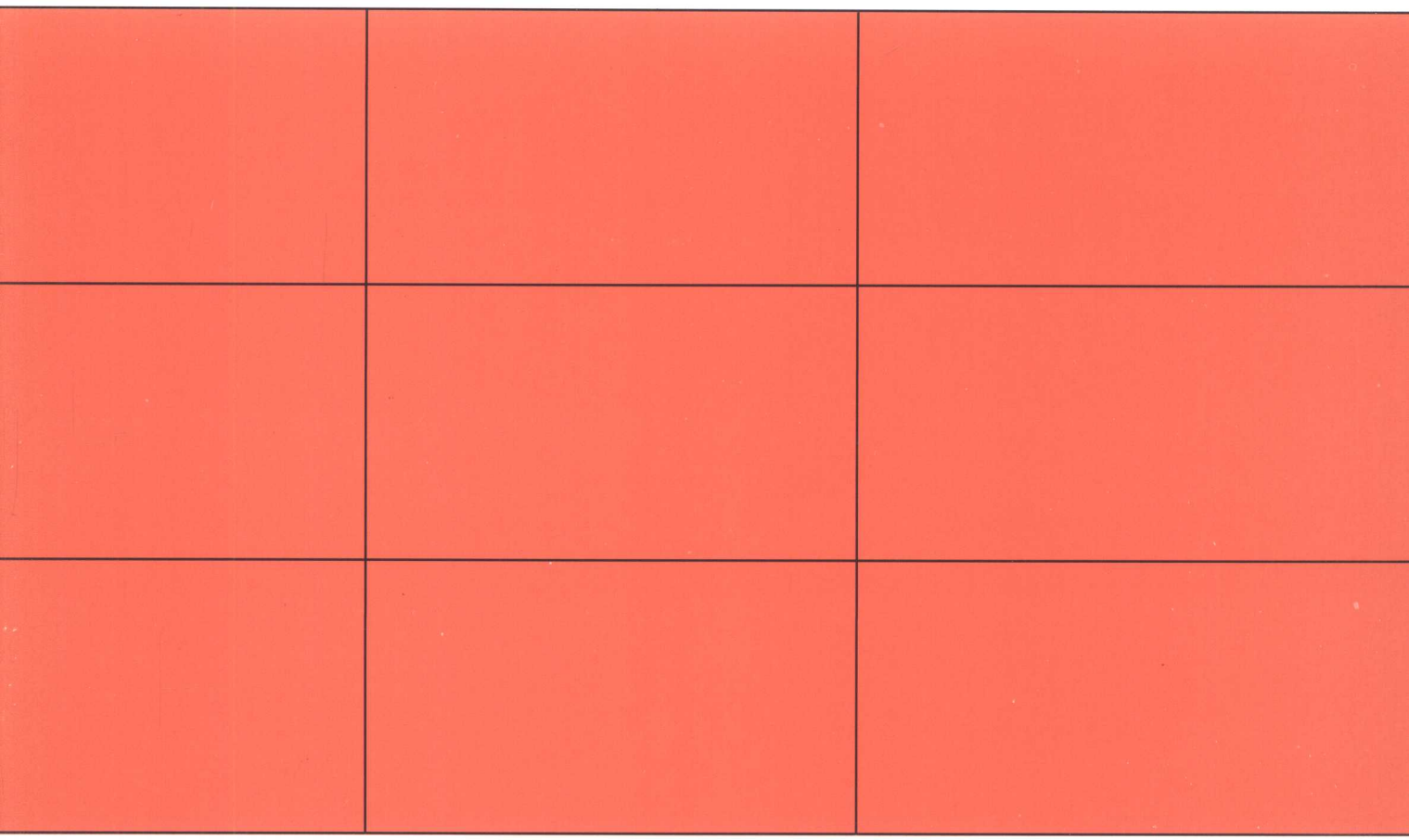
Public Policies Towards Agricultural Diversification in Thailand



PUBLIC POLICIES TOWARDS AGRICULTURAL DIVERSIFICATION IN THAILAND

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Introduction

In the immediate postwar period, rice was central for the Thai economy. It was the predominant crop within the agricultural sector, it contributed about a half of its foreign exchange earnings, and rice growing then probably employed more than two thirds of the labor force. Revenues from the rice export tax contributed 19% of the total government revenue in 1958 (Ingram 1971:226), and was closer to a third ten years earlier. For most of the postwar period, rice was the largest export item, and today it remains the largest agricultural export item.[1] On the other hand, the share of rice in the economy (and in crop agriculture) has been steadily declining from that of the immediate postwar levels. In this sense, Thai farmers have been steadily diversifying away from rice.

The factors leading to this diversification is complex, and still unclear. Thailand in the immediate postwar period was a land-surplus country, with population growth surging forward at a rate exceeding 3 per cent per annum in the 1960s. There was thus a natural pressure to bring more land under cultivation. Since much of this was upland with clear comparative advantage in crops other than rice, the move away from it was just as natural. With these new lands coming into cultivation, newer crops were grown, each of which had its golden age of rapid expansion, followed by a levelling off of the growth rate. Maize was the first in the late 1950s and early 1960s, kenaf in the mid 1960s (this crop is the only one to have suffered an absolute decline later),

[1] Throughout this essay, unless specified, agriculture should be taken to mean only crop agriculture.

sugarcane in the late 1960s and early 1970s, and cassava in the 1970s. Table 1 below shows the growth rates of cultivated areas under the different types of crops.

TABLE 1

Growth Rates of Cultivated Areas

of Different Types of Crops, 1961-1987

(Per Cent per annum)

Rice	1.95
Upland	3.21
Vegetables	1.49
Trees	2.81

Note: Trends are estimated from semi-logarithmic regressions.

Source: Cultivated area statistics collected by the Ministry of Agriculture and Agricultural Cooperatives and compiled by the Thailand Development Research Institute (TDRI).

This story of rapid land expansion bringing in its train automatic diversification came to an end in the 1980s, as a result of two factors. First, the land surplus that fuelled the rapid expansion of agricultural growth and diversification came to an end around the late 1970s--the upward trend in land per agricultural worker reversed itself around 1978. Secondly, the high prices that marked the markets for most agricultural products in the 1970s, particularly for carbohydrate products, reverse themselves sharply after 1982.

The decline of agricultural prices during the 1980s, and of rice prices in particular have led many to advocate some degree of diversification of Thai agriculture, especially diversification away from rice. Before we examine public policy with regard to diversification, we have to examine what reasons there are for the public sector to intervene to promote this diversification. This is what we shall do in the next section of the paper, followed by individual sections discussing public policies in the areas of pricing and marketing; credit; irrigation; research and extension.

Rationale for Public Intervention

The term 'diversification' is normally used in the invetment literature. Investment risks can be reduced by committing oneself to a diversified portfolio of assets. As agriculture is inherently a risky activity, and involves an investment of resources, one can quite naturally apply the idea of diversification to its analysis. As risk-markets are in many cases absent, there is a prima facie case for government intervention. What sort of government intervention is required however remains murky. A first step in the analysis is the distinction between the problem of diversification as faced by the economy as a whole and as faced by the individual farmer.

For the economy as a whole, an overconcentration on a few crops may be deemed socially undesirable over and above what may be undesirable from the individual farmer's point of view, primarily because fluctuations in the production and prices of these crops will have severe spillover effects on tax revenues and on the other sectors of the economy through various form of linkages (Brainard and Cooper 1967; Siamwalla and Valdes 1986). However, if agriculture thus has some other sectors to share the risk, and if the extent of that sharing is fully realized and anticipated, it is far from clear whether such risk sharing through spillover effects will themselves improve or decrease welfare. The need for government intervention to insulate agriculture from the rest of the economy is therefore questionable, as is the justification for trying to impose diversification on agriculture in order to attain the alleged social benefits arising from it.

In the Thai context, the spillover effects of fluctuations of Thai agricultural production on the rest of the economy are now less than ever, as agriculture contributes merely one-sixth of the Gross Domestic Product. Its direct contribution to the tax revenue is probably even less, as most of the export taxes have been removed, and the land and income taxes levied on agriculture are minimal.

At the farm level, as risk markets are absent, one would expect that farmers will themselves have to adopt risk-reducing strategies, among which diversification would feature prominently.

Diversification enables farmers to cope with uninsurable risks (both on price and quantity sides) on their own. Relative to a scenario in which these risks can be insured, a diversification will be socially inefficient, as risks are not traded across farms, and the value of the aggregate output would be less than it would be if such markets exist. It thus appears that left to their own devices, farmers will over-diversify rather than the reverse.

In Thailand, slightly more than half the farmers grow more than one crop (Table 2). A large number of farmers do not diversify within their own farms, even though the average farm size is about 3-4 hectares for paddy, and 5-8 hectares for upland crops. Why do these farmers not diversify? In the case of paddy, it appears that the nature of the land itself and the lack of water-control appear to limit the possibility. But even in upland areas, where many crops can potentially be grown, farmers usually do not diversify. Indeed those who grow only upland crops mostly do not diversify. The vast majority of the cases where diversification seems to have taken place are where farmers grow rice and some other (usually upland) crop. As substitution of land-use between rice and upland crops is possible only to a limited extent, this pattern of land-holdings seems to reveal the farmers' choice to have been dictated by the need to reduce weather risks by owning both rice and upland areas, and that the reduction of price risk appears to be merely a byproduct.

Should the government nonetheless be concerned about the extent of diversification over and above what the farmers themselves wish? There are a number of reasons why there should be such concern. Classically, it has been argued that for an open agricultural economy such as Thailand which may have a degree of monopoly power in the world markets, there is ultimately a limit on the amount of any particular product it can sell in the world market without having an adverse impact on its terms of trade. There is, in other words, an optimal level of exports above which it will cost the country more to produce than the marginal revenue that the extra export brings in. Under such circumstances, to allow private, competitive markets to perform its function would lead to suboptimal results. For Thailand, rice clearly belongs to this category. After its

TABLE 2
Number of crops grown on holdings in Thai Agriculture 1982

(No. of holdings)

	All sizes	Below 6 Rais	6-9.9 Rais	10-39.9 Rais	Above 40 Rais
Growing only single crops	2,032,474	455,680	280,897	1,076,345	219,552
Rice	1,458,104	276,795	206,587	816,783	157,939
Upland	272,560	66,767	31,955	138,595	35,243
Vegetables	25,329	18,296	3,340	3,412	281
Trees	276,481	93,822	39,015	117,555	26,089
Growing more than one crop	2,397,869	167,890	270,485	1,502,711	456,783
Rice and other crops	2,196,461	132,987	248,077	1,397,186	418,211
Combination of other crops	201,408	34,903	22,408	105,525	38,572
Uncultivated holdings	33,546	31,468	381	1,576	121
TOTAL	4,463,889	655,038	551,763	2,580,632	676,456

1 Rai = 0.16 hectare.

Source: National Statistical Office, 1983 Intercensal Survey of Agriculture.

voluntary export restraint agreement with the European Community--itself an action that demands government intervention to control export volumes, cassava also belongs here.

A second set of reasons have to do with the fact that the government is already intervening in agricultural production and markets for all kinds of reasons, and that all of these interventions are not neutral in their impact on the various crops. Consequently, it is of some interest to know how much influence government policies have had on crop diversification. Also, as the shifting international prices for many of the agricultural crops could be expected to affect the returns from government expenditures to promote their production, one would like to find out how flexible the government has been in adapting its activities. In particular, as the world rice market has been weakening until 1987 and is expected to resume its downward trend in a few years' time, we would like to know what role the government may have in facilitating a move by farmers away from rice. In addressing these questions, therefore, it should be understood that no position is taken here as to whether or not public policies to force diversification per se is desirable.

Pricing and Marketing Policies

Throughout the developing world, internal marketing of agricultural crops is handled to some extent by government agencies, with significant impact on market prices, and on the availability of marketing services in the rural areas. Thailand has been almost unique in that the role of state enterprises in marketing has been negligible. True, there exists a state enterprise, the Marketing Organization for Farmers (MOF) set up in 1975 to engage in various marketing activities, and since then assigned from time to time to help implement various government "price-support" programs. However, the effectiveness of these programs on actual farm prices is highly questionable (Siamwalla and Setboonsarng 1989).

Consequently, internal marketing in Tbailand is almost entirely the domain of private traders, who have over the years created, through an evolutionary process, a marketing system of some sophistication, all the way from the farm level to the export markets. Except for some

commodities (notably sugar), the structure of the entire marketing systems for most commodities are highly competitive, and where they are not, government policies had a hand in allowing the trade to cartelize itself (Usher 1967).

Not that the government has refrained from pursuing effective price policies. Since Thailand is an exporter of most of its agricultural commodities, the government has had a powerful and elegant means to influence domestic prices of these commodities, namely through border taxes. Powerful, because the government can induce large changes in prices by simply varying export taxes. Elegant, because there is no need for public capital to be expended on warehouses and transport facilities, and therefore the intensity of the intervention can be varied at will. Since for most of the period under consideration, the government has had more of an interest in lowering domestic prices relative to the world prices rather than increasing them, as we shall see, such a mode of intervention yields revenue for the government as a byproduct. This revenue yielded a financial "slack" which allowed the government to pursue a plethora of interests without the discipline of the budget constraint (on which more below). Without this discipline, a major component of the explanation for the government policies therefore rests on the politics rather than on the economics of the situation. It is in recent years, when its objectives have changed, and the budget constraint has thereby become binding, did the government begin to have trouble with this mode of intervention.

The history of border intervention in agricultural products has been much studied and documented in earlier work (Siamwalla 1975 for rice; Jessadachatr 1977 for sugar; Siamwalla and Setboonsarng 1989 updated both of these and did additional work on maize and rubber). The following summarizes these works from the vantage-point of the problem of diversification.

We begin by noting one central factor about the Thai government's budgetary system. It is highly inflexible and permits very little government expenditures on subsidies of any kind, particularly if such subsidies are to fluctuate a great deal, and particularly if it were to move in an

upward direction. Fluctuations in tax revenues are more tolerable, but even there, if the contribution of the tax to the budget was large, there would be great reluctance to allow the total intake to vary. Thus in the 1950s and the early 1960s when the rice premium contributed more than 10 per cent of the government budget, there was considerable reluctance to vary the rice premium, which, significantly, was set as a specific tax. Only when the dependence of the government on these taxes became less, was the government willing to play around with the rates in order to achieve other objectives. After 1966, when the premium began to contribute a smaller share of the total revenue, the government began to vary the premium rates quite frequently, and introduced a progressive export tax on rubber, signalling a shift to a greater emphasis on stabilization as a policy objective.

The impact of this rigidity of government policies can be clearly seen in Table 3, which gives the deviation of domestic prices from the world prices of eight commodities. With the sole exception of sugar, the pattern in the past is clear and consistent. Exportables tend to have their prices pressed below the world prices, and producers of importables enjoy prices above world levels. Both these deviations generate revenues for the government. Sugar has been an exception. The concentrated nature of the industry lets the government pursue a two-price policy, taxing the domestic consumers to finance the subsidization of exports (with zero impact on the treasury), thus lifting the domestic price above the world level, except in years when world prices are at exceptionally high levels.

Subject, then, to the constraint that the pricing policies should have either positive or zero impact on the budget, what objectives have the government pursued, and what impact has it had on diversification? For many of the commodities whose history of price intervention is shown in Table 3, an important objective has been the stabilization of domestic prices. Hence the high degree of variability of those figures.

TABLE 3
EFFECT OF DIRECT INTERVENTION ON THE AGRICULTURAL SECTOR
ON DOMESTIC RELATIVE PRICES OF SELECTED AGRICULTURAL COMMODITIES 1970-1986

(Proportionate Deviation from Real World Price)

YEAR	RICE	MAIZE	SUGAR			RUBBER	CASSAVA	COTTON	SOYBEAN	PALM OIL
			GROWER	MILLER	CONSUMER					
1970	-0.1829	-0.0268	0.2382	0.4085	0.4939	-0.1303	0.0000	1.1780	NA	NA
1971	-0.2583	-0.0358	0.0216	0.2799	0.4287	-0.1058	0.0000	1.1658	NA	NA
1972	-0.2682	0.0622	-0.2201	0.0252	0.1451	-0.1101	0.0000	1.0385	NA	NA
1973	-0.4044	-0.0971	-0.2932	-0.1114	-0.1547	-0.1712	0.0000	1.1054	NA	NA
1974	-0.4755	-0.0258	-0.6224	-0.4092	-0.5605	-0.1888	0.0000	0.3104	NA	NA
1975	-0.3176	-0.0650	-0.5578	-0.4082	-0.6353	-0.1661	0.0000	0.4198	NA	NA
1976	-0.1576	-0.0327	-0.2078	-0.1127	-0.2495	-0.2083	0.0000	0.1774	-0.0753	NA
1977	-0.2199	0.0033	-0.0256	-0.0280	-0.1067	-0.2228	0.0000	0.0258	0.1824	-0.0198
1978	-0.3163	-0.0229	0.3491	0.0423	0.1462	-0.2275	0.0000	0.1001	0.1550	-0.0390
1979	-0.2392	-0.0461	0.3921	0.1047	0.2117	-0.2449	0.0000	0.0740	0.1688	-0.0766
1980	-0.2611	-0.0545	-0.0282	0.2105	0.3565	-0.2611	0.0000	0.0870	0.1398	-0.0820
1981	-0.2573	-0.0873	-0.1017	-0.0093	-0.0057	-0.1890	0.0000	0.0301	0.1183	0.0001
1982	-0.1155	0.0000	0.3609	0.0841	0.6005	-0.1312	0.0000	0.0254	0.2886	0.0715
1983	-0.0805	0.0000	0.5158	0.3512	1.3564	-0.1795	0.0000	0.3791	0.2455	0.0934
1984	-0.0611	0.0000	0.5310	0.4857	1.2781	-0.1509	-0.0034	0.2234	0.2606	-0.1395
1985	-0.0442	0.0000	0.9672	0.2380	1.8829	-0.1056	-0.1734	0.4538	0.1553	-0.1186
1986	-0.0030	0.0000	0.8085	0.0632	1.6537	-0.1107	-0.2082	0.6423	0.3413	0.3176

Note: For rice and cassava for which Thailand is not a small country, the deviation is from the world price as it would be if Thailand unilaterally eliminates its intervention.

Source: Siamwally and Setboonsarng (1989) for rice, maize, sugar and rubber and for the period 1970-1985; additional calculations made for the remaining commodities and for 1986.

Specifically for rice, the domestic real price instability between 1975-1984 has been about a quarter that of the world price instability, all achieved through variations in the border intervention. In interpreting these numbers one has to bear in mind that Thailand is not a small country in the world rice trade. Stabilization of the domestic rice price by border intervention implies an automatic destabilization of the world price.

To the extent that Thai rice farmers have been thus insulated from world price instability, they have been spared the need to diversify between rice and other crops in order to minimise price risks. Indeed, as the prices of most other crops (excepting, again, sugar) have been much less insulated from international prices, farmers have less incentive to diversify away from rice towards these other crops. In a sense, the policy of insulation could be claimed as a successful effort to compensate for the absence of risk-markets for farmers.

However, an often-heard refrain is that the level of past rice export taxes had the effect of pushing farmers away from rice towards a more diversified cropping pattern. Normatively, why the government should want to do this is hard to understand. From a positive point of view, the impact is most likely small, as the cross-elaticity inproduction of upland crops (as a group) with respect to rice price is only 0.03. In any case, while this may (or may not) have been the impact in the past, one clear point that emerges from Table 3 is the broadly declining trend in the impact of negative price intervention, particularly for rice. Among exportables (which form the bulk of Thai agriculture), the persistent bias of price policies against rice is now a thing of the past. In 1986, all taxes on rice exports have been removed, the final act coming after a period of more than half a decade when the taxes were continually whittled down.

This stance of the government with respect to agricultural (particularly rice) prices is a result of its pursuit of an objective that has come very much to the fore since the mid 1970s, namely, the urge to support producer interests. One likely explanation for this turn of events is the fact that rice now comprises only 4 per cent of the average Bangkokian's budget. Also, perhaps

public opinion may have been anaesthetized by the very rapid growth rates during the last three years.

The pressure from the producers has meanwhile gathered steam. In recent years, there have been a series of farmers' protests for various crops, to which the government response have tended to be more cosmetic than effective.

In a way, one could argue that the decline and final elimination of the border taxes for rice and other commodities has been the response to the declining world prices that took place in the early and mid 1980s. But this would be belied by the government's action when the world market for most agricultural commodities tightened after 1987, caused first by the Thai drought of 1987 which affected rice prices, and then by the North American drought of 1988, which affected the prices of other agricultural commodities. The government then permitted a rise in the domestic rice prices of about 50 per cent over a period of 18 months without making an attempt to bring it down. The surprise was not in what the government did or did not do, but in the fact that there was very little political pressure against the surge in prices. A few years earlier years, when the rice price was low, the government was under considerable pressure to lift it.

One of the issues that the Thai government has now to grapple with now is how to shift from taxing agriculture to protecting it. For importables, such protective policies are already indulged in, as is to some extent indicated by the figures for palm oil, soybeans and cotton in Table 3, and for dairy products not reported there. For exportables, particularly for rice, the problem is more serious. The export taxes have been eliminated, and hence the government could no longer "give" to the farmers by taking less away from them. It could only give by providing export subsidies, and here the budget constraint has finally caught up with the government. Funds now have to be earmarked from the budget for agricultural subsidization, and procedures established to implement an ongoing and permanent subsidization program, instead of a whole panoply of ad hoc programs more typical of past measures on agricultural prices.

In designing such a permanent program, a number of issues have to be tackled. Use of border measures have to be carefully thought through. Although using them as a lever to lift domestic prices would minimize budgetary cost, international complications (e.g. GATT, the American Export Enhancement Program) will have to be taken into account. The alternative path of intervention in the domestic market for tradable goods will mean both a bigger drain on the budget and an improvement in the efficiency of the government's marketing organization as well as in its capability to deal in domestic as well as international markets.

Of course, such protectionist policies, while politically expedient, would freeze Thai agriculture within its present structure, and would fly against any reasonable definition of "diversification". Indeed, if Thailand has some monopoly power in rice, it is hard to justify an export subsidy rather than an export tax.

Yet if to diversify intelligently is to facilitate the transition to those subsectors growing rapidly in the future, it is then difficult to avoid taking a position on where the "sunrise" subsectors will be to which one should devote one's resources, including support from the marketing and pricing policies of the government. Such speculation has in recent years settled on high-valued horticultural crops, such as fruits and vegetables. Although the high growth rate of the Thai economy in recent years should boost demand of these income-elastic food crops, much of the government efforts have gone into promoting their exports (but not involving as yet any explicit subsidization). In any case, it is hard to see a very aggressive role played by the government in the field of marketing and pricing for these crops. Besides, the number of holdings growing these crops is extremely small (see Table 2 above). As these crops are highly capital-intensive, there may perhaps be some role for credit policies.

Credit

Credit provision for working capital in the agricultural sector may be deemed one of the more successful policies of the government. Established in 1969, the Bank for Agriculture and

Agricultural Cooperatives (BAAC) now has a branch in every province in the country,and has on its roll more than 2 million farmers, or almost half of all the farmers in the country. This institution, together with a Bank of Thailand directive in 1975 that requested commercial banks to lend a certain percentage (at present 14) of its deposits to the agricultural sector (defined to include livestock, fisheries and forestry) has been responsible for pushing the share of the formal sector in the total credit up from less than 10 per cent in the mid 1960s to something close to a half now (Siamwalla et al. forthcoming).

BAAC's credit is subsidized. There have been three modes of subsidization. Forcing the bank to lend to the agricultural sector is an implicit tax on the nonagricultural sector which is used to subsidize the agricultural loans (assuming the banking sector to be competitive). More importantly, the BAAC has been following an average-cost pricing rule, rather than using the more correct marginal-cost pricing rule to set the interest rate it charges its clients. Finally, since 1987, the BAAC has embarked on a paddy mortgage scheme,in response to the government's policy. All these subsidies add up to a small amount (1 billion baht or US$ 40 million) per annum, however (Siamwalla and Nettayarak 1990).

Has the government been using credit to direct farmers in the direction it desires? There are special lending programs in the BAAC portfolio, usually funded from aboard (e.g. the European Community), designed to bribe the farmers away from crops that the government and the foreign donor may want to discourage (e.g. cassava). These special programs form however a small part of the BAAC's loan portfolio. The bulk (75 per cent) of the BAAC's loans are for short-term working capital loans. This is where the BAAC has had the most impact on Thailand's agricultural sector. For our purposes, there is an additional convenience in that these loans are identified by the type of crops, which enable us to obtain information on the crop-wise direction of the loans.

Table 4 reports the share of the various crops in value added in the crop subsector and in the short-term loan portfolio of the BAAC. It is immediately obvious that the BAAC has been following a conservative lending policy. BAAC's personnel repeatedly indicate in their interviews with us that in their choice of clients to lend to, they tend to discriminate against monocultural farmers growing traditional crops, particularly in the rainfed area. This would lead one to expect that they would direct their funds away from most of the traditional crops. Yet the figures in Table 4 indicate quite strikingly that, at the very least, rice and cassava growers still receive a more lenient treatment from its loan officers than they would if the bank or the government has been following a policy of diversification. Tree crops on the other hand have not had the share commensurate with their importance. Although here the figures (based as it is on short-term loans) reported in Table 4 underestimated the credit received by the rubber growers in particular. The government has supported them in a very significant way through a separate Rubber Replanting Fund.

If one examines the modus operandi of the BAAC closely, in particular of its short-term loans, then it is easy to understand why it has not succeeded in changing the structure of its loan portfolio. At the beginning of each year, it will lend money to farmers for their working capital, and at the end the farmers are supposed to repay the loans in full--even if the latter will return in a matter of weeks to re-obtain the loans for the following year. A non-defaulting farmer has come to expect that if he has repaid his loans properly, he will have no trouble in his reapplication for the following year's loan. If this is the case, then clearly the BAAC cannot redirect its loans at will towards sectors that it favors at any given moment, unless its clients themselves wish to shift towards those sectors. In the past, the rapid growth of the bank could have facilitated such redirections, at least with the new clients. It appears to have chosen not to use this option.

For the rubber planters the Rubber Replanting Fund has also concentrated on the single crop that is in their jurisdiction. Its modus operandi gives it even less flexibility to promote alternative cropping in the South which is heavily dependent on rubber.

Table 4
SHARE IN ALL CROP AGRICULTURE OF VALUE-ADDED (V.A.) AND SHORT-TERM BAAC LOANS

(Per Cent)

Crop	Variable	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988e
1.Rice	V.A.	44.7	41.4	40.7	45.1	40.7	41.2	38.2	38.0	34.7	36.0	42.2
	Loan	52.6	51.1	52.0	54.4	53.3	51.2	53.6	54.2	59.5	59.9	59.0
2.Cassava	V.A.	7.7	9.8	10.1	5.6	6.9	9.3	6.9	6.2	12.6	8.8	5.6
	Loan	13.9	15.5	16.0	14.9	16.1	17.0	13.1	12.6	11.7	12.4	12.4
3.Maize	V.A.	4.3	5.1	5.5	5.2	3.7	5.4	6.7	6.1	4.0	3.2	6.8
	Loan	10.4	12.0	12.5	11.8	12.0	12.9	12.6	13.3	12.8	11.8	12.3
4.Sugar cane	V.A.	3.8	3.8	2.2	8.0	10.3	4.9	6.7	4.1	5.4	4.3	4.4
	Loan	8.3	7.7	6.2	7.9	7.0	5.8	6.8	5.7	3.2	2.3	1.9
5.Tree crops	V.A.	16.8	19.9	19.5	17.9	17.6	17.9	21.9	24.0	24.7	27.3	24.1
	Loan	2.5	1.3	1.4	2.7	3.6	3.4	4.0	4.5	4.5	5.1	6.1
6.Others	V.A.	22.7	20.0	21.9	18.2	20.8	21.2	19.8	21.6	18.7	20.3	16.9
	Loan	12.4	12.3	11.9	8.3	8.0	9.6	9.9	9.7	8.3	8.5	8.2
TOTAL	V.A.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Loan	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: National Economic and Social Development Board, National Accounts Division (for value-added), and Bank for Agriculture and Agricultural Cooperatives, Annual Reports (various issues) for loans.

In addition to BAAC's loans, twice as great a sum is lent to the agricultural sector by commercial banks. However, this figure is somewhat inflated, as commercial banks appear to evade the Bank of Thailand's directive quite substantially.

Irrigation

Of all the government activities that have influenced the relative quantities of various agricultural goods produced, none looms as large as irrigation. It is an activity in which the Thai government has regularly spent large sums of money every year, ever since the end ofthe Second World War. Year after year, the Royal Irrigation Department has claimed the largest budgets among the various departments of the Ministry of Agriculture and Cooperatives. The cumulative capital expenditures of the Department total close to US$ 5 billion (1984 prices).

There are certain peculiarities that separates irrigation from other agricultural inputs. At the level of the economy, water can be regarded as a private good, which could in principle be bought and sold, particularly if it is scarce, as it has been in the dry season. However, because of the way the system has been designed, it is extremely difficult to collect a water charge to enhance the efficiency of water use. This problem arises because at the level of the system and subsystem, irrigation may be considered as a kind of club goods; it is normally better utilized by a group collectively than by the individual farmers. This is the case only when water is not scarce. If it is, the dependence of a downstream farmer on the behavior of those upstream is well known (Bromley 1982). Conflicts among various water users without clearly established property rights are then common, which require state intervention.

Because the government has as a consequence become the main actor, who plans and invests in irrigation using public money, there is a separation between the users of irrigation service and the taxpayers who bear the costs. The path between the desire to have an efficiently working irrigation system and the means to pay for it is full of political pitfalls of varying degrees of seriousness, which is further complicated by the fact that the irrigation structures are durable

capital goods which are costly to convert to other purposes. In Thailand, this problem is further complicated by the specificity (for rice production) of existing distribution structures.

Brief History of Irrigation Projects in Thailand

The development of modern irrigation in Thailand dates from a series of very ambitious proposals in 1903 by van der Heide, a Dutch engineer hired by the Thai government to design an irrigation system for the whole of the lower Chao Phraya with a series of storage and diversion dams (Ingram 1971; Small 1973; Feeny 1982; Brown 1988).[2]

Even though van der Heide's proposal was at that time rejected, and a far more modest proposal made by Sir Thomas Ward later accepted in 1916, van der Heide's grand conception of the Chao Phraya scheme remained, to be eventually adopted with some major changes as the central program of work for the RID inthe early postwar period. Major milestones in the evolution of this system are: the completion of the Bhumipol dam, at that time the largest storage dam in Thailand, in 1957, the completion of the Chao Phraya dam, the main diversion dam of the Lower Chao Phraya system in 1958, the completion of the ditches and dykes system, which makes possible dry-season rice cultivation in 1969, the completion of the Sirikit Dam, the second major storage dam in the system in 1972, to be followed finally by the completion of the Naresuan Dam in 1979, another diversion dam in the upper central plains. This, together with the adjoining Mae Klong sytem forms the core of the Thai irrigation system, with a command area covering some 40 per cent of the total irrigated area of the country.

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[2] Prior to the arrival of van der Heide, a canal system was built in the late 1880s by a private company owned by the members of the Thai elite in what is now the Rangsit area, in exchange for a land grant from the king. This cannot be regarded as an irrigation project, as there was no attempt to control the water supply that would be deliverable to the farms. The main benefit of this project is to open up a large new area for cultivation by having access to water transport which the canals provide (Asawai 1987). The only part of van der Heide's project to have been immediately implemented was one which improved the water conditions of the Rangsit canal system.

Ever since its conception, the creation of the Chao Phraya system was the work of engineers. Economic and financial considerations do enter in the determination of the pacing of the investments (on which more below). At the time investments in the project form the central core of RID work, there was little discussion of how to allocate the resources that RID could obtain among the various areas in Thailand.

Among rice-importing countries, the drive for self-sufficiency imposed a discipline of sorts, by making governments attempting to maximize rice production in the shortest time from the amount of investment funds available. Such an approach would naturally tend to favor investments in the most favorable areas of the country, because that is where it requires the least effort to get the most results. Although Thailand was not subject to the same discipline to the same degree, the pattern of its efforts turns out not to be too dissimilar. As a result of this pattern of expenditure, projects that are adopted earlier tend to cost less in real terms to develop than projects that are later adopted. The figures in Table 5 show the steep acceleration in costs quite clearly.

Costs have been increasing primarily because in recent years, another motivation has been coming to the fore: the need to increase incomes of farmers in remoter areas, and the consequential preference for smaller-scale projects. Table 6 provides summary statistics as of 1988. The command area was about 25 million rai (4 million hectares), and accounts for about 20 per cent of arable land, and, assuming that the overwhelming proportion of these grow rice, about 40 per cent of the areas underrice. Table 6 classifies irrigation projects into four types. Large scale projects are those for which the construction budget exceeds B200 million or which take many years to complete; medium-scale projects are those requiring 2-200 million baht in budget and 2-5 years of construction period; small-scale projects cost less than 2 million baht and take only one year or less to construct. The royal development projects are those initiated as a consequence of the King's visit and his suggestions. Self-defence village projects are of minorimportance.

Table 5
Costs of Irrigation Projects in Thailand 1956-1985

Regions	Period	No.of Projects	Investment Cost (mn.baht)	Command Area ('000 Rais)	Cost per Rai (baht)
North	1956-1965	9	4,481	1,927	2,326
	1966-1975	34	7,064	1,327	5,326
	1976-1985	94	9,546	1,440	6,628
Northeast	1956-1965	31	395	511	772
	1966-1975	21	1,291	176	7,323
	1976-1985	47	12,105	1,367	8,852
Central	1956-1965	76	3,453	5,580	619
	1966-1975	36	2,516	1,795	1,401
	1976-1985	67	5,904	1,959	3,015
South	1956-1965	11	27	131	205
	1966-1975	12	681	282	2,418
	1976-1985	44	6,248	1,448	4,316
Whole Kingdom	1956-1965	127	8,356	8,150	1,025
	1966-1975	103	11,552	3,580	3,227
	1976-1985	252	33,803	6,214	5,440
	Total 3 Peroid	482	53,711	17,944	2,993

Source: Siamwalla and na Ranong (1990)

Table 6
Summary statistics of Irrigation in Thailand as of 1988

	Amount of Projects	Capacity (mill. M3)	Command Area (rai)
Large and Medium Scale projects			
Northern	127	630.07 (22,463.36)	2,981,162 (676,450)
Northeast	239	3,563.22 (0.57)	2,412,593 (15,300)
Central Plain	162	1,913.10 (41.68)	11,985,835 (61,250)
Southern	76	63.88 (0.42)	1,714,615 (22,400)
Total	604	6,170.27 (22,508.03)	19,094,205 (775,400)
Small Scale Projects			
Northern	1174	159.54	2,279,221
Northeast	2582	575.93	1,468,988
Central Plain	744	107.81	1,335,527
Southern	488	7.05	799,190
Total	4988	850.33	5,882,926
Royal Development Projects (Office of the Co-ordination Committee for Royal Development Projects)			
Northern	33	49.62	94,570
Northeast	17	25.47	28,320
Central Plain	40	19.72	26,434
Southern	18	0.86	56,663
Total	108	95.67	205,987
Self-defense Villages Projects			
Northern	20	5.57	20,900
Northeast	43	12.05	17,700
Central Plain	10	15.83	8,228
Southern	6	0.00	200
Total	79	33.45	47,028

Note: Figures in brackets are projects which are entrusted to other organizations for operation and maintenance.

Souce: RID, 1989 Irrigation Projects Statistics

The Returns on Irrigation Investments

The money that has been poured into the vast irrigation in the Central Plains system in particular has elicited a great deal of questions as to their efficacy. Small (1972) estimated the real rate of return in the Chao Phraya system to be of the order of 5-7 per cent per annum. This modest estimate was made at a time when the dry-season rice cultivation has not taken off. Ngo Quoc Trung (1980) had the benefit of observing some of the results of these developments and was able to increase the rate of return to 10 per cent. The efforts expended on the tank irrigation systems yielded a return of 10-16 percent (Tubpun et al 1982), but the return was high largely because of the benefits from drinking water and from fisheries. If agricultural benefits alone are counted, then the returns would be -7 to -8 percent. Contrast this return with those from groundwater which are of the order of 12 per cent to more than 200 per cent (World Bank 1985), and we can see that serious questions can be raised about the efficiency of surface water irrigation.

In an exercise that we have carried out at TDRI, we have attempted to estimate the impact of irrigation on agricultural production, by estimating a nested supply function. The first nest look at the supply of agricultural output as a whole, given various fixed and quasi-fixed factors, of which irrigation is one.

Irrigation is measured by the cumulated expenditures on irrigation in the province. The observations are by province for a period of 27 years between 1961 and 1987.

The impact of irrigation was relatively small and its significance somewhat fugitive. It is only by introducing a multiplicative term with research that we could obtain a reasonable estimate. In a growth accounting exercise based on this econometric supply function, we found the impact of both variables combined added 0.59 per cent to the growth rate of agricultural productivity per worker in Thailand (Patamasiriwat and Suewattana 1990; Siamwalla, Setboonsarng and Patamasiriwat, 1990).

It is only in the second nest of our estimates which explain the crop composition that the impact of irrigation can be clearly seen. Its key role, as can be seen in Table 7, is in shifting the crop composition towards rice in the various regions. For the important central plains region, the introduction of irrigation leads to an increase in the share of rice by almost 4 percentage points. Much of this increase has been at the expense of upland crops. Another major rice supplying region, the Lower North has its rice share increased by 4.3 percentage points.

TABLE 7
Change in share of rice in total crop value caused by a 1% increse in cumulated irrigation expenditures, 1961-1987

Regions	Absolute Share in Output	Change due to irrigation
Upper North	44.5	0.0
Lower North	58.2	4.3
Central Plains	73.6	3.9
East	55.8	-5.9
West	39.8	-3.6
Northeast	65.3	0.7
South	25.8	1.0

Source: Estimates made by TDRI Agriculture and Rural Development Program.

The conclusion that may be drawn from this exercise is that irrigation expenditures, at least in the past, have tended to reinforce a region's specialization in rice. Therefore if diversification is to be understood as a move towards other types of crops, particularly upland crops, then Table 7 shows that irrigation investments are a poor vehicle to bring this about. This is in line with the World Bank's irrigation subsector review in 1985. On the other hand, some planners have expressed the view that irrigated areas have more flexibility to move to the more high-valued horticultural and aquacultural activities. The data that we have to estimate the results shown in Table 7 do not allow us to pass judgement on this issue, as they vastly underestimate the

contribution of horticulture and ignore aquaculture altogether (as did the World Bank 1985 review).

The Responsiveness of Government Investment in Irrigation

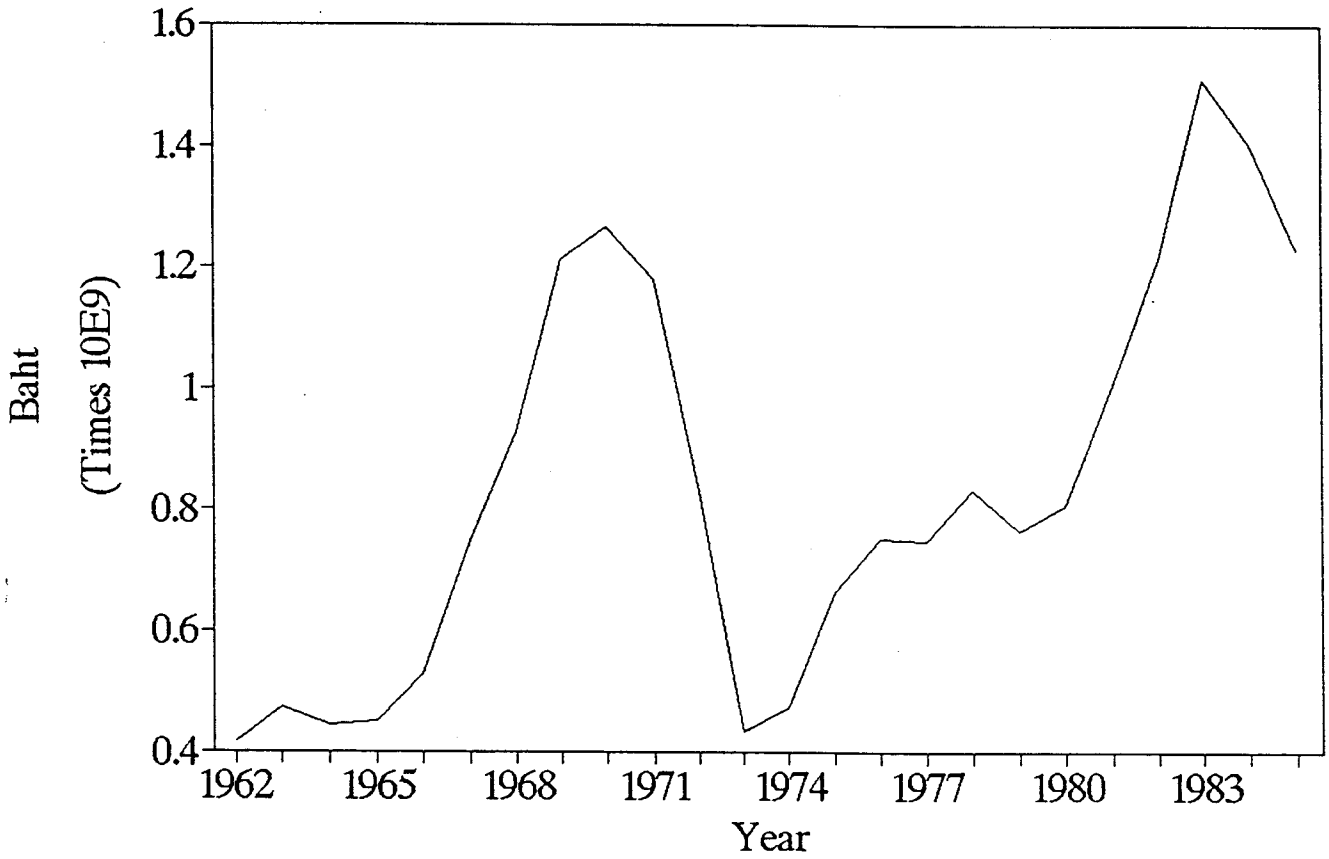
Figure 1 shows the movements of real government investments in irrigation (the data are actual expenses incurred in any given year). Eyeballing the data would lead one to conclude that the two peaks show one of two possibilities: the first peak being the period of heavy investments in the Chao Phraya system, while the second indicates those in the Mae Klong and the Pitsanulok (Naresuan) systems. Another interpretation could be that the first peak followed the high prices of the mid 1960s and the latter the high prices of the early 1970s,and therefore indicates government responsiveness to the price movements.

An unpublished econometric estimate by Rosegrant and Mongkolsmai indicates that the government does respond significantly to movements in the world prices in its budgeting of investments in irrigation, and is inhibited by the increasing costs of irrigation. However, the latter has been to some extent compensated by the increase in GNP which presumably means that the government can afford an expenditure which in many sections of the government is regarded as a means to help the poor.

Current Policy Issues

Ever since the completion of the Naresuan dam in the Pitsanulok plain, no new major irrigation projects have been initiated. There are macroeconomic reasons as well as low rice prices which argue for belt-tightening in the early 1980s, but there are specific reasons for this hiatus as well. Without any new addition to the storage capacity, the Chao Phraya system cannot be expanded. Indeed the Naresuan project (financed by the World Bank) came as close to a zero-return investmentas any project can be. By 1977, the water stored by the two mainstorage dams: the Bhumipol and the Sirikit are already having trouble meeting the water demand for the dry-

Figure 1
Irrigation Investment, 1962-1985



season rice crop. It was precisely in that year that the government decided to invest in the Naresuan dam. The dry-season water for this project area could only be obtained by diverting water from the other parts of the Chao Phraya system. As much of the return from the irrigation system is from the dry-season crop, what the Naresuan command area has gained, the other parts of the system lost, with a near zero net result for the system as a whole.

Despite the clear excess demand (admittedly at zero price) for water during the dry season,[3] the government has been reluctant to invest in new storage dams, not least because public opinion against such dams has been gathering steam. The adverse environmental impact is often cited as a reason, but probably as powerful is the desperate tactics engaged in by the potential evictees from the dam site. Compensation for land requisitioned by the government is small and very slow in coming.

As a substitute for major new investments, the government has concentrated more and more on small-scale projects. A hard-headed calculation by the Bureau of Budget indicates considerable wastage in these small projects. The alternative view points out that government agencies in charge of small-scale projects have tended to ignore the need to involve local people in various aspects of the projects from an early enough stage. As these projects are ultimately dependent on local management skills, their failure rate is thus not a surprise (Lawson 1984).

Given the difficulties in engaging in new construction, there should have been an interest in reforming the management of the existing system. Attempts have been made to collect water charges (on a flat per-area basis), but the bill was withdrawn (by the Ministry of Agriculture) after a brief show at the National Assembly.

It is doubtful however, whether a water charge would improve the present poor management. The biggest drawback of the system is that it does not reduce the farmers'

[3] The government has not been loth to use the water rationing as a tool to limit rice production in years when the rice price is low.

uncertainty as to his water supplies, surely the raison d'etre of an irrigation system. At the moment, for much of the command area, the dry season water is rotated from year to year. But the system of rotation is not yet clearly spelt out, and government promises are reneged on all too often.

The existing system has another drawback in that it does not allow total (or even partial) control over the water level on each individual farms. Thus in areas where second-cropping is practised, besides the fact that each farmer cannot choose what crops he can grow, he has even little choice as to what variety of rice he can grow. The lockstep nature of most farm activities in a locality has in its turn created severe labor constraints.

The high prices to be obtained on their rice during the last two years have led farmers to invest substantially in tubewells--a delayed response to the expansion of rural electrification, which has been a major public investment of the late 1970s and early 1980s. This development appears far more promising as it also will make farmers more independent in their cropping decisions.

Research and Extension

Research and extension have a longer term impact on the change in the productivity of the agricultural sector. Both public and private sectors are engaged in research and extension, although information on the role of the private sector is limited. Since much of the research investment is done by the public sector, government behavior in producing and transferring new technology to the farmer can play a major role in shaping the crop mix.

Development of Agricultural Research

The ThaiGovernment started to conduct active agricultural research after World War II, although pre-war governments did select and propagate rice seeds with good eating quality, to enhance the returns to rice-farming. In the early post-war period the government emphasized the buildup of research infrastructure--both human resources and research stations. Kasetsart

University, the main agricultural university, was established in 1942. Later, primarily in the 1960s and early 1970s, regional universities with sizable faculties of agriculture were established in the north (Chiang Mai), northeast (Khon Kaen) and south (Songkhla and Pattani).

Until the 1970s, public research was fairly low-keyed. There was relatively less pressure to increase the crop yield per area because Thailand had relatively abundant supply of land.

Research on crops is the domain of the Department of Agriculture (DOA). Research on livestock, fisheries and forestry is conducted by the departments responsible for each of these subsectors. Apart from the DOA, other government agencies are engaged in crop and other research as well. Most notable among these are the universities, which together spend annually a quarter of the amount spent by the DOA. The DOA and the universities together spend more than 95 per cent of the total research expenditure for crops.

Among the agencies within the Ministry of Agriculture and Cooperatives, crop research under DOA took up the major portion of the research expenditure, simply because crop production is the largest component of agriculture, although when compared to its value added, research in crop receives proportionately less attention than does research in livestock, fisheries and forestry (Table 8)--despite the fact that the private sector is also very active in both livestock and fishery research. Because of the dominance DOA (between 75 and 80% of total expenditures on crop research), and because this paper is concerned with the crop subsector, we shall concentrate our attention in what follows on DOA's behavior.

Determinants of Research Expenditure Allocation among Crops

In analyzing the DOA's expenditure allocation among crops, it is worth recalling our earlier discussion concerning the rigidity of the Thai budgetary system. Furthermore, research expenditure is considered as a recurrent and not as a capital expenditure. Reallocations among

Table 8

Research Expenditures Per 100 Baht of Value Added

YEAR	CROPS	LIVESTOCK	FISHERY	FORESTRY
1960/1964	0.0265	0.0816	0.1821	0.2736
1965/1969	0.0560	0.1520	0.1851	0.4968
1970/1974	0.0767	0.1714	0.1254	0.6798
1975/1979	0.1426	0.3017	0.2643	1.7172
1980/1984	0.2724	0.5199	0.6180	4.4333
1985/1987	0.4767	0.7477	1.5911	6.7754

Note: Value Added of 1985-1987 are New Series.

the various lines of such expenditure can be achieved only with difficulty. Sharp changes in the direction of research are therefore not to be expected.

From its past allocation patterns, the following may be concluded about the Thai government's research policy.[4] Firstly, crop-wise allocation of research expenditure is biased toward importables and against exportables and nontradable goods (Table 9). Secondly, although there is some rigidity in the crop-wise allocation over time, for the reason given above, there is also some movement. When an econometric model was constructed to account for government behavior in agricultural research, it was found that the main explanatory factor for the share of research going to each major crop is the amount of land devoted to its cultivation.

From these findings, one may conclude that, because the Thai government has never used its research funds as a tool to foster diversification, the end result on the cropping mix cannot therefore be simply stated. That a more than proportionate share of its funding goes to import-competing crops would naturally tend to more diversity in cropping pattern, in the sense that such crops, by the sheer fact that they have to be supplemented by imports, would tend to be under-produced. The under-representation of the exportable crops in research would, of course, similarly tend to more diversification, because it is the more extensively grown crops that are being discouraged.

On the other hand, that the share of money going into research (at least among the major export crops) tend to follow rather the cropped areas implies that research funding has followed rather than led farmers' choice. To the extent that farmers' choice of crops has followed market signals, one can infer that research funding has also tended to follow (via farmers' decisions) market signals as well. This conclusion finds support also from an examination of the procedures followed by DOA in allocating its research funds. In evaluating research proposals for funding, the department does follow clearly guidelines which are heavily weighted by expected economic

[4] This and the subsequent paragraphs of this section draw on Setboonsarng et al. (1990b)

Table 9
Research Expenditures per 100 Baht of Crop Value, by types of crops

Year	Exportables					Importables		Home
	Rice	Maize	Rubber	Kenaf	Other Fld.Crops	Oilseeds	Cotton	Horticulture
1975	0.174	0.252	1.243	0.802	0.029	0.930	11.879	0.170
1976	0.180	0.365	0.955	1.410	0.024	0.846	14.571	0.189
1977	0.164	0.600	0.746	0.815	0.046	0.982	4.637	0.186
1978	0.142	0.639	0.641	0.692	0.056	0.880	3.646	0.165
1979	0.159	0.476	0.523	1.174	0.057	1.244	1.835	0.149
1980	0.136	0.345	0.642	0.994	0.038	1.001	1.695	0.150
1981	0.174	0.324	0.833	1.037	0.054	1.032	2.009	0.191
1982	0.215	0.409	0.720	1.070	0.062	1.192	3.668	0.257
1983	0.230	0.304	0.823	1.155	0.066	0.984	2.873	0.185
1984	0.269	0.276	0.850	n.a.	0.120	0.848	4.648	0.221
1985	0.316	0.316	0.702	n.a.	0.163	0.762	5.296	0.336

benefits, although admittedly it has at times somewhat idiosyncratic criteria for what constitutes relative "economic benefits" among crops, e.g. share of export values or, even more strangely, relative import values (Setboonsarng and Khaoparisuthi 1990a).

The impact of agricultural research

The above analysis of the share of funding for research across crops relative to their value added would give an adequate account of the impact of research on diversification, only if it is assumed that a baht of research on any crop would yield an equal expected return. The econometric exercise thus far has yielded no clear conclusion for the relative profitability of the various crops. There are certain casual evidence that would lead one to expect quite different returns to research investments in the different crops. Thus, all rices grown during the dry season are modern high-yielding varieties which are ultimately based on the output of the international research system, in particular from the International Rice Research Institute (IRRI). This means that each baht spent by the Thai government on rice research has produced proportionately more increase in dry-season rice yield than that spent on other crops (except possibly maize, which can also draw on research from the International Wheat and Maize Research Center (CIMMYT)).

Agricultural Extension

The Department Agricultural Extension (DOAE) was established in 1967 and underwent a major change in 1977, when the government decided to adopt the training and visit (T&V) approach recommended by the World Bank, leading to a rapid rise in the number of employees in the department to reach a figure of 13,292 in 1988.

The Thai government now expends greater resources in its agricultural extension network than in its research by a proportion of approximately 1.7 to 1. The DOAE is the primary mechanism by which the government introduces new technology to the farmers. Beside

conventional extension work through the T&V technique, the DOAE also produces significant amounts of open-pollinated seeds in most of the major crops for the farmers.

In response to low agriculture prices in the early and mid 1980s, the government strongly pushed DOAE to promote agricultural diversification among farmers. DOAE's agricultural plan along the line of the Sixth Plan (1982) states that 5 strategies would be taken: (i) reduce rice planting area in the low-yielding area, particularly the Northeast; (ii) promote other crops' production to substitute for rice and other "less promising" crops, namely, sugarcane, tobacco, and cassava; (iii) limit the production area for crops whose demands are likely to be saturated but productivity within the existing area would continue to be raised (there was no mention how); (iv) replace rubber trees with traditional varieties with modern high-yielding varieties and (v) promote production of non-traditional crops.

To achieve these objective a Four Cooperation Scheme was initiated by the Ministry of Agriculture and Cooperatives in 1986 to foster crop diversification and to stimulate technology transfer. The scheme is so called because it brings in 4 parties, namely, government, private firm, financial institutions, and farmers. According to the scheme the participating farmers will be assisted technologically by the private firms and by the government agency; farmers are assured of the market with the minimum price or income guarantee by the participating firms; farmers are trained by the DOAE to plant the promoted crops and to adopt the technology and use inputs suggested by the firm. The government will ensure that input prices are reasonable, i.e. not higher than the market prices. To induce more farmers' participation the scheme subsidizes the interest cost by 3.5 percent--participating farmers pay 8.5 percent instead of 12 percent normally charged by the BAAC).

The scheme was financed by Baht 250 million (about US$ 10 million) from the Farmers' Aid Fund (which despite its name obtain its revenue by levying export taxes on agricultural goods) and use the earned interest to finance the subsidies in this scheme. Formal contracts are to be

signed between the firm and farmers. Other government agencies agree to provide the necessary support (e.g., irrigation).

Prima facie, this scheme has the attractive feature in that it seems to cover all bases. Since this is a program that tries to push farmers do things other than what the market (in their perception) dictates to them, the government must ensure that they are not left in the lurch by the markets, should they follow the government's instructions. The private firms' participation takes care of that. Because the new technology may require cash inputs and be quite risky, the scheme provides credit and price or income guarantees. The scheme does however have some problems.

Firstly, it does not necessarily change farmers' crop choices. Theoretically, the most effective subsidy should work only at the margin, i.e. on the marginal farmer who would be induced by the subsidy to switch her crop choice from what she has been growing to grow what the scheme wants her to grow. Inasmuch as this scheme depends on the firms to select the eligible farmers, it is unlikely that the firms would choose such a marginal farmer. On the contrary they would tend to pick areas and farmers who already have comparative advantage in growing the promoted crop. The subsidy would merely add to the rent of farmers who already have this comparative advantage. Hence this scheme cannot be expected to have a major impact on the cropping pattern.

Furthermore, the conditions set by the government may be too restrictive and unrealistic, for example, the firm must set up buying points all over the promoted areas. This requirement ignores the possible (indeed likely) advantage of the existing local middlemen.

When all is said and done, it is interesting to note that the only tool that the Thai government has deployed specifically to induce diversification is its extension system. Admittedly some resources are thrown in through the credit system to change the relative profitability of the various crops over and above what the market dictates. But the amount of subsidy involved is trivial.

Conclusion

The role of the Thai government in influencing the production of various crops has been examined in this paper. There are four prongs among the policies followed by the government: pricing and marketing policies (mostly exercised through border measures), credit, irrigation, and research and extension. Different agencies are involved in the different prongs, with different political and administrative pressures.

The Five-Year National Economic and Social Development Plan theoretically details for the government as a whole policies which are to be followed by individual agencies, and the Sixth Plan (1986-1991) did specify that diversification is to be the guiding concept in the agricultural policies of the government during the plan period. But at the time the Plan was written and promulgated, world market conditions for most of the agricultural products turn out to be so bad that all agencies were already under identical pressures to try to diversify Thai agriculture away, not just from rice but from all the major food crops, particularly the three other carbohydrate crops (cassava, maize and sugarcane).

This brings us to the key factor that drives the Thai agricultural sector and the government's role in it. Particularly since the early 1980s, but even before that for all crops other than rice, the agricultural sector is fully exposed to the world markets. When world markets turn adverse, it is not only the traders and the farmers who have to respond, but the government itself is subject to strong pressures to adjust. It is at this point that conflicting objectives come into play.

For on the one hand, the government is under pressure to provide some support as a safety net to the incomes of the farmers, this, given the strong price-responsiveness of Thai farmers implies an anti-diversification move. On the other hand, in its supply of support services, for example: credit, irrigation, research and extension, it has theoretically the tools to shift the production structure away from those goods that are adversely affected. The question then is: is the government structure itself free enough to induce these shifts. Our answer is mostly in the

negative. In some cases (research and extension and credit) it is the procedural rigidity that holds up the needed changes. Irrigation is a capital expenditure, and thus can be and actually is changed around a great deal more flexibly than research and extension which, in the accountant's eyes, is regarded as a recurrent expenditure. But with capital expenditure the problem is physical, once the investment has been made, the structures are fixed and cannot be easily changed to produce other commodities. Throughout the postwar period, irrigation has been almost exclusively concerned with rice, and given the structures, the scheduling of water supplies is still entirely dictated by the rhythm of rice production.

The severe battering received by the Thai farmers as a result of the fall in world prices in the early and mid-1980s has raised concerns that a diversified cropping pattern should be the standard practice with each farmer. Within the government this concern is felt only within the Department of Agriculture (the agency in charge of research), and then only within the Farming Systems Institute, which gets only about one-tenth of the total research allocation. The BAAC claims that in its lending policies, it tends to avoid monocropped farms, but on closer examination, the only group that comes under this definition seems to be rainfed-rice farmers, and the reason why they are discriminated against is because relative to their incomes, they market less of their products, and therefore are not as "bankable".

Could the government, while itself rigid, encourage a diversified pattern of cropping? For most annual crops, farmers have tended to diversify only to cope with environmental risks, but to eschew such practice to cope with market fluctuations, as most farmers produce annual crops and therefore already have the needed flexibility, at least over the medium term (more than one crop cycle). Interestingly enough, from casual observations, it appears that tree crop growers also do not diversify. If anything, among the fruit growers there appears to be now a strong trend toward specialization at the farm level, as fruit production has become somewhat more "professionalized" and less of a sideline activity.

It appears therefore that Thai farmers will still look to the markets primarily for their signals to produce or shift away from any crop. The choice for the government, given the unfavorable prospects for agriculture in the long term, is whether to provide the safety net necessary for the farmers growing traditional crops. The alternative, to push for intensification by investing heavily in research and to promote modern varietal technology may be appropriate in the near term (5-10 years), but given the rapid growth of the nonagricultural economy during the last years of the 1980s and expected to continue into the 1990s, it is expected that the absolute size of the labor force in agriculture will begin to shrink by the end of the 1990s. Whether the varietal technology in which Thailand has arguably a backlog to catch up on will then be relevant is a question to ponder on.

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Table 1 = in text
Table 2 = divert2.wk1
Table 3 = divert3.wk1
Table 4 = diver4.wk1
TAble 5 = divert6.wk1
Table 6 = divert7.wk1
Table 7 = in text
Table 8 = divert8.wk1
Table 9 = divert9.wk1
Figure 1 = irg.pic + irg.wk1