined) and firms investing in them would be virtually assured of receiving the most favorable promotional incentives, similar to those currently provided to enterprises in the Investment Promotion Zones. Given that the main motivations behind promoting the agro-industry sector involve the generation of exports and employment, industrial decentralization, and the increased use of domestic raw materials, it is not clear why a number of arbitrary areas should be set aside by the Government for the discretionary use of a particular industry. Indeed, as discussed above, an eligible activity that fulfills all or some of the major policy targets required by BOI for promotion will receive special consideration in any case.

4.45 A somewhat related idea recently implemented by the BOI involved the addition of export zones for agro-industrial products to the list of activities eligible for promotion. While no projects under this category have yet been approved, it is anticipated that these zones would essentially consist of centralized facilities for the collection, processing and exporting of agricultural based products. The motivation behind this initiative appeared to be a desire to address the major problems associated with exports of agro-industrial products by reducing the cost to the producers of obtaining quality certifications and other documentation required for exporting and allowing the benefits of economies of scale to be reaped to some extent. This is also expected to encourage more foreign involvement in the sector, especially in the field of packaging where technology upgrading is seen as being most necessary.

^{18/} A specific example of the constraints imposed by size conditions concerns the 5,000 ton minimum capacity for crop drying and silo facilities. A project undertaken in cooperation with the Bank of Agriculture and Agricultural Cooperatives established that a major reduction in the aflatoxin content of Thai maize exports could be achieved by drying the maize as soon as possible after harvesting. This would entail the establishment of small drying facilities closer to the farm gate than currently exist. Such activities, although enhancing significantly the value of the maize exports, would not qualify for promotion under the existing conditions.

4.46 Promotion of Large Plantations and Integrated Projects. In order to promote exports and address the pervasive material input supply problems, the BOI has been and will continue pushing for the expansion of large plantations or integrated farming/processing activities depending on the nature of the products being produced. The latter approach, for example has been used very successfully by the Bangkok-based Charoen Pokphand Group group in their frozen poultry for export business. In this context, the role of the BOI is frequently seen as being one of playing a catalytic role in bringing together the various local and foreign actors that are necessary to enable ventures of this type to succeed. The combination of a local knowledge of the agricultural conditions in Thailand as well as experience in dealing with Thai farmers, with foreign expertise in technological and managerial areas is seen as being a crucial element in promoting the development of the agro-industry sector.

4.47 Promotion of Slaughterhouses. In a recent effort to promote the slaughterhouse industry, the BOI has reduced the capital investment requirement from B 50 to 10 million and removed the BOI-imposed export requirement for such activities. As part of the new incentive package, the Government has terminated the requirement to pay a fee to local interior authorities for each animal slaughtered. Despite the fact that the ownership regulations of the Animal Slaughtering Act of 1959 have already been waived for promoted firms, none of the five firms that have received promotional status since 1982 have yet started operations. The disincentive of the slaughtering fee and the difficulties of breaking into export markets in just four years have been cited as major reasons for the inability of the industry to take off. It is hoped that the revised promotion requirements will lead to the development of an efficient and sanitary abattoir sector that will better serve the domestic market and eventually be able to break into export markets.

4.48 Revision of Investment Promotion Law. Lastly, a major revision of the investment promotion law of 1977 is currently being undertaken. In the revision process, considerable attention will be given to identifying the most effective incentive package with regard to encouraging the development of those activities given priority in the Sixth Development Plan, namely agro-industries, export industries, engineering industries, and small and regional industries. As discussed above, some initiatives along these lines have already been taken by modifying conditions and criteria for eligible activities. The revised law would hopefully provide the basis for a comprehensive revision of the existing incentive structure, providing a clearer, more efficient, and more focussed approach to the promotion and stimulation of investment activities that will contribute to the policy goals of the Sixth Development Plan.

4.49 Recommendations. The promotional role of the BOI should best be seen as one of providing information to prospective investors both within Thailand and abroad. Accordingly, the BOI should continue to increase the allocation of resources with regard both to accumulating and analyzing information and to disseminating such information in the most efficient manner. The recent efforts to promote investment in agro-industry by providing investors with information regarding the various licenses and permits that are required represent examples of the type of activities that should be

encouraged and increased. The establishment of a BOI matchmaking database should also prove especially useful for foreign firms seeking domestic joint venture partners,^{19/} something which is especially important for agribusiness concerns who have little experience in the country specific nature of raw material supply networks and farmer contracts but who can contribute significantly in terms of technology and management expertise.

4.50 A complementary measure would be for BOI to increase its specific expertise in any particular sector. One possible solution to the problem would be for the BOI to create special units to gather, analyze, and disseminate information relating to specific sectors.^{20/} In order to be consistent with the goals in the Sixth Plan, two ideal candidates to begin this process would be the agro-industry and engineering sectors. These functional units would be able to build up a certain sectoral expertise and serve as a coordinating body for BOI policies that affect the respective sectors. They could provide a conduit to channel sector specific problems (especially those caused by other government policies) that are identified as part of the information gathering and disseminating process to the relevant government agencies for consideration and remedial action.

4.51 On the fiscal incentive side, the BOI should exercise extreme caution when contemplating the creation of Investment Promotion Zones for agro-industry or the granting of even more fiscal incentives to specific sectors or activities such as agro-industry. The reason for this is that most of the problems faced by such activities would not be addressed by encouraging firms to locate in the regions. In addition, BOI incentives as is typical of other investment codes provide the most benefit to capital intensive projects or to projects which require large imports. But as shown by Table 4.5, agro-industrial projects in Thailand have so far been less capital intensive and less import intensive than other BOI promoted projects. This suggests that BOI incentives have not been major factors in the promotion of most agro-industrial investments in Thailand. This is certainly an important and beneficial characteristic which is often not found to follow from investment codes. Such a feature should be preserved in order to avoid the promotion of noneconomic project. This is best accomplished by not providing more fiscal incentives to investment.

^{19/} This initiative involves the establishment of a database in the BOI of information on a number of Thai firms that are seeking foreign participation for various projects. This information will be made available to potentially interested foreign investors.

^{20/} A comprehensive reorganization of the BOI along functional lines was recommended by a major study of BOI operations in the early 1980s. However, at the time, the promotional role of the BOI was not seen as being as important as it is at the present time and a partial reorganization of this type would seem to be particularly consistent with current thinking among top level management.

4.52 There is also growing pressure from the private sector to use BOI incentives to protect investors against competition including new investors in Thailand. Such pressure should be resisted. Giving in to parochial interest would have major adverse consequences for Thailand's export competitiveness and economic growth. The fact that, in the short term, certain sectors are suffering from over-capacity and that certain private investors are suffering as a result does not mean that Thailand as a whole would benefit from attempts to cartelize domestic production or erect barriers to new investors. Under Thai circumstances such efforts are not likely to result in any national economic benefits. Therefore, over-capacity problems will have to correct themselves through normal financial and commercial practice. This sort of adjustment will obviously involve changes in the ownership of important assets and even liquidation of some firms. However, such internal competition is essential if Thailand is to remain a viable exporter in future world agricultural markets.

4.53 Measures to increase the transparency of BOI policies and reduce the discretionary aspects of the promotional packages both between firms and between sectors would be beneficial. Such measures should certainly include a revision of the existing list of activities eligible for promotion as well as the development of more systematic procedures for adding or suspending activities on the list and for determining the conditions for specific activities.

4.54 Finally, given the necessity of encouraging the transfer of technology to the domestic agro-industry sector, any BOI efforts to monitor or control the inflows of technology as described in the Fifth Plan should be focused mainly on the development of an informational source to allow other producers to be aware of the technologies that are available. The establishment of strict conditions relating to technology imports could well provide a serious disincentive to such transfers. The information gathering exercise should be coordinated carefully with the Technology Transfer Centre of the Ministry of Science and Technology which has already begun to assemble a database on technology contracts.

C. Marketing Policies

4.55 Thai producers and traders have developed over several decades an efficient marketing system for Thailand's traditional crops. This system has been responsible for Thailand's position as a major exporter of foodstuffs, and has been a significant contributing factor to agricultural development by being flexible at the farm level and responsive to variations of international commodity prices. This same system is in transition, having to adapt itself to a considerably changed international situation in the trading of traditional and nontraditional agricultural commodities.

4.56 For both traditional and nontraditional commodities, improved growth will depend on a number of changes concerning commercial policies. The objectives of these changes would to improve Thailand's access to international markets, strengthen agro-industrial linkages so as to expand domestic demand, and provide incentives for quality control. The role that the Government can play in support of this evolution is analyzed in the following paragraphs.

Limited International Markets and Trade Restrictions

4.57 Thai agricultural export successes have been concentrated in "commodity" products where importers buy on the basis of price and where quality controls can easily met. But Thailand has been much less successful in specialty-product markets where quality controls are much more important. For both commodity and specialty products, an increasingly crucial factor determining Thai competitiveness are export subsidies offered by other suppliers and politically motivated import constraints.

4.58 An immediate source of concern is the 1985 US Farm Bill which could lead to smaller market share for Thailand. In order to prepare a trade policy for the commodities affected by the US Bill, the Government may want to more actively monitor the commercial implementation of USDA's export programs (ir rice and sugar) which include major discretionary elements. In particular, the mechanics of USDA's determination of the "world rice price"-- which is the basis for export subsidies--would probably be less detrimental to Thai exports if a transparent Bangkok-origin reference price existed, whereas the current Board of Trade price quotation is not an accurate indicator of rice prices with a 10-30% gap between it and actual market prices. However, the recommended creation of a commodity exchange would generate accurate market prices for rice.

4.59 In view of the politicized nature of agricultural trading the Government may also want to directly defend agricultural interests. One channel open to the Government would be to use the GATT remonstrance process, which it did not use to object to the recent US changes in the rice policy and EEC imposition of quotas on Thai cassava exports.

4.60 Another area where government action is needed concerns the current restrictions on Thailand's exports to the US and Japanese markets. These restrictions stem from the 1959 Japanese Quarantine Act and USDA regulations, but a review of the products currently affected may reveal that the original concern about health or infestation no longer applies. Such action has already led to the removal of import prohibitions on Thai papaya and mango exports to Japan. In other cases arising from restrictions related to genuine health or infestation concerns, public quality controls would have to be improved, and this is an area where the Government has a role to play.

4.61 In view of the difficulty of obtaining access to foreign markets and the cost involved in the identification of market niches, the Government may want to facilitate the operations of foreign trading companies in Thailand as well as the expansion of domestic trading companies. At present, the Alien Business Law (1972) prohibits foreign companies from doing business in Thailand on a commission basis. This prevents Thailand's products from being sold through buying offices set up by foreign companies. Such buying offices have made an important contribution to the expansion of exports in a number of developing countries, especially Korea, Taiwan, Hong Kong and Singapore.

4.62 A related measure would be to facilitate the expansion of trading companies. Such companies have been important to the success of Japan and Korea as they enable private firms to specialize in production and leave the

identification of foreign markets and product marketing to firms specialized in marketing. Two conditions are required to facilitate the expansion of trading companies. First, indirect exporters involved in the manufacturing of exports for trading companies must have access to duty free inputs and be exempted from indirect taxes. And second, trading companies must have sufficient working capital. At present, there are very few successful trading companies in Thailand. To promote trading companies, the Government through the Board of Investment has provided specific incentives to potential Thai trading companies such as income tax deductions for overseas marketing expenses during the first five years and exemption from import taxes and indirect taxes on inputs used for producing exports. However, these fiscal incentives are currently limited to the first stage suppliers of trading companies, and this has induced producers to export directly because it is the only way that they can obtain all export incentives. Implementation of the recommended measures (see Section A) concerning exports and the domestic letter of credit would make it possible for all indirect suppliers of trading companies to have access to fiscal incentives.

4.63 Recommendations. Concrete administrative and technical measures are needed to improve Thailand's bargaining on agricultural protectionism with its trading partners. These reforms would also be important for effective participation in the forthcoming GATT round. The first step would be a systematic government strategy that outlines priority negotiations, tactics, intra-ministerial collaboration and specific terms of reference for supporting services required. The latter should be developed on a two-track system for the US, EEC and Japan. For each of these markets, private experts could be retained to review current political and technical protectionist measures affecting Thai products. An ongoing "early-warning" information effort would also protect Government from being caught unaware by new protectionist measures (discretionary administrative actions being the most important to be kept abreast of early enough so that they can be removed through political pressure).

4.64 There is also a need to promulgate clear-cut regulations for counter-trade transactions and state trading. Experience in other countries indicates that this is not an area where Government should play a direct role given its lack of marketing expertise. However, the Government may want to develop with the private sector a strategy for selling to countries who prefer to buy through monopoly state trading companies. Experience with rice exports managed by the Commerce ministry might serve as a model for approaching other markets.

4.65 Another area for government action would be to help the private sector create a favorable consumer attitude towards Thai products in importing countries. This effort should be tied to promotion of direct foreign investment and, most important of all, tourism. The link to tourism is important not only as an end in itself but also to increase familiarity with Thai products as well as to increase the frequency of air connections with potential import markets (critical for perishable produce or cut flowers). Elements would include opinion research focused on consumers or more specialized buyers of Thai products (e.g., purchasing agents of major EEC, Japanese and US supermarket chains or flower wholesalers). Having established base-

line survey results, a program of generic advertising and more specific product promotion could be developed and, equally important, evaluated as it was implemented. Such an effort should be linked to private sector funded and product-specific promotional activities.

4.66 And finally, the Government should tap commercial expertise available from developed countries currently providing foreign aid. This would involve diverting the flow of resources towards commercial objectives. Priorities could be matched with areas suited to particular donor countries. For example, the Netherlands could be asked to refocus their aid efforts on stimulating fresh produce and flower exports.

Improvements in Domestic Market Reliability

4.67 Private investors and government policy analysts have recognized the need to improve the reliability of the agro-industrial marketing chain from farmers, processors and retailers through to consumers. Such improvement is critical in order to address marketing constraints currently affecting traditional crops. These constraints include: (i) lack of a guaranteed access to agricultural raw materials, this increases agribusiness risks and costs of operation, and prevents the expansion of more efficient linkages particularly between maize farmers and the livestock subsector (pork and cattle); (ii) insufficient incentives for investment in post-harvest technology such as maize-drying equipment and quality control; this has resulted in a relatively high level of aflatoxin in maize and has affected Thailand's exports (see Annex 1, paras. 10-12); and (iii), generally high risks inherent to agro-industry. Improved commercial practice would encompass reduced risk of contract defaults, related quality control improvements and greater market transparency.

Commodity Exchange

4.68 A first step in the broader process of modernizing commercial practice would be the establishment of a commodity exchange. A proposal along these lines is already included in the Sixth Plan and is supported by the Ministry of Commerce as well as key private banks and agribusinesses. This proposal would build upon commercial practice in the maize market where an informal exchange involving the main exporters who agree to trade forward contracts among themselves so long as overall quality standards are maintained is already functioning.

4.69 The main functions of the proposed commodity exchange would be to provide a central place where trading in spot and forward contracts could take place, but unlike the current informal maize exchange, contracts would be enforceable. The establishment of such a commodity exchange would, in the first instance, require liquidity by having a large number of buyers and sellers so that normal sized transactions could be absorbed without affecting the price of the commodity being traded. Second, the exchange would involve an "open outcry" trading system with centralized buying and selling of contracts or public posting of contracts so that all market participants, and others as well, could see the price at which trading was being conducted. Liquidity and transparency would increase the market's credibility which

would, in turn, encourage greater use of the market and still greater liquidity.

4.70 Organization of the Commodity Exchange. The most important requirement for establishing a successful commodity exchange is that the exchange must be an independent, privately managed organization. The importance of this principle is shown by the failure of commodity exchanges when trading was subject to government control and intervention. In Thailand, for example, previous government attempts at consolidating existing trading in the rice market, including the creation of a cash market in Bangkok, were unsuccessful. The problem was that Government attempted to manipulate the rice price in line with policy objectives. As a result, private trading was driven off-market. This experience is similar to that of other government organized exchanges such as the Kuala Lumpur Commodity Exchange. It is a striking contrast to the successful development of privately controlled exchanges in the U.S., Japan, Canada, Australia, Brazil, and Argentina or even the informal export "club" which governs Thai maize exports.

4.71 An important consequence of the requirement that the exchange would have to be privately managed is that the regulations of the exchange should be enforced through member committees that would handle the arbitration of contract disputes, grading, etc. Beyond this principle, there are a number of alternative institutional structures for any possible Thai organization. For example, ownership of the exchange could be vested in floor traders, brokers, major agribusiness and banks--or any combination of these. Similarly, the relationship between trading on the exchange where the terms of the contracts are public, and "kerb" or off-exchange trading by members of the commodity exchange would have to be clarified (e.g., many commodity exchanges prohibit their members from engaging in trading outside the exchange).

4.72 At the start, trading could be conducted on the basis of posted offers where buyers and sellers would indicate quantities, locations and dates for delivery on a large blackboard (more sophisticated telecommunications would be desirable only on public relations grounds). Successful bids would then be posted as well. An alternative to this would require trading "rings" or "pits" where the brokers acting for buyers and sellers would meet face-to-face to trade in standardized dates. As with the London Metal Exchange this could work by fixing the time of day when, say, one month forward contracts were to be traded, ten minutes later, trading in two month forward contracts would be conducted, etc. Alternatively, different dates could be traded in different parts of the pit or ring. Actual contracts would be noted by clerks hovering on the side of the trading ring. The closing price for each commodity delivery would be fixed by a "ring chairman" who was himself a broker. It would reflect the price paid on the last transaction for that delivery and be posted as a reference price for the day.

4.73 The most important and key difference between existing trading arrangements and the proposed commodity exchange is that forward contracts would be enforced through a clearinghouse. The clearinghouse function could be set up as a separate entity with private shareowners (as in the U.K) or else as part of the exchange organization (as in the U.S.). The mechanics of clearing would involve traders posting initial margins that represented some

fixed percentage of contract value (in the form of cash or acceptable guarantees including bank guarantees or bonds). Additional margins would also be required to cover the full daily variation in the price of the commodity traded under contract. If this additional margin payment were not made, the clearinghouse would liquidate the defaulters' position. The reason for imposing an initial margin, and subsequently additional margins, is to eliminate the incentives for sellers or buyers to default on their contracts when commodity prices move against them. Changing the margins required also provides additional protection to the clearinghouse because it reduces the amount of clearinghouse exposure to the maximum daily variation in price permitted on the exchange, which is how initial margins are fixed. Given that a credible clearinghouse is the sine qua non of exchange trading, it is probably advisable to have international equity participation in it. Investors that might be considered include the International Commodity Clearinghouse, Ltd of the U.K. which operates the Sydney exchange clearinghouse or the Chicago Board Clearing Corporation; either of which could also provide necessary technical assistance in creating the commodity exchange.

4.74 Commodities to be Traded. In view of the complexity involved in setting up completely new trading arrangements, it would appear preferable to initially start trading maize on the commodity exchange with additional products introduced over time as market credibility and liquidity grow. Maize is a logical starting point for a number of reasons. First, maize exports are already actively traded while maize is at sea among members of the export "club" who trust one another's quality controls. Second, top quality grain elevators already exist for handling maize and they issue credible storage warrants. Third, forward trading of maize is already quite common (up to six months in advance). And fourth, defaults on domestic contracts are frequent (a large processor indicated that 25% to 30% of its forward contracts in maize are defaulted upon). To improve trading in maize, the industry has experimented with various ways of assuring performance including the posting of bonds (via undated checks or actual bank letters of credit) and complicated option pricing formula that minimize the incentive for defaulting (by fixing a ceiling on the possible losses which one particularly party to a forward contract would have to make). The creation of a commodity exchange would thus constitute a normal step in the modernization of Thailand's marketing for maize.

4.75 Maize transactions in the commodity exchange would normally take place on the basis of warehouse receipts. Since trading of contracts would be based on auction, standards for maize would have to be defined by the exchange. This would make it possible for trading to take place without actually seeing the merchandise through the use of warehouse receipts. In view of the crucial role played by warehouse receipts, only invoices issued by warehouses which are certified by the exchange would be accepted.

4.76 Other commodities such as rice and tapioca could also be traded on the commodity exchange. Both rice and tapioca pellets would be logical commodities to be traded so long as the rules of the game in respect of government controls and taxes were known in advance, and market forces were allowed to operate freely in the exchange. This is particularly important for

tapioca where access to the high price EEC market is currently controlled by the Ministry of Commerce which allocates quotas on the basis of inventories held by exporters rather than open market trading. However, the recommended change to auction off tapioca export quotas would make it possible to trade forward contracts for tapioca pellets on the exchange. Similarly, rice could be traded on the exchange but trading would have to take into account the quality differentials of rice. These differentials imply that trading would initially be on the basis of samples which brokers could inspect before trading sessions began for prompt delivery (this is how the market currently operates). An active forward market would then develop over time on the basis of the most commonly used export grades of rice.

4.77 Benefits of the Commodity Exchange. The benefits of the commodity exchange would be far reaching. The first one would be to increase farmers' income and save government resources. In the absence of market transparency one would expect the initial distribution of market prices to have a large variance so that a large number of farmers (or other market participants) would contract for delivery at prices below the market clearing price. The creation of a commodity exchange would address this lack of market information because the daily process of auction bidding on contracts for spot or forward delivery would generate daily market clearing prices. As a result, farmers would sell their commodities at prices much closer to market clearing prices than before, which will increase their income. This, in turn, would make it possible to save government resources which otherwise would have been used for government marketing programs as in the case of paddy. Such programs are usually initiated to buy farm products at prices believed to better reflect "true" market prices. But since the commodity exchange would generate market clearing prices and trading at such prices, there would no longer be a need for a government paddy marketing program.

4.78 The second benefit of the exchange would address an important concern of government agricultural policy, namely that farmers are often forced to sell just after the harvest when prices are the lowest. This concern would be addressed because the exchange would facilitate commodity related lending by providing a transparent and reliable price that banks could use for valuing collateral pledged as security for transaction credits. The basic change would be to tie crop credit to open pricing and storage receipts rather than to personal connections and other collaterals as under the current system (see Section D). As a consequence, the new system of crop credit would become more liquid and provide all concerned, particularly farmers, with a wider range of marketing options (e.g., farmers could hold stocks after harvest rather than selling them through placing them in public warehouses and using storage warrants for obtaining credit).

4.79 The third benefit of the commodity exchange would be to increase exports. As mentioned in Annex 2 (paras. 10-12), Thailand has lost some market share in maize, particularly in Asia, because of insufficient quality control and lack of adequate financial guarantees to compensate the party suffering a loss from contract default. However, these markets could be recaptured by Thailand provided foreign buyers are assured that (i) the quality of the maize they contract for will correspond to the one actually delivered; and (ii) financial compensation will be paid in the case of failure

to deliver the stipulated quality and quantity of maize. The latter concern would be addressed through the creation of a commodity exchange because forward contracts would be enforceable and financial compensation would be paid in the case of contract defaults. The former concern would also be addressed because processors, exporters, and traders would have strong incentives to invest in adequate warehouses and maize-drying equipment needed for meeting the commodity quality specified in contracts. Such investment would help reduce the aflatoxin content of maize which is due to improper drying and storage, and which has been the main factor behind Thailand's loss of markets. Besides the financial sanctions to be paid in case of contract defaults, exporters and processors would also have another incentive to invest in post-harvest technology for improving crop quality. This incentive follows from the link between warehouse receipts and banking credit, i.e., quality control would have to be sufficient for warehouse receipts to be accepted by commercial banks for extending credit.

4.80 The creation of a commodity exchange would benefit rice and tapioca exports for nearly the same reasons. In addition, increasing the rice market's transparency and stability would allay importers' concerns about relying on Thai rice imports when the future price and available quantities of rice could not be guaranteed.

4.81 Finally, the creation of a commodity exchange would help reduce risks because agribusinesses could hedge commodity price risks by contracting for forward delivery at a guaranteed price. Hedging would be a powerful incentive to agribusiness investments that would be prohibitably risky in the absence of hedging. This would be particularly important in improving logistics and handling (including drying) by private intermediaries. For example, in the U.S. bulk grain elevators were only developed after private warehouse companies had access to price hedging instruments at organized exchanges (in the late 19th century). Prior to this, the known technology for bulk handling was not applied due to price risks.

4.82 Overall, the creation of a commodity exchange would help improve the agro-industrial chain of activities. Besides increased farmers' income, the improvements would be particularly important for the domestic users of maize such as the livestock industry, since they would address three of their main constraints, namely (i) the difficulty of obtaining a guaranteed access to maize in terms of price, quality and quantity; (ii) insufficient incentives to apply adequate post-harvest technology; and (iii) the high risk stemming from the fluctuation in feed grain prices. The creation of a commodity exchange for maize would thus help develop the domestic cattle industry and enhance the export competitiveness of the pork and chicken subsectors.

4.83 Another area for improving commercial practice would be to facilitate the use of international futures and options markets. Access to such markets were an important element in the success of other successful exporters such as Brazil and Argentina.

4.84 Recommendations. Until now, the possibility that transaction taxes would be levied each time a given contract would be traded on the exchange has been a strong deterrent to the creation of a commodity exchange. To facili-

tate the establishment of more efficient agricultural markets, the Government may want to remove the transaction tax from all supervised paper trades (none is now collected from existing paper trading).

4.85 In view of the importance of the commodity exchange, the initiative to set up such a market could originate from the Government which could invite well-known businessmen to organize it. In addition, the Government may want to review the rules and regulations required for the commodity exchange.

4.86 A related important consideration is that the extent to which the commodity exchange would be successful depends on the lack of government intervention in the markets for maize, rice and tapioca. In the case of maize, export controls were removed in the early eighties and "informal" forward contracts have accordingly been used as a marketing instrument. For this reason, a commodity exchange for maize could be created rapidly as is the government's intention. At a later stage the Government may want to include rice and cassava pellets among the commodities traded on the exchange.

4.87 In the case of rice, export controls were removed in 1986. However, the government paddy marketing program affects the determination of domestic rice prices, which may reduce the attractiveness of forward contracts as a way of reducing price uncertainty. Since the creation of a commodity exchange would increase farmers' income and improve access to credit based on warehouse receipts, it would address most of the reasons advanced for the government paddy marketing program. As a consequence, the Government may want to phase out the current paddy marketing program.

4.88 Finally, in the case of cassava pellets a commodity exchange could also be created, but its functioning would depend on a change in the allocation procedure of export quotas. As recommended in the report, the Government may want to auction off export quotas which among other advantages would increase the attractiveness of the exchange.

Domestic Quality Control

4.89 Thailand has, by in large, specialized in commodity products--a strategy that has worked extremely well. This orientation towards commodities and the commodity-end of products has been cited as a handicap to Thai participation in more specialized higher value product markets. As a result, quality control has become a major topic for discussion by Government and private sector. As discussed in Chapter III, Section D, one response to the need for quality has been contract growing arrangements that tie individual producers directly to processors or exporters who require homogeneous qualities of, for example, Virginia tobacco. It is the homogeneity and consistency in quality which is critical for such products (along with reliable supplies). But contract growing is not likely to prove effective for commodities such as grains where homogeneity is not the key quality variable or where a monopoly consumption point does not exist. In such cases, incentives for improved quality control would have to be provided through different channels. One such channel was discussed in the previous paragraphs: it concerns the creation of a commodity exchange for maize, rice and tapioca pellets which would increase incentives to improve quality controls. Other measures to improve quality, particularly for fruits and vegetables, are discussed in the following paragraphs.

4.90 Constraints and Problem Areas. The present system of trading high value fruits and vegetables in Thailand is responsive to local market needs, adequately meeting domestic demand, but exporters are frequently confronted with a situation where insufficient quantities of fruits and vegetables are available to fill large export orders. This is partly because farmers do not produce specifically for an export market, nor do rural traders purchase with an export market in mind. At the wholesale market level, several obstacles prevent the more efficient marketing of nontraditional crops and hamper the operations of exporters. Specifically, the physical location, congestion, and lack of storage at wholesale market locations serve to increase market costs and cause serious fluctuations in wholesale prices for many commodities.

4.91 Specific marketing problems which lead to low quality standards of Thai fruits and vegetables, but especially fruits, include the following: premature harvesting; uneven sizes of fruits and vegetables for canning; and inferior packing and packaging. Exporters' attitudes are that packaging is of considerably less importance than production and quality standards and that any improved packaging will lead to increased costs and lower profits. However, a report by the Thailand Institute of Scientific and Technological Research ^{21/} points out that improved packaging does in fact increase final product cost, but reduces losses sufficient to cover any increase in prices. An additional constraint is that although it would be to Thailand's advantage to obtain the state-of-the-art technology for packaging, Thailand's tin plate is high cost with the result that tin cans are more expensive in Thailand than in Taiwan.

4.92 There does not seem any need for Government to impose compulsory quality standards on exports as such a measure would be difficult to implement and is unlikely to result in increased export earnings. In the case of vegetables for example, the lack of uniformity of standards of quality and styles among exporters tends to complicate any attempt to develop a mutually agreeable set of quality standards. In addition, the criteria used in judging vegetable quality involve so many details that it would be difficult for the Government to enact any general plan to introduce a proper grading system. It should also be taken into account that imposing stringent quality controls would result in (i) additional export costs due to examination and export quality certificates; and (ii) prohibition of certain (e.g., low quality) exports which may adversely affect Thailand's international competitiveness. Such a case was reported to have occurred for Thailand's export of fishmeal in 1986. Furthermore, deciding which quality standards to enforce would be generally difficult because the quality demanded by potential buyers of Thai speciality produce vary across markets. For example, Japanese consumers prefer different sorts of fresh vegetables than Americans. More importantly, both Japanese and American consumers have preferences that are different from those of Thai consumers. Because existing production and marketing channels

^{21/} Kanika Cherchai, Butsakorn Maysook, Umaphon Netsawang, Prioritizing Fruit and Vegetables for the Development of Packaging (Thai language document), Thailand Institute of Scientific and Technological Research (Bangkok, 1985), p. 7.

are organized to service the existing domestic market, this makes "quality" a bottleneck for certain exports. This is a major competitive disadvantage when other suppliers have domestic preferences in line with those of major import markets (e.g., Taiwan consumers have the same quality preferences as the Japanese). But this competitive disadvantage would not be offset by imposing compulsory export standards.

4.93 More promising measures for addressing export related quality problems would be (i) to invest in agricultural research, and more specifically in crop breeding directed to quality improvement; and (ii) to modernize Thailand's domestic produce marketing chain. The importance of the first measure comes from the increase in producers' income, but also from the gain in consumer surplus which by itself may result in a high rate of return to research for quality improvements. This conclusion is suggested by a recent study of the value attached by consumers to differences in the quality of rice in Thailand, the Philippines and Indonesia. This study found that improvements in head rice recovery (fewer broken) obtained through the breeding of a new rice variety (IR20) had generated a 61% internal rate on agricultural research in the Philippines and Indonesia; and reducing the rice amylose content in Indonesia had a 37% rate of return.^{22/}

4.94 Implementation of the second measure--modernization of Thailand's domestic produce marketing chain -- would mean continued investments in food retailing and wholesaling. The expansion of high volume retail markets is particularly important given its linkage to better organization of rural production and, quality control and improved packaging. Development of large-scale chains or cooperative of supermarkets would result in improved domestic marketing of fresh fruits and vegetables, and meat. It would, therefore, provide exporters desiring to have access to well-packaged and good quality produce with an additional marketing channel. This would address one of the main resources for the quality "bottleneck" that Thailand faces for some commodities because of the differences in quality requirements among export and domestic markets. Expansion of food supermarkets would also partly obviate the need for developing a new central Bangkok wholesale market (as the supermarkets would themselves organize new distribution channels directly from their own cool stores in rural areas).

4.95 Recommendations. One of the major problems facing the nontraditional food processing sector concerns the quality levels achieved by actual or potential exporters. While standards for many of the products are prepared by the Thai Industrial Standards Institute and other government agencies involved in the quality support network, they do not seem to be well publicized or adhered to and the various agencies do not coordinate their activities. To address these issues, the Government should establish export standards for major nontraditional export products, in cooperation with domestic producers and the countries to which the products are to be

^{22/} See Laurian J. Unnevehr, Consumer Demand for Rice Grain Quality and Returns to Research for Quality Improvement in Southeast Asia, Amer. J. Agric. Econ., Augst 1986, pp. 634-641.

exported. This would contribute to expanding export markets by improving the image of Thai products abroad. However, these standards should not become compulsory.

4.96 Another dimension to quality would be to establish a reputation for quality among foreign consumers of Thai products. Private sector self-regulation, as is practiced in the canned food subsector, is one key along with expanded privately operated quality control and testing services. Such an effort should also build on successful experience of other agricultural exporters in promoting an image of quality. Relevant examples include Colombia's coffee promotion program which helped establish Colombian coffee as a premium product along with similar efforts launched by Canada (e.g., promoting rapeseed oil under the brand name of "Canola"), Israel (e.g., AGRO-EXCO's establishment of brand loyalty for its "Carnel" label) and the American Soya-bean Association (e.g., advertising to associate the soya product logo with health foods).

4.97 To accelerate the modernization of Thailand's produce marketing chain, the Government should allow foreign investors with needed marketing, managerial and technical expertise to invest in this subsector rather than prevent them from doing so (as is now official policy, although a recent exception was made with a Japanese supermarket chain).

D. Issues in Finance and Credit

4.98 Despite the uncertainty affecting available estimates, it would appear that access to financing was not a major constraint to Thailand's agricultural growth in the seventies. This conclusion is suggested by the high growth rate of the capital stock in agriculture, which according to some estimates might have increased by 4.5% p.a. in real terms with the private sector accounting for 70% of it.^{23/} In retrospect, it is probable that most of the increase in the capital stock was financed by farmers' saving and credit obtained from traditional sources (money lenders), although credit from formal sources (BAAC and commercial banks) has become much more important. This latter trend is expected to become more crucial to successful agro-industrial development for two reasons. The first one is that farm prices for Thailand's traditional crops have declined since 1980, and are not expected to increase in real terms. Although the impact on farm incomes would be alleviated by the current diversification process, most new agro-industrial commodities are intensive in their use of capital, agricultural research and modern inputs. As a result, improvements in the access to institutional credit would be necessary to facilitate increase in the production of nontraditional commodities.

^{23/} This estimate is derived from unpublished BOT and NESDB sources which both indicate that the capital stock in agriculture grew rapidly. However, the usual uncertainty affecting these estimates indicates that such estimates are only indicative of the actual growth.

Role of Lending Institutions

4.99 Thailand has a relatively well developed financial sector compared to similar other developing countries. With an impressive record of financial deepening and a variety of sophisticated financial institutions and instruments, it has contributed significantly to the process of steady and sustained growth of the economy. Main institutions providing finance for agro-industrial development are commercial banks, the Bank for Agriculture and Agricultural Cooperatives (BAAC), and the Industrial Finance Corporation of Thailand (IFCT). The three largest commercial banks, namely, Bangkok Bank, Krung Thai Bank, and Thai Farmers' Bank, which together account for over one-half of the total assets of all commercial banks, provide more than one-half of the total commercial bank credit for agriculture and agro-industries. The Government maintains a significant equity participation in two of these major institutions, namely, BAAC and Krung Thai Bank, and a small equity participation in IFCT. In addition, the Central Bank of Thailand, namely, the Bank of Thailand (BOT) is involved in influencing credit allocation for agriculture and agro-industries through its policies for mandatory allocation of commercial bank credit for this purpose, and through its rediscounting window.

4.100 Commercial Banks. Increasing the flow of credit to the agro-industrial sector has been the policy of the Government since 1975. This was achieved by requiring commercial banks to allocate initially 5% of their portfolio to agriculture and now 20% of their deposits to agriculture, rural industries and agribusiness.^{24/} As a result, commercial bank's share of agro-industrial credit has increased from about 2% in the early 1970s to about 14% by 1985. As shown in Table 4.6, commercial banks have been increasingly providing this credit directly to the agro-industrial sector as their indirect contribution through deposits with the BAAC has steadily declined from 43% in 1975 to 25% in 1980 and further to 15% by 1985. The commercial banks had no difficulties in satisfying the Bank of Thailand's regulatory measures as can be seen from their provision of about one-third of the total agricultural credit through lending to agro-industries throughout the period beginning in 1978. In fact, the commercial banks would prefer to substitute agro-industrial credit for direct credit to farmers or deposits with the BAAC.

^{24/} Commercial banks are now required to lend at least 14% of deposits to farmers and rural industry, and the remaining 6% (or less) to agribusiness.

Table 4.6: COMMERCIAL BANKS: AGRO-INDUSTRIAL CREDIT
(Baht millions)

Year	Direct lending to farmers	Lending to agribusiness	Bank deposits with BAAC for lending to agribusiness	Total agro-industrial credit	Agro-industrial credit as % of bank deposits
1975	2,234	-	1,671	3,905	4.7
1980	11,553	9,962	7,000	28,515	12.7
1981	14,457	9,932	7,804	32,193	12.5
1982	20,140	10,706	8,405	39,251	12.8
1983	28,613	13,410	8,806	50,829	12.3
1984	35,936	18,255	10,191	64,382	13.4
1985	37,829	24,851	10,685	73,365	13.8

Source: Bank of Thailand.

4.101 Although there has been a substantial increase in commercial banks' lending for agriculture and agro-industries during the last decade, there has been only little changes in commercial banks' lending practices and attitudes towards small industries and farmers. The notable exceptions to these are the above mentioned three largest commercial banks which are actively pursuing their agricultural credit policies. The Bangkok Bank has particularly played an important role by providing credit, technical services and marketing services to farmers for several years. It has also started lending on the basis of collective guarantees, and undertaken small scale projects for the benefit of landless farmers. Its agricultural portfolio exceeded B 18 billion at the end of 1985. The Government-owned Krung Thai Bank, through its Agricultural Credit Center, provides credit to individual farmers, farmer groups, and agro-industrial projects. Its total agricultural lending amounted to about B 10 billion at the end of 1985. The Thai Farmers Bank, which dominates in the rice milling business, is also actively involved in export credits for processed agricultural products, promotion of new projects, and term lending.

4.102 Despite these exceptions and some beginning towards acceptance of the idea of providing credit on the basis of the cash flow generated by projects, commercial banks in general continue to place much emphasis on collateral, mainly tangible assets and land in particular. Similarly, use of machinery, raw materials, goods in process, or finished goods as a basis for security or collateral has not been widely practised in Thailand. Small firms in particular, are unable to make use of these methods due to lack of knowledge, inefficient accounting practices, lack of factory licenses and subsequent registration of machinery, and lack of warehousing facilities. As a result, firms tend to have considerable difficulty securing project financing without a family name and substantial collateral.

4.103 Most of the commercial bank lending is still done on the basis of overdraft facilities which are preferred by banks as well as borrowers since these facilities are relatively simple to operate and convenient for both sides. However, they may not be the most suitable system from the viewpoint of efficient use of resources since it is difficult to adjust lending rates according to maturity and purpose. Moreover, the overdraft facilities are extended to established account holders and the limits are determined upon the relationships between the banks and the clients. Nevertheless, the system has prevailed in Thailand as in several other countries for a long time and the extensive use of term lending, however desirable, will take a long time.

4.104 As previously argued, credit is required for the expansion of new agro-industrial commodities because it is unlikely that farmers' savings would be sufficient to finance the required investments and purchase modern inputs. Nevertheless, increasing the supply of credit alone without complementary measures would not improve most farmers' access to institutional credit. The reason for this is that only about 50% of total land under agriculture may be considered to have "secure" land rights.^{25/} The lack of proper land titling, which would be accepted by banks as collateral, constitutes an important obstacle to farm investment, especially for land improvements, irrigation and other high capital-cost expenditures that are essential to the intensification process required for the cultivation of new crops, and particularly to new tree crops.

4.105 The separation of lending from the borrowers' equity is an option that has been adopted by the BAAC in specific cases, but is not widely open to commercial banks. The reason for this is that such a lending policy would greatly increase the credit risk borne by banks, but commercial banks would not be in a position to recover the resulting increased cost by charging higher interest rates for agricultural projects. At present such a course of action is blocked by the existing ceilings on interest rates which apply uniformly to the economy, independently of differences in sector-specific risks. Nevertheless, agriculture credit risk can be lessened if management services are provided along with credit. This approach has been used by the BAAC, and among commercial banks by the Krung Thai Bank and the Bangkok Bank. But it is not an approach that can be easily followed by all commercial banks as it requires considerable field experience in agro-industry. For most banks appropriate collateral would still remain the main criterion for obtaining access to credit; and for this reason, there is a need to accelerate the current land titling program by granting full land ownership rights to

^{25/} It was estimated that out of the 24 million ha of land under agriculture in 1978, about 1.5 million rai (6%) were covered by a full title, acceptable for modern and long term loans as collateral; some 10.3 million ha (43%) were covered by a permanent possession right known as NS3, which was accepted by official credit institutions but not always by commercial banks; and 1.2 million ha (5%) were covered by "preemption certificates" which had an unclear legal status. The remaining area (11 million ha or 45% of the total agricultural area) had no legal status. See Tura Institute, Land Use Development Policy, Bangkok 1981.

farmers. This would make it easier for small farmers to have access to institutional credit, and as documented by a recent research project, farmers will invest and produce more.^{26/}

4.106 In the absence of such a policy, small firms and farmers would continue to depend on informal credit markets which charge substantially higher rates of interest ranging from about 2% to 4% a month. The main reason for the existence of these markets with such high interest rates is the continued practice of binding interest rate ceilings and resulting credit rationing in the formal financial markets. Unless these restrictions are removed and financial institutions are allowed to charge flexible interest rates with a spread large enough to cover the higher risks and administrative costs of lending to small agribusinesses and farmers, the informal financial sector will continue to play an important role in providing credit to small agribusinesses as well as farmers.^{27/}

4.107 The Bank for Agriculture and Agricultural Cooperatives (BAAC). While commercial banks seem to provide credit mainly to medium and large size agro-industrial enterprises and farming units, the BAAC, created in 1966 by the Government out of its erstwhile Bank for Cooperatives, concentrates on lending to a wider spectrum of farm families. With its 68 branches and 580 field offices, it reaches more than 40% of the estimated 5 million farm families in Thailand. As shown in Table 4.7, total lending to farmers and agribusinesses from commercial banks and BAAC has reached a level of over B 80 billion by 1985 of which more than 30% is directed towards agribusinesses.

^{26/} See Gershon Feder, Tongroj Onchan and Yongyuth Chalamwong, Land Policies and Farm Productivity in Thailand's Forest Reserve Areas; 1986 World Bank research project (RPO-673-33).

^{27/} According to a 1980/81 MOAC survey of credit, informal credit sources amounted to 45% of agricultural credit in Northern Thailand and 42% for the whole country.

**Table 4.7: TOTAL AGRO-INDUSTRIAL CREDIT FROM COMMERCIAL BANKS AND BAAC
(Billions of Baht)**

	Commercial banks			Lending by BAAC to farmers	Commercial banks and BAAC		Total agro- industrial credit
	Farmers	Agribusiness	Total		Farmers	Agribusiness	
1975	2.23	-	2.23	3.84	6.07	-	6.07
1980	11.55	9.96	21.51	8.28	19.83	9.96	29.80
1981	14.46	9.93	24.39	10.66	25.12	9.93	35.05
1982	20.14	10.71	30.85	11.80	31.94	10.71	42.65
1983	28.61	13.41	42.02	13.45	42.06	13.41	55.47
1984	35.94	18.25	54.19	16.42	52.36	18.25	70.62
1985	37.83	24.85	62.68	17.35	55.18	24.85	80.03

Source: Bank of Thailand and BAAC.

4.108 The BAAC's apparent focus on small and medium farmers is evident from the average sizes of its loans which are B 10,000 for short-term, B 14,000 for medium-term, and B 27,000 for long-term loans. Recently, the BAAC has introduced the use of joint liability as the security for short-term loans to enable more small farmers, who do not have adequate collateral in the form of mortgage assets, to take advantage of its short term lending facilities. Term loans for agricultural investment require a 20% equity contribution, two guarantors, or the mortgage of fixed assets worth twice the value of the loan. Lending rates for farmers are lower at 12.5% compared to the current commercial bank lending rates of 14-15%, while those to cooperatives and associations at 10% are further subsidized.

4.109 The BAAC has also been involved in project related lending activities for about a decade, initially in collaboration with other government agencies responsible for agricultural development. More recently, it has broadened the scope to cover integrated agricultural development projects involving joint venture projects and schemes with the private sector. The BAAC also introduced in 1980 its credit-in-kind operations to ensure that the farmers obtain quality farm inputs, adopt improved machinery and equipment, and minimize diversion of funds to other nonfarm activities. In 1984, these operations accounted for about 13% of the total production and investment loans, although their share of the latter was much higher to the extent of about one-third.

4.110 The analysis of repayment performance of the BAAC clients by scale of the farming operation indicates that the approach used by the BAAC of providing management services and inputs in kind can significantly reduce the risk of lending to small farmers. For example, repayment rates are the lowest in the central region with the highest average farm income, while the poorest region of Northeast possesses the best repayment record. This suggests that repayment performance depends more on the institutional factors affecting the

quality of loan administration than on the economic characteristics of the farmers.

4.111 If lending to small scale farmers is not necessarily riskier than other lending as indicated above, the only other major impediment to increasing lending to small scale farmers is the high operational costs associated with it. BAAC's total operating costs have averaged about 5.1% of total average loans over the past five years, largely because of its branch expansion program in the past few years. So far, they have been adequately covered by the spread between the borrowing and lending costs of the BAAC. However, future expansion of lending to small scale farmers depends on both the adequacy of funds as well as the "spread" available to the BAAC.

4.112 The BAAC's total resources have grown at an annual rate of about 11% during the past five years (Table 4.8). About one-half of these funds, including a substantial proportion of foreign and domestic borrowings, are obtained at relatively low costs, which enables the BAAC to reduce its average cost of borrowing. Foreign borrowings, which are the most important source of cheap credit, have risen rapidly in recent years accounting for over one-fifth of the total at present, but they may not continue to rise at the same rate in future. The assistance from the Bank of Thailand, the next important source of subsidized funds, has registered a steady decline over the last five years. The single most important source of funds continues to be deposits by commercial banks, currently accounting for about 38% of the total resources, but this source may not continue to be as dependable as in the past, and certainly not much beyond the mandatory requirements of the Bank of Thailand directives.

Table 4.8: RESOURCES OF BAAC
(Millions of Baht)

Source	1980	1985	Annual % Growth
Commercial Bank deposits	6,646 (40.8)	10,323 (37.9)	9.2
Foreign borrowings	1,528 (9.4)	5,775 (21.2)	30.5
Bank of Thailand	3,442 (21.1)	3,208 (11.8)	-1.4
Public deposits	2,043 (12.5)	4,389 (16.1)	16.5
Own funds and others	2,641 (16.2)	3,534 (13.0)	6.0
<u>Total</u>	<u>16,300</u> (100.0)	<u>27,229</u> (100.0)	<u>10.8</u>

Source: BAAC.

Note: Figures in parenthesis indicate percentages of the total.

4.113 Increasing domestic resource mobilization, especially from noncaptive sources, therefore, acquires critical importance in the BAAC's future resource planning, after considering the fact that almost 90% of its present deposits are either due to mandatory lending requirement by commercial banks or originate from government departments and other nonbanking institutions. The BAAC has recently introduced a new form of savings certificates in 1985 for this purpose, and it is currently engaged in devising new plans to make these certificates and similar other financial instruments attractive to potential savers. The BAAC is in an advantageous position to get involved in a vigorous resource mobilization campaign with its extensive network of about 648 branches and field offices, large farmer membership in different parts of the country, and significant potential savings available in a steadily growing economy. The BAAC's success in increasing domestic resource mobilization, however, largely depends on the flexibility with which interest rate policies are implemented in Thailand. Flexible interest rate policies are required not only for resource mobilization but also for efficient allocation of resources, and for enabling the BAAC to have a larger "spread" on its various lending operations commensurate with different degrees of risks as well as varying operational costs.

4.114 There is a need to review the restrictions placed on the BAAC's operations, especially in terms of its scope of lending and the functions of its field offices. At present, it is not allowed to lend to nonfarmers. There is also a need to expand lending to farmers to cover crop processing, storage financing and marketing activities; to review credit eligibility criteria to incorporate nonfarm income which accounts for a substantial proportion of total rural household incomes; to decentralize decision making as well as monitoring and evaluation procedures. To achieve this, BAAC's large number of field offices, which presently are not equipped to deal with financial transactions, need to be converted into branch offices offering regular banking facilities to its clients. These offices would provide links between rural savings and rural lending by encouraging small scale farmers to save with the BAAC, to establish their creditworthiness, and to obtain credit for their farming as well as other related activities. Revisions in BAAC's scope and activities on the above lines, together with the appropriate changes in financial policies related to flexible interest rate policy and deemphasis on specialization and compartmentalization of financial institutions and functions, could gradually transform the BAAC into an agricultural development bank in a broader sense.

4.115 Flexible interest rate policies will also enhance the competitive position of the BAAC and make it more self-sufficient by reducing its dependence on captive and subsidized resources. Wider spreads between its borrowing and lending rates will, however, inevitably result in higher costs to small scale farmers, an argument invariably put forward to maintain an artificially low level of interest rates. But, considering the alternative source of still higher cost of funds from the informal markets, on whom the small scale farmers have to depend in any way, the higher levels of interest rates resulting from the flexible interest rate policies would still be lower than the informal market rates and would at least ensure the availability of formal market credit to smallscale farmers.

4.116 The Industrial Finance Corporation of Thailand (IFCT). Although IFCT, established in 1959, is the only development banking institution in Thailand involved in medium and long-term lending to industries on a project basis, its overall impact is only marginal considering the volume of its operations which account for slightly over 1% of the total credit of all financial institutions. Its developmental orientation and term lending in domestic as well as foreign currencies at rates below those of commercial banks, however, lends IFCT a unique position in the financial system. Its lending contribution to agro-industries also occupies an apparently important position in its portfolio, accounting for about 15% of the total IFCT loans in 1960-80.

4.117 Most of this financial assistance, however, appears to have been directed towards relatively bigger projects as evidenced by the average size of agro-industrial loans of over B 9 million during 1960-80. At the same time, IFCT has made efforts since 1984 to provide assistance to small scale industries with fixed assets of less than B 10 million. It also reduced its minimum loan size for this purpose from B 1 million to B 500,000. This has led to an increase in the number of small projects with an average loan size of less than B 10 million from about one-half to about three-fourths of the total. And, recently, in 1985, IFCT established the Small Industry Credit Guarantee Fund (SICGF) of B 200 million to provide guarantees for loans to small scale industries by IFCT and commercial banks, charging a fee of 1.5% of the guaranteed amount.

4.118 IFCT's future role depends on several factors including increased domestic resource mobilization, improved competitive position, widening of the scope of its operations, simplification of project evaluation procedures, and removal of restrictions based on its character as a specialized institution. Foreign borrowings account for over 80% of IFCT's resources and shortage of domestic resources continues to act as a serious constraint on its activities. IFCT cannot accept deposits while its debenture issues constitute only a marginal source of capital. Recently, it has started providing working capital finance on a selective basis, but that activity is also fairly limited. It also has few branch offices. It thus operates in a restricted and fragmented field. Although its operations are considered efficient and its procedures are thorough, these are often expensive and beyond the capacity of small scale entrepreneurs. Some of these limitations are based on its charter while others arise from institutional restriction. For example, legal codes which prevent collateral sharing lead to borrowers' preference to borrow from a single institution, generally a commercial bank, for their fixed as well as working capital needs.

Capital Market Development

4.119 If widespread use of term financing is likely to require a long time in Thailand as mentioned earlier, capital market development and especially the development of a market for equity capital will require a much longer time. Despite the promulgation of the Securities Exchange of Thailand Act in 1974 and the subsequent creation of regulatory, legislative and fiscal incentives environments, the securities markets have remained underdeveloped. The total listings of companies are still less than 100, while the ten largest companies account for about two-thirds of the total market capitalization. Many

companies originated as family concerns and these families still retain hold over their companies. These companies are rather reluctant to seek outside equity finance for fear of information and disclosure requirements and, as a result, have high gearing ratios. Similar to many other developing countries, the stock market in Thailand has gone through a speculative boom and a sudden crash in 1978, followed by the government's stabilization measures. The financial markets further suffered another bout of crisis in 1983-84 with severe problems in banking and other finance companies, as well as important informal money market institutions.

4.120 Developments in bond markets and short-term securities market have been equally disappointing as issues from the private sector have been very limited. Moreover, there is not much of a secondary market and interest rates are not determined by competitive market forces. The financial markets also do not have much variation in terms of financial instruments such as certificates of deposits and negotiable financial instruments. Under these circumstances, it will take a long time for equity and long-term debt markets to become a significant source of capital for private sector development.

4.121 A new development in this area in Thailand relates to the proposals currently being considered for creation of venture capital companies. Although it is generally agreed that equity financing is not a major constraint for agro-industrial development, joint venture capital companies with foreign partnerships are likely to serve as catalysts in providing access to foreign technology and foreign markets, both of which are supposed to be badly needed for this purpose. Current proposals are diverse and reflect divergent views on whether access to technology, or reluctance on the part of foreigners to invest directly in Thailand is the key constraint.

4.122 At present, however, the scope for generalizing the venture capital model in agro-industry seems limited for a number of reasons. First, the sophisticated venture capital concept is not consistent with the established, traditional local business culture and practices which do not feel much the need for such institutional reform. Second, the success of venture capital companies depends very much on a large stock market, a condition not existing in Thailand at present.^{28/} And third, the number of new agro-industrial projects which would qualify and attract venture capital is not exceedingly large as required by a venture capital company in order to be rigorously selective in choosing projects. Venture capital companies will, therefore, have to get involved in the development of projects itself, a rather expensive and lengthy procedure.

Recommendations

4.123 Policy issues that require further attention in credit and finance include: (a) flexible interest rate policy to allow financial institutions to increase their spread on loans to small firms and farmers in order to cover

^{28/} This is required because usually venture companies want to sell the stock of successful ventures to invest in other projects.

additional administrative costs and extra risks; (b) deemphasizing specialization and compartmentalization, and increasing competitiveness of financial institutions; (c) joint financing schemes between commercial banks, BAAC and IFCT; (d) credit guarantee schemes to reduce credit risks to banks and other financial institutions, and to enable small business enterprises, which lack tangible collateral, to obtain financial assistance; (e) encouragement of integrated agricultural projects where credit links are more readily established between producers, processors, and marketers; (f) linking mobilization of rural savings with rural lending through BAAC in order to make BAAC more self sufficient.

4.124 Although the use of low interest rate (BAAC) and government directed credit has steadily increased, it may not necessarily reach the targetted group of small farmers, and particularly farmers without legal land title. If subsidies have to be provided as a policy for sectoral promotion, a more cost-efficient alternative would be to provide direct subsidies rather than through the financial system.^{29/} In view of the need to improve the access to agro-industrial credit which by nature involves a high risk, the Government may want to remove interest rate regulations and allow financial institutions to charge marginal borrowers any resulting additional administrative costs and risks. This would facilitate access to credit from the organized financial system and reduce firms and farmers' dependence on more costly funds from the informal system.

4.125 Flexible interest rate policies are also essential for increasing competitiveness among financial institutions. The present structure of highly specialized financial institutions unnecessarily reduces competition and increases the total costs of financial intermediation. These problems are further aggravated by restrictions to new entry in the most important commercial banking subsector. The specialization of government lending institutions by sectors, functions and type of borrowers is a particular constraint for agro-industrial development, which typically involves investment in several sectors. For example, BAAC is restricted to lending to farmers and is thus not allowed to invest in agro-industry; IFCT lends only to industrial investors; but KTB, which operates as a commercial bank, lends to farmers as well as agro-industrial investors.

4.126 Considering the experiences of these specialized institutions and the advantages that they possess in their own unique positions, it has been suggested that joint financing schemes between commercial banks, BAAC and IFCT could complement the strengths of each institution. Although such schemes appear attractive to begin with, their actual implementation is likely to present serious complications. The experience of the KTB and the small Industry Finance Office (SIFO) of the Ministry of Industry provides an example of the

^{29/} As argued in Chapter III, Section B, there does not seem to be a case for providing subsidies to credit or seeds to promote the cultivation of specific crops. Rather, a more efficient use of these funds for promotional purpose would be to finance the setting-up of demonstration plots and field tests for nontraditional crops.

difficulties involved in such collaborative processes. Another important constraint in this context is the limited legal status of collateral in Thailand which makes collateral sharing difficult among several lending institutions.

4.127 Another proposal, supplementary to the above referred suggestions for flexible interest rate policies and increasing competitiveness among financial institutions, relates to the creation of credit guarantee schemes especially to assist small borrowers facing collateral constraints to obtain finance while, at the same time, to reduce risks to banking institutions. The Government has already approved the proposal, although no concrete action has been taken yet. Similar schemes are operating in other developing countries, albeit with differing rates of success. Lending to small borrowers without collateral would be a new experience to many financial institutions, and it would involve higher administrative costs as well as risks at least in the initial stages. Lessons from other countries' experiences, particularly like the Philippines and Malaysia, will have to be carefully learnt to avoid similar problems. A government backing, along the lines provided in Korea, may be necessary in the transitional stage. With cautious selection, monitoring and supervision of projects, the costs of operation and default could be reduced over a longer period. At the same time, initial public support should not result in yet another form of public subsidy creating further distortions.

4.128 Facilities for agro-industrial financing could particularly be enhanced through development of integrated agricultural projects. Such schemes have been already initiated by the Bangkok Bank and the BAAC as stated earlier. These schemes have been successful in transmitting credit to small farmers without collateral and integrating them into agro-industrial development. There is also a considerable scope to encourage integrated agricultural projects where credit links are established between producers, processors and marketers. There have already been some examples of such projects where a business enterprise takes the responsibility for providing quality inputs, extension services, processing as well as marketing facilities. The Government could further encourage such individual projects by linking the government institutional credit to these projects in order to ensure adoption of new, appropriate production technology, proper product diversification, efficient processing and marketing.

4.129 Among the government financial institutions, the BAAC is in a unique position to acquire a significantly important role in providing credit to agriculture and agro-industries by becoming an independent agricultural development bank. For this, it will have to reduce its excessive reliance on captive domestic resources. With its extensive branch network, it is ideally situated to expand its role in rural savings mobilization for which there is also a considerable potential. Its field offices, for this purpose, will have to be transformed into full-fledged banking offices. With this transformation, it could also enlarge the scope of its lending operations to include provision of credit to farmers as well as non-farmers or agro-industries for crop-processing and marketing activities. This may require some modification of the statutory provisions. In fact, these changes could enable the BAAC to become more self-sufficient, independent and viable financial institution.

Such an institution, with its experienced staff acquainted with the development potential of different localities, would also be able to link its rural savings mobilization efforts with the efficient allocation of resources for agriculture and agro-industries in various rural areas of Thailand.

THAILAND

AGRO-INDUSTRIAL DIVERSIFICATION: ISSUES AND PROSPECTS

Production Potential and Market Prospects for Traditional
Agro-Industrial Commodities

1. Thailand's traditional agro-industrial exports have fared poorly in 1980-85. Major factors were the decline in the prices of cereals and other agricultural crops which fell primarily because of consecutive years of good harvests worldwide, and poor world demand growth. Until 1985 the US had, through its loan rate programs, set a floor to the US prices of maize, wheat, rice and cotton. Prices of other commodities such as soybeans and competing vegetable oils, and other feedgrains were also supported. However, when during the 1980-84 period the dollar appreciated, the US loan rates were left unchanged. This stimulated the production of these commodities in foreign countries, because their domestic agricultural prices rose when expressed in local currencies. But, since the increase in world output occurred at the same time that the world demand for agricultural products slowed down due to the international recession, the dollar price of most agricultural commodities fell.
2. Following the 1985 Food Security Act, the US has now set loan rates for wheat, maize and other feedgrain for the 1986/87 crop year approximately 25% lower. Under that program rice has been treated differently in the sense that a specific marketing loan program was introduced in 1986 to allow producers to sell rice at the lesser of the loan rate or the prevailing world market price for rice as determined by the Secretary of Agriculture. Loan rates in the future years of the current Act--which runs until 1990--will be determined on the basis of the average market price in the middle three (excluding the highest and the lowest years) of the five previous years.
3. The expected impact of the reduction in the US loan rates is to reduce world prices of cereals and production in the rest of the world, thereby allowing the US to expand exports and decrease its stocks, but it is expected that the price decline resulting from the new US agricultural policy would be limited to the short-run, and that prices would rise over the medium-term for three reasons. The first reason is that under the US program farmers are provided with incentives to take land out of grain production. The objective is to reduce rice cultivated areas by 35%, wheat areas by 30% and other coarse grain areas by 25%. As a result, it is expected that by about 1988, with production and stocks falling in the US, the US could relax its downward pressure on cereal prices. The second reason operating to diminish the downward pressure on cereal prices over the medium-term is the likely change in EEC agricultural policy. Due to the reduction in the dollar price of agricultural products and the sharp appreciation of European currencies vis-a-vis the dollar, it has become increasingly costly for the EEC to dispose of surplus production onto world markets. It is likely that adjustments by the EEC will take the form of production controls rather than domestic price reductions. The third reason is specific to rice: after three years of above-trend yields

in 1982-85, rice yields are expected to return to normal level, which would reduce the growth of rice production and lead to higher prices than otherwise.

4. Table 1 includes the commodity price projections recently prepared by the World Bank, taking into account the various trends outlined in the above paragraphs. It shows that the current dollar prices of Thailand's main traditional commodities are expected to increase from 1987 onwards. In real terms, however, the price outlook is different. Prices of most commodities are expected to rise slightly in 1987-90, but over the longer term cereals prices, including rice, would resume their historical decline in real terms. It is only for rubber that prices are projected to increase in real terms. The market outlook for Thailand's traditional commodities is briefly reviewed in the following paragraphs.

Table 1: TRENDS IN THE DOLLAR PRICES OF TRADITIONAL AGRICULTURAL EXPORTS
(1985 = 100)

	Actual			Projected			
	1970	1980	1985	1986	1987	1990	2000
<u>I. Trends in current dollars</u>							
Rice	67	200	100	97	102	131	162
Maize	52	112	100	88	104	108	142
Sorghum	50	125	100	91	108	112	147
Tobacco	52	121	100	100	104	117	156
Rubber	50	176	100	100	107	126	203
Sugar	90	702	100	171	208	433	478
<u>II. Trends in constant dollars /a</u>							
Rice	183	192	100	86	88	108	95
Maize	232	107	100	78	89	89	84
Sorghum	138	119	100	81	92	92	86
Tobacco	142	115	100	88	89	97	92
Rubber	137	168	100	88	91	104	120
Sugar	247	586	100	151	179	358	281

/a Deflated by manufacturing value index.

Source: Price Prospects for Primary Commodities, World Bank Report, October 1986.

Rice

5. The current policy of MOAC is to reduce output growth to a level consistent with the export growth forecasted by Government. To achieve this

goal, MOAC intends to reduce the acreage of the second rice crop in several irrigated areas in the Central Plains (Chao Phaya and Mae Klong river basins) by 1 million rai (160,000 ha) over a three-year period, starting with 400,000 rai (64,000 ha) in 1986-87. In other areas of the country such as the North and Northeast, the policy of the Agricultural Ministry is also to encourage farmers to grow other crops than rice during the dry season. Such policies to be effective require that the profitability of rice cultivation be low compared to other crops and nonrice crops be agronomically suited to these regions. As indicated by Table 2.3, Chapter II, most agricultural commodities provide on average a higher return to farmers than rice, but this is not so uniformly throughout Thailand. What matters in the final analysis is (a) the relative comparative advantage of each region in growing rice; and (b) the relative comparative advantage of rice vis-a-vis other crops in a given region. As indicated by a 1981 study, the domestic resource cost (DRC) of growing rice during the dry season was below one in the Central Plains and above one in the Northeast.^{1/} This result suggests that, unlike the Northeast, the Central Plains have a comparative advantage relative to other regions in growing dry season rice. Moreover, this study found that the DRCs of three important export crops (cassava, maize and sugarcane) exceeded rice's DRC during the dry season in the Mae Klong and Chao Phaya basins, but were below rice's DRC in the Northeast. On the basis of these data, the substitution of dry season rice with other commodities appears justified in the Northeast. This conclusion is further strengthened by the fall in the price of rice relative to most nontraditional commodities that has taken place since 1981 (see Table 1 in Annex 1 and Table 2 in Annex 2). However, there is no clear evidence that reduction of dry season rice cropping and promotion of alternative crops are optimal policies to implement in every irrigated area of the Central Plains. Such policies have to take into account that a large part (about 320,000 ha) of the Chao Phaya is a low-lying flooded plain with heavy soils which are best suited for paddy production. Changing production from rice to nonrice crops would require not only improving the irrigation infrastructure which is not well suited for nonrice crops, but also installing a drainage system. The remaining part of the Central Plains is different. It consists of low terrace areas (720,000 ha) with well drained soils which are suitable for field crops, vegetables and fruit trees. This area is mainly located in the Mae Klong irrigated project where crop diversification is already well advanced.

6. In view of the current prospects for rice exports and the apparent comparative advantage of the Chao Phaya river basin in rice cultivation, the Government may want to proceed with caution in reducing dry season rice

^{1/} Praipol Koomsup, Agricultural Incentives, Comparative Advantage and Employment in Thailand: a Case Study of Rice, Maize, Cassava and Sugarcane; Council for Asian Manpower Studies, discussion paper No. 81-02, June 1981, University of the Philippines. The domestic resource cost of rice production during the dry season ranged from 0.4 in Nakorn Pathorn (Mae Klong) to 0.5 in Supanburi (Chao Phaya), but it was above one (1.1) in Nakorn Rajsima (Northeast).

cropping and promoting alternative commodities in the Chao Phaya.^{2/} Although the cultivation of nonrice crops in some parts of the Chao Phaya could help alleviate the current shortage of water during the dry season, it would also require additional investment in irrigation infrastructure (see Chapter III Section C). For this reason, there is a need to estimate the economic and financial profitability of improving the irrigation infrastructure to the standards required for the cultivation of nonrice crops in the southern Chao Phaya before initiating any major crop diversification program in that region.

7. Over the medium- to long-term, it seems likely that, as is well recognized by the Government, Thailand's rice exports will not increase much due to the disappearance of some of Thailand's traditional markets in Asia, and increased competition from the USA and new exporters. Among Asian countries China, Pakistan and India would remain self-sufficient, and rice imports would continue to shift away from Asia towards Latin America and Africa. These changes have important implications for the quality of rice being exported by Thailand since African demand favors the more "commodity" grades of rice (even 100% broken) which are classified as medium- or low-quality rice. Such a trend will require Thailand to adjust its marketing policy for rice.

8. The first adjustment already occurred in January 1986 with the Government's decision to liberalize rice exports and eliminate the minimum export price imposed in 1985 on broken rice. As exporters were no longer required to hold large rice stocks in excess of their normal working requirements, they reduced their stocks by increasing exports. The most important consequence was that the elimination of the minimum export price on broken rice made it possible for the more efficient Thai exporters to sharply increase their exports (some firms doubled their exports) by adjusting to the shift in overseas demand toward medium- and low-quality rice.^{3/} Faced with a decline in the US export price of high quality rice, Thai exporters increased their exports of medium- and low-quality rice such as broken rice--which is not usually exported by the US--and for which the price differential with US rice is sufficiently attractive. As a result, Thailand managed to gain new export markets such as Brazil and increase its rice exports by 11.4% in volume in 1986, although this was achieved at the cost of a 16.4% fall in the dollar export price of Thai rice. These trends suggest that contrary to what is often assumed, attempting to export more high quality rice may not improve Thailand's competitive position, or its export earnings.

^{2/} This does not rule out that further agro-industrial diversification may take place in the Central Plains on the basis of the relative profitability of different commodities; but the decision to carry out such diversification should be left to the private sector, and should not be artificially encouraged through subsidies on seeds or credit.

^{3/} By contrast the imposition of a minimum export price on broken rice prevented such an adjustment in 1985 and exports of broken rice fell by 379,000 tons from the 959,000 tons shipped in 1984.

9. The second adjustment of Thailand's marketing policy would involve the creation of a commodity exchange through which forward trading of rice would take place (See Chapter IV, Section C). A key characteristic of such trading is that crucial marketing elements such as the price, quality and quantity of the commodity to be delivered at the end of the stipulated period would be guaranteed. The reason for this is that forward contracts negotiated through the commodity exchange would be enforced since the violation of contracts would entail financial compensation to the party suffering a loss. These aspects of forward trading in rice would be particularly important for countries which may be reluctant to rely on rice imports when the future price and available quantities of rice may be uncertain.

Maize

10. For other important Thai cereal exports such as maize, market prospects are not favorable. This is so because world stocks are currently equal to 22% of world utilization, and a large surplus is expected to remain in the industrial countries for many years--encouraged by large domestic price supports in the case of the EEC and the US. Nevertheless, there are important markets for Thailand's maize as indicated by the 47.3% rise in the volume of Thailand's maize export in 1986 and the continuous increase in domestic consumption.

11. Maize was Thailand's fifth largest export (\$355 million) in 1986. It increased rapidly in the 1960s and early seventies, but since the late seventies Thailand has lost some important Asian markets.^{4/} The recent loss in market shares reflects both a change in market demand towards maize with low aflatoxin content, and increased competition from new Asian exporters such as China. In the past Thailand was able to gain a substantial market share in Asian markets by exporting maize, which, despite its higher aflatoxin level, was priced sufficiently low to be more attractive than maize with a lower aflatoxin level. In recent years this situation has changed as a number of Asian countries have started to impose stricter limits on the aflatoxin content of maize, and the quality issue became magnified when China started to export maize with a zero aflatoxin level and a low price.

12. Since aflatoxin is caused by high humidity, the aflatoxin content of maize could be reduced by changing the planting date of maize so that it would be harvested during the dry season. This, however, would conflict with the cropping patterns of other agricultural products, which would not be profitable. The other solution would be to invest in maize drying equipment and adequate warehouse facilities so as to reduce the level of aflatoxin in maize. This would be important for recapturing Southeast Asian markets. One

^{4/} Japan's imports of Thai maize fell from B 1.1 billion in 1979 to 21 million baht by 1984. Taiwan imports fell from B 800 million in 1977 to B 24 million in 1983 and were stopped in 1984. In both cases, imports fell because of concern over the aflatoxin level of Thai maize. Overall, Thailand's share in world's exports fell from 3.1% in 1978 to 2.1% in 1984.

means of achieving this would be to create a grain exchange for maize (See Chapter IV, Section C). Since forward contracts would be enforceable in the grain exchange and financial compensation payable in case of contract violation, traders and processors would have an incentive to invest in warehouse facilities and maize-drying equipment. This would lead to a reduction in aflatoxin and ensure foreign buyers that the quality of the maize delivered at the time of contract settlement would correspond to the stipulated quality. As a result, the creation of a grain exchange would make it possible for Thailand to increase its regional market share. In the case of Taiwan, for example, markets were lost because the quality of the maize received by Taiwan did not match the quality that was contracted for initially; but, with the proposed grain exchange Thailand would be in a position to recapture such a market.

13. In the early seventies, Thailand's domestic consumption of corn amounted to 10 to 11% of production, but as the animal feed industry expanded, domestic demand increased and it now amounts to about 30% of production. An important uncertainty affecting the future demand of corn is the likely expansion of the beef and swine sectors. In the past this sector grew slowly, mainly because of government restrictions on private sector activities. If as argued in this report restrictions on private sector investment in slaughterhouses (beef and pork) are lifted, the domestic demand for corn would rise rapidly, which would help sustain growth in output.

Tapioca Products

14. In the seventies exports of cassava by Thailand to the EEC rose rapidly in response to sharp increase in EEC demand. This induced the EEC to limit Thailand's exports in order to protect its farmers. In 1982 the EEC reached an agreement with Thailand under which Thailand's tapioca exports were to decrease from 7 million tons in 1981 to 5 million tons in 1982 and 4.725 million tons in 1985 and 1986. In 1986 Thailand signed a new agreement with the EEC under which Thailand agreed to limit its export of cassava pellets and chips to 21 million tons in 1987-90 provided its exports in a given year do not exceed 5.5 million tons. This limit is equivalent to about 12.5 million tons of cassava roots on average per year. But, since during this period Thailand's production would amount to 20 million tons of cassava roots on the basis of current production level, excess production will persist unless domestic demand and non-EEC sales grow. In the present situation, this would

require a fall in domestic cassava prices in order to induce Thai farmers to grow other crops, and make new domestic cassava processing profitable.^{5/}

15. The cassava government substitution program was initiated in 1984/85 with the aim of reducing planting acreage for cassava by 50,000 ha in the Northeast. Minor crops recommended by MOAC as substitutes were red sorghum, mungbean, hamata bean and eucalyptus. To induce farmers to cultivate these crops, seeds were provided at a subsidized price and credit was made available through BAAC. However, farmers who grew sorghum and mungbean suffered a net loss, but other farmers, who resold for 15 to 20 baht/kg the sorghum hybrid seeds obtained from MOAC for 2.5 baht/kg, made a profit. Overall, and despite the Government's program, total cassava output increased in 1984. In 1985 the target area under the cassava substitution program was increased to 1 million rai resulting in an increase in the cultivation of alternative crops, and cassava output fell by 3.7%. In 1986 cassava output declined by about 21% for reasons probably related to the weather and international conditions, since maize output also fell by the same percentage. At the end of 1986, however, the domestic price of cassava roots rose rapidly by over 100% compared to 1985 whereas the world prices of maize and sugarcane fell. This made cassava cultivation quite attractive and farmers were replacing maize and sugarcane with cassava.

16. Recommendations. Cassava is well suited for regions such as the Northeast where soils are poor. It is also one of the most profitable crops at current prices for such regions,^{6/} since the cultivation of other crops would require fertilizers and capital investment to stabilize yields. This indicates that unless the farm gate price of cassava is substantially reduced from its currently high level, profitable substitution possibilities may be non-existent for cassava.

17. In the short-run, the Government may want to modify the current cassava quota allocations by increasing their efficiency. At present, export quotas are allocated on the basis of the stocks held by exporters and, more recently, past export performance (i.e., extra quotas are accorded in return for sales to non-EEC countries on a one to one ratio). The effects of this regulation were to induce exporters to (i) compete for quota allocations by increasing their cassava stocks up to 30% of output in 1985; and (ii) build additional storage facilities, and thus dissipate part of the rent arising from the large difference in export prices between EEC sales and non-EEC

^{5/} The decline in cassava price may stimulate the local production of tapioca flour. Provided technology improvements take place, tapioca could be used in the production of glucose, lactose, infant meal and modified starch. Partially fermented cassava could also be used as a concentration feed for swine and cattle. Until now, however, maize has been a cheaper alternative for the livestock feed industry.

^{6/} Among traditional crops only sugarcane and pineapple generated a higher net return to farmers than cassava in 1981-85. See Table 2.3, Chapter II, Section B.

sales.^{7/} These effects could be avoided by auctioning off the quota rights at the beginning of the cassava season. To ensure flexibility the quota rights should be transferable and allocated on the basis of small quantities to meet the needs of small exporters. Since one of the objectives of the Government's agricultural policy is to replace cassava with alternative crops, the proceeds generated by the allocation of export quotas could be used to fund agricultural research on commodity diversification.

Rubber

18. Rubber export by Thailand amounted to \$577 million in 1986 and was Thailand's fourth largest agro-industrial export. As shown in Table 1, the price of rubber is projected to rise in real terms in 1986-2000, which should benefit Thailand given its recent rubber replanting program. So far, about 480,000 ha (of which about 200,000 ha are in production) have been replanted to high yielding rubber under the Government-assisted replanting program of the Office of the Rubber Replanting Aid Fund (ORRAF). Under this program, ORRAF provides technical and financial support to smallholders. Replanting assistance is provided in kind (high-yielding clonal plant material, fertilizers and agro-chemicals) over a five and a half year period. The main markets for natural rubber are expected to be Japan, and developing countries as a consequence of the expansion of their motor vehicle and rubber-based industries, especially in Korea, Brazil, India and China.^{8/}

19. An important issue is the quality of Thailand's rubber exports. Historically, the world trend has been for block rubber to increase relative to smoked sheets due to the technical characteristics of block rubber. In Thailand, the situation has been different and smoked sheets still accounted for about 75% of natural rubber exports in 1984. This was due to (a) the high export taxation of block rubber; (b) Thailand's comparative advantage which was in selling low quality smoked sheets to Japan and Singapore;^{9/} and (c) Japanese demand for smoked sheets which are preferred by automobile tire manufacturers. Although the export tax on rubber has now been substantially reduced, the Government may want to eliminate it completely in order to improve the incentives to export higher quality products. Nevertheless, prospects for increased exports of higher quality rubber are limited since markets for higher grades are small and largely dominated by Malaysia.

^{7/} Export prices to the EEC were \$135-140 per ton in early 1987, whereas if Thailand were to sell large quantities of cassava on non-EEC markets, cassava prices would have to be below the maize price, or about \$70 per ton.

^{8/} It is estimated that Thailand's export of natural rubber could increase by 3.7% p.a. in 1985-2000. See World Bank report, al. cit.

^{9/} In 1978-84 exports of third grade rubber sheets accounted for 64% of total exports of rubber sheets (in tonnage terms).

Sugar

20. Sugar exports are relatively important for Thailand (\$277 million in 1986) but the long-term outlook is for little growth in free market trade. As a result, the volume of sugar exports by Thailand is not expected to increase. Domestic production, however, could rise by 3% p.a. due to increasing domestic demand.

THAILAND

AGRO-INDUSTRIAL DIVERSIFICATION: ISSUES AND PROSPECTS

Production Potential and Markets for Nontraditional Agro-industrial Products

1. The price performance of nontraditional commodities is indicated by Table 1. This table shows that, unlike traditional commodity prices, the prices of the main (fresh fish, shrimps, canned fruits) and some minor (spices, pimento, fruits) Thai agro-industrial nontraditional exports have increased in current dollars in 1980-84. As had happened earlier for other commodities, the price increase was transmitted to farmers through the marketing system and farmers responded by rapidly increasing output and exports of nontraditional commodities which have been Thailand's most dynamic exports in 1980-85. This result indicates that Thailand has the potential for producing nontraditional commodities. In order to investigate Thailand's potential to further increase the production of nontraditional commodities, twenty one commodities were selected for investigation from a larger list of 199 products, in consultation with NESDB. Criteria used in the selection of the commodities discussed in this annex include: (a) potential for export; (b) potential for efficient import-substitution; (c) potential for value added processing; (d) linkages to the agro-industrial subsector; and (e) availability of data. Prospects for the production processing and marketing of selected nontraditional commodities are summarized in the following paragraphs.

Field Crops ^{1/}

2. Sesame. During the 1975-85 period Thailand's share of world sesame exports rose from 2.5% to 4.6% and Thailand's export price consistently remained below the average world market price. However, in the last few years China has entered the world sesame market as a major participant. Competition from China explains the quite dramatic decline in Thai sesame exports to Japan in the last three years. Supplies from Sri Lanka, Vietnam, the Sudan and Mexico, which are more competitively priced and of superior quality to Thai sesame, have also been competing for the major markets in Taiwan and Japan.

^{1/} The available production and trade data concerning some of these crops are summarized in Table 2.

**Table 1: COMMODITY PRICE INDICES FOR SELECTED NONTRADITIONAL
AGRO-INDUSTRIAL PRODUCTS, 1975-85 /a**
(1980=100)

	1975	1980	1984	1985
Mungbeans /b	69	100	111	91
Sorghum /b	66	100	87	73
Sesame seeds	89	100	85	78
Spices, excluding peppers	91	100	126	n.a.
Pimento	193	100	120	120
Cocoa, brazil and cashew nuts	48	100	90	n.a.
Groundnuts	70	100	91	72
Fresh vegetables (excl. tomatoes)	61	100	85	n.a.
Fresh tomatoes	72	100	83	71
Fresh fruits /b	57	100	146	122
Bananas	53	100	113	118
Mangoes /b	89	100	143	89
Papayas /b	n.a.	100	159	103
Dried fruits	43	100	51	n.a.
Preserved and prepared fruits	58	100	100	n.a.
Fruit and vegetable juices	43	100	120	n.a.
Dried vegetables	57	100	83	n.a.
Preserved and prepared vegetables	69	100	79	n.a.
Frozen fowl /b	n.a.	100	101	82
Fresh fish /b	47	100	127	117
Canned fish /b	62	100	92	89
Canned crustaceans /b	76	100	111	94
Prawns /b	60	100	114	99
Orchids	47	100	48	50
Palm oil	74	100	125	86

/a Average unit export value index for developing country exports in current dollars.

/b Average unit export value index for Thailand.

Source: FAO and Bank of Thailand.

Table 2: PRODUCTION, PLANTED AREA AND TRADE FOR SELECTED
NONTRADITIONAL CROPS, 1984/85

	Planted area ('000 ha)	Production ('000 tons)	Exports <u>/a</u> ('000 tons)	Imports <u>/a</u> ('000 tons)
Sunflower	-	-	-	57
Sesame	39	26	12	7
Groundnut	131	172	18	-
Soybean	200	246	1	296 <u>/b</u>
Sorghum	294	374	219	-
Asparagus	-	-	-	-
Tomato	8	62	2	-
Cucumber	17	123	0.2	-
Chili pepper	68	125	1.7	1.1
Ginger	8	92	3.9	-
Papaya	n.a.	1,000	5.8	-
Mango	n.a.	n.a.	8.0	-
Cashew nut <u>/c</u>	27	24	2.3	41
Banana <u>/d</u>	-	2,000	3.9	-

/a Data refer to unprocessed crops unless otherwise indicated.

/b Data refer to soybean meal. Imports of soybean oil were 43,000 tons.

/c 1981/82 data. Export and import data refer to unshelled nuts. Imports and exports of shelled nuts were, respectively, 61 tons and 2.3 tons.

/d 1983/84 data.

Source: MOAC and Department of Customs.

3. Sesame is well suited as a dry season crop in irrigated areas, especially in areas where dry season irrigation may be limited. It is also suitable for rainfed areas where it could follow rice or maize provided there is adequate soil moisture remaining after harvesting the principal crop. Many varieties of sesame exist, and careful selection should be made to select the best varieties for growing under Thai conditions. A key characteristic of sesame is that seed pods burst when they reach maturity. For this reason harvesting must be completed within two weeks of the physiological maturity of the crop. This places heavy labor demands on many farm households. However, varieties of sesame are available whose seed pods do not shatter. As with higher yielding varieties their use would entail greater overall labor inputs than traditional varieties. Provided a package of inputs and techniques acceptable to farmers could be developed, it would be feasible to increase yields and encourage more widespread adoption of sesame as a second crop. Domestically sesame is one possible input to both the oil seed milling and livestock feed industries, but it is likely to remain a minor input unless its price relative to its competitors (soybean and groundnuts) falls considerably. This implies that unless a price change takes place its domestic use would be chiefly as seed.

4. Sunflower. Sunflower has been regarded as difficult to grow in Thailand, mainly because of self-infertility, but the introduction of hybrid varieties has now overcome this problem. Sunflower is currently promoted as a second crop by two private firms, and demonstration plots have been established by the Department of Agricultural Extension in the North and North-east. Based on these production trials it would appear that sunflower has a lower production cost than soybeans, which should give it an advantage in the local market and make it possible to replace present imports of sunflower seeds and meal, but the resulting market would be small (B 70 million in 1985). Sunflower could be used by the domestic edible oil industry, but so far no Thai factory has used sunflower seeds to produce vegetable oil because the production cost is high and sunflower oil is a new product, far from being popular among Thai consumers. The situation has also been aggravated by fierce competition in the vegetable oil market. A third possible market for sunflower would be as an oilseed meal for livestock. But since sunflower meal has a lower nutritional value than soybean meal, sunflower meal would have to be priced 60% below soybean meal. This may translate into a rather low farmgate price for sunflower seeds, which farmers may not find attractive enough compared to soybean.

5. For 1987 the objective of the Department of Agricultural Extension is to promote sunflower cultivation on 30,000 rai (4,800 ha) with a production target of 6,700 tons of sunflower seeds, which if achieved, would greatly exceed seeds imports (57 tons in 1985). In view of this, it would appear that the development of sunflower production should be pursued with caution as present domestic markets appear to be limited, and full scale production attempted only once markets have been confirmed.

6. Groundnuts. This crop is cultivated as a minor crop throughout Thailand under both rainfed and irrigated conditions. Most groundnuts produced in Thailand are consumed locally. Only about one fifth or less of the crop is crushed to produce oil and meal. The meal is in demand as an input for animal feeds for the broiler and other livestock industries. However, groundnuts for oil and meal are in competition with soybeans, sunflower and sesame, and prospect for groundnuts in this sector will at least partly depend upon the relative prices of these commodities. Recently, groundnut exports have declined sharply from \$12.3 million in 1981 to less than \$1 million in 1985 largely because of rapid growth in domestic demand. This trend reflects the highly competitive nature of world groundnut exports and the relatively high price of Thai groundnuts as a result of high import tariff rates (60% in 1985). In addition, Thai groundnuts have not, in general, been of high quality and this has adversely affected their saleability in international markets. As a consequence, Thailand would have to produce and sell at more competitive price to gain any significant market share abroad.

7. A prerequisite for increasing Thailand's world market share is to upgrade the quality of Thai groundnuts for export, which includes production of varieties appropriate to foreign markets and control of aflatoxin contamination. At present three groundnut varieties are recommended by the Department of Agriculture (Tainan, Sukhothai 38 and Lampang). Tainan is particularly suited for production for export as an oil nut, but production is inhibited by the shortage of seeds, although the Department of Agricultural

Extension is making an effort to increase the availability of seeds through an organized seed production program. The second constraint affecting Thai groundnuts comes from their high aflatoxin content resulting from improper drying after harvest and poor post-harvest handling. Since the main export markets for groundnuts (Europe and Japan) enforce rigid controls on the permissible levels of aflatoxin, the quality of Thai groundnuts must be improved if groundnuts are to be exported. To achieve this, there must be a sufficient supply of seeds of the recommended varieties; farmers must be instructed in proper cultural practices; and rhizobium must be supplied with seeds, especially in new production areas, although it tends to be in short supply in Thailand. Attention should also be given to the use of fertilizers and irrigation, and to the best methods for harvesting and drying the crop. These methods have been shown in the Lam Nam Oon Project in Sakon Nakhon to result in high quality groundnuts, but the current high tariff protection (60%) may still make it more profitable for farmers to produce low quality groundnuts to meet the local demand which has been increasing at an annual rate of 4% per annum since 1980 rather than producing for export markets.

8. Soybeans. Soybean is one of the commodities promoted by the Government, and protected by a specific import substitution policy under which the imports of soybeans are banned and the imports of soybean meal and cake are subject to licensing. The implementation of such an import substitution policy resulted in a sharp rise in output from 102,000 tons in 1979/80 to 296,000 tons in 1985/86. But during the same period the domestic price of Thai soybeans, which was equal to the world price in 1975, reached a level 34% higher by 1985.^{2/} This evolution indicates a gradual loss of competitiveness in world market which has been costly for the domestic users of soybean meals, mainly the livestock and poultry subsectors. The increase in the domestic price of soybeans has also negatively affected the cultivation of competing oil crops such as groundnuts, sesame and sunflower, and feedgrains such as sorghum, which may be well suited for the North and the Northeast.^{3/}

9. There are a number of significant constraints associated with the production of soybeans in Thailand. Most production suffers from low yields, arising from poor quality seed and poor cultivation practices. In the North the recommended varieties are SJ4 and SJ5, but local black-seeded varieties are preferred by many farmers as their seeds are more readily available, retain their viability longer and are better adapted to adverse conditions

^{2/} In 1985, the average export price of soybeans for developing countries was \$208 per ton, or 5,646 baht/ton. The average wholesale price of Thai soybean in Bangkok was 7,583 baht/ton, i.e. 34% above.

^{3/} This effect occurs for two reasons: on the production side, the increased profitability of soybean induces producers to shift production away from other oilseed crops, and towards soybean. On the demand side, the rise in the relative price of soybean induces a shift in consumption towards other oilseeds, which being exported in the case of Thailand, results in a reduction in their exports rather than in an increase in output.

than the recommended varieties. In addition, neither the traditional method of sowing soybean into no-tilled soil after rice nor the recommended DOAE method of sowing on prepared beds may succeed in irrigated areas. The former method may not be suited to heavy soils with a high clay content, and the latter method results in increasing the average production cost by 150-200 baht/rai due to land preparation cost. These factors explain why soybean has expanded mainly as an upland wet season crop. But the yields observed in the newly expanded areas have been too low (625-940 kg/ha) for soybean production to be economically justified. The main reason for the low yields in new areas is that the soils have to be inoculated with the rhizobium bacteria necessary for the soybean's nitrogen fixing symbiosis; but the supply of rhizobium from the Department of Agriculture in Bangkok is often limited, which then becomes a critical element affecting output in some areas. To address this constraint, the Government may want to develop the production of rhizobium by the private sector. The best prospects for expanding soybean output would be to further promote it as a dry season crop in the irrigated areas of the North, Northeast and the Western part of the Cnao Phaya irrigation system. But to do this adaptive research to determine the best varieties and production package for each area are required; farmers must be introduced to the proper techniques for efficient production including pest and insect control; and proper drainage facilities must be available in irrigated areas.

10. Sorghum is still a minor crop in Thailand, but output has increased rapidly (11.5% p.a. in 1972-84) as well as exports which rose from 181,000 tons in 1980 to 393,000 tons in 1985. The principle variety grown is Hegari, a white seeded sorghum with a high tannin content and low yields, but output of red sorghum may have reached recently about one third of total sorghum production. It has been shown in field trials that with optimal plant population, weeding and pest control, and without the use of fertilizers, yields as high as 320 to 400 kg/rai (2,000 to 2,500 kg/ha) may be obtained in Thailand compared to the average yield of 204 kg/rai reached in 1984. Yields could be increased up to 480 kg/rai with fertilizer, but the labor requirements for such production would be too high for farmers unless sorghum would be mechanically harvested and threshed. There is scope for the planting of sorghum as a second crop in upland areas, and in well drained areas. Prospects for successful expansion of this crop are good as several firms are actively engaged in the multiplication of hybrid sorghum seeds in Thailand.

11. The white seeded sorghum grown in Thailand is mainly exported because (i) its high tannin content--which results in low digestibility as animal feed--has restricted its domestic use in producing livestock feeds; and (ii) domestic animal feed manufacturers would buy maize rather than sorghum which they use only when it is about 15% cheaper than maize. (This is partly because yellow colored feed is preferred for chickens and using sorghum as a feed requires the use of coloring in the feed.) In addition, the domestic price of white seeded sorghum has been relatively high because Thailand was able to export nearly all of its white seeded sorghum production to Saudi Arabia, to feed donkeys and camels which tolerate the high tannin content of Thai sorghum. These factors probably explain why Thailand's production of red sorghum has so far remained small relative to that of white sorghum. However, the relative profitability of growing white sorghum may be changing as Saudi

Arabia has now reportedly built silos that allows it to import sorghum on a bulk basis, which removes Thailand's advantage over US and Argentine sorghum.^{4/}

12. To increase the importance of sorghum as a commercial feed grain, producers should aim to increase production of high yielding hybrid red seed varieties, since market demand is chiefly for red sorghum, not white sorghum. Thai producers have in the past depended on the Saudis for about 70% of their market. This situation appears unlikely to continue, and in order to make Thai sorghum more acceptable to both Thai animal feed producers and to buyers in foreign markets, greater emphasis must be given to the production of red sorghum. However, for this strategy to succeed sorghum must become competitive with maize as a feed grain, which will require sorghum growers to produce grain animal feed manufacturers want, at a competitive price, and of the required quality. To achieve this two constraints will have to be overcome. The first one is the lack of hybrid seeds availability, but steps are being taken by private companies to increase seed production, which to be successful would require modification of DOAE's seed policy (see below). The second constraint that will have to be addressed is the moisture content of the sorghum after harvest, since if the grain is not properly dried before or immediately after harvest it will be subject to molding and other post-harvest damage.

13. Finally, it should be stressed that an important stimulus to the production of sorghum (and other feed crops) may come from the recommended liberalization of restrictions affecting private sector activities in slaughterhouses and the swine and beef subsectors (see Chapter IV, Section A for an analysis of changes in the demand for feed grains). This may, as had previously happened for the chicken subsector, increase agro-industrial linkages and stimulate the transfer of technology from firms to farmers under contract farming.

Seeds

14. Private sector role. Since the late seventies, the private sector has played an increasingly important role in the production and multiplication of improved seeds (and even in research), particularly for maize and sorghum. Currently, there are twelve large companies producing and supplying quality seeds. As indicated by Table 3, private firms supply nearly half of the total maize seeds used by farmers and about 20% of sorghum seeds. Although private companies have also recently started to produce improved seeds for vegetables, legumes and fruits, the amounts are still small partly because of low demand and partly because it is a new activity for Thailand. But it is an area which seems promising for exports (for example, the US exports of seeds amount to \$300 million a year), and for farmers' income. An indication of the latter potential is provided by the estimation that commer-

^{4/} By exporting sorghum in bags to countries which do not have harbor silos such as Saudi Arabia, Thailand was able to successfully compete with the US and Argentina sorghum which is exported in bulk.

cial seed production for crops would require about 150,000 rai (24,000 ha). This would imply that about 20,000 farms could change from grain to seed production with a resulting increase in income following from the higher price of commercial seeds.

Table 3: SEED REQUIREMENTS AND PRODUCTION, 1984
(in thousand tons)

	Seeds used by farmers /a	Production of commercial seeds	
		Government /a	Private sector /b
Rice	288.5	5.541	n.a.
Maize	42.2	4.493	18.0 /c
Sorghum	5.0	0.030	0.1 /d
Mungbean	12.0	0.890	n.a.
Soybean	6.9	1.617	n.a.
Groundnut	15.4	1.296	n.a.
Cotton	1.6	0.150	n.a.
14 vegetables	1.9	n.a.	n.a.
Total	<u>373.5</u>	<u>14.017</u>	<u>18.1</u>

/a DOAE estimates.

/b Estimates.

/c About 15,000 tons are Suwan 1 seeds and 2,500 tons are hybrid seeds.

/d All of it is red hybrid sorghum.

15. The potential for Thailand to expand its seed industry has been strengthened by recent advances in biotechnology. Until recently for cereal grains the output (grain) could be used as seed. This basic aspect of agricultural biology has made it possible for farmers to easily multiply seeds that were developed and sold by private firms. As a result, involvements by private firms in seed production has remained small. The situation is, however, different with hybrids. Since farmers must buy hybrid seeds every year,^{5/} private firms are faced with a much higher annual demand for seeds.

5/ This follows because the so-called F_1 hybrids are produced by crossing two inbred lines from different genetic backgrounds. The first-generation offspring possesses hybrid vigour (high yields). But when F_1 hybrids are crossed with themselves, the uniformity of their genetic make up is upset and hybrid vigour is lost. In order to continue to obtain high yields, a farmer must buy more F_1 seeds from the company.

In addition, hybrids have a built-in biological patent: as long as the firm keeps the plant's parental line secret, seeds cannot be multiplied. Both factors make it profitable for firms to carry out hybrid seed research and produce hybrid seeds. As indicated by Table 3, commercial production of maize and sorghum hybrid seeds reached 2,600 tons in 1986 which is not negligible for Thailand if one takes into account the high price of hybrid seeds (six to seven times more expensive than DOAE's nonhybrid seed); and indications are that the seed industry could expand further. First, as previously mentioned the expansion of sorghum and sunflower is linked to the cultivation of sunflower and sorghum hybrid seeds. Second, it was recently announced that Thai rice researchers have succeeded in breeding a local hybrid rice seedling that produces twice as much per rai (640 kg/rai) as the average (306 kg/rai).^{6/} If the potential of this new hybrid is confirmed through paddy field tests, the development of the local seed industry could be stimulated provided that the parental lines be sold by the Department of Agriculture (DOA) to private firms. This would make it possible to duplicate the earlier success story of the Suwan I corn variety which was developed by the Government, and then multiplied by private firms.

Tree Crops

16. Cashews. Most of the cashews produced in Thailand are consumed domestically and are traditionally grown in Southern Thailand. The Department of Agriculture (DOA) has been conducting research on the cultivation and production of cashew nuts in Northeastern Thailand for nearly twenty years. The DOA has found cashews to be a crop well suited to the agroecological conditions prevalent in the Northeast. The Thai Government has had over the years numerous cashew promotion programs in the Northeast but little production has been achieved due to the fact that no local traders offered a market for the cashew nuts. The varieties promoted were for local consumption, and thus were not in high demand by exporters.

17. Currently, the Mah Boonkrong Cashew Nuts Co., Ltd. (MCN) is planning to expand cashew nut production in the Northeast, mainly in land reform areas and land settlements since it is in these areas that farmers are frequently searching for higher valued crops and can obtain access to institutional credit. The first part of MCN's project was initiated in 1986 on 12,000 rai in the Northeast. The principal aim of the project is to encourage farmers to switch production from tapioca to cashew nuts by providing farmers with high quality cashew nuts in demand in world markets. MCN's role in the project includes the provision of hybrid cashew samplings (Sirichai 25 strain) and technical assistance, the purchase of cashew nuts from farmers at a guaranteed price, the construction of a shelling mill in Pathum Tani and the export of finished products. In addition the Bank for Agriculture and Cooperatives (BAAC) and the Bangkok Bank would provide credit to farmers.

^{6/} This hybrid was obtained by crossing sterilized Korkhor 21 with other rice seedling in 1986, and the resulting cross of Korkhor 21 with Korkhor 7 yielded 640 kg/rai.

18. The production program by the Mah Boonkrong company may lead to significant increase in production of high quality cashew nuts in the Northeast. However, the cashew production in the Northeast is a new crop for most growers, with the following problems:

- (a) Most Northeastern farmers are unfamiliar with crop maintenance and harvesting, and shelling and grading techniques.
- (b) Extension officials are themselves unfamiliar with the crop, making it difficult for them to advise farmers on how to increase and improve production and yields.
- (c) It takes three years before cashew trees will generate an income. Meanwhile, the cultivation of cassava remains an attractive option since the price of cassava roots rose again at the end of 1986. These factors may limit farmers' participation.
- (d) The high water content of nuts is also a difficulty that will affect export markets if not remedied at the harvesting and processing stages.

19. Expanded production of high quality cashew nuts may lead to increased exports by Thailand provided the chief constraints--price and quality--are resolved. Exports of cashews have so far been very limited, partly because production for the local market (protected by a 60% import tariff) has been more profitable than production for exports, and partly because Thai cashews and kernels have not been competitive in the world market.^{7/} Major markets for cashews that may be targeted by Thai cashew producers and processors is limited to a relatively small number of 17 countries, and particularly the USA, the EEC, and Japan. Overall total world exports of cashew nuts amount to about 70,000 tons. However, Thailand will face strong competition from Brazil in North American markets, and from India there and elsewhere. Only small quantities of cashews have been exported to Japan but Japanese processors are always looking for new sources of supply, and nuts of high quality at competitive prices should find a market in Japan. Other possible markets include Hong Kong where prices received by Thailand (HK\$4.58/kg) were substantially lower than those supplied by India and China (HK\$27-33/kg) due to the limited processing and quality (broken pieces) of the Thai product. Although Thailand may not be able to increase its share of the market, there is the definite possibility of obtaining higher prices by further processing and raising quality. In Singapore the market is also highly competitive, but Thailand's share is much smaller. Only 250 kg were sent there in 1985. A greater share of the market, to which Thailand has the advantage over other major producers due to proximity, depends upon improving the quality of the product and marketing under established labels in this brand conscious market.

^{7/} Sales of cashew nuts to China fell in recent years due to poor quality and the fact that they were \$50-80 a ton more expensive than higher quality African exports.

20. Oil Palm. Cultivation of oil palm was introduced in southern Thailand in 1968 and has expanded significantly in recent years. The area under cultivation rose from 300 ha in 1970 to an estimated 55,000 ha in 1986 with palm oil production estimated at 100,000 mt per year. The main factors behind this expansion were (a) the relatively high protection given to oil palm cultivation (35% in 1985); and (b) the rapid rise in the palm oil share of all vegetable oils produced in Thailand from 11% in 1977 to 37% in 1984. The major constraints to expansion of oil palm cultivation is finding appropriate financing. With trees not yielding for four years and full maturity not occurring for seven years, oil palm requires a long-term investment.

21. Despite currently depressed prices, prospects for further expansion of the palm oil industry appear good due to: (a) satisfactory growing conditions for cultivation of oil palm in southern Thailand; (b) relatively low land and labor costs compared to other major oil palm producing countries such as Malaysia; (c) high export potential; and (d) a strong domestic market for palm oil. However, an important issue that needs to be addressed is the level and structure of tariffs and quotas on vegetable oils. As indicated by Table 4.3, Chapter IV, the effective protection rate of palm oil was negative (-4%) whereas the effective protection rate of other vegetable oils was 18%. To address the strong disincentive effect of the tariff structure, the Government has in 1982 introduced import quotas on palm oil and palm kernel oil which have stimulated the production of palm oil relative to vegetable oils. In order to stimulate the efficient development of the vegetable oils industry, the Government may want to remove these quotas and replace them by tariffs. In view, however, of the strong substitution in consumption of vegetable oils, the tariff reform for palm oil should be implemented as part of a general reform of the protection currently granted to the edible oil industry, included oil seeds used by the livestock feed industry (see Chapter IV, Section B).

Fresh Fruits and Vegetables and Potential for Processing.

22. Thailand produces a wide variety of tropical fruits and vegetables, for which high-value export markets exist. Fresh fruit exports from Thailand rose from \$2 million in 1975 to \$23 million in 1984, but they are still small compared with overall production. So far markets for Thai fresh fruits have been mainly in Asia, with Hong Kong, Singapore and Malaysia accounting for more than 70% of total fruit exports. Other potential export markets for Thailand include the EEC--which increased its imports of fresh tropical fruits from \$86 million to \$100 million in 1980-84, and the US--imports rose from \$8 million to \$41 million during the same period.

23. Constraints. The major constraints to the development of export markets for fresh fruits and vegetables are (i) the lack of a consistent supply of good quality produce; (ii) insufficient quality control; and (iii) health restrictions. An important characteristic of Thailand's fruits and vegetables production is that most produce are grown for the local market

protected by high tariff rates,^{8/} whereas the export and processing markets mostly obtain what is left. As a result, the quality of Thai exports has often been poor and prices relatively high. This is in sharp contrast to Taiwan where producers grow fruits and vegetables specifically for the export market. This situation may, however, be changing as some local businessmen are trying to develop tropical fruit exports to Hong Kong, Singapore and Japan. But to be successful, exporters will have to establish reputations for well packaged consistently high quality goods.

24. The export of fresh produce can be increased through better quality control which is particularly important for Japan--where imports of a number of fruit exports from Thailand are prohibited under the Japanese Quarantine Act for health reasons,^{9/} and the USA where imports of Thai fresh fruits and vegetables are prohibited due to USDA restrictions.^{10/} This is an area where assistance from the Government would be helpful. A specific means to improve quality is through the ionizing radiation of fresh fruits and vegetables which has been approved by the US FDA (at doses of up to 10 kilograms) and successfully applied to papayas and mangoes. Ionizing radiation would result in (a) disinfestation of fruit flies and other insect pests; and (b) extension of shelf-life by restricting the growth of wastage organisms. It would thus address two of the major reasons underlying health restrictions, but the limitation remains, however, that this irradiation must be done in the USA. One of the major advantages of irradiation from the consumer point of view is likely to be its presentation as an additive- or chemical-free agent.

25. Papaya. Compared to production (about 1 million tons), fresh papaya exports have been small (12,600 tons in 1984), but there are good prospects for further expansion of exports as there are no major constraints to increased production. Papaya is easy to grow, matures quickly and is not greatly affected by diseases and pests in most areas of Thailand. The selling of fresh papaya, as with other fruits, on export markets depends upon exporters being able to supply fruit of consistently high quality, which implies that papaya must be treated for post-harvest disease, such as black spot and anthracnose. The biggest potential export market for Thai fresh papaya is Japan, where imports of fresh papaya have grown nearly 20% p.a. Markets also exist in Hong Kong, Singapore and the Middle East. Major competitors for these markets include Malaysia, Indonesia, and the Philippines.

^{8/} Nominal protection rate was 46.4% on vegetables and 93.4% on fruits (see Table 4.2. Chapter IV).

^{9/} It concerns rambutan, mangosteen, melon, watermelon, longan, avacado, loquat, litchi, plum, pomegranate, pomelo, orange and tangerine.

^{10/} The FDA requires a pest risk analysis before imports of fresh produce are allowed. It is unclear if Thailand could get such certification due to the presence of the Mediterranean fruit fly.

26. Markets exist also in Europe and the USA for some papaya products, notably papaya puree, dried papaya and canned papaya. These are at present very small outlets for Thai processed papaya (280 tons in 1984), but they are growing. The US market for dried papaya is met by Taiwan and the Philippines, but Thailand should be able to find a place in this market provided Thai prices are competitive to Philippine prices. There is also a growing market in the USA for tropical fruit purees for making fruit nectars. The consumption of papaya in this form is at present small, but processors would be more interested in papaya if they could obtain the puree in aseptic packaging since with this type of processing the product does not require refrigeration during transport and distribution, and fruit flavor is best preserved.

27. Mango. Until now exports of fresh mangoes have been relatively constant at 3,000 tons per annum since 1978 and the main export markets for Thai mangoes have been Singapore, Malaysia and Hong Kong. Provided competitive air freight rates are available and mango quality is improved, Thai exporters should be able to develop markets for fresh mangoes in Europe and the USA, Europe and Southeast Asia. Expanding sales in the USA will, however, be difficult since the peak Thai mango season (April/May) coincides with the flow of Mexican and Philippine mangoes on to the US market and production from Florida. Better prospects for market development may be in Europe where mango consumption has in recent years been growing at over 20% per annum. The dominance of the Philippines is a constraint to expansion in the Hong Kong market, but attention should be given to recapturing a greater share of the Singapore market for both fresh mangoes and mango puree. Factors affecting Thai exports to Singapore are exporters' reliability, price and quality. Thai exporters must be able to make shipments when committed and they must maintain product quality in all shipments. Singapore importers have also found that Thai prices are high compared with those of comparable products from Taiwan.

28. The market for processed mangoes--canned, juice, puree--is growing and good possibilities exist for Thai manufacturers. Singapore, for example, produces considerable quantities of mango juice from imported mangoes and concentrated juice. Possibilities for supplying mango juice to the Singapore market and to regional markets at present supplied by Singapore should be explored. The growing US market for fruit nectars (a type of pure fruit drink having a higher pulp content than other fruit juices) should also be investigated.

29. Banana production in Thailand currently has no linkages to agro-industries, except for small quantities sent to drying factories. In 1980-84, domestic production of bananas fell by about 30% because of a 16% fall in domestic prices and increased competition from other fruits in the domestic market. Exports of bananas have remained extremely small (about 4,000 tons in 1985 for a value of \$1 million), and nearly all of them goes to Hong Kong. Prospects for increased exports to other markets are extremely slim, as the quality and price of the local varieties do not appear well suited for foreign

markets.^{11/} This is indicated by the recent decline in Thailand's exports of bananas due to strong competition from cheaper, better quality bananas exported by the People's Republic of China, and also by Taiwan and the Philippines.

30. Increased exports of Thai bananas face two major difficulties. The first is the nature of the trade, and the second the quality of Thai bananas, especially the thin skins of traditional varieties. As concerns the first constraint, the mode of supply to exporters is indicative. When bananas are air-freighted, they are usually purchased a day in advance, and exporters have little control over price and quality. When bananas are shipped by sea, they are bought directly from growers but exporters' experience is that growers will sell bananas only at the going market price regardless of any prior informal arrangements. Under present arrangements, Thailand's banana export trade is a marginal aspect of the domestic banana trade, and exporters are not in a position to control either the price or the quality of the product.

31. The second constraint is the thin skins of local banana varieties which render them especially susceptible to damage in transit and therefore make quality control for the foreign market more difficult. In practice, exporters also do not take special precautions with packing, as bananas for export are usually packed only in bamboo baskets. Increased export of banana will have to depend upon a different variety of banana such as the Giant Cavendish variety (usually known as K. Hom Taiwan). Several attempts have been made to grow this variety, but they have not been successful, probably because of poor marketing.

32. Banana production has no present agro-industrial linkages except to small drying factories. Development of banana processing facilities in the future are perhaps problematical as the markets for processed banana products are not large. The principal area for development of the banana industry is, therefore, in the improvement of banana production for the export of fresh fruit. This would require the use of non-traditional varieties that are less susceptible to damage in transit than the varieties kluai hom thong and kluai khai. It would also require the establishment of an improved system of production and marketing in order to increase currently low outputs per rai and to ensure the arrival of a high quality product in the foreign market place. Good possibilities for the establishment of such a system exist in newly irrigated areas.

33. Strawberries have been planted in recent years among hill tribe groups in Chiang Mai and Chiang Rai provinces on about 500 rai (80 ha). Although strawberries are a highly profitable crop for growers compared to most alternatives, the expansion of output is constrained by the relatively

^{11/} In 1985 Thai banana exports to Hong Kong declined due to strong competition from China, Taiwan and the Philippines.

limited areas in which the crop may be grown.^{12/} However, farm yields are low and a doubling of present output could be achieved with advanced technologies.

34. Asparagus is relatively new to the Thai diet and production is small. It is concentrated in the Hubkraphong area of Phetchaburi province and involves about 200 growers in this area. Since a fairly high level of soil moisture is required during the asparagus active growing season, asparagus would be suitable for regions where irrigation is available. Expansion of cultivation into the Western portion of the Mae Klong irrigation area would be thus appropriate as producers would still be close to canning factories drawing from the Hubkraphong area. Asparagus has also been successfully cultivated in Northern and Eastern Thailand. Research on asparagus in the Northeast is still underway.

35. Two types of asparagus may be produced--green and white. Due to limited local demand for fresh asparagus, expansion of production is directly linked to the food processing industry and exports. Prospects for further development are high, supported by the growing demand for canned asparagus in North America, Europe, Japan, and Hong Kong. This seems particularly true at a time when the major supplier, Taiwan, is facing rising labor costs. The US market for local and imported canned asparagus is currently estimated at over 36,000 tons per year. Because the production of white asparagus is a labor intensive activity, all the white-and green-tipped white asparagus, fresh and processed, consumed in the US market is imported. White-tipped is considered to be more desirable and only relatively minor quantities of green-tipped is marketed. (White refers to both types.) White asparagus is regarded in the market as a specialty commodity with low volumes and high prices relative to all green asparagus. The US market for imported white asparagus is rather limited (1,000 tons annually) as the US consumer has converted to the acceptance of all-green asparagus as the common form of the commodity, both processed and fresh. A further characteristic of the US market is that because of rising labor costs the production of canned and frozen green asparagus has declined. This ultimately may lead to the cessation of production of green asparagus in the US, as has already happened for white asparagus. It seems likely, therefore, that there are good opportunities for Thailand to export canned white and canned and frozen green asparagus to the US. Another market to investigate is the European market which consists of green and white asparagus. Since about 80% of Taiwan asparagus production goes to Europe, there may be good opportunities for market development there. The Hong Kong market is also a substantial one for canned asparagus, with current annual demand being estimated at 7,700 tons.

36. So far no marketing constraints have been encountered in the selling of fresh asparagus on the local market as several local canning factories and Japanese food retailing chains are interested in obtaining supplies of

^{12/} The cool climate of the Northern Hill area has been found suitable for strawberries, but because of the climatic conditions required by strawberries, possibilities for production outside the hill areas are limited. At present, strawberries are cultivated on 64 to 80 ha.

asparagus. The principal constraint to expanded production is lack of supply, apparently due to limitations on labor availability and irrigation water in the principal areas of production. Asparagus is also subject to a number of diseases and a few pests, but these are rarely serious. Since the local consumption of fresh asparagus is quite limited, this crop could be developed through technology transfer from private firms. As proven by the successful expansion of other agricultural commodities in Thailand under contract farming, such a transfer can be an effective way for increasing output and reducing production costs. Since the quality of asparagus deteriorates rapidly after harvesting, asparagus production must be located in areas where processing facilities are already available or are being established.

37. Tomatoes have become one of the most important vegetables in Thailand with output increasing by 13.6% p.a. in 1977-84 in response to rapidly expanding markets for both fresh and processed tomatoes (exported with tuna in cans). Most tomatoes produced in the North and Northeast are used in paste manufacturing factories, close to the plantation areas. Tomato paste in bulk pack is then transported to fish canning factories which are located in the central region or in the south of the country. Apart from tomato paste, production of tomato ketchups and tomato sauce are other outlets for tomatoes in Thailand. Only small quantities of juice and canned whole tomato are produced.

38. Major constraints affecting the production of tomato paste include (a) the inferior quality of the tomatoes grown in Thailand; and (b) the need to introduce state-of-the-art processing equipment to increase the quality of Thai tomato products. Tomatoes grown in Italy and California have total solids of 4.5-5 Brix, which in practice means that 6 tons of fresh tomatoes will yield 1 ton of tomato paste after processing. The local tomatoes have about 3 to 4 Brix so that at least 8 tons are needed to produce one ton of paste. It has also been found that varieties of tomato grown from imported seeds are susceptible to pests and disease under local conditions. Considerable adaptive agricultural research is thus required to select suitable varieties of tomato for processing and identify proper cultivation techniques.^{13/}

39. The present tomato paste processing plants in Thailand are built using local-made machineries copied from Italian and US equipment, but the locally-made evaporators do not perform well as the concentration of the paste produced is around 24 to 26 Brix instead of 32 to 35 Brix as in Taiwan, Italy, and the USA. This means that the price of transportation and packaging material is relatively high per unit of tomato. The locally made machinery for tomato paste processing also produces a product of inferior color as the time required to concentrate in the evaporators is longer than in foreign evaporators. These problems are further aggravated by the reportedly low quality of the locally made cans used for packaging tomato paste.

^{13/} An important consideration is that the tomato varieties needed for tomato paste are different from the ones consumed fresh or used to produce solid pack tomato.

40. As a result of these various constraints, exports of tomato paste have remained small, and it seems likely that the main outlet will remain the domestic market. Fresh tomato exports from Thailand have increased from \$1,000 in 1980 to \$0.6 million in 1985, mostly sold to Malaysia and Hong Kong but the average export price of Thai tomatoes has been about 20% below the average price received by all developing countries and 30% below the average world price due to the lower quality of Thai tomatoes. Thailand is a small exporter of tomato products, but it should be possible provided tomatoes are competitively priced and of acceptable quality for Thailand to establish markets for tomato products. It is suggested that Hong Kong, the Gulf states and Saudi Arabia and South Korea offer good market possibilities.

41. Cucumber will grow on a wide variety of soil types, but they should be well drained and contain a high level of organic content. A consistently high amount of moisture is needed during the growing period. Cucumbers are therefore suitable in Thailand for cultivation in irrigated areas. In Thailand, cucumber is largely consumed fresh, although it is an important vegetable, processed in the form of pickles for exports. Two principal varieties are cultivated: the large cucumber, nearly all of which is consumed fresh; and, the dwarf cucumber, which is appropriate for pickling. Since 1983 two factories have been established for the pickling of cucumber and ginger, and salted cucumber was exported to Japan. Besides the Japanese market for pickled cucumber, market opportunities exist for supplying pickled gherkins (young dwarf cucumbers) to the French and other European markets to meet an expanding demand (15% p.a.), which can no longer be met by local production. Three sizes are marketed: 180-200 units per kg; 120-140 units per kg; and 90-100 units per kg. Demand is chiefly for the two smaller sizes of gherkins as the larger size is produced in Greece, Spain and Morocco. One international company has begun tests on the commercial production of young dwarf cucumber (gherkins) in irrigated areas of Thailand. The firm is planning to pickle and export the gherkins to European markets.

42. Agro-ecological conditions are appropriate in several irrigation command areas to produce cucumbers in the dry season to meet export demand. Although farmers have experience growing both large and dwarf cucumbers, an expanded processing industry would require a different quality of cucumber from that grown for the domestic market. To produce pickled cucumber for the international market, research and development is needed to test selected varieties of cucumber. For western markets, gherkins are required and farmers would need some training in the growing of this product for processing factories. Trials to determine the best varieties of cucumbers for processing, suitable to local conditions, and the best cultural practices (including the time of harvest which is critical) would thus be needed.

43. Cucumber production especially for the processing industry would appear to have good prospects for outlets in Japan, Europe and possibly Asian regional markets. However, as with other high value specialty commodities, product quality and packaging requirements of foreign market are high. Exporters must establish and maintain high standards of quality and reliability as sources of supply and of price competitiveness. These marketing constraints apply to salted cucumber as well as to other processed Thai products entering the Japanese market. Similar constraints apply for

exporters wishing to penetrate European markets, especially as there are many potential sources of supply for this product. As Thailand produces large quantities of vegetables, a mixed vegetable pickle containing carrot, cauliflower, cabbage, and chilli, with cucumber as a base, could also be produced for the export market. Pickled carrot and cauliflower, in particular, exhibit good texture and taste. Such products have been well received on the local market, e.g. in Chinese restaurants, and they could readily be tailored to the taste of specific Oriental markets overseas.

44. Chilli Peppers. In Thailand, chillies are mostly regarded as a crop for home consumption. Domestically, chillies are also processed into chilli powder and chilli sauce. Thailand is a net importer of chillies both whole and powdered due to the seasonability of production in Thailand and it exports only small amounts of chillies and chilli products. Chilli production could be expanded in well irrigated areas, but production costs in Thailand have tended to be high relative to import prices, which has discouraged production. The principal constraints to an increase of chilli production include low yields and generally inefficient production and poor post-harvest handling. Overcoming these constraints is necessary to reduce the cost of production and make Thai chillies competitive with those produced in Burma, Indonesia, Pakistan and India.

45. Ginger is used in many countries as food and drink flavoring. In Thailand, fresh ginger is a commonly used spice, whereas processed forms of ginger are mainly for export. A significant volume of ginger is produced in Chiang Rai province and sold to Bangkok processors on a consistent basis for export. There are no significant constraints to the expansion of ginger production in Thailand, but high production costs and low yields presently make Thai ginger on the main international markets (USA, UK, Middle East) uncompetitive with that produced in China and India. A possibly more promising market is the Japanese one for pickled ginger. Thailand, Taiwan and China are the three major exporting countries of this product to Japan. Taiwanese exports have levelled off, but exports from China and Thailand (\$18 million in 1985) have increased.

Canned Fruits and Vegetables

46. Canned fruit exports rose from \$17 million in 1975 to \$128 million in 1985, but canned pineapple exports accounted for nearly all of it (\$121 million). Since 1984, Thailand has been the world's largest exporter of canned pineapple and this continues to be seen as a promising area for future export growth. Major export markets are the USA, West Germany and Canada. Exports to Japan have been limited due to high tariffs and import quotas. Non-pineapple canned fruits have been exported mainly to Asian markets, but amounts have remained small since tropical canned fruits are now only becoming popular among Asians. Nevertheless, there is a probably a market in the US and the EEC for canned tropical fruits. Little also seems to have been done in the area of frozen fruit processing, although one firm is now doing pilot work in the area of fast freezing of ready-to-eat tropical fruits for eventual commercial export to France.

47. Canning of bamboo shoots, mushrooms, baby corn, water chestnuts and asparagus and tomatoes is also seen as an area with significant growth potential. Cultivation and subsequent processing of these crops are very labor intensive, and Thailand, because of its low labor costs, should have a comparative advantage in their production. Taiwan is the major exporter of these products and it is felt that Thailand should be able to secure additional market share as Taiwan's labor cost increases.

48. The major constraints to growth appear to be (a) lack of consistent quality raw materials; (b) price; (c) processing technology; and (d) packaging. Since most fruits and vegetables are grown by small farmers, they lack uniformity in quality, and post-harvest technology is rarely employed which results in further quality decline. In other instances, quantity rather than quality is the main constraint. This is particularly the case for asparagus and other specialty vegetable crops which are not available in sufficient quantities to meet the demand of processors. To overcome this, processors must develop their own source of supply either by establishing and managing their own plantations, and/or by working closely with contract farmers (see Chapter III, Section D). This is a costly process which requires the firm's commitment and constitutes a considerable entry barrier to a foreign investor.

49. Price together with quality is the second constraint affecting the export of Thai canned fruits and vegetables. A major issue to be decided by private firms is whether increased quality would result in a price sufficiently competitive with other foreign producers for Thailand to export more. There does not appear to be a clear-cut answer to this issue as the required quality of the product is highly market specific. For example, Thai-owned pineapple canneries sell mostly on the European market because the European consumers seem to prefer the lower-priced, lower-quality product that the Thai canneries are set up to produce. However, an important market for Thai pineapple has also been the USA, which has received about 50% of Thailand's production. About half of Thailand's exports to the USA is in the form of relatively high quality canned pineapple.

50. Overall, it would seem that in order for Thailand to increase its exports of canned fruits and vegetables, efforts should be made to export higher quality products through better processing (in addition to the low or medium quality products being exported). Currently, fruits and vegetables are processed by using a pressure cooker or a still retort, which gives somewhat low-quality products as it requires a relatively long time to destroy micro-organisms. The quality of the products could be improved significantly through the use of a rotary retort with continuous operation, as a shorter heating time is required. At present, only some of the big pineapple factories have rotary retorts as they require a large investment.

51. Another area of needed technological innovation concerns packaging which could be improved by using glass bottles of various sizes and shapes to package fruits and vegetables, and better cans. Glass bottles are becoming very popular especially in European and US markets because they allow the content to be visible. Although products in glass bottles command high prices, only a few Thai factories can pack vegetables in glass containers as this requires some skill during heat treatment to avoid breaking the glass

containers. The second constraint affecting packaging is the lack of good quality packaging materials. Locally produced cans and tin plated containers are adequate for domestic consumption when the product is subject to rapid turn-over, but when the same quality of cans is used for exports, leakage, rust, internal corrosion, and spoilage are reportedly frequent, which has resulted in the rejection of shipment by overseas importers.

Dried Fruits and Vegetables

52. Dried fruit and vegetable exports from Thailand have been small (about \$2 million in 1984) although international markets exist for dried banana, mango, and papaya. A constraint to the marketing of dried fruits and vegetables is that they are subject to insect infestation when stored under unsuitable conditions. A second difficulty facing exporters of dried fruits and vegetables is that there are many relatively small markets for these products, which require an extra degree of marketing effort. However, production of dried fruits would be well adapted to hill tribe areas, and a growing demand exists in several Western countries for dried fruits and vegetables which are perceived as a more natural alternative to other forms of processing. Although this is a narrow market, often limited to gourmet foods, it is a high value market which can absorb the high cost of producing such dried commodities.

Fruit and Vegetable Juices

53. Fruit and vegetable juice exports from Thailand grew from \$0.4 million in 1975 to \$12 million in 1985, but most of it came from pineapple juices. Production levels are a function of overseas demand and there does not appear to be any significant constraints. Upgrading Thai technology further by using aseptic packaging of fruit juices and purees would put Thai producers in a good position to compete in expanding tropical fruit juice, concentrate and puree markets.

Aquaculture and Fishery Products

54. Seaweed. Thailand presently exports small amounts of seaweed, 182 tons in 1985 valued at \$32 million. All of it comes from the exploitation of naturally growing populations, which have dramatically declined in the past twenty years due to environmental causes and overexploitation. The Department of Fisheries has recently begun research into the commercial production and processing of seaweed under controlled management conditions. Seaweed farming is a labor intensive process which could provide supplementary income for coastal fishermen and their families. If successful, the development of seaweed farming could lead to increased exports of seaweed and reduced import of agar. Currently, the world seaweed industry (excluding China) processes various seaweed species (about \$60 million) into various products such as agar--which is imported by Thailand (\$3-4 million per year). Although there is no agar processing plant in Thailand, it does not seem justified to build such a plant in Thailand. As a result, prospects for development of seaweed are linked to growth of local and foreign markets for seaweeds.

55. Catfish. Both Clarias batrachus and Clarias macrocephalus are very popular fish in Thailand and have been cultured for many years. Traditionally, these catfish were obtained from natural sources such as paddy fields during harvest and canals, but supply from these sources has been adversely affected by the use of agricultural pesticides and the filling up of canals for road construction. This development has encouraged the culture of catfish in ponds, though natural catches still make up the bulk of the catfish marketed in Thailand. Annual pond production of Clarias reached over 10,000 tons in 1974, but fell to about 3,000 tons in 1984 due to the increasing cost of production and major disease problems. Catfish caught from natural water sources totaled over 13,000 tons. The industry is currently going under a major restructuring and many inefficient farmers are changing occupations.

56. Catfish has good prospects for expansion as the consumption of fish is increasing rapidly in Thailand and in countries such as the US where processors are looking to foreign countries to supply the demand. Several of the American fast food chains are offering fried catfish on their menus and suppliers are looking at Thailand as a possible source of fish flesh. One such American supplier is now investigating the feasibility of producing catfish under managed production methods as opposed to either having processor-owned farms or buying from the Bangkok fish market. As the American market requires a breaded fillet suitable for frying, it will be necessary to construct a processing plant capable of filleting and applying the appropriate breading prior to freezing and packing. There is also a demand for catfish in other markets. Live catfish are now shipped to Hong Kong and Singapore, and frozen catfish to the US, Europe, the Middle East and Japan. Current exports of catfish are primarily to supply the demand of the Asian populations in the importing countries as the fish are shipped "heads on".

57. Production of catfish could be increased through fish farming as seed fish travel well and can be shipped long distances with minimal fatalities if handled well. The availability of trash fish could be a limiting factor if the site is located far from a seaport though there are poultry processing plants in many areas of the country and pelletized feed is available in all provinces. Many catfish farmers are also owners or operators of rice lands and/or orchards, and they raise hogs close to the fishponds. These individuals use the water from their fish ponds on their crops as pond water is high in organic nutrients. Fish farming is ideal as one component in an integrated farming system.

58. The expansion of catfish culture faces, however, a number of constraints. The most important are lack of sufficient water during the dry season in some areas, disease, cost of credit and the rising cost of inputs coupled with decreasing prices for catfish. Disease is by far the biggest

constraint,^{14/} since biologists have yet to identify a single treatment and medication often amounts to half the cost of feed. The second constraint--the cost of credit--comes from the large share of feed, seed fish and fuel in total production cost (about 80%). Most inputs must be paid in cash, although occasionally the broker of trade fish is also a broker for catfish and credit can be obtained from him when backed up by the fish crop. The third constraint concerns the price of catfish which has fallen since 1980. This, however, may be the consequence of technological progress and is not inconsistent with high profit at the producer level.

59. Shrimps. Thailand's shrimp industry is already quite important, but it is on the verge of significant additional growth. Among the world's leading exporters of shrimps, Thailand ranked sixth in 1984. In 1986 its exports of frozen shrimps rose to \$167 million largely as a result of a sharp increase in exports to Japan. Most shrimps are exported frozen, although Thailand exports some shrimps in canned and dried forms. Perhaps the most important reasons why Thailand has been successful in exporting shrimps are that exports by other countries were not sufficient to meet the expanding Japanese and US demand, and Thailand has responded quickly to fill the supply gap by increasing frozen shrimp exports from 4,880 tons in 1965 to 28,717 tons in 1986. Important factors accounting for the rapid increase in supply have been Thailand's skilled fishing fleet, low wages--one of the crucial cost factors in processing shrimps, and the 1986 rise in domestic price provided by the appreciation of the yen with respect to the baht.

60. The Thai shrimp industry is based on trawling (160,981 tons in 1983), but there is an acute shortage of shrimps in the waters where Thai fishermen travel. As a result of strong demand growth, it is expected that production of cultured shrimps (13,200 tons in 1985) would increase.^{15/} Most of the more than 5,000 shrimp farmers own only one pond which is managed extensively by using very little inputs. Although the yield has been low, the production cost has also been low compared to the ex-pond price thus leaving room for a large profit. With strong international demand, more intensive methods would seem to be justified.

61. Key constraints such as shortage of fry, cost of credit, and lack of knowledge by farmers could be addressed through increased involvement of private firms in shrimp farming. Several large companies are already involved in prawn farming, the most notable one being a joint venture between Charoen Pokphand, the largest agro-industrial company in Thailand, and Mitsubishi of

^{14/} Recently researchers have linked a virus to a prevailing disease known as "epizootic ulcerative syndrome." The disease, characterized by large ulcers on the fish's body was previously believed to be caused by pesticides, fertilizers and other chemicals. It may ease with time as fish develop immunity.

^{15/} As shown by the experience of other countries such as Ecuador shrimp farming can play a major role. In 1983, Ecuador had 40,000 ha in shrimp farming and 12,000 ha under construction.

Japan to develop a prawn species called "Peneaus Monodon" or tiger prawn for export to Asian countries. In the initial stage baby prawns will be sold to farmers, and in the second stage the company will look towards integrated prawn farming which, it hopes, would be achieved in three years. The comparative advantage of Thailand is that (i) prawns can be farmed all-year-round (unlike Taiwan); (ii) production costs are about 30% to 40% cheaper than Taiwan; and (iii) Thailand produces fishmeal at a competitive price. As a result of the new technology that will be introduced, yields are expected to rise from 60 kg per rai per year to more than 300 kg.

Livestock

62. Poultry. The growth of the poultry sector over the past ten years is one of Thailand's agribusiness success stories. The industry has moved from a backyard small farm enterprise to a fully commercialized industry with 65 million tons exported and export earnings of \$114 million in 1986. In 1985, Japan absorbed about 90% of the exports, but new markets are being developed in West Germany and the Netherlands. Growth in the Japanese market is expected to increase further with a drop in duty on Thai deboned chicken from 18% to 14% and on chicken that has not been deboned from 11.3% to 10%. There are no exports of frozen chicken to the US due to an FDA prohibition.^{16/}

63. Charoen Pokphand (CP) is the major poultry processor in the country with two factories operating at full capacity. They began as a feed mixing operation and have integrated downstream into poultry and swine, and upstream into field crops. In poultry, CP does the breeding, hatching and processing, while contract farmers raise the chickens using CP inputs and technology. The poultry operation is a joint venture with Arbor Acres, US. This approach was chosen by CP in order to share the risk and ensure that the foreign partner has a stake in the success of the venture. But finding the correct model to work in Thailand took time as did developing markets.

64. Pork and Beef. The Animal Slaughtering and Meat Sale Control Act of 1959 enforced by the Ministry of Interior has had a severe impact in limiting the growth of the pork and beef industries in Thailand. Among other things,

^{16/} In addition to not meeting US processing standards, Newcastle disease is endemic to Thailand. However, the Malaysia's University of Agriculture and Australia's University of Queensland have developed a low cost vaccine. In a joint project funded by the Australian Center for International Agricultural Research, they have produced a live vaccine that farmers can spray onto chicken-feed pellets. Results of the field tests of the new vaccine carried out in Southeast Asia are promising. Pilot studies suggest that simply throwing the coated feed on the ground is enough to immunize some chicken.

the Act stipulates that: (a) a permit from local government is needed to build a slaughterhouse; once the slaughterhouse is built, its ownership is transferred to the local government which, however, may appoint the builder to operate it; (b) carcasses from each slaughterhouse cannot be shipped outside the legal market area of the slaughterhouse; and (c) all animals slaughtered must have been inspected and granted a slaughtering permit for which a fee must be paid. Such permits are given only the day prior to slaughtering. The reasons given for these requirements were to ensure sanitary inspections so as to protect public health and increase local revenues.

65. In early 1987, the Government liberalized restrictions on private investment in slaughterhouses provided the firms received BOI promotion status. The slaughtering fee was dropped, and earlier requirements on the volume of exports and size of investment were reduced. A number of constraints still must be addressed. First, there is a need to launch a program to prevent and eradicate foot-and-mouth disease. This would require a sharp increase in the current and future production of vaccines by the Department of Livestock, since the current vaccine production is too low to vaccinate all cattle.^{17/} As indicated by the rapid development of the poultry sector and its successful control of potential health problems, a key ingredient for improvements in the livestock sector would be to facilitate investments by private firms in modern slaughterhouses and expansion of contract farming. Key measures to that effect would be to (i) repeal the Animal Slaughter and Meat Trade control Act of 1959; (ii) allow free domestic trade in livestock and remove current zonal restrictions on meat trade; and (iii) remove current restrictions (prohibitions or licensing) on exports of swine and/or meat. Under this new framework, there would still be a need for veterinary inspections for animal diseases and sanitary inspections of slaughterhouse, but they would be carried out respectively by the Department of Livestock and the Ministry of Health. To protect against animal disease epidemics, controls on the meat trade would be imposed only upon evidence of an animal disease epidemic in a specific area. These controls would be decided by the Livestock Department.

66. Specific constraints that may prevent the expansion of swine exports are the local cost of feed and the selection of good breed. Since 70% of the cost of raising swines comes from animal feed costs, the price of animal feed, and in particular of soybean meal, is an issue. One solution would be for Government to reduce the protection granted to soybean meal and other needed raw material inputs (current import duties range from 15 to 30%). Another solution, which would be less satisfactory (since it would not lead to a fall in the production cost for sale on the domestic market) would be to allow duty-free imports of soybean meal for swine exports.

^{17/} At present, the Livestock Development Department can produce only 10-12 million doses annually for the prevention of the foot-and-mouth disease. It has approved a project to increase production up to 40 million doses, but this would be sufficient to vaccinate only 70% of the animals.

67. Should there be reform it is felt that there is good potential for growth of the pork industry, in particular, and of the cattle and buffalo industry to some extent. Major export markets for swine would be Hong Kong (3.2 million swines a year are imported) and Singapore. The Singapore market may be quite important (1 million swine a year) since the Government has decided to abolish local swine production by 1988. There is thus an excellent opportunity for Thailand to expand swine exports. Thailand may also have a good potential for development of the cattle sector to meet the increasing domestic demand for high quality meat. A constraint on increased production is the lack of forage during the dry season. One possible solution would be for farmers to set aside a small piece of land for animal feed production and to supplement this with appropriate animal feed stuff. This approach has been successfully applied in a livestock cooperative in Northeast Thailand, but its commercial viability (without subsidies) would have to be further investigated. In addition, the use of processing byproducts such as molasses in foodstuff would also have to be explored. In view of the importance of these constraints for small farmholders, the Government may want to further examine these issues.

68. The development of the cattle subsector would be particularly important for the Northeast where natural conditions (poor soils) limit the extent to which crop diversification away from cassava, sugarcane and kenaf can be carried out in rainfed areas. Increased irrigation to raise yields and income is not a general solution since there are few permanent rivers, and irrigation would increase the risk of salinity (30% of agricultural land in the Northeast has salinity problems). For this reason, the potential for diversification seems to be limited to the cultivation of new crops in irrigated areas during the dry season, and expansion of the livestock sector. Since the Northeast has already a large animal population, it would seem that livestock has a good prospect for further growth in this region.

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THAILAND

AGRO-INDUSTRIAL DIVERSIFICATION: ISSUES AND PROSPECTS

(TRANSLATION)

Announcement by the Ministry of Agriculture and Cooperatives

Subject: An Implementing Framework for Participation of Private Sector Agricultural Development Firms in Irrigation Command Areas.

During a meeting held on March 27, 1985, between the Ministry of Agriculture and Cooperatives and private firms in an effort to solve certain economic problems, it was concluded that some implementing framework be set up for private enterprises wishing to participate in agricultural development projects and expanded to provide wider scope for participants. Thus, the previous Announcement made by the Ministry of Agriculture on January 3, 1985 is hereby canceled, and a new framework is set as follows:

- (a) Any farmers who wish to participate in the Project should do so of their own free will.
- (b) Any project submitted by a private enterprise should state definite objectives to increase the income of participating farmers to an appropriate level, with plans for crop production and marketing so that they have regular incomes.
- (c) Farmers shall not suffer the loss of land-holding rights to the private enterprise, including the right to enjoy all benefits provided by the Government.
- (d) The private enterprise must guarantee marketing and other services to farmers who participate in the project.
- (e) The private enterprise shall provide training in modern agricultural technology to the participants throughout the period of the project.
- (f) The implementation of each project by the private enterprise must not conflict with the legal right to enjoy all the benefits of the Government's investment in infrastructure by individual farmers in nearby areas, specifically those not participating in the project.
- (g) The project must encourage cooperation among farmers; to form groups in order to participate with private enterprise in the form of organized farmer institutions relating to the irrigated agriculture development program.
- (h) The proposed project by the private enterprise must not be monopolistic in nature and must encourage free competition among participants. This competition means providing production and marketing services in order to encourage farmers to join the project, leaving

them freedom to withdraw when the contract has expired and permitting them to join another private enterprise.

Government's Role in Agricultural Development Projects with the Participation of Private Enterprises and Farmers

Any project which follows the implementing framework described above will receive priority consideration from the Government which will also provide the following assistance:

- (a) Promote and provide necessary facilities for crop production to the farmers, e.g., credit, fertilizer and insecticides.
- (b) Technical officers for the training of participating farmers.
- (c) Research plot in collaboration with private enterprises using various cultivation techniques for demonstration to farmers.
- (d) Provide an irrigation system which is appropriate for the project area.
- (e) Select an irrigation system which is appropriate for the project area.
- (f) Provide publicity so that farmers can understand their roles and the benefits which they are entitled to receive from the project. This service includes collecting data, making reports concerning production and marketing situations, the irrigation system and the appropriate area for the cultivation of each crop in the project area.
- (g) Coordinate signing of contract agreements between farmers and private enterprise, including the enforcement of contract conditions for the mutual benefit of both parties.

Any private enterprise wishing to participate in any irrigation area can do so by contacting the Director of the Project, the Director of the Regional Irrigation Office or the Chief Technician concerned, appointed by the Ministry of Agriculture and Cooperatives for that particular area, so that a project proposal can be submitted for consideration by the Irrigation and Agricultural Development Committee.

Announced on April 15, 1985

(Mr. Narong Wongwan)
Minister of Ministry of Agriculture
and Cooperative

THAILAND

AGRO-INDUSTRIAL DIVERSIFICATION: ISSUES AND PROSPECTS

Public Sector Initiative - Lam Nam Oon Model

1. Even though the private sector is dynamic in production marketing, major private sector impact has not been felt in remote areas because of the lack of physical and institutional infrastructures. One particular project where the public sector is actively involved in encouraging private companies' investments is the Lam Nam Oon (LNO) irrigation project in the Northeast. The Lam Nam Oon Irrigated Rural Development Project, financed in part by a US\$4.5 million loan from the United States Agency for International Development, was implemented in the irrigation command area of the Lam Nam Oon Basin of North-east Thailand beginning in 1979.
2. Since 1984/85, government active involvement in encouraging private sector investments at LNO has resulted in bringing in five private companies to establish branches at LNO to research and develop nontraditional crop production in the dry season. Nontraditional crops that are currently produced under contractual arrangements between the firms and farmers include hybrid tomato and cantalope seeds, young ear corn, and tomatoes. Other crops with potential include asparagus, sweet corn, gherkins, string beans and peas. Though private and public sectors involvement at LNO in nontraditional agro-industry is at its pilot stage, valuable insights are available, particularly with respect to the possible role of Government in similarly remote areas in Thailand.
3. At LNO, the Government has provided excellent physical infrastructure such as good roads linking LNO to terminal markets in Bangkok, and regional airports in Khon Kaen and Sakon Nahkon. Irrigation water is available for 185,000 rai in the wet season, and 63,000 rai in the dry season. Because of the low cropping intensity during the dry season, potential for increased nontraditional crop production exists. Housing and other modern amenities are also available for firms.
4. As concerns the institutional aspect, the Government, through the Royal Irrigation Department (RID), has assumed new responsibilities. In addition to RID's traditional role of maintaining the irrigation system in good working conditions, the RID staff at LNO has promoted the concept of contract farming. In essence, the Government facilitates the contractual arrangements between the firms and farmers in matters concerning price, quality standards and contract disputes. To trim down bureaucratic red tape, a one-stop shop to coordinate the various government agencies involved in agro-industries is available. Government agency coordination in research projects, training and extension services in conjunction and anticipation of private sector needs is crucial at this stage because most of the nontraditional crops introduced are new to the traditional rainfed-glutinous rice farmers. These initial support services are necessary not only to train the farmers, but at the same time to provide incentives for private firms to venture into LNO. Government activities at LNO point to the need of government involvement at the district or

project level so that they are more attuned to the field problems. Cost recovery for on-farm irrigation works are in the planning stage and would be implemented if the farm operations are profitable over a certain period of time. Initial government's support services would eventually be handled over to the private sector once the business relationship with farmers are established.

THAILAND
AGRO-INDUSTRIAL DIVERSIFICATION REPORT

Gross Domestic Product at 1972 Prices by Sector of Origin - 1960-85
(%)

	Distribution						Compound annual growth rates				
	1960	1965	1970	1975	1980	1985	1960-65	1965-70	1970-75	1975-80	1980-85
Agriculture	40.5	36.4	32.1	30.5	24.9	23.2	4.8	6.0	5.1	3.2	3.8
Mining	1.3	1.7	1.7	1.2	1.6	1.6	13.6	8.5	-0.6	14.0	4.7
Manufacturing	11.8	14.4	15.5	18.1	20.7	20.8	11.5	10.3	9.6	10.5	5.4
Of which:											
Processed food	4.1	3.7	3.2	3.1	2.9	3.1	5.0	5.4	5.7	6.4	6.8
Beverages	1.2	1.5	2.0	1.6	2.0	1.9	11.6	14.9	2.0	12.0	3.6
Tobacco & snuff	1.6	1.7	1.6	1.7	1.6	1.2	9.5	6.8	7.5	6.0	-0.7
Textiles	0.6	1.5	1.4	2.5	3.0	3.2	28.7	7.2	18.6	11.8	6.2
Wearing apparel except footwear	0.9	0.8	0.7	1.3	1.9	2.4	3.4	6.8	19.8	15.6	10.3
Leather & leather products & footwear	0.1	0.1	0.2	0.2	0.1	0.1	7.7	26.7	6.9	-0.6	10.9
Wood & cork	0.6	0.7	0.5	0.5	0.3	0.3	13.4	-0.2	5.2	-2.6	4.3
Furniture & fixtures	0.1	0.2	0.2	0.1	0.1	0.1	15.3	9.0	2.7	5.7	9.2
Paper & paper products	0.0	0.1	0.1	0.2	0.3	0.3	24.6	27.4	13.3	24.6	4.2
Printing, publishing & allied industries	0.4	0.4	0.3	0.5	0.6	0.5	7.4	6.5	14.7	10.2	2.3
Chemicals & chemical products	0.8	0.8	1.0	1.0	1.7	1.8	8.1	12.0	6.1	20.5	6.7
Petroleum refining & petroleum products	0.0	0.6	0.9	1.4	1.1	0.8	264.7	17.0	14.5	2.2	0.0
Rubber & rubber products	0.1	0.1	0.2	0.4	0.6	0.4	15.4	31.8	19.3	12.3	-2.7
Nonmetallic mineral products	0.3	0.6	0.8	1.1	1.2	1.2	18.8	15.8	13.2	9.1	6.7
Basic metals industries	0.1	0.1	0.3	0.2	0.2	0.2	16.7	38.1	0.9	11.7	-1.1
Metal products	0.0	0.1	0.3	0.2	0.2	0.2	24.3	35.8	1.6	5.9	5.6
Machinery	0.1	0.2	0.4	0.3	0.4	0.4	32.0	22.7	2.8	12.5	7.1
Electrical machinery & supplies	0.1	0.1	0.2	0.2	0.4	0.4	18.5	22.1	8.5	20.9	4.6
Transport equipment	0.6	0.9	0.8	1.2	1.6	1.6	13.6	7.1	15.1	14.7	5.2
Miscellaneous	0.1	0.2	0.4	0.4	0.5	0.6	16.9	27.2	7.7	11.2	12.1
Construction	4.8	5.7	5.8	4.2	5.7	4.6	10.9	8.8	0.5	14.3	1.2
Others	41.6	41.8	44.9	46.0	47.2	49.7	7.2	10.2	6.8	8.1	6.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	7.1	8.6	6.2	7.5	5.3

Source: National Economic and Social Development Board.

THAILAND

AGRO-INDUSTRIAL DIVERSIFICATION REPORT

Manufacturing GDP - 1970-85: Values, Shares and Growth Rates

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Values (1972 B million)																
Agroprocessing	10.2	9.9	10.3	11.4	12.8	13.0	15.0	16.9	17.6	19.8	19.1	19.5	20.6	21.0	23.2	23.3
Of which:																
Food processing	4.8	5.2	5.2	5.4	6.0	6.3	7.3	8.4	8.4	8.9	8.6	9.2	10.9	10.4	11.6	11.9
Beverages	3.0	2.2	2.5	3.0	3.7	3.3	4.0	5.0	5.6	6.8	5.9	5.4	5.6	6.3	7.3	7.0
Tobacco & snuff	2.4	2.5	2.6	3.0	3.1	3.4	3.7	3.5	3.6	4.1	4.6	4.9	4.1	4.3	4.3	4.4
Other light industries	5.8	7.0	8.0	9.1	10.2	11.5	13.2	14.2	16.5	17.7	20.0	22.0	23.5	25.2	26.4	28.6
Heavy industries	7.3	8.3	9.6	11.0	11.4	12.3	14.3	17.0	18.4	20.3	21.5	23.0	23.2	26.1	27.5	27.0
Total Manufacturing GDP	23.3	25.2	27.9	31.5	34.4	36.8	42.5	48.1	52.5	57.8	60.6	64.5	67.3	72.3	77.1	78.9
Shares of Manufacturing GDP (%)																
Agroprocessing	43.8	39.3	36.9	36.2	37.2	35.3	35.3	35.1	33.5	34.3	31.5	30.2	30.6	29.0	30.1	29.5
Of which:																
Food processing	20.6	20.6	18.6	17.1	17.4	17.1	17.2	17.5	16.0	15.4	14.2	14.3	16.2	14.4	15.0	15.1
Beverages	12.9	8.7	9.0	9.5	10.8	9.0	9.4	10.4	10.7	11.8	9.7	8.4	8.3	8.7	9.5	8.9
Tobacco & snuff	10.3	9.9	9.3	9.5	9.0	9.2	8.7	7.3	6.9	7.1	7.6	7.6	6.1	5.9	5.6	5.6
Other light industries	24.9	27.8	28.7	28.9	29.7	31.3	31.1	29.5	31.4	30.6	33.0	34.1	34.9	34.9	34.2	36.2
Heavy industries	31.3	32.9	34.4	34.9	33.1	33.4	33.6	35.3	35.0	35.1	35.5	35.7	34.5	36.1	35.7	34.2
Total Manufacturing GDP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Growth Rates (%)																
Agroprocessing	-	-2.9	4.0	10.7	12.3	1.6	15.4	12.7	4.1	12.5	-3.5	2.1	5.6	1.9	10.5	0.4
Of which:																
Food processing	-	8.3	0.0	3.8	11.1	5.0	15.9	15.1	0.0	6.0	-3.4	7.0	18.5	-4.6	11.5	2.6
Beverages	-	-26.7	13.6	20.0	23.3	-10.8	21.2	25.0	12.0	21.4	-13.2	-8.5	3.7	12.5	15.9	-4.1
Tobacco & snuff	-	4.2	4.0	15.4	3.3	9.7	8.8	-5.4	2.9	13.9	12.2	6.5	-16.3	4.9	0.0	2.3
Other light industries	-	20.7	14.3	13.8	12.1	12.7	14.8	7.6	16.2	7.3	13.0	10.0	6.8	7.2	4.8	8.3
Heavy industries	-	13.7	15.7	14.6	3.6	7.9	16.3	18.9	8.2	10.3	5.9	7.0	0.9	12.5	5.4	-1.8
Total Manufacturing GDP	-	8.2	10.7	12.9	9.2	7.0	15.5	13.2	9.1	10.1	4.8	6.4	4.3	7.4	6.6	2.3

Source: National Economic and Social Development Board.

THAILAND

AGRO-INDUSTRIAL DIVERSIFICATION REPORT

Value Added of Food, Beverage and Tobacco at Current Prices
(As % of total value added)

	1970-74	1975-79	1980/81	1982/83	1984/85
Food	53.7	55.1	52.5	48.7	46.0
Slaughter houses	6.1	8.6	9.3	8.0	5.6
Preserving of meats	0.8	0.8	0.8	0.8	0.7
Milk and butter, etc.	2.5	3.0	3.8	3.8	3.6
Ice cream	0.2	0.6	0.9	1.4	1.5
Preserving of fruits & veg.	1.5	1.5	1.6	1.8	1.4
Preserving of fish & seafood	1.0	0.9	0.8	1.1	1.2
Glycerin, veg. & animal oil	1.3	1.0	0.8	0.7	0.8
Rice mills	15.8	10.8	13.8	7.8	10.1
Flour mills	2.1	6.0	3.2	3.9	2.7
Grain mills, not flour	0.0	0.0	0.0	0.0	0.0
Bakery products	1.2	1.2	1.8	2.0	1.6
Rice noodles	0.5	0.5	0.6	0.9	1.0
Sugar mills & refinery	7.2	10.3	6.6	8.0	6.3
Palm & cane sugar	0.9	0.7	0.7	0.7	0.7
Syrup making	0.0	0.0	0.0	0.0	0.0
Confectioneries	0.2	0.1	0.1	0.1	0.1
Animal feeds	1.2	1.5	1.5	2.2	2.0
Monosodium glutamate	1.2	1.9	1.2	0.7	0.6
Ice factories	7.1	2.3	1.8	1.9	2.7
Bean curd	0.1	0.1	0.1	0.1	0.1
Soy sauce	0.2	0.1	0.0	0.1	0.1
Fish soy making	1.4	1.1	1.0	1.0	0.9
Food & fruit canning	0.7	1.6	1.6	1.4	2.0
Miscellaneous food	0.5	0.4	0.4	0.3	0.3
Beverage	23.5	24.3	26.0	28.9	32.8
Tobacco	22.8	20.6	21.4	22.4	21.2
<u>Total Value Added</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

Source: National Economic and Social Development Board.

THAILAND

AGRO-INDUSTRIAL DIVERSIFICATION REPORT

Gross Domestic Product Originating from Agriculture at 1972 Prices
(Growth rate, % p.a.)

	1970-75	1975-80	1980-85
<u>Crop</u>	<u>5.3</u>	<u>3.7</u>	<u>4.2</u>
Paddy	3.3	1.5	3.9
Rubber	4.3	7.4	7.6
Coconut	-4.0	6.3	5.3
Sugarcane	25.3	7.1	13.0
Maize and sorghum	15.3	6.3	9.0
Groundnut	1.0	-1.9	0.8
Mung bean	-2.9	6.7	7.8
Castor bean	-7.3	-1.7	-1.3
Soy bean	28.4	-2.5	15.8
Cassava	25.3	22.1	4.1
Tobacco	17.9	2.8	-1.1
Cotton	6.9	39.6	17.3
Kenaf, jute and ramie	-2.2	-0.6	1.8
Kapok	0.7	-4.6	4.2
Sesame	15.5	9.4	-8.5
Garlic, onion, shallot, chilli	2.9	-3.0	0.9
Vegetables	4.8	2.1	4.6
Fruits	5.7	8.3	1.6
Other crops	7.8	7.9	6.1
<u>Livestock</u>	<u>8.0</u>	<u>4.1</u>	<u>4.2</u>
Cattle and buffaloes	2.0	1.4	2.9
Swine	8.4	0.8	0.6
Hens, ducks and other poultry	8.4	6.0	5.9
Eggs	18.0	7.9	5.2
Dairy products	19.2	11.3	15.2
Others	0.1	-0.7	50.8
<u>Fisheries</u>	<u>3.0</u>	<u>2.6</u>	<u>3.0</u>
Marine fish	1.5	4.7	4.0
Freshwater fish	8.2	-0.5	-0.4
<u>Forestry</u>	<u>3.7</u>	<u>0.1</u>	<u>3.3</u>
<u>Total Value Added</u>	<u>5.2</u>	<u>3.3</u>	<u>3.9</u>

Source: National Economic and Social Development Board.

THAILAND
AGRO-INDUSTRIAL DIVERSIFICATION REPORT

Selected Principal Exports - 1970-85
(B million)

	1970	1975	1979	1980	1981	1982	1983	1984	1985
Traditional Agro-products	8,231	25,893	49,518	58,391	73,313	75,560	63,946	72,543	66,587
Rice	2,516	5,852	15,592	19,508	26,366	22,510	20,157	25,932	22,523
Rubber	2,232	3,474	12,351	12,351	10,841	9,490	11,787	13,004	13,567
Maize	1,969	5,705	5,644	7,299	8,349	8,330	8,486	10,147	7,700
Tapioca products	1,223	4,597	9,891	14,887	16,446	19,752	15,387	16,600	14,969
Sugar	94	5,696	4,797	2,975	9,572	12,932	6,338	5,222	6,247
Tobacco leaves	197	569	1,243	1,371	1,739	2,546	1,791	1,638	1,580
Total Nontraditional Agro-products	1,101	5,053	15,868	1,371	20,829	24,326	22,736	29,887	35,155
Other Crops, Fruits & Vegetable Products	636	2,050	4,709	5,373	6,943	7,886	6,671	8,229	9,878
Mung beans	255	465	1,375	1,448	1,693	1,915	1,552	1,778	2,284
Sorghum	103	482	495	661	904	928	790	809	1,048
Fresh fruits	22	88	215	275	426	657	525	567	684
Natural orchids	4	-	373	422	402	334	354	391	488
Raw cotton	17	21	88	343	267	627	268	228	211
Coffee	1	-	127	173	231	352	452	527	883
Kapok fiber	134	169	264	255	285	229	250	220	230
Canned pineapple	55	346	1,244	1,432	2,039	1,993	1,871	2,846	3,292
Molasses	45	478	528	364	696	851	609	863	758
Other Agro-Processed Products /a	115	1,145	3,825	4,225	4,517	5,077	5,383	6,971	7,494
Seafood Products	332	1,839	6,706	6,583	7,859	9,689	10,682	12,910	15,932
Prawns	224	891	2,372	1,961	2,136	2,764	3,164	2,799	3,439
Fresh cuttlefish	38	513	1,471	1,301	1,336	1,784	1,637	1,693	2,120
Fish meal	35	136	884	972	1,014	701	785	743	605
Fresh fish	35	122	399	381	767	689	686	1,017	1,376
Dried cuttlefish	-	103	362	378	488	607	630	800	1,046
Canned fish	-	34	374	603	1,109	1,665	2,116	3,696	5,203
Canned crustaceans	-	40	844	987	1,009	1,479	1,664	2,162	2,143
Animal Products	18	19	628	791	1,510	1,744	1,312	1,777	1,851
Unworked feathers	18	10	111	135	323	434	366	357	384
Frozen fowl	-	9	517	656	1,187	1,310	946	1,420	1,467
Other Manufactured Products	2,145	6,211	25,682	33,926	35,456	35,247	35,258	42,989	50,643
Integrated circuits	-	339	2,903	6,156	6,193	5,930	5,829	7,352	8,231
Textile products	43	1,997	8,795	9,643	12,570	14,005	14,351	19,155	23,575
Precious stones	130	785	2,250	3,240	4,486	4,671	6,214	6,129	6,351
Iron, steel tubes & pipes	24	68	395	932	580	468	429	867	1,648
Artificial flowers	-	24	166	286	383	372	481	756	914
Wall and floor tiles	-	12	177	218	227	217	302	311	296
Tin	1,618	2,247	9,252	11,347	9,091	7,773	5,265	5,280	5,647
Fluorite	222	204	252	314	332	320	289	368	363
Tungsten	83	379	620	647	379	200	132	220	150
Plastic products	9	93	370	610	689	713	938	1,297	1,262
Jewelry	16	63	502	533	526	578	1,028	1,254	2,168
Other Products /b	3,295	7,849	17,111	23,908	23,403	24,595	23,220	29,683	40,978
Total	14,772	45,007	108,179	133,197	153,001	159,728	146,472	175,237	193,366

/a Footwear, wood products, jute products, furniture and parts, leather gloves.

/b Also include nonclassified agro-industrial products.

Source: Bank of Thailand.

THAILAND

AGRO-INDUSTRIAL DIVERSIFICATION REPORT

Selected Principal Exports - 1970-85:
Shares and Growth Rates in Current Prices /a

	Shares (%)				Growth rates in % p.a.		
	1970	1975	1980	1985	1970-75	1975-80	1980-85
Traditional Agro-products	55.7	57.5	43.8	34.4	25.8	17.7	2.7
Rice	17.0	13.0	14.6	11.6	18.4	27.2	2.9
Rubber	15.1	7.7	9.3	7.0	9.3	28.9	1.9
Maize	13.3	12.7	5.5	4.0	23.7	5.1	1.1
Tapioca products	8.3	10.2	11.2	7.7	30.3	26.5	0.1
Sugar	0.6	12.7	2.2	3.2	127.2	-12.2	16.0
Tobacco leaves	1.3	1.3	1.0	0.8	23.6	19.2	2.9
Nontraditional Agro-products	7.5	11.2	12.7	18.2	35.6	27.4	15.7
Other Crops, Fruits and Vegetable Products							
Mung beans	1.7	1.0	1.1	1.2	12.8	25.5	9.5
Sorghum	0.7	1.1	0.5	0.5	36.2	6.5	9.7
Fresh fruits	0.2	0.2	0.2	0.4	32.0	25.6	20.0
Natural orchids	0.0	0.0	0.3	0.3	n.a.	n.a.	2.9
Raw cotton	0.1	0.0	0.3	0.1	4.3	74.8	-9.3
Coffee	0.0	0.0	0.1	0.5	n.a.	n.a.	38.5
Kapok fiber	0.9	0.4	0.2	0.1	4.8	8.6	-2.0
Canned pineapple	0.4	0.8	1.1	1.7	44.5	32.9	18.1
Molasses	0.3	1.1	0.3	0.4	60.4	-5.3	15.8
Subtotal	<u>4.3</u>	<u>4.6</u>	<u>4.0</u>	<u>5.1</u>	<u>26.4</u>	<u>21.3</u>	<u>13.0</u>
Seafood Products							
Prawns	1.5	2.0	1.5	1.8	31.8	17.1	11.9
Fresh cuttlefish	0.3	1.1	1.0	1.1	68.3	20.5	10.3
Fish meal	0.2	0.3	0.7	0.3	31.2	48.2	-9.0
Fresh fish	0.2	0.3	0.3	0.7	28.4	25.6	29.3
Dried cuttlefish	0.0	0.2	0.3	0.5	n.a.	29.7	22.6
Canned fish	0.0	0.1	0.5	2.7	n.a.	77.7	53.9
Canned crustaceans	0.0	0.1	0.7	1.1	n.a.	89.9	16.8
Subtotal	<u>2.2</u>	<u>4.1</u>	<u>4.9</u>	<u>8.2</u>	<u>40.8</u>	<u>29.1</u>	<u>19.3</u>
Animal Products							
Unworked feathers	0.1	0.0	0.1	0.2	-11.1	68.3	23.3
Frozen fowl	0.0	0.0	0.5	0.8	n.a.	135.8	17.5
Subtotal	<u>0.1</u>	<u>0.0</u>	<u>0.6</u>	<u>1.0</u>	<u>1.1</u>	<u>110.8</u>	<u>18.5</u>
Other Agro-processed Products /b	0.8	2.5	2.0	3.9	58.4	29.8	12.1
Total Agro-products	63.2	68.7	56.5	52.6	27.1	19.5	6.2
Other Manufactured Products /c	14.5	13.8	25.5	26.2	23.7	40.4	8.3
Other Products	22.3	17.5	18.0	21.2	19.0	25.0	11.4
GRAND TOTAL	100.0	100.0	100.0	100.0	25.0	24.2	7.7

/a Totals may not add up due to rounding up errors.

/b Footwear, wood products, jute products, furnitures and parts and leather gloves.

/c Nonagro-industrial manufactured exports.

Source: Table 5, Statistical Annex.

THAILAND

AGRO-INDUSTRIAL DIVERSIFICATION REPORT

Average Yields for Major Crops
(kg per rai)

	1959-61	1968-70	1978-80	1984/85	Annual percentage increase in yields		
					1959/61 to 1968-70	1968-70 to 1978-80	1978-80 to 1984/85
Paddy	245	267	278	322	1.0	0.4	2.7
Rubber /a	57	62	64	84	0.9	0.3	4.5
Maize	290	291	318	373	0.0	0.9	2.9
Sorghum	-	248	173	209	-	-3.5	3.5
Kenaf	195	207	174	185	0.7	-1.7	1.1
Cassava	2,762	2,411	2,212	2,273	-1.4	-0.9	0.5
Sugarcane	5,336	5,620	5,975	6,442	0.6	0.6	1.4
Tobacco	80	134	157	197	5.9	1.6	4.2
Cotton	121	148	189	178	2.2	12.8	-1.1
Groundnuts	204	217	189	206	0.7	-1.4	1.6
Soybeans	187	155	144	202	-2.1	-0.7	6.4
Mung beans	174	142	95	99	-2.2	-3.9	0.8
Castor beans	185	164	126	126	-1.3	-2.6	0.0

/a Immature and senile land is included in the computation of yields.

Source: Mission estimates.

THAILANDAGRO-INDUSTRIAL DIVERSIFICATION REPORT

Nominal Tariff Rates and Trade Values - Agricultural and
Agro-processing Products
(BTN Codes 1 to 24, as of February 1986)

BTN Code	Product	Tariff rate	1985 Values (B'000)		
			Imports	Exports	Balance
1	Live animals - for breeding - other	free 10-40%	154,318	200,780	46,462
2	Meat - fresh, chilled, or frozen	60%	35,976	1,720,654	1,684,678
3	Seafood - fresh, chilled, or frozen	60%/a	3,702,875	8,984,612	5,281,737
401	Fresh milk and cream	40%	4,630	267	(4,363)
402	Concentrated or sweetened milk and cream	30%	979,783	98,020	(881,763)
40231	Powder milk for infants	5%	981,581	1,824	(979,757)
40310	Butter - fat	5%	196,045	0	(196,045)
40321-23	Butter - other	60%/b	8,684	718	(7,966)
404	Cheese and curd	60%/b	25,353	168	(25,185)
40510	Eggs - hatching	free	5,224	0	(5,224)
40530	Eggs - other	30%	1,213	179,545	178,332
406	Natural honey	65%	2,977	5,199	2,222
5	Products of animal origin	35%	52,517	628,955	576,438
6	Trees, bulbs, flowers, etc.	60%	9,672	525,332	515,660
7	Edible vegetables incl. manioc	60%	112,128	16,017,570	15,905,442
8	Edible fruits and nuts	60%/c	257,883	1,412,772	1,154,889
901	Coffee	40%/b	32	882,924	882,892
902-3	Tea and mate	60%/b	25,761	21,885	(3,876)

BTW Code	Product	Tariff rate	1985 Values (B'000)		
			Imports	Exports	Balance
904-10	Spices	30%/b	103,397	325,806	222,409
10	Cereals: paddy, rice, maize, etc.	B 2.75/kilo	689,673	32,221,248	30,531,575
1101-2	Cereal flours and meal	40%/d	183,362	636,210	452,848
1103-4	Flours of vegetables and fruits	60%	101	3,699	3,598
1105	Flour, meal, & flakes of potatoes	40%	1	0	(1)
1106	Flours of cassava & other tubers	40%	116	1,640,618	1,640,502
1107	Salt	B 2.75/kilo	308,254	0	(308,254)
1108-9	Starches & gluten flour	40%/b	55,425	283,170	227,745
120110	Copra	B 1/kilo	0	200	200
120122	Soyabean	6%/b	20	21,697	21,677
120121, 120123-23 120210	Other edible oil seeds and flours and meals thereof	60%/b	3,524	262,535	259,011
120131-49 120220	Inedible oils seeds & flours & meals thereof	35%	2,727	103,297	100,570
1203	Seeds etc. for sowing for human or animal food, for pharmacy or industrial use	0%	85,476	39,246	(46,230)
1204	Sugar beet, sugarcane	30%	0	114	114
120711-12	Pyrethrum	5%	6,402	390	(6,012)
120731- 120749	Medicinal plants, etc.	B 4.2/kilo	106,792	226,080	119,288
120810	Melon seeds The remainder of BTN Chapter 12	65%/e 30%	330 98,996	53,391 2,261	53,061 (96,735)
1301	Vegetable materials used for dyeing	20%/b	3,571	0	(3,571)
1302	Lacs, natural gums & resins	15%	20,503	652,464	631,961

BTW Code	Product	Tariff rate	1985 Values (B'000)		
			Imports	Exports	Balance
1303	Vegetable saps & extracts	misc.	185,050	3,214	(181,836)
1401-04	Vegetable plaiting & carving materials	35%	4,498	248,722	244,224
140102	Rattan	free	74,485	59	(74,426)
140510	Seaweed	60%	4,225	38,880	34,655
140520	Nipa leaves for cigarettes	30%/b	958	0	(958)
140530	Vegetable products	40%	5,716	5,608	(108)
1501	Lard & other pig & poultry fat	30%/b	10	0	(10)
1502-06	Other animal grease & unrendered fats	25%/b	52,128	9,774	(42,354)
150710, 150810, 151210	Olive oil: fixed, boiled, hydrogenated	B 7/liter	4,726	3	(4,723)
150720, 150820, 151220	Linseed oil: fixed, boiled, hydrogenated	B 2/liter	7,778	0	(7,778)
150731-34 150831-34 51231-34	Peanut oil: soyabean oil, palm oil & coconut oil: fixed, boiled, hydrogenated	B 2.5/liter	379,892	355,524	(24,368)
150740-59, 150840-59, 151240-59	Other fixed, boiled, & hydrogenated oils	30%/b	43,176	289,186	246,010
1509-10	Degras & fatty acids, oils & alcohols	25%/b	92,042	19,678	(72,364)
1511	Glycerol & glycerol lyes	35%	59,804	441	(59,363)
1513	Margarine & other prepared edible fats	60%/b	6,882	180	(6,702)
1514-16	Spermaceti, beeswax & vegetable waxes	30%/b	4,477	306	(4,171)
1517	Residues from waxes	25%/b	880	1,201	321

BTW Code	Product	Tariff rate	1985 Values (B'000)		
			Imports	Exports	Balance
16	Preparation of meat, fish, crustaceans & mollusks	60%/d	6,810	7,740,949	7,734,139
160513-14	Blachan	free	45,474	3,827	(41,647)
1701	Beet sugar or cane sugar, solid	B 3.5/kilo	9	6,246,927	6,246,918
170210	Artificial honey & sugar syrups	65%	55	0	(55)
170221-39	Other sugars	40%	6,067	32,871	26,804
1703	Molasses	3 0.08/kilo	1,125	756,901	755,776
1704	Sugar confectionary not containing cocoa	60%/b	8,173	20,343	12,170
1705	Flavored or colored sugars	65%	752	201	(551)
1801-05	Cocoa beans, paste, butter & power	30%/b	49,497	1,647	(47,850)
1806	Chocolate and other foods with cocoa	60%/b	42,301	1,429	(40,872)
1901	Malt extract	35%	275	0	(275)
190210	Infant milkfoods	5%	5,500	2,198	(362,471)
1903-08	Other prep. of cereals, flour & starch	60%/d	7,237	477,126	469,889
20	Prep. of vegetables & fruits	60%/d	20,945	4,852,155	4,831,210
21	Misc. edible preparations	60%/b	501,356	787,069	285,713
210710	Infant milkfoods	5%	17,728	0	(17,728)
2201	Aerated & spa waters	B 2/liter or free	2,116	720	(1,396)
2202	Lemonades & flavored waters	60%/b	1,152	23	(1,129)
2203-7	Beer, wine & other fermented beverages	60%/c	58,738	38,867	(19,871)

BTW Code	Product	Tariff rate	1985 Values (B'000)		
			Imports	Exports	Balance
2208	Ethyl alcohol & neutral spirits	B 80/liter/e	2,128	0	(2,128)
2209	Spirits	60%/d	673,793	17,695	(656,098)
2210	Vinegar	60%/b	1,050	514	(536)
23	Residues & waste from food industries	10%	488,709	1,972,010	1,483,301
230402	Soyabean residue	6%	761,053	41	(761,012)
24	Tobacco	60%/b	1,520,026	1,589,689	69,663
	<u>Total</u>		<u>13,738,787</u>	<u>91,669,720</u>	<u>77,930,933</u>

/a Fish caught by Thai vessels exempt from duty.

/b With redundant specific rates in addition to the ad-valorem rates.

/c With specific rates that sometimes dominate the ad-valorem rates.

/d With specific rates of 33 baht per kilo in addition to the ad-valorem rates.

/e Only 2.5 baht per kilo for denatured alcohol.

Sources: Tariff rates - Customs Tariff of Thailand, Dhavil Wisuthachipinda.
 Trade Values - Foreign Trade Statistics of Thailand, December 1985, Department of Customs.

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AGRO-INDUSTRIAL DIVERSIFICATION REPORT

Nominal Tariff Rates - Selected Agro-industry Inputs

BTN Code	Product	Tariff rate (%)
31	Fertilizers	free
7313	Sheets and plates of iron & steel, tinned, galvanized, or plated	17
7323	Cans of sheet or plate iron & steel	35
7603	Wrought plates, sheets, and strips of aluminum	35
761001	Seamless drums for raw milk	free
761010	Tubes for toothpaste or the like	17
761020	Cans & other aluminum containers	35
8002	Wrought bars, rods, angles, shapes, & sections of tin, tin wire	17
8003	Wrought plates, sheets, & strips of tin	17
800621	Cans and containers of tin	30
8424	Agricultural machinery for soil preparation and cultivation	20
8425	Harvesting & threshing machinery, agricultural produce-grading machines	20
842611-12	Milking machines	5
842621-30	Other dairy machinery	20
8427	Presses and crushes used for beverages	20
8428	Other agricultural machinery	20
8429	Machinery for bread grain milling and for the working of cereals or dried leguminous vegetables	20
8430	Other machinery for food processing	20
870110	Parts of tractors imported for assembly	5
870121-24	Tractors more than 1,100 cc displacement	5
	Tractors less than 1,100 cc displacement	30
870240	Parts of vans & pickup trucks imported for assembly	72
870251-52	Vans & pickup trucks	120

Source: Customs Tariff of Thailand, February 1986.

THAILANDAGRO-INDUSTRIAL DIVERSIFICATION REPORTNumbers of Agro-industry Firms Granted Promotion Certificates
and Starting Operations - 1960 to November 1986

Category number	Category name	Number of certificates issued /a	Number of firms starting operations
1	<u>Agricultural Products and Commodities</u>	<u>388</u>	<u>289</u>
1.1	Large-scale cultivation	23	16
1.2	Processing of agricultural products	74	52
1.3	Processing or preservation of food	86	71
1.4	Animal feed	45	35
1.5	Oil production from agricultural products	31	22
1.6	Corn products	5	2
1.7	Products from stick lac	1	0
1.8	Rubber products	33	27
1.9	Livestock raising or meat processing	24	13
1.10	Animal products	18	12
1.11	Cultivation of mulberry trees & silk worm farming	3	3
1.12	Silk reeling	1	1
1.13	Deep-sea & off-shore fishing	17	17
1.14	Slaughtering and disemboweling of chicken for export	6	6
1.15	Manufacture of export products from rattan, bamboo, or palm leaf	11	9
1.16	Multiplication of vegetable seeds	5	4
1.17	Rabbit raising & processing for export	0	0
1.18	Slaughterhouse and hog carcass	4	0
1.19	Slaughter & carcass of cattle	1	0
1.20	Production of milk powder	0	0
5	<u>Other Products</u>	<u>40</u>	<u>12</u>
5.9	Rubber tree products	14	7
5.34	Production of rubber soles in both sheet & pattern forms	2	1
5.49	Production primarily for export	13	1
5.52	Manufacture of steamed rice utilizing modern technology	2	0
5.53	Canned seafood production for export	9	3

Category number	Category name	Number of certificates issued /a	Number of firms starting operations
6	<u>Services</u>	<u>98</u>	<u>86</u>
6.8	Cold storage	78	71
6.14	Crop drying & silo facilities	15	12
6.15	Modern rice milling	1	1
6.17	Modern packaging of vegetable & fruit for export	0	0
6.20	Grading facility for agricultural products	3	2
6.22	Disinfection services for export products	1	0
6.24	Agricultural export zones	0	0
	<u>Unclassified /b</u>	<u>45</u>	<u>45</u>
	Veneer Industry	8	8
	Wood parquet products	17	17
	Others	20	20

/a Excludes those firms for which the certificate was withdrawn.

/b Most of these firms were promoted many years ago and the activities have been suspended.

Source: Board of Investment.

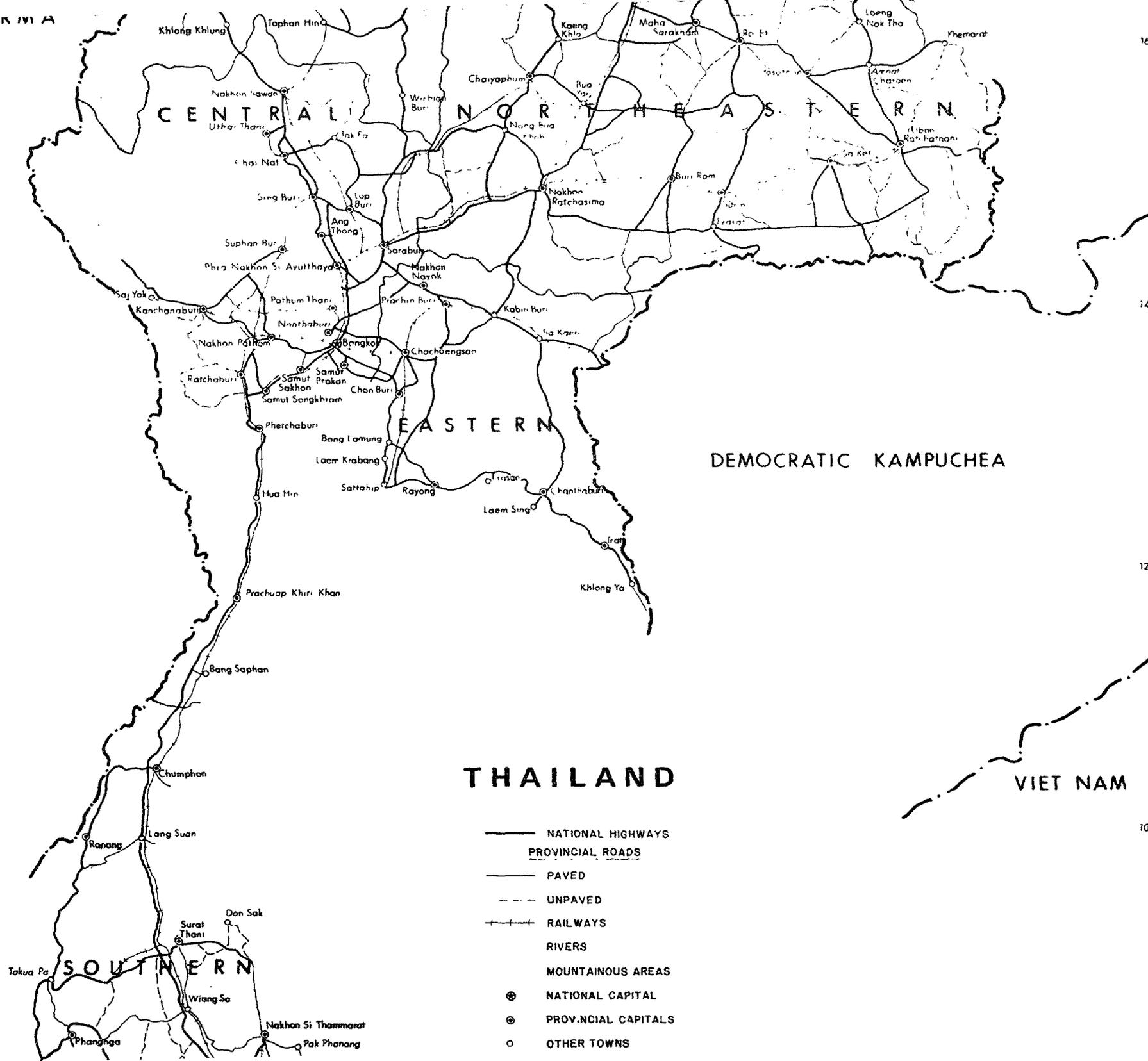
NOTES

MAP SECTION

BURMA

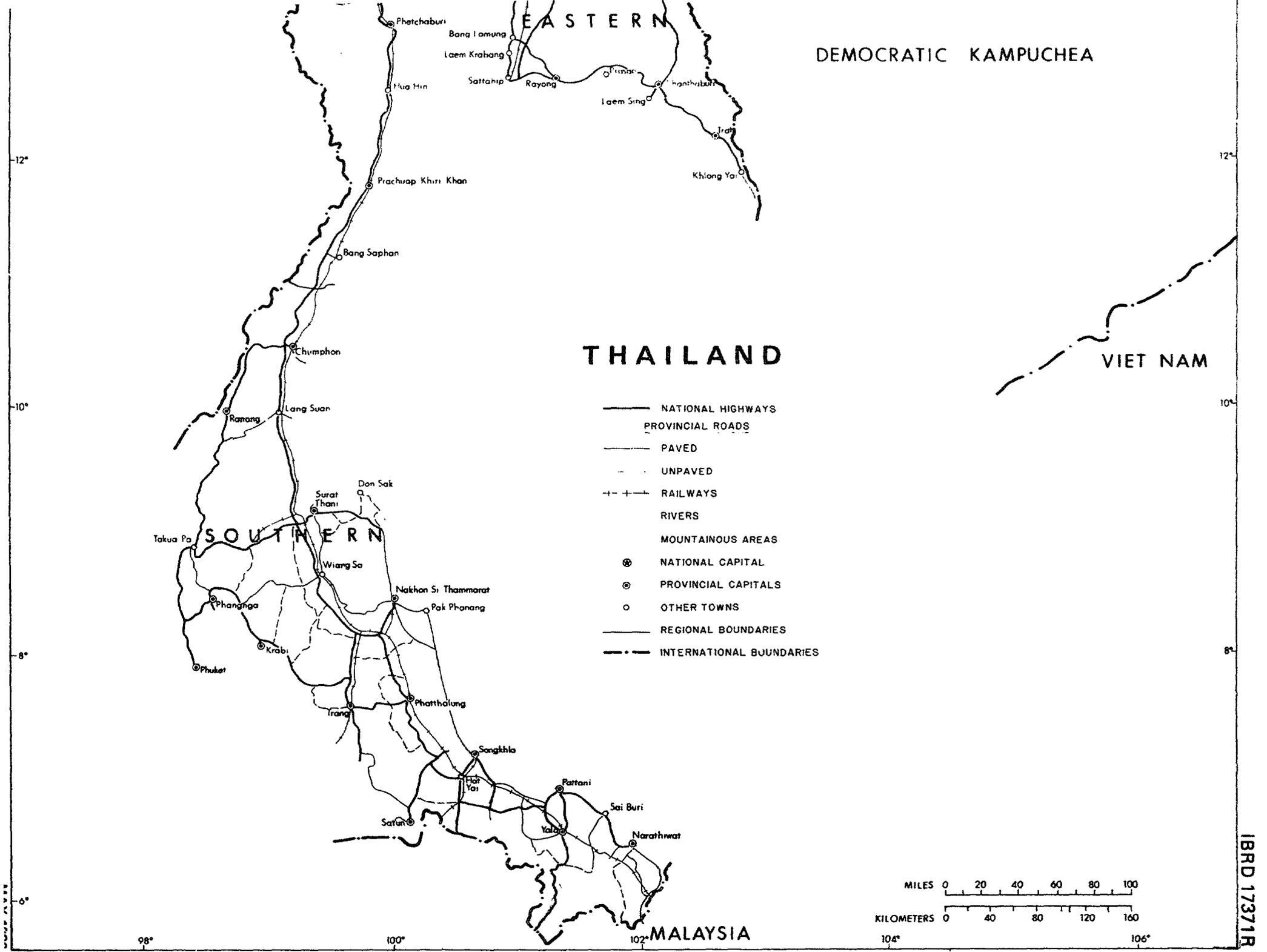
16°
14°
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16°
14°
12°
10°



THAILAND

- NATIONAL HIGHWAYS
- - - PROVINCIAL ROADS
- PAVED
- - - UNPAVED
- + + + RAILWAYS
- ~ RIVERS
- MOUNTAINOUS AREAS
- ⊙ NATIONAL CAPITAL
- ⊙ PROVINCIAL CAPITALS
- OTHER TOWNS



EASTERN

DEMOCRATIC KAMPUCHEA

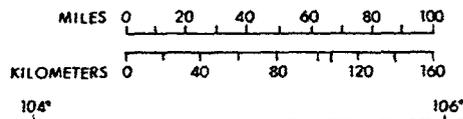
THAILAND

VIET NAM

SOUTHERN

MALAYSIA

- NATIONAL HIGHWAYS
- PROVINCIAL ROADS
- PAVED
- - - UNPAVED
- + + + RAILWAYS
- RIVERS
- MOUNTAINOUS AREAS
- ⊗ NATIONAL CAPITAL
- ⊙ PROVINCIAL CAPITALS
- OTHER TOWNS
- REGIONAL BOUNDARIES
- · - · INTERNATIONAL BOUNDARIES



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