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THAILAND  
AGRICULTURAL PROJECT  
IDENTIFICATION REPORT  
JUNE 1984

Asia Division  
Project Management Department

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### CURRENCY EQUIVALENTS

Currency Unit	=	Bhat (B)
B 1	=	US\$ 0.049
US\$ 1	=	B 22.75
B 1	=	100 Satant

### WEIGHTS AND MEASURES

The metric system is used throughout the Kingdom, an exception for the traditional area measurement.

1 rai	=	0.16 ha.
1 ha	=	6.25 rai

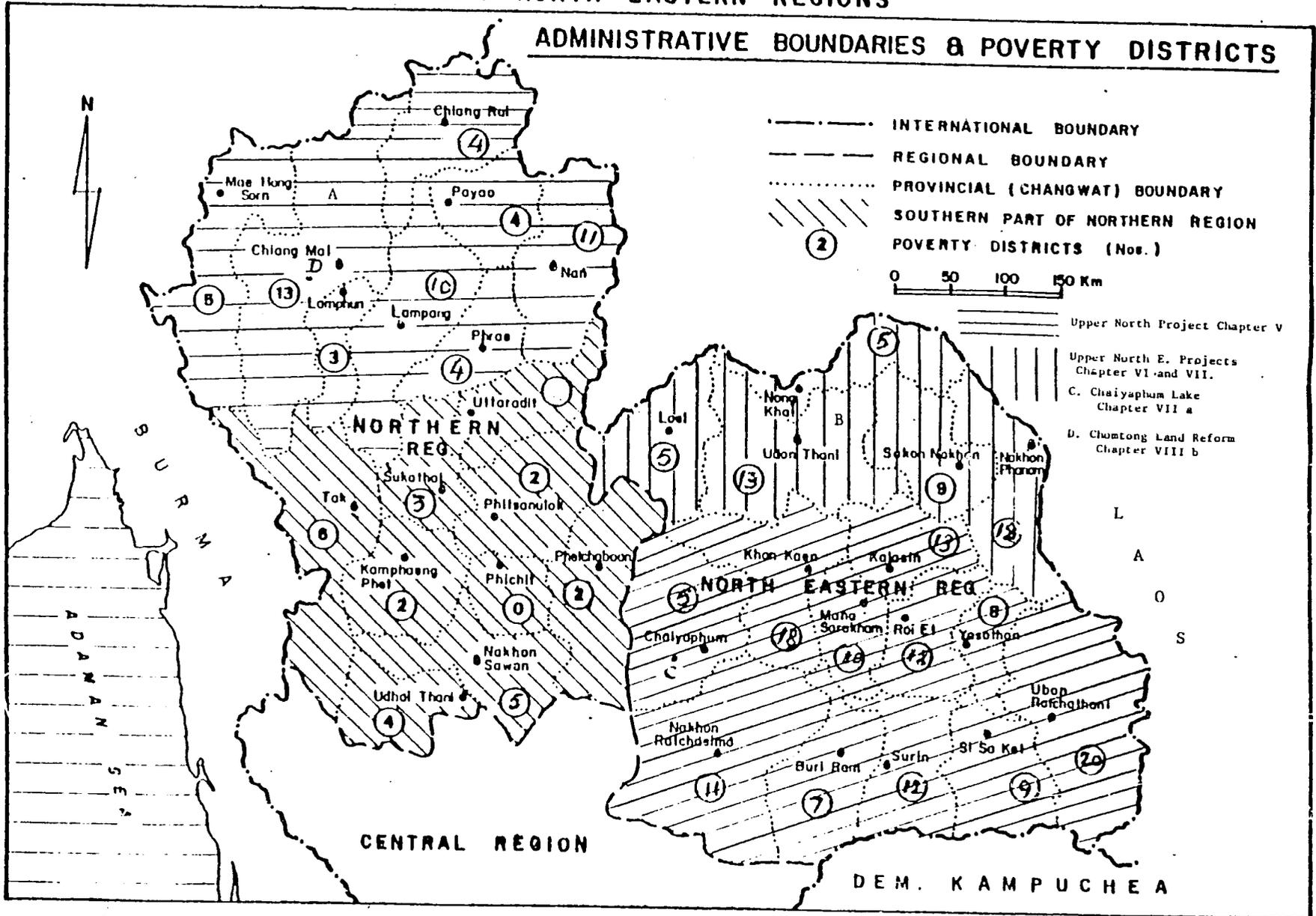
### ABBREVIATIONS AND ACRONYMS

AI	Artificial Insemination
AIT	Asian Institute of Technology
ALRC	Agricultural Land Reform Office
BAAC	Bank for Agriculture and Agricultural Cooperatives
DLD	Department for Livestock Development
DDF	Department of Fisheries
EEC	European Economic Community
IBRD	International Bank for Reconstruction and Development
IFAD	International Fund for Agricultural Development
JPPC	Joint Public and Private Sector Consultative Committee
MOAC	Ministry of Agriculture and Cooperatives
NESDB	National Economic and Social Development Board
NRDC	National Rural Development Commission
OECF	The Overseas Economic Cooperation Fund
O & M	Operation and Maintenance
PIA	Peoples Irrigation Association
PIS	Peoples Irrigation System
RID	Royal Irrigation Department
RFD	Royal Forestry Department
USAID	United States Agency for International Development
WMD	Watershed Management Division

GOVERNMENT OF THAILAND FISCAL YEAR

1 October to 30 September

ADMINISTRATIVE BOUNDARIES & POVERTY DISTRICTS



## I. INTRODUCTION

1.01 Following discussions in Bangkok in early 1983 between staff of IFAD and officials of the Ministry of Agriculture and Cooperatives (MOAC), IFAD prepared for a general agricultural project identification exercise. Further discussions on the timing and organization of an identification mission were held in Rome during the IFAD Board meeting in late 1983. As a result of these discussions a mission<sup>1/</sup> visited Thailand from February 5 to March 4, 1984.

1.02 IFAD's involvement in agricultural development in Thailand to date has been:

- (a) 1978, North-East Irrigation Project, IFAD loan US\$ 17.5 million.
- (b) 1980, National Research Project, IFAD loan US\$ 15.0 million.
- (c) 1983, Agricultural Credit Project, IFAD Loan US\$ 20.2 million.

1.03 This involvement has been through co-financing of projects with other donor agencies, notably IBRD. It was felt that the time had come for a more IFAD specific support to Thailand's agricultural development and this contributed to the decision to mount an IFAD specific agricultural project identification mission. On the side of Thailand, Government agricultural development policy has been reformulated, not least through the launching of the Rural Poverty Eradication Programme, enhancing the possibilities for IFAD supported project work.

1.04 The mission's terms of reference were set to concentrate on agricultural development possibilities in the northern and north-eastern regions only. In particular emphasis was to be given to small-scale irrigation in the north and crop diversification in the north-east.

1.05 The mission held discussions in Bangkok on possible IFAD supported projects with senior staff of MOAC, technical staff of the various MOAC departments, staff from other Government agencies and bilateral and multilateral agencies. These discussions took place during the week of February 6 to 12. The week of February 13 to 19 was spent in the northern region, that of February 20 to 26 in the northeast while the final week of the mission's stay in Thailand was used to follow-up on field findings and discuss mission proposals in Bangkok. During a round-up meeting with senior staff of MOAC on March 2, 1984, agreement in principle on the future IFAD support programme was reached. Annex I provides a list of principal contacts made whilst Annex II gives the text of a note of understanding prepared after the March 2 meeting.

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<sup>1/</sup> R. Ellinger, Mission Leader, A. Guinard, Agronomist, C. Gonzales, Irrigation Engineer, R. Isarankura, Economist (Consultants). Mr. I. Persson, IFAD, accompanied the mission throughout its stay in Thailand.

1.06 MOAC was well prepared for the identification mission. Some eight proposals for IFAD support actions were submitted to the mission. These are summarized in Annex II. Throughout the mission's visit cooperation with MOAC staff was very good.

1.07 This mission also took the opportunity of discussing ongoing and planned assistance projects with major aid donors, notably IBRD, EEC, UNDP and Australian, Germany, Japanese and American bilateral aid agencies. Upon return from the field visits, broad mission findings were discussed with these agencies to clarify interests and avoid duplication and conceptual contradictions.

## II. GENERAL BACKGROUND

### Part I : The Setting

#### A. Economic Aspects

##### General Economic Indicators

2.01 The fifth National Economic and Social Development Plan (1982-86) summarizes Thailand's development problems as follows: <sup>2/</sup>

"....the rapid economic growth in agriculture, manufacturing industry and services in the past has contributed to the deterioration of the country's economic and financial stability, and has disturbingly damaged many important natural resources, particularly land, forest and water resources. This has resulted in the deterioration of the rural environment. The rapid expansion of industrial activities, highly concentrated in and around Bangkok and other urban centres, has resulted in increasing urban congestion. The industrial activities have generated urban employment and material progress, but they have also caused social changes in value, discipline and relationships in the society. It has also caused some problems in culture, mental well being, and safety of lives and property. The provision of social services in these urban areas has also become more difficult and more unevenly distributed."

2.02 The key problems to the economic development of Thailand have thus been identified as:

- (a) Deterioration of the country's economic and financial position as a result of public and private overspending.
- (b) Deterioration of the country's natural resource base in particular land and water resources, forests and fishing grounds.

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<sup>2/</sup> Government of Thailand : The Fifth National Economic and Social Development Plan (1982-1986) page 5.

- (c) Deterioration of the country's social structures as a result of past rapid expansion of the economy.
- (d) Deterioration in the population's equilibrium structure with increasing income disparities between population in the urban centres particularly Bangkok on the one side and in the upper north and north eastern regions on the other side:

2.03 Basic economic indicators are given in Table 2.1. The steadily increasing deficit in the balance of trade which is still continuing is a key problem. Inflation on the other hand had declined by 1983 to only 3.5%.

Table 2.1 Major Economic Indicators

	<u>1973</u>	<u>1975</u>	<u>1977</u>	<u>1979</u>	<u>1981</u>	<u>1982</u>
GNP (million Baht)	216 119	298 597	391 016	546 449	765 030	834 308
(US\$ million)	9 500	13 125	17 378	24 020	33 628	36 673
Economic Growth Rate %	31.5	10.3	16.2	17.6	13.8	9.1
Agricultural Prod. Index <sup>3/</sup>	146.7	188.4	222.2	298.4	381.1	359.4
Crop Index <sup>3/</sup>	157.0	193.7	219.9	300.8	386.9	361.7
Consumer Price Index <sup>4/</sup>	74.2	95.3	108.4	130.0	176.8	186.3
Exports million Baht	32 226	48 438	70 398	106 337	149 261	156 264
Imports million Baht	42 184	66 835	94 117	146 161	218 060	197 170
Balance of trade million Baht	9 958	18 398	23 719	39 824	68 799	40 901
(US\$ million)	0 438	0 808	1 042	1 750	3 024	1 798

<sup>3/</sup> 1972 = 100

<sup>4/</sup> 1976 = 100 (Bangkok Metropolis)

Source: MOAC, Div. of Agricultural Economics

## B. Agriculture and the Rural Economy

2.04 The rural economy of Thailand has performed exceptionally well over the last decades, much more dynamically and successfully than rural economies in other countries at a similar level of overall economic development. The exceptional performance is characterized by the following facts: (a) Thailand is the only Asian country and with the exception of Argentina and Uruguay, the only developing country with sustained major food grain exports; (b) the composition of agricultural production has changed dramatically over the years as a result of farmers' willingness to exploit market possibilities and to respond to relative price incentives; (c) the overall growth of the agricultural sector, 5-5.3% per annum during the period 1960 to 1975, was a big factor in the exceptional growth of the national GDP (7-8% per annum). It has only been in the more recent years that total GDP and particularly agricultural GDP has slowed down, the latter from 3 to 3.5% per annum.

2.05 The impressive performance of the agricultural sector was made possible by: (a) the large scale expansion of the area used for crop production resulting in the rather unique phenomena of increasing average agricultural holdings combined with increasing numbers of such holdings; (see Table 2.2). However, more recently this area expansion went into marginal lands resulting in a slow but general decrease in average yields. A consequence of the past area expansion possibilities has been that relatively little emphasis was placed on improving yields per hectare through introducing improved cultural practices and high yielding varieties. (b) The fact that ownership of cultivated land even in the absence of clear land titles and usufruct, is widely and fairly evenly distributed. The ongoing land reform is aimed at further improving this situation. (c) The great labour mobility within rural areas and between rural and urban areas, making use of seasonal rural labour surpluses whilst maintaining agricultural production. (d) Expansion and improvement of irrigation areas and/or improvement of rain water usage resulting in increasing crop intensities. Thus crop diversification has not been at the expense of paddy land which has grown at an annual rate of 2% during the last two decades.

2.06 The agricultural sector in Thailand is also characterized by the fact that production and marketing is almost exclusively in private hands. Government, with the important exception of the rice and rubber taxation, has created an environment within which agriculture can develop and respond to market opportunities.

2.07 Furthermore, Government's large scale programmes of expansion of the national and provincial network of paved roads combined with the expansion of secondary and tertiary road networks<sup>5/</sup> contributed largely to the expansion of agricultural land. On the negative side it also contributed to rapid deforestation and all this entails.

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<sup>5/</sup> The rural road system increased from 8 500 km in 1960 to around 13 500 km in 1980.

Peoples' Irrigation Systems  
Agricultural Development

Table 2.2      Total Area Under Holdings, Number of Holdings and  
Average Size of Holdings, 1963 and 1978

SES 1975/76 region	Total area under holdings			Number of holdings			Average size of holdings		
	1963 ----- (rai)	1978 -----	% increase 1963-1978	1963 ----- (number)	1978 -----	% increase 1963-1978	1963 -- (rai) --	1978 --	% increase 1963-1978
North-Upper	3,369,619	4,814,090	42.9	396,426	483,342	21.9	8.5	10.0	17.6
North-Lower	9,167,735	15,128,333	65.0	380,404	521,667	37.1	24.1	29.0	20.3
Northeast-Upper	12,581,576	19,306,895	53.5	619,782	834,712	34.7	20.3	22.9	12.8
Northeast-Lower	13,821,294	21,201,522	53.4	600,926	812,630	35.2	23.0	26.1	13.5
Center-West	4,450,527	5,576,155	25.3	183,149	216,130	18.0	24.3	25.8	6.2
Center-Middle	6,867,259	7,474,704	8.8	265,145	269,845	1.8	25.9	27.7	6.9
Center-East	5,772,212	7,340,234	27.2	186,803	222,769	19.3	30.9	31.0	0.3
South-Upper	9,093,014	9,055,298	-0.4	378,876	381,919	0.8	24.0	23.7	-1.3
South-Lower	2,228,460	1,962,023	-12.0	113,697	124,494	9.5	19.6	15.8	-19.4
<u>Total</u>	<u>67,351,696</u>	<u>91,859,254</u>	<u>36.4</u>	<u>3,125,206</u>	<u>3,867,508</u>	<u>23.8</u>	<u>21.6</u>	<u>23.8</u>	<u>10.2</u>

Sources: IBRD Programme and Policy Priorities for an Agricultural Economy in Transition, December 3, 1982.

Table 2.3: Income Distribution and Rural Poor

	<u>North</u>	<u>North East</u>	<u>South</u>	<u>Centre</u>	<u>Bangkok</u>	<u>Total</u>
<u>GRP at Constant Price %</u>						
1960	15.8	17.0	14.1	29.3	23.8	100.0
1970	15.2	16.0	12.8	27.5	28.5	100.0
1979	14.9	14.7	11.8	31.2	27.4	100.0
<u>Regional per capita Income</u>						
<u>Current Prices, Baht</u>						
1960	1496	1082	2700	2564	5630	2106
1970	2699	1822	3858	4662	11234	3844
1979	8781	4991	12683	17635	30161	12067
<u>Regional per capita Income</u>						
<u>Current Prices, US\$ <sup>6/</sup></u>						
1960	65.75	47.55	118.70	112.70	247.45	92.25
1970	118.65	80.10	169.60	204.90	493.80	169.20
1979	386.00	219.40	557.50	776.05	1325.75	530.40
<u>Rural Population '000</u>						
1979	7911	13373	4720	8339		34343
<u>Rural Poor as Percent</u>						
<u>of Total Rural</u>						
<u>Population</u>						
	34	45	33	15		33.5
<u>Rural Poor '000</u>						
1979	2690	6017	1557	1251		11515
<u>Share of Rural Poor</u>						
<u>by Region</u>						
	23.3	52.3	13.5	10.9		100.0

<sup>6/</sup> at B 22.75 = US\$ 1 Source, NESDB, Rural Poverty Eradication Programme.

2.08 The expansion of the agricultural area has been accompanied by rapid mechanization, another indication of private sector initiative and responsiveness. The number of two wheel tractors increased from 2 000 in 1968 to 325 000 in 1982, that of four wheel tractors from around 20 000 to 105 000. It might be argued that the rate of mechanization has been too rapid leading to an uneconomic substitution of capital for labour. Mechanization certainly has resulted in a decrease of the number of draft animals.

2.09 Yet, in spite of its excellent performance, the agricultural sector is declining in overall economic importance. The sector's contribution to GNP declined from an estimated 40% in 1960 to 25% in 1982, and the sector's contribution to exports declined from about 90% in 1960 to 64% in 1982. Agricultural employment is estimated to have fallen from 84% of total employment in 1960 to 73% in 1982, most likely an estimate that over emphasizes the importance of agriculture, underestimating off-farm employment and rural underemployment.

2.10 The rapid increase in off-farm employment and its contribution to farm household income has been another basic trend in the Thai rural economy. Estimates indicate that for an average farm household, 49% of net income was derived from sale of farm products, 33% from non farming activities, 13% through house consumption of farm produced goods and 5% from hiring out factors of agricultural production to other farmers. Obviously the shares of on-farm and off-farm income in total incomes vary tremendously between regions and within regions, but the phenomena as such is nationwide, contributing to rural stability and overall economic development.

2.11 The steady growth of agriculture affecting the whole of the country has been of major importance in the reduction of poverty from 57% in 1962/63 to around 30% today<sup>7/</sup>. Poverty is concentrated in the rural areas of Thailand, particularly the north east, north and south where over one-third of the rural population is considered to be poor (see Table 2.3). Any slowdowns in agricultural production will directly affect rural and thus national poverty levels. In this connection the 3% annual growth of the labour force is of particular importance. It is unlikely that economic growth or agricultural growth will be strong enough to create the required 700 000 new jobs per year. As a result rural unemployment is bound to increase.

### C. Government Rural Development Policy

#### Administrative Structure

2.12 Administratively, Thailand is divided into (73) provinces headed by provincial governors under the Ministry of Interior. A province is further divided into districts, subdistricts, tambons and villages. The districts and subdistricts are headed by district officers, also under the

<sup>7/</sup> Poverty as defined by IBRD i.e., annual per capita income of less than US\$ 100.

Ministry of Interior. Heads of the tambon and villages are elected. For planning and coordination of rural development programmes, committees are formed at provincial, district, tambon, and village levels. The tambon council is the key body in which people can participate in decision making. It is responsible for consideration of problems identified by the village committee and formulates them into projects for funding. Each tambon is responsible for formulation of 5-year and annual plans which are then aggregated into provincial plans. The provincial plans are linked to the National Development Plan through development plans of ministries concerned. Each year the ministries inform the governors of the projects which the ministries would prefer to implement. Governors, through the provincial planning system, review the proposals submitted to them prior to implementation.

2.13 At the national level, the National Rural Development Commission (NRDC) chaired by the Prime Minister has been established with NESDB serving as secretariat. The National Rural Development Coordinating Centre has been institutionally set up in NESDB to serve NRDC. Policies and projects aimed at poverty eradication are decided by NRDC.

2.14 Economic policies, not involving poverty eradication, are decided by the Council of Economic Ministers chaired by the Prime Minister with NESDB serving as non-member secretary. The Council acts more or less as a sub-cabinet.

2.15 Development projects, not involving poverty eradication, seeking Government budget or external loans, go through the normal process from the Executive Board of NESDB to the Cabinet.

2.16 Issues involving the private sector are resolved in the Joint Public and Private Sector Consultative Committee (JPPCC) chaired by the Prime Minister with NESDB serving as secretariat. Decisions made by the Committee are forwarded for approval to the Council of Economic Ministers and its decisions are taken as the Cabinet's resolution. (for more details see Annex III)

#### D. Public Resource Allocation

2.17 Resource allocation is governed by the following plans:

- (a) Five-Year National Economic and Social Development Plans formulated by NESDB with cooperation and assistance from line agencies, universities and resource persons. The plans provide broad policy frameworks and require Cabinet approval.
- (b) Three-Year Rolling Plans formulated by NESDB aiming basically at improving management and utilization of external loan funds. The plans indicate maximum amounts of external borrowing, sectoral distribution, important projects and the project preparation schedule for monitoring purpose.

- (c) Annual plans starting with the fixing of government's annual budget by NESDB, Bank of Thailand, Ministry of Finance and Bureau of Budget, followed by an allocation for each ministry. Once the approval from the Cabinet is obtained, NESDB prepares "Pink Books" containing development performance in the previous year, problems in implementation, strategies for the new fiscal year, and high priority projects. (For more details see Annex IV)

2.18 Institutional reform is one of the key policies in the Fifth Plan, and the Government has implemented many activities toward that goal. Coordination among government agencies has been successful to a large extent in poverty eradication programmes in which administrative decentralization and people participation have also been improved. The various plans for resource allocation have also contributed to improving the planning-programming-budgeting process.

#### E. Key Policies

2.19 Rural development in the present Fifth National Economic and Social Development Plan (1982-86) calls for four basic policy objectives:

- (a) To eradicate rural poverty;
- (b) To increase the ability of rural populations to help themselves;
- (c) To increase agricultural production efficiency;
- (d) To improve conservation and utilization of natural resources.

2.20 To achieve the above objectives, the Government has divided rural areas into poverty and non-poverty districts, subject to different development policies.

2.21 Government has declared 286 districts and subdistricts (34% of national total) in 38 provinces as poverty areas. Out of these, 32 districts are in the South, 82 are in the North, and 172 in the Northeast. So that 45% and 66% of the total numbers of districts in the North and Northeast, respectively, are poverty areas. The total target population affected is about 8 million, living in 12 555 villages.

2.22 Since the people in poverty areas are poor because of their dependence on poor resource endowment, limited off-farm job opportunities and inadequate government support services, the Government has declared policy guidelines for the poverty areas which include:

- (a) Development efforts must be primarily directed toward poverty districts.
- (b) Sufficient public services will have to be provided to assist the local population to help themselves and thus improve their standard of living.

- (c) Solutions will have to be found for the development of poverty areas emphasizing low-cost, self-help techniques and maximum participation by the people.
- (d) Institutional reform will have to be introduced to bring about better coordination between the central Government and Government units in the rural areas and among the main ministries.

2.23 A programme for poverty eradication has been designed aiming at provision of basic needs and of nuclei for community development. It consists of three sub-programmes which contain the projects of the Ministry of Agriculture and Cooperatives, Interior, Education and Public Health. The three sub-programmes are:

- (a) Village Based Activities based on group action for resource development including projects for fish ponds, livestock exchange, water resources and woodlot development.
- (b) Social and Physical Infrastructure development including health and sanitation, human development, and local physical infrastructures.
- (c) Production Support Activities intended to assist individual farmers in improving their production. This includes agricultural projects on food production, organic fertilizers, rainfed rice, livestock improvement, soil alkalinity and salinity, soil conservation, upland crops, and backyard tree crops.

2.24 In addition to the specific programme for poverty eradication, there are another seven development programmes being reorganized for better management coordination. These are (i) small scale irrigation, (ii) rural employment generation, (iii) security areas development, (iv) regular programmes of MOAC, (v) regular programmes of the Ministry of Interior, (vi) regular programmes of the Ministry of Education, and (vii) regular programmes of the Ministry of Public Health. Coordination between high level committees and provincial level committees is to be assured through a strong secretariat at the national level.

2.25 Agricultural development in the non-poverty areas is aimed at an improvement in production efficiency to lower costs of production, and at agricultural diversification for better utilization of natural resources and labour. Thus agricultural production is to be changed from an extensive (area expansion) to an intensive (yield improvement) approach. This is to be achieved through (i) improvement of land and water utilization efficiency, (ii) greater use of appropriate production inputs, (iii) security of land tenure, (iv) strengthening research and extension activities, (v) reduction or removal of export taxes on agricultural commodities, (vi) protection from import competition of those commodities which could be potentially produced locally, (vii) improvement of market information at farm level, (viii) increased credit from financial institutions, (ix) support of farmers' cooperatives, and (x) increasing the role of the private sector in agricultural technology transfer.

2.26 During the first two years of the Fifth Plan, Government has taken several actions which have direct policy implications on the agricultural sector. The important ones include:

- (a) A decision to postpone implementation of the Kud and other large scale irrigation projects, but to support projects for agricultural development in the irrigated areas. This is in line with Government's policy to concentrate efforts on better utilization of existing facilities rather than on investment in new construction of high cost irrigation with its long gestation period.
- (b) The decision to reject an externally financed project for the Public Warehouse Organization aiming at an expansion of warehouse capacity up-country. This is in line with the policy to minimize Government's direct involvement in purchasing of farm commodities.
- (c) The strong commitment to involve the private sector in all aspects of agricultural production.
- (d) The approval of a cattle/buffalo bank and a seed exchange project in which public investments in areas outside the poverty districts produce inputs to be utilized by people in the poverty districts. This indicates the flexible approach with regard to public investment in achieving the aims of the poverty eradication programme.
- (e) The appointment by Cabinet of a committee, responsible for accelerated dry season cropping in four irrigation projects in the Northeast. The project, chaired by the Minister of MOAC coordinates the efforts of several MOAC departments.

## Part II : Agricultural Production

### A. Production Patterns

2.27 Major crops grown are: food crops - paddy, maize, cassava, sugarcane, mung beans and sorghum; oil Seeds - soya beans, groundnut, castor seed and sesame; fibre crops - cotton, kenaf, kapok; tree crops - rubber and coconut; vegetables - chilli, garlic, onions and shallots, plus tobacco. Table 2.4 gives details of areas planted to these crops.

2.28 Rice is the staple food and is grown in most areas. Rice consumption in Thailand is the highest in the world estimated at around 250 kg/capita/year. In spite of the rapid population growth, the country managed not only to remain self-sufficient but also to increase exports. This was achieved through acreage expansion and double cropping.

2.29 Cassava. Cassava has been grown in Thailand since around 1850, originally as food crop. The recent rapid increase in production has been stimulated by the demand for cassava by the animal feed industry in Europe and made possible by the expansion of the road network in the north east where about 45% of all cassava is grown. The centre east accounts for a further 45%. Cassava is not grown at the expense of paddy but rather on newly cleared forest land. As the crop is tolerant to poor soils and irregular rainfall, it is ideal for the north eastern region with its unreliable rainfall.

2.30 Kenaf. Nearly all kenaf is grown in the north east. Production has declined as producer prices have declined and the crop is no longer competitive with cassava. Also, kenaf is a much more labour demanding crop than cassava.

2.31 Maize. The major maize areas are the lower north accounting for around 40% of the crop area, the north east 25% and the centre middle 25%. Originally maize was grown for export, but since 1975 increasing quantities are used by the rapidly developing poultry industry which presently absorbs about 40% of total maize production. Poultry production has grown into an important export industry.

Table 2.4 Major Crops, Area, Yields,

Total Production 1973/74 - 1982/83

Crop Year	Rice			Maize			Cassava			Soyabean		
	ha	Yield	Prod	ha	Yield	Prod	ha	Yield	Prod	ha	Yield	Prod
	'000	kg/ha	'000	'000	kg/ha	'000	'000	tn/ha	'000	'000	kg/ha	'000
	ton			ton			ton			ton		
1973/74	8363	1780	14900	1148	2035	2340	428	15	6415	122	850	110
1975/76	8896	1720	15300	1313	2180	2865	492	14	6765	118	960	115
1977/78	9031	1545	13925	1205	1395	1675	847	16	11840	153	585	95
1979/80	9435	1670	15750	1525	1875	2865	846	13	11100	109	935	100
1981/82	9595	1850	17775	1567	2200	3450	1270	14	17745	128	1030	131
1982/83	9261	1755	16880	1679	1785	3000	1236	14	17790	124	910	113

	Cotton			Kenaf			Mungbean			Rubber		
	ha	Yield	Prod	ha	Yield	Prod	ha	Yield	Prod	ha	Yield	Prod
	'000	kg/ha	'000	'000	kg/ha	'000	'000	kg/ha	'000	'000	kg/ha	'000
	ton			ton			ton			ton		
1973/74	29	980	28	1134	1080	470	255	820	210	1372	390	365
1975/76	30	955	29	326	945	305	163	735	120	1405	350	350
1977/78	84	1075	91	256	955	245	435	475	205	1484	395	430
1979/80	120	1185	143	227	975	220	424	585	250	1532	375	535
1981/82	155	1285	176	186	1035	194	486	585	285	1579	400	510
1982/83	114	1070	122	217	920	200	485	580	280	1600	405	575

Source: MOAC, Division of Agricultural Economics

### Part III. Agricultural Support Services

#### A. Agricultural Credit

2.32 Through an active rural development policy during the last several years the Thai government has increased its support to institutional credit to farmers. An estimated 66% of Thailand's short and medium term credit extended to agriculture is at present met from institutional sources and the rest from private moneylenders. The Bank for Agriculture and Agricultural Cooperatives (BAAC) is the single most important source, contributing about the same amount as the total of all loans provided directly to agriculture by commercial banks. Whilst the commercial banks are playing an important role, the farmers benefitting are mainly medium and large scale farmers. The BAAC, however, has a mandate to direct its resources to viable small and medium scale farmers, either directly to individual farmers joined in liability groups or indirectly through cooperatives or farmers' associations.

2.33 BAAC, established in 1966 as a state enterprise bank to provide short, medium and long term credit to farmers is presently represented through 64 branches and 586 field offices in all 73 provinces of Thailand. About 2.1 million farmers or about half of all Thai farmers received credit through BAAC in FY 1982. Credit disbursements reached US\$ 515 million, an increase of 10.7% over the preceding year. Of this total, US\$ 391 million was extended to individual farmers at 14% interest rate, US\$ 122 million to agricultural cooperatives and US\$ 2 million to farmers associations at 11% (on-lending to farmers at 14%). The government supports these lower than prevailing commercial market rates as a means to increase the overall flow of credit to the agricultural sector.

2.34 An important feature in BAAC's source of funds is the mandatory deposit from commercial banks introduced by the government in 1975 reflecting another strategy to channel more funds to farmers at low cost. The Bank of Thailand controls that a fixed percentage of commercial bank deposits is allocated directly to farmers or through BAAC. More than 40% of BAAC's operating fund originates from deposits from commercial banks.

2.35 The BAAC is presently taking steps to expand its lending to small farmers, since many of these still have difficulty in obtaining institutional credit which could constrain further growth of the Thai agricultural sector. This strategy is based upon the concept that potential borrowers need access to higher return technology in order to produce surplus and thus become a safe borrower. A small farmer in this concept is believed to be as creditworthy as a large farmer when linking technical packages and credit together. (More information Annex V).

#### B. Agricultural Marketing

2.36 The marketing system in Thailand is quite efficient and thus the government has adopted a free trade policy and is concentrating its role on the improvement of basic marketing infrastructures such as transportation and communication systems. Exceptions of trade restrictions include the premium on export of rice, the export tax on

rubber, the export quota on maize and cassava, and domestic marketing restrictions on livestock. However, since 1981 the export quotas for maize were discontinued, the ban on white sugar export was lifted, cassava export controls were relaxed, the export tax on rubber was reduced by a third and the rice premium was reduced by one-half.

2.37 Government intervention in agricultural marketing aims at an improvement in market intelligence abroad, liberalization of government control particularly at exporters' level, improvement of marketing information at farm level, and protection of those commodities for which the government wishes to encourage domestic production. Export taxes have been reduced or entirely abolished, rules and regulations on agricultural export have also been reduced. Embassies abroad have been reporting back on agricultural production and marketing in various countries.

2.36 Marketing of agricultural produce in Thailand is predominantly in the hands of private enterprise. It is carried out through at least three layers of middlemen. One layer is at the village, tambon and district levels acting as sub-agents for merchants in big cities. At the village level there are usually large numbers of buyers where accessibility by pick-up trucks is possible and where supplies of products are big enough. The traders mostly deliver goods to wholesalers in towns where the commodities are assembled and stored before transporting to central markets in Bangkok. Most of the agricultural goods are transported by trucks. In Bangkok, there is another set of traders who take over the responsibility of selling commodities to exporters or local manufacturers or retailers in Bangkok. Exceptions are of course known i.e. vegetable oil producers and animal feed producers are competing for soybeans, consequently they each contract big local middlemen in the cities and bypass the middleman in Bangkok (see information in Annex VI).

### C. Agricultural Research

2.39 The Department of Agriculture has an extensive network of research stations covering the North and the North East Regions : 3 rice centres with 10 experiment stations, 3 field crop centres with 8 experiment stations, 3 horticultural centres with 8 experiment stations, 3 sericulture centres with 10 sub-stations.

2.40 The faculties of Agriculture of the Universities of Chiangmai and Khon Kaen which have no formal relations with the Ministry of Agriculture also have their own research activities.

2.41 Agricultural research has benefitted from foreign financial support. An IFAD loan co-financed by the World Bank and the Australian Government was made in 1980.

2.42 Agricultural research has produced impressive results mainly in the breeding of high yielding varieties. However, many technical problems have not yet been solved (see para. 3.25 and 4.30) and research programmes need to be further expanded. Close coordination of research programmes would be useful to concentrate resources on the major problems. It is not evident that the present emphasis given to farm systems research would be

fruitful. Admittedly, any research works has to be planned according to the type of farms which are to use its results and farming systems should be the general framework of agricultural research. However, Thai farmers have largely demonstrated that they will adopt new techniques when they are profitable using their available resources responding to market conditions.

2.43 The main problem seems to be insufficient coordination between research and extension. New techniques or the required inputs (seed, fertilizer, plant protection chemicals, equipment) are not always made available to the farmers by the extension department and other supporting services (MOF notably). Reciprocally for the planning of agricultural research, agricultural extension should be able to define and to quantify the problems faced by the farmers.

#### D. Agricultural Extension

2.44 The department of Agricultural Extension is the main agency providing technical support to the farmers. It has one extension worker per tambon, an administrative unit consisting of 10-15 villages and 1000-1500 farms. All Departments of the Ministry of Agriculture and Cooperatives or of other ministries (Department of Livestock, Land Development Department, Office of Accelerated Rural Development, Department of Cooperative Promotion, Public Welfare Department, Faculties of Agriculture, etc) as well as state organizations (tobacco monopoly) or private firms (seed companies) working with farmers have their own extension services.

2.45 As usual in old farming communities the average farmer looks to his more advanced neighbours for technical advice and support (seeds mainly). Progressive farmers are the real leaders in agricultural development at village level. Middlemen also play an important role since they supply a large part if not most of the modern inputs on credit (seeds, fertilizers, plant chemicals).

2.46 The main problem is in the coordination of the various sources of technical support. The efficiency of the Department of Agricultural Extension is also hampered by the lack of specialists who could advise tambon staff on technical problems.

2.47 Thai farmers are responsive to competent technical advice as demonstrated by the results of various projects under either government agencies or private firms.

#### Part IV : General Constraints to Agricultural Development

2.48 There exists undoubtedly a considerable interest within MOAC, NESDB and the Ministry of Finance to mobilize and use IFAD support for agricultural development. The interest stems in part from the understood aims and mandate of IFAD, in part from the favourable lending conditions. Nevertheless a number of principal issues exist which will affect IFAD co-operation with the Thai administration as do some basic structural issues which might affect eventual project implementation.

#### A. Structure of Agricultural Services

2.49 Annex III summarizes the structure of Government services particularly that of MOAC. Until recently the various departments of MOAC enjoyed considerable freedom in preparing their separate programmes and in securing finance, particularly external financing, for the implementation of these programmes. More recently a greater degree of coordination and control has been introduced which includes inputs from NESDB and the Ministry of Finance. Principal responsibility for project implementation should best be given to a nondepartmental body such as the Office of the Permanent Secretary of MOAC, where coordination among departments would be ensured through the establishment of a project coordination committee. It would appear preferable to entrust Government agencies with the preparation of all technical aspects of a project which would instill the need for inter-departmental cooperation. External assistance should be restricted to general guidance particularly in project report presentation and economic analysis.

#### B. Multiplicity of Outside Assistance

2.50 Thailand enjoys substantial interest and support from a wide range of multilateral and bilateral aid agencies (Annex IV provides a summary of ongoing and planned assistance projects). Thus, ongoing foreign assisted projects cover practically all segments of agricultural development activities and such broad based projects as the IBRD supported "Agricultural Support Services Project" or the "Poverty Eradication Programme" affect most technical and social aspects of any new agricultural development scheme. Cooperation and coordination with ongoing projects is thus imperative and will have to be ensured by the Thai Government.

2.51 Concomitant with this problem is that new project ideas are automatically of interest to other donors, i.e. the availability of technically and economically sound projects appears to be less than availability of external financial assistance. This supply and demand imbalance implies that a) mobilizing cofinancing should be relatively easy, (b) project preparation should start as soon as possible and should be undertaken with strong Government participation and clear donor identification.

#### C. Marketing

2.52 Marketing of farm produce as well as of most inputs, is in private hands. For a summary description of the agricultural marketing situation see Annex VI. The issue is that in project preparation and implementation, mobilization of private sector participation is essential. Government participation in marketing is limited and Government policy is not to change this. Cooperative marketing is being promoted but the vast majority of cooperatives is not yet in a position to undertake such a task.

2.53 Farmers see marketing as a major constraint to development. However, it is the pricing constraint or more precisely the supply and demand problem rather than infrastructures or organization that affects "marketing". There appear to be cyclical movements in production of certain crops such as garlic and onions leading to wide inter year price fluctuations. On-farm storage and market information would appear to be an appropriate approach to help farmers.

#### D. Land Ownership

2.54 The majority of agricultural land is operated by farmers without definite title or ownership certificates. This is particularly true for the recently developed areas in forest land in the North and Northeast. These areas are relatively poor and frequently prone to serious erosion. Terracing appears to be a condition for agricultural development. However, farmers are understandably reluctant to invest substantial amounts of labour and money in land for which they have no titles. Consequently, agricultural development in those areas virtually stagnates. The IBRD is now providing assistance to undertake a country wide cadastral survey. Once completed, basic agricultural improvement through land development should become a possibility.

### III. THE NORTHERN REGION

#### A. Introduction

3.01 The northern region, the second largest region in Thailand covering some 10 million ha, can somewhat arbitrarily be divided into two subregions, the Upper North and the Lower North. The Upper North is an area of smallholder agriculture with a substantial landless population. The average size of landholdings, around 15 rai or 2.4 ha, is by far the smallest in the country. The area covers the eight northern provinces of the Kingdom <sup>8/</sup> and approximately twenty percent of the country. The contribution to the GNP is around 6%.

3.02 The Lower North is characterized by recent rapid expansion and immigration. The agricultural area has increased sharply and the extent of agricultural crop diversification is the greatest of all the agricultural regions. Average farm family incomes were B 24 750 (US\$ 1 090) and infrastructure as well as Government services are superior to those of the Upper North. According to a recent World Bank Study about 36% of the regions population are living below the poverty of US\$ 100 per capita.

3.03 Future possible IFAD assistance should preferably be concentrated on the Upper North, a priority classification shared by MOAC and NESDB. The following summary description is restricted to that subregion.

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<sup>8/</sup> Mae Hong Son, Chiang Mai, Chiang Rai, Phayao, Nan, Phrae, Lampang, and Lamphun.

## B. Population and Poverty

3.04 The population of the Upper North is about 4.8 million or about 10% of the total population of Thailand. Population density is only 48 persons/km<sup>2</sup>. Nevertheless, population pressure is high in view of the vast areas of mountains and wasteland unsuitable for agriculture. Population density is 100 persons/km<sup>2</sup> on agricultural land. In fact the prevailing population density strains the ability of lowland agriculture both with regard to food production and with regard to availability of land for farmers. The result has been and still is a steady migration of farmers from the lowlands to the uplands leading to deforestation and soil erosion.

3.05 The population growth rate for the period 1960-1980 was 2.68%. However, there seem to be indications that this is declining and that present rate is actually below 2% and thus below the national average of 2.17%. The total agricultural population of the subregion is around 3.2 million, an increase of nearly 40% over 1960 levels.

3.06 The total average farm family income in the subregion is around B 16 900 or US\$ 735 per year. It is considerably below that of the northern region as a whole and below the national average farm family income of B 26 500 (US\$ 1 160). Of the average cash income of around B 14 300 (US\$ 630), approximately half comes from agriculture and half from non agricultural pursuits. The low income of the population is reflected in the concentration of Government's Poverty Eradication Programme activities in the subregion. Out of a total of 67 districts, 51 have been included in the Programme.

## C. Infrastructure and Services

3.07 The main centres in the north are well served by paved roads and by regular rail and road services to Bangkok. Most lowland areas have roads passable all year and since most people cultivating in the uplands live in the lowlands, these roads meet their village access requirements. Upland areas close to densely populated lowlands have dry season access, often a single lane, dirt road which allows adequate access for tractors, ox-drawn vehicles and the removal of produce under present circumstances, but upgrading and construction of additional roads would be needed for intensification of production. In most highland areas only some district headquarters and some key villages are connected by "provincial roads" constructed by the Office of Accelerated Rural Development. Some other areas are served by tracks but most villages have no vehicular access and are connected only by footpaths. This lack of access seriously limits the provision of services in highland areas and is a major obstacle to the production of cash crops other than high value crops, such as opium, which can be easily transported.

3.08 Elementary schooling is generally adequate in lowland areas but is seriously deficient in the highlands. Secondary schooling, although improving, is still inadequate in the lowlands and almost nonexistent elsewhere. Health services in the lowlands, although reasonably

widespread, fall far below target levels. There are many serious and debilitating diseases such as malaria, which could be controlled in highland areas but health coverage in most locations is totally inadequate. Absence of appropriate medication is an important factor in the high levels of opium addiction amongst some tribal groups.

3.09 The major industries in the sub-region are food processing, tobacco curing and sawmill installations. The greatest concentration of these industries is around Chiang Rai and Chiang Mai. The industries are important sources of off-farm employment and income.

#### D. Climate

3.10 The long term average rainfall in the Upper North is 1 270 mm with higher precipitation in the north in the province of Chiang Rai (1 760 mm) and the lowest in the south (1 050 mm). Major rains are between May and October accounting for most of the rainfall. The cool dry season is November to January while the hot dry season is February to April (mean daily minimum in January 12°C, in April 36°C). The average annual humidity is 73%.

#### E. Topography

3.11 The subregion is bound to the north and west by the Union of Burma, to the east by Laos, to the south by the Lower North provinces of Uttaradit, Sukhotai, and Tuk. The subregion is very hilly and mountainous. The mountainous areas are between 400 and 2 500 m a.m.s.l. having slopes in excess of 30%. The mountain ranges run generally north-south.

3.12 The subregion can be broadly divided into three zones: (a) The lowlands: areas with not more than 2% slopes and not more than 30 m above the levels of the local river bed. These lowlands or flood plains are largely alluvial, they cover some 865 000 ha or somewhat more than 8.5% of the subregion. These are of course the most fertile areas and the ones where irrigation is concentrated. (b) The uplands: areas with slopes of 2% to 30% and elevations up to 700 m a.m.s.l. These are rolling or hilly areas, many of them badly eroded as a result of deforestation and destructive cultivation methods. Total upland areas are approximately 1 975 000 ha or not quite 20% of the total area (c) The Highlands: areas with slopes of more than 30% and elevations of more than 700 m. There are glens and highland valleys suitable for cultivation but most of the area is under forest, often secondary growth. Highlands cover some 7 300 000 ha or more than 70% of the subregion.

#### F. Government Services

3.13 Government services to agriculture as provided by MOAC cover a wide range of activities and are applicable to all regions of the kingdom.

3.14 The significant contributions of the public sector to agricultural growth in the north have been in the areas of physical and technical infrastructures. This is reflected in the annual budget appropriation of MOAC in which not less than 60% of the total has always been for

irrigation development. As a result, 0.9 million ha out of a total 1.2 million ha of irrigated farm holdings in the North benefit from Government financed irrigation systems. The Government has also invested in the improvement of agricultural research and extension. Today each province has at least 7 agricultural service stations or centres and each Cambon has one extension agent. Agricultural research has concentrated in varietal improvement and new varieties of paddy, corn, soyabeans and cotton have been released to the farmers in the northern areas.

3.15 Agricultural intensification has always been the key objective in agricultural policy. To achieve this, farmers must be encouraged to use better inputs. Since costs to the farmers to use the inputs are high relative to prices of farm produce, the government has adopted an input subsidies policy which is intended to accelerate adoption by the farmers of modern means of production and to act as a "price stabilizer" without disrupting the market structure of the private sector.

3.16 Each year the Government is subsidizing transportation costs of chemical fertilizers at fixed rates of US\$ 15.21 per ton for a total of about 100 000 to 120 000 tons a year, for the whole of the country.

3.17 MOAC started producing crop seeds in 1976, first with assistance from USAID, later assisted by OECF and EEC. In 1983, the Ministry produced 7 545 tons of paddy, peanuts, corn, mung beans, soyabeans and sorghum seed with main emphasis on paddy. The seeds are being used in seed exchange programmes in which farmers can either buy the seed at below market prices or exchange with their own seed. The north has received benefits mainly in paddy and soyabeans seed exchange programmes. The quantities provided are extremely low compared to actual demand from farmers.

3.18 MOAC has constructed one seed processing plant in Lampang and one in Pitsanulok, and plans to construct another 5 units in the north. Each unit has a production capacity of 2 000 tons/year. MOAC is also producing 20 tons of rhizobium most of which would benefit farmers in the North, the main soyabean producing area.

3.19 The Government has been spending about US\$ 22 million a year for pesticides and spraying of the chemicals at no charge to the corn and cotton growers. Since 52% and 44% of total corn and cotton production, respectively, are from the north, the region should have received a significant proportion of the support.

3.20 The Department of Livestock Development carries out cattle and buffalo vaccinations and artificial insemination free of charge. The Fisheries Department produces and distributes fishseed free of charge in poverty areas and for a minimal fee in non poverty areas.

3.21 The Marketing Organization for Farmers is a state enterprise under MOAC, which is empowered to directly purchase farm produce mainly paddy, corn and cotton and to supply inputs.

### G. Farming Patterns

3.22 The average farm size in the lowland and upland area is about 15 rai (2.4 ha). Only 2% of farms are more than 50 rai (8 ha). In the highlands the average farmer cultivates about 6 to 10 rai (1 to 1.5 ha) but, because of the traditional shifting cultivation, occupies 50 to 60 rai (8 to 10 ha) including fallow under natural vegetation. Most farms own a buffalo for ploughing and one head of cattle. Total arable land in the sub-region is around 1.55 million ha.

3.23 Lowlands have been levelled and bunded and about one fourth of their area receives some form of irrigation. Cropping patterns in these fields are based on paddy (mainly glutinous, three fourths of the production, one fourth being non-glutinous) transplanted in July August and followed in December by vegetables or legumes (soyabeans, mungbean and peanuts). Some tobacco or corn is sometimes grown before paddy with the early rains. Upland fields have not been levelled; they are cultivated early in the rainy season with paddy interplanted with maize, legumes and chillies. Farmers in the lowlands use cash inputs (improved seeds, fertilizers, chemicals, mechanical ploughing) although in limited quantities. Unit yields are of the same order as the national average, per rai, 290 kg of paddy (1740 kg per ha) 125 kg of soyabeans (750 kg per ha).

3.24 Cropping patterns in the highlands depend on local tradition. Natural vegetation is slashed and burnt during the dry season, mixed crops of paddy and maize with some legumes are grown for 2 years followed on part of the field by poppy in some areas. Fields are then left under bush fallow for several years. Unit yields are about 200 kg of paddy per rai (1200 kg per ha).

3.25 Farmers have demonstrated their competence, and their interest in new techniques. However, major problems still limit agricultural production.

- (a) Rainfall fluctuations, particularly at the beginning of the rainy season, often delay rice transplanting and thus reduce crop unit yields. Consequently, to reduce their financial risks, farmers tend to limit the use of cash inputs. A secure water supply in farmers' fields through proper irrigation systems, is a prerequisite for intensive agriculture in the lowlands.
- (b) Farmers are not always able to find the required modern inputs when needed. A large part of the seeds are bought from neighbours or village dealers because they are not available from the official sources of improved seeds. Rhizobium inoculum which is essential for good yields of soyabeans and other legumes in lowlands is difficult to find. Compound fertilizers e.g. for tobacco may be applied on rice for want of the required mixture. The present system for the distribution of inputs needs to be improved. The Private sector could play a dynamic and constructive role in this direction if adequate incentives are provided to encourage them.

- (c) Improvement of upland cultivation has been started in some areas with foreign assistance. It is based on soil conservation structures which prevent erosion and allow permanent cultivation with techniques developed by agricultural research. Such development on a larger scale would require considerable investment of family labour. Therefore, farmers should be given definite and permanent rights to the land they have terraced. This problem is still under consideration by the Government.
- (d) Present agricultural production in the highlands is almost exclusively for home consumption. Most of the villages are far from any road. Any notable increase in productivity would require the construction of access tracks to market surplus harvests and to supply farm inputs.
- (e) Improved agricultural techniques have not yet been completely worked out for the highlands. Breeding has started to develop improved varieties of rice, wheat and barley suited to the physical conditions and to the local demand. Cultivation techniques (fertilizing crop rotations, plant protection) need further refinements.
- (f) Plant protection (particularly for cotton) is still a problem in some areas. Chemicals and application techniques (ultra low-volume spraying notably) used in other countries could probably be adopted after adjustments to local conditions and more specialized training of extension officers. Similarly herbicides could be of more general use to limit the growth of weeds which is a serious problem in legume fields.

3.26 Water Resources Much of the Northern Region is drained by the four main tributaries of the Chao Phya: the Ping, Wang, Yom and Nan. Farther north, the area is drained by the tributaries of the Mekong River.

3.27 RID projects in the region including those under construction will irrigate a total of 900 000 ha. These projects comprise small scale irrigation projects serving some 150 000 ha and medium and large scale projects serving 750 000 ha.

3.28 Aside from RID constructed projects, there are also Peoples Irrigation Systems consisting of small schemes commanding an average area of 750 ha each which have been constructed several hundred years ago. They are serving about 250 000 hectares in the Chao Phya Basin and some 50 000 hectares in the Mekong Basin.

3.29 Provision for storage on the Ping and Yom on the Chao Phya Basin and the Maekok on the Mekong are at various stages of development. Any future development on the tributaries of the Chao Phya has to take into consideration the effect on the Bhumiphol and Sirikit Dams as well as the present irrigated areas in the Central Plain.

#### IV. THE NORTH-EAST REGION

##### A. Introduction

4.01 Population and Poverty: The north-east is the poorest region of Thailand. It covers approximately one third of the total territory of the Kingdom. Administratively the region is divided into 17 provinces. Agriculture is by far the most important economic activity.

4.02 The total population is around 15 million or one third of the country's population. The majority are Phou-Thai who have migrated from Laos over the past several hundred years. In the south there are around half a million Khmers and around 100 000 Vietnamese, mostly recent immigrants found in urban centres.

4.03 Population growth varies substantially between various provinces. For the north-east as a whole it can be estimated at around 2.4% per annum including immigration. Average population density with 88 per km<sup>2</sup> is marginally higher than the country average, densities along the main rivers is in excess of 100/km<sup>2</sup>. Average family size is around 6.5 persons.

4.04 Average income per capita in 1982 was B 6 390 (US\$ 280) or 36% of the average national income. There are major differences in income between different provinces in the north east. However, a recent study by NESDB reveals that the incidence of poverty in the region as a whole is more than 43%, i.e. per capita incomes of less than B 1 980/year (US\$ 87), with another around 27% of the rural population having annual incomes of between B 1 980 and B 2 400 (US\$ 87 to 105). The general poverty of the region is further demonstrated by the fact that all provinces in the region are included in the Rural Poverty Eradication Programme (see Para 2.19). 145 districts and 27 subdistricts out of 259 districts in all 17 provinces.

##### B. Infrastructure and Industry

4.05 The region has an extensive network of good quality roads. A total of around 6 000 km of hard surfaced roads link provincial capitals and districts. Included in this is the "Friendship Highway" linking the north of the region through the region's main centre Khon Kaen to Bangkok. The network of gravel and dirt roads is extensive and the region is also connected to the rest of the kingdom by rail and air links. Electricity is widely available from four major dams and is imported from Laos.

4.06 Literacy rates are high with more than 80% of the population having at least primary education and with around 1 100 secondary schools plus numerous institutes of higher education including eight agricultural colleges.

4.07 The manufacturing industry, accounting for some 10% of the gross regional product, consists primarily of cassava and kenaf processing factories around Khon Kaen and Nakhon Ratchasima. Seasonal off-farm employment during the dry season is common and contributes substantially

to rural incomes. Employment is found locally in industry and services and through the Government sponsored Rural Work Programme. There is also a tradition of seasonal employment for some family members in Bangkok.

4.08 Climate: The climate is typical tropical monsoonal. The rainy season normally occurs during May to October when the south west monsoon brings heavy rains. This period is preceded (February-April) by light showers stemming from Bengal Bay cyclones. November to January are generally dry. The average annual rainfall is around 1 100 to 1 200 mm, with regional differences and year to year variations. Basically the north and east of the region has the highest (1 500 mm) and most reliable rainfall with the western part the lowest (1 100 mm) and least reliable rainfall. Year to year variations can be as high as 70%.

4.09 Topography and Geology: The region, covering some 170 000 km<sup>2</sup>, is bound to the north and east by the Mekong River, by hills and the central plains of Thailand to the west and by hills and the Khmer Republic to the south. The region is a gently undulating plateau at around 300 m a.m.s.l. sloping toward the south east and drained by the river systems of the Chi and the Mun, the former emptying into the latter and the Mun being a tributary of the Mekong. The plateau is composed of fine grained sand stone and shales with alluvial deposits along the river valleys.

### C. Services

4.10 The north east has more agricultural land and more farmers than the North, however, there is less irrigated land in the north east than in the north. In recent years the north east has been getting much government support in small scale water development projects.

4.11 Agricultural research and extension activities are similar to those in the North but their impact has been much less in the north-east. No technological breakthrough has as yet been achieved for the north-east agriculture. Paddy seed exchange, livestock vaccination and fish seed distribution are the major programmes considered as having the widest impact on the north-east farmers. MOAC has set up seed processing plants in Nakhon Rathasima, and plans to construct another 7 in the region to produce seeds of paddy, maize, sorghum, peanuts and vegetables.

4.12 The north east is the main producing area of glutinous rice. So far the Marketing Organization for Farmers has not handled glutinous rice.

4.13 Agriculture General: Agriculture in the hilly areas to the west and south having relatively low, unreliable rain, is based on cultivation of field crops. Paddy production is of limited importance. Cassava, kenaf and maize are the most important crops. Kenaf production has shown a declining trend. Restricted import of cassava to the european market in the future is expected to depress the cassava market with a following decline in production.

Table 4.1

Number of Buffalo and Cattle  
in  
Thailand and the Northeast  
(Thousands Heads)

	<u>Thailand</u>		<u>Northeast</u>	
	<u>Buffalo</u>	<u>Cattle</u>	<u>Buffalo</u>	<u>Cattle</u>
1984	5,312	4,796	n.a.	n.a.
50	5,422	4,490	n.a.	n.a.
55	5,960	4,724	2,557	3,199
60	6,666	5,265	2,950	2,262
65	6,691	5,104	3,304	2,300
70	5,735	4,667	3,196	1,892
75	5,597	4,142	3,329	1,857
80	5,651	3,938	3,673	1,558

Source: Office of Agricultural Economics, Ministry of Agriculture and Cooperatives, "Agricultural Statistics of Thailand".

- 4.14 In the large central part of the region, the so called Korat Triangle, paddy is the most important crop but acreage and yields vary considerably in between years due to variations in rainfall. About a quarter of the total agricultural area is devoted to field crops, primarily cassava and kenaf. Double cropping is rarely possible outside larger irrigation schemes of which there are six with a total command area of around 180 000 ha. They are located outside the flood plains of the Chi and Mun Rivers.
- 4.15 Along the Mekong, paddy cultivation dominates and due to more reliable rainfall, rice acreage and yields are more stable. There are some pump irrigation schemes along the Mekong and the Chi and Mun improving the chances for double cropping although cropping intensities in general remain below 100%.
- 4.16 Livestock rearing is important in the Korat Triangle and along the Mekong. Buffaloes are kept for labour and meat production, cattle are no longer used for labour and in the north east their numbers appear to be declining whilst that of buffalo remains more or less constant. Yet, the north east continues to account for around two thirds of the national buffalo herd and around 40% of the national cattle herd. Other livestock, e.g. pigs and poultry are found throughout the region but are kept largely for home consumption. Silk production is common (see table 4.1).
- 4.17 Soils throughout most of the north east are light and sandy with poor moisture holding capacity and low fertility. Average farm size in the north east is therefore larger than the national average, about 28 rai or 4.5 ha against 26.7 rai or 4.3 ha. Land distribution amongst families is uniform. Most farmers farm their own land and generally own both upland and paddy land. Rice is the dominant crop on virtually all farms apart from those in the western and southern hill areas. Rice is grown on around 16 rai (2.5 ha)/farm and is primarily for household consumption. Only 10 to 15% of production is marketed in normal years. Most farms also produce tree crops such as coconut, banana, mango, papaya, kapok for home consumption and sale as well as vegetables for home consumption. Upland crops - casava, maize, kenaf and to a lesser extent sugarcane are the important cash crops for the farmers.
- 4.18 Cropping patterns can change quite rapidly in response to market and price influences. The rapid development of cassava to some degree replacing kenaf, is a good example. There is a range of crops that could be grown such as groundnuts, sesame, and soyabean if market conditions were more favourable.
- 4.19 The scope for double cropping is quite limited as in general residual soil moisture content is insufficient for a dry season crop. However, an added disincentive to double cropping is the availability of off-farm employment. Relatively low yields of dry season crops are generally insufficient to provide real incomes competitive to those from off-farm employment. On the other hand seasonal underemployment remains

as only some members of the farm family are seeking off-farm employment. Non crop production activities such as livestock, poultry, silk, fuelwood and possibly fisheries could make use of their reserves and increase rural incomes.

#### D. Agricultural Production Patterns

4.20 Most of the cultivation is rainfed; from a total cultivated area of 47.5 million rai (7.9 million ha) not more than 3% or 1.5 million rai (240 000 ha) benefit from some irrigation and 80% of the farms are outside the irrigable areas.

4.21 Paddy fields cover 36 million rai (6 million ha), three fourths of the total cultivated area. Glutinous rice is predominant (80% of the production) over most of the region except in the south west provinces. Field crops cover 11 million rai (1.8 million ha) mainly under cassava, maize, kenaf, sugar cane and cotton. Tree crops (fruit trees, kapok and mulberry) cover 550 00 rai (90 000 ha).

4.22 The actual cropping pattern in the lowland and the lower terraces is: paddy transplanted in July and harvested in November - December, sometimes followed where residual moisture is sufficient, with vegetables or beans; in the upper terraces, shorter cycle paddy transplanted in August and harvested in October - November; In uplands, either cassava grown during the whole year or kenaf is sown in March - April and harvested in October. However, actual farm production system is much more diversified because of various minor crops and activities (livestock, silk production).

4.23 Farmers use minimum quantities of cash inputs because of the risks incurred in rainfed cultivation. Average unit yields of the staple food crop are much lower than in the rest of the country, 195 kg of paddy per rai (1 220 kg per ha) versus a national average of 266 kg (1 660 kg per ha). Moreover, total production fluctuates widely from year to year. Irregular rainfall not only reduces unit yields, but also limits the area which can be planted. For instance in the whole of Chaiyaphum province the coefficient of variation of paddy production is 48% from 1974 to 1982; on any individual farm in this area the variations should be even higher.

4.24 Water Resources As mentioned in para 4.09, the Mekong River marks the northern and eastern boundaries of the Region, at the same time establishing the border between Thailand and Laos. From Pa Mong to the Kampuchean border, the river flows first eastwards and then southwards, following the rim of the Korat Plateau. In this reach, the drainage basin is more extensive on the right (Thai) bank than on the left. The principal branches debouching into the right bank of the river are the Nam Huang, Nam Loei, Nam Mong, Huai Luang, Songkhan (the largest branch) Huai Thuai, Nam Kam and Hai Bang Sai.

4.25 The other two major river basins are the Chi which runs across the middle part as far as the Phu Phan range, and the Mun, located in the southernmost part of the plateau up to the ridges between the Mun and the Chi. The Chi has three principal branches (all on the left, or northern, bank) known as the Nam Phang, Lam Pao and Nam Yang. The branches of the Mun are more numerous and mainly flow into the river from the south. The Chi meets the Mun just west of Ubon Latchathani and the Mun then flows into the Mekong about 100 kms beyond that town.

4.26 In the 1960s, the Royal Irrigation Department, with bilateral assistance, embarked on a major programme of dam and canal construction. Since then, several large and medium-scale dam projects designed to irrigate about 560,000 ha, have been built. These were Nam Oon and Huai Luang in the Mekong basin, Nam Pong and Lam Pao in the Chi basin, and Lam Takhong, Lam Phra Plerng and Lam Noi in the Mun basin. However, the area receiving a reliable and timely irrigation supply has been far less than the potential because of inadequacies in the canal systems. On-farm development was also lacking and RID is now engaged in a programme to improve irrigation systems downstream.

4.27 Apart from these relatively large schemes and a limited amount of pumping from the rivers, the main source of water supplies in the Northeast is the hundreds of small reservoirs or tanks constructed by the RID and other agencies over the past 25 years or so. There are now over 800 such facilities in the Northeast, mostly located in the vicinity of villages in isolated and remote areas. The dams are fed by small streams or smaller tributaries of the main rivers, or are located in natural depressions or hollows to intercept the natural drainage run-off, and most have a capacity of 200,000 to 600,000 m<sup>3</sup>. The ongoing water development programme is concerned with further construction of such dams.

#### E. Constraints to Agricultural Development

4.28 The main problems stem from the difficult physical conditions and widely fluctuating rainfall. At Khon Kaen for instance, July rainfall has been less than 100 mm 2 years out of 5. This is insufficient for transplanting. Two years out of 5 rainfall was over 275 mm during September, thereby creating flood risks in the lowlands. Irrigation, however, is not a general solution in the North East because of the lack of permanent rivers and since the topography is too flat for building large storage dams. Irrigation, moreover, could increase the risk of salinity which is often present in the North East. The solution lies in diversification of production which is already practiced by farmers. The aim is to spread risks over a larger number of crops more or less tolerant to drought or excess water. A crop in point is cassava, a drought resistant crop with a large market, consequently production has quadrupled from 1974 to 1982.

4.29 Farmers also have to face severe labour constraints as timing of agricultural operations in non-irrigated agriculture depends on the rains. Transplanting in July/August and harvesting in November/

December are the two main labour peaks. During the rest of the rainy season family labour is underemployed which would facilitate the development of other activities. During the dry season off-farm employment is an important source of income.

4.30 A number of technical problems have not yet been solved at farm level. To improve soil fertility interplanting of legumes (peanut, cowpea) in cassava and kenaf has been tried. Results have been conclusive on experimental plots but not on farmer fields. This discrepancy seems to be due to weed infestation which is another major problem in upland fields. The economic justification of intercropping at present prices seems also doubtful. Pests can take a heavy toll in paddy, beans and cotton. As in the Northern Region, pests could probably be better controlled if trained extension staff could advise farmers on proper treatments and if the right chemicals were available at the right time.

## V. FIRST GENERATION PROJECTS

### A. Introduction

5.01 General: During project identification, different departments of the MOAC submitted project suggestions. All of these suggestions were rather limited in scope reflecting the still prevailing departmentalization within MOAC. (For a summary of project suggestions see Annex II). Some of the suggestions might either partially be included in more comprehensive projects or could be subject to special feasibility studies leading to later investment possibilities. These projects can be described as potential "second generation projects". On the other hand there are "first generation projects" i.e., schemes requiring a relatively shorter preparation period. These schemes are:

- (a) Land and Water Development in Peoples' Irrigation Schemes (Northern Region),
- (b) Agricultural Diversification in rainfed areas (North-East Region),
- (c) Agricultural Development Project (North-East Region).

It should be underlined that the first generation projects were all identified during the IFAD mission's visit to Thailand.

5.02 The primary criteria in project identification included:

- (a) Projects will have to fit into Government's development policy particularly the new broad based strategies centering around the Rural Poverty Eradication Programme (see Chapter II).

- ✓ (b) Projects will have to meet basic IFAD criteria of helping the poorest of the rural population in achieving sustained increases in food production and lasting improvements in living standards.
- ✓ (c) Projects should correspond to declared interests of the farming population and should allow maximum active participation by the farming community.
- ✓ (d) Projects should be restricted to the northern and north-eastern regions of Thailand which are the most poverty stricken regions of the country.

5.03 Status of dialogue with Government: Projects identified were discussed with Government, in particular with the MOAC and with NESDB. Understanding in principle was reached on the priority allocation for the preparation and implementation of "first generation projects", see Annex II. This understanding implies that the Land and Water Development Project based on People's Irrigation Systems in the Northern Region should be given first priority followed by the Agricultural Diversification Project in the north east. The Agricultural Development Project for the north east was given low priority in light of the concentration of foreign assistance on the irrigated sector in the region, the consequent need to first concentrate on rainfed agriculture and the expected relative high unit costs of the project.

Land and Water Development in Peoples' Irrigation Systems, Northern Region.

5.04 Background. The northern region of Thailand has a long tradition of irrigation primarily for paddy production. The region has an estimated total of 17 million ha, of which 3.8 million ha are agricultural land. RID projects in the region are capable of irrigating 0.9 million ha while several thousand Peoples' Irrigation Systems have an irrigable area of 0.30 million ha. Irrigation development potential in this region can bring the area under irrigation to about 50% of the agricultural land area.

5.05 Peoples' Irrigations Systems (PIS). This is the official translation of the name under which these farmer sponsored irrigation schemes are known in Thai. They are traditional irrigation systems constructed and maintained by farmers who voluntarily formed themselves into associations. Some of these schemes can be traced back to the 13th century, but most are of much more recent vintage. They operate today under a Peoples Irrigation Act promulgated in 1939 (see Annex VIII).

5.06 As these irrigation schemes are based on voluntary groupings of farmers, so called Peoples' Irrigation Associations (PIA). Their regulations for operation, repair and maintenance vary from one another, but they all operate within the framework of the provisions of the Peoples' Irrigation Act established in 1939. Each scheme is headed by a committee composed of all the village head men. The distinguishing feature of PIS's is their self control and an operation and management system entirely self generated. As a result, PIS do not face the problems of operation and maintenance so frequently encountered in Government sponsored irrigation projects. A typical PIS management structure is:

- (a) The PIA is governed by a village committee composed of 10 villagers plus a chairman elected by all PIA members. The chairman appoints two deputies bringing the total committee membership to 13. If the village headman is elected chairman of the PIA, he will have two votes in committee deliberations.
- (b) Upon election the chairman is officially appointed and confirmed in his position by the local District Officer (DO), a power vested in the DO under the People's Irrigation Act. The chairman also ipso facto becomes manager of the irrigation system.
- (c) Individual villages within the PIS appoint village subcommittees with the village headman as chairman and two deputies plus one liaison man who acts as coordinator, messenger, etc. The subcommittees look after water distribution and are responsible to organize emergency repairs when necessary.
- (d) At least three men are permanently engaged to work at the weirs. They act as gate keepers and weir tenders and undertake minor routine repairs; they also protect the weir from fire danger. They are paid around B 300/year each plus a premium of up to B 400 in a year of good harvest.
- (e) The chairman, his deputies and the staff of the village committees receive annual payments, one example indicates B 2500/year to the chairman, B 675 to the village deputy and B 400 to the village liaison man. Funds for these payments come from levies placed on the farmer, levies are generally in kind possibly 7 kg paddy/rai irrigated land.

5.07 Project Objectives: The project would aim at assisting existing PIA's groups in improving their crop production capabilities, reducing recurrent labour and material investments and allowing more efficient irrigation water useage. The project would also keep removing imbalances the gap in financial support given by Government to different farmer groupings in the north.

5.08 Crop production would be enhanced on the one side through improved water control and on the other hand through improved provision of support services, including availability of the right means of production, improved extension and credit services. It would also be the aim of the project to improve crop marketing particularly through promoting private sector involvement.

5.09 Recurrent labour and material investment would be reduced through the construction of permanent weirs. Presently the temporary weirs are washed out at least two to three times per year requiring major repairs and material inputs. The labour spent on repairs - provided by members of the PIA - could be more productively used on the fields. The materials required-rocks, logs, bamboo - are becoming more and more difficult to obtain. The constant use of timber and bamboo also contributes to deforestation.

5.10 Water usage would be improved through the construction of proper head regulators. With today's temporary structures, subject to recurrent partial destruction, no proper head regulators can be installed. Water availability on the fields downstream is thus more irregular than it should be and water availability on fields located farthest from the weirs is particularly erratic. This latter, in turn, has led in some instances to the construction of too numerous weirs with added costs and water losses.

5.11 Geographical Location: The northern region of Thailand, the second largest of the four regions<sup>10/</sup> into which the Kingdom is divided, can on geographic and economic grounds be divided into an upper north and a lower north. The upper north accounts for about 62% of the total area of the region or for some 10 million ha (for a description of the northern region see Chapter III).

5.12 The lower north in contrast to the upper north is much better endowed with infrastructure, economic activity and production potential, it has a larger portion of fertile flat areas and somewhat better, more reliable climatic conditions. The upper north is thus poorer and more in need of development assistance. Although PIS's are found throughout the region the project would emphasise on the upper north, i.e. the sub region consisting of the provinces of Chiang Mai, Chiang Rai, Lamphun, Lampang, Mae Hong Son, Nan, Payao, Phrae.

5.13 Within these provinces there are several thousand PIS covering some 300 000 ha of irrigated area. It would clearly be unrealistic to attempt developing all the PIS within one programme. The project would therefore have to be based upon a phased development, selecting a small number of PIS more ready for participation leaving others for later attention. Para 5.48 sets out some of the basic criteria for a selection. This approach would also imply the replicability of the project.

5.14 Target Group. The direct beneficiaries of the project would be small farmers, members of peoples' irrigation associations in the upper north. A typical beneficiary would have a holding of around 15 rai or (2.4 ha) against a national average of more than 26 rai (4.2 ha).

5.15 About 11 rais (1.75 ha) per holding are irrigated, The limitation to cropping intensity, today averaging around 130%, being water availability. The average farm family income can be roughly estimated at B 16 900 (US\$ 735) compared to a national average farm family income of around B 26 500 (US\$ 1 160) - the average farm family income for the northern region as a whole is estimated at B 24 500 (US\$ 1 075). With an average family size of 5.2 this translates into per capita incomes of US\$ 141 and US\$ 207 respectively compared with a per capita income estimated to US\$ 751 in 1982 current prices for the total population.

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<sup>10/</sup> Northern Region	-	106 253 750 rai
Northeastern Region	-	106 391 250 rai
Central Plain	-	64 736 875 rai
Southern Region	-	43 868 125 rai
Total	-	<u>321 250 000 rai</u>

6.25 rai equals 1 hectare.

5.16 All the provinces included in the upper north are partially included in the Rural Poverty Eradication Programme of Government (See Chapter II and Annex III)). More precisely 51 of 67 districts have been declared poverty areas by NESDB.

5.17 The average family in the target group around 5 persons of whom around 2 to two and half can be considered full time labour units, but total labour demand today would probably be not more than 1 labour unit with seasonal peak demands during land preparation and harvesting seasons. Seasonal underemployment on farms is thus widely spread. A recent sample survey<sup>11/</sup> indicates that 41% of farm family members over the age of 11 worked only on the farm, 2% only off-farm, 26% both on and off farm and 32% did not work at all. In this particular sample off-farm income was very much higher than income from the farm: 75% : 25%. Annex IX provides details of socio-economic aspects of the region.

#### B. Consistency of the Project with Government Agricultural Policies

5.18 The proposed project aims at providing support to small farmers in the Upper North to maintain their group efforts which have been successful over a long period. The farmers were able to help themselves because of the plentiful supplies of logs from nearby forests for their weir construction. This situation no longer exists and there is a need to find substitutes for wooden weirs through more permanent structures. This will involve cash investment beyond the financial ability of the farmers. Strengthening farmers' institutions and distribution of public services to those who have so far been by-passed, are the basic thrusts of Governments present rural development policy.

5.19 Improvement of existing irrigation facilities combined with better extension services and the involvement of private sector in farm input distribution and marketing of farm outputs should lead to greater cropping intensity and improved crop yields. This in turn should facilitate crop diversification and help in the implementation of Government's soyabean project. The soyabean project is under preparation in the MOAC, preparation is expected to be completed by mid 1984. Basically the project will aim at increasing Thailand's production of soyabean as part of a programme of import substitution (1982 imports of soyabean and soyabean oil were 13 000 t valued at around B 140 million). The project will aim at increasing seed availability and improving marketing with the help of the private sector. Major constraints to soyabean production today is poor seed, limited availability of Rhizobium innoculum and poor extension. Besides soyabean, the project would also concentrate on increasing rice, maize and vegetable production.

5.20 The project, therefore, is in line with the policies laid down in the Fifth-National Economic and Social Development Plan. It also supports present government attempts to improve basic services to rural populations.

<sup>11/</sup> Chiang Mai University: Upper North Agricultural Development. Feasibility Study. Draft undated but prepared 1983.

### C. The Project

#### 5.21 General Outline

##### (a) Irrigation Development.

PIS today are generally operated at very low efficiency because of lack of control structures and low canal embankments. Proper distribution of water to all PIA members is difficult with those upstream getting often too much, those downstream insufficient water. The project would provide means for commanding the service areas, even at a minimum of 50% flow. This would be achieved through raising the canal embankments and installing water control systems. Some land levelling might also have to be undertaken. Another important project action would be proper sizing of distribution intakes as well as farm turnouts. As a corollary of improved irrigation water distribution the drainage network would be improved to increase and/or accelerate return flows. Finally, the project would assist in developing operational guidelines for each PIS and for each river basin included in the project. Necessary staff training and supervision would be provided by RID.

##### (b) Agricultural Development

5.22 Improving irrigation headworks and distribution channels would result in a more secure water supply and increased dry season flow. More intensive crop production techniques would then be justified since the main risk to crop failure which was the destruction of headworks by flash floods would no longer pose any threats to canal embankments. Labour now required for the reconstruction of the weirs could be devoted to agricultural operations. It is estimated that dry season cultivation could be expanded from 30% of the irrigated area at present to 80%.

5.23 Cropping patterns which depend on physical and working conditions would not be much modified. However unit yields and returns would increase as a result of improved agricultural practices. High yielding varieties are available for all the main crops (glutinous and non-glutinous paddy, maize, soybean, peanuts, mungbean etc). They are well adapted to the different ecological situations in the lowlands. Fertilizer recommendations have been developed for the various soil types. Major pests are known as well as the insecticides to be used. As shown by farm surveys these new techniques are profitable. Table 5.1.

5.24 Irrigation is only one of the prerequisites of agricultural intensification. Farmers must also be advised in the new technologies. Therefore, competent extension staff would be appointed in the project area, after having received proper training. It is estimated that one extension agent could support 250 to 400 farmers during the first 5 years, about 400 to 750 farmers thereafter. Subject matter specialists (soil, plant protection, agronomy) would be necessary to help 15 extension staff. All these personnel should receive 2 months refresher courses at the CHIANG MAI Faculty of Agriculture before joining the project; in-service training (about 4 weeks each year) should also be programmed. Thailand's agricultural extension services have adopted the IBRD sponsored visiting and training system. It would be difficult under this project to break away from the VAT but suitable adjustments would be made.

Table 5.1 Impact on Yields from Improved Techniques

<u>Crop</u>	<u>Present Techniques 12/</u>		<u>Improved Techniques</u>	
	<u>Unit Yield</u> <u>Kg per rai</u>	<u>Gross Profit 13/</u> <u>Baht per</u> <u>rai</u>	<u>Unit Yield</u> <u>kg per</u> <u>rai</u>	<u>Gross Profit 14/</u> <u>Baht per</u> <u>rai</u>
Paddy	290	510	830	1360
Soybean	125	470	380	720
Maize	335	560	896	1170

5.25 Cash inputs (seed, fertilizer, Rhizobium inoculum, pesticides, herbicides) would be made available to farmers close to their village and at the time when they are needed. Input supply would be organised through local middlemen or through the PIA. Some storage facilities would be built by the project for this purpose.

5.26 As an example of the proposed development a model of an average farm of 11 rai as given in Table 5.2. Rainy season crop would remain glutinous rice. In the dry season the cropped area in the lowlands would increase from 3.3 to 6.6 rai; soybean would be introduced in the second season cropping in accordance with government plans. Estimates of yields and production costs are based on research results as taken from the available documentation. At full development, expected in the fifth year, agricultural gross profit would increase by about B6300 per farm, from B13000 at present to B21000. However, because of the extra work required on the farm during the dry season, off-farm income would probably be reduced. It is estimated that 25% of the active population works outside of the farm, mainly during the dry season. Since the labour required on the farm at this time of the year will be at least doubled, off-farm income estimated at B7200 per farm might decrease. It is estimated that this reduction could be of 25 to 30%, i.e. about B2000. Real incremental income would thus be only around B 6 000 or around half of the without project farm income. It is considered that this increase would be sufficiently attractive to farmers to participate. Evidence in this regard is available through other similar projects.

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12/ Upper North Upland Agricultural Development feasibility study - CHIANGMAI University.

13/ An interdisciplinary perspective of cropping systems in the CHIANG MAI Valley - CHIANG MAI University - 1980

14/ Value of Production less cash cost of production.

Table 5.2  
Costs and Returns <sup>15/</sup>per Farm  
(11 rai Lowland and 4 rai Upland)

<u>Cropping Patterns</u>	<u>Area (rai)</u>	<u>Unit Yield</u>	<u>Prod. Value</u>	<u>Prod. Cost<sup>16/</sup></u>	<u>Net Value of Prod.</u>
<u>Present Situation</u>					
<u>Lowlands</u>					
<u>Rainy Season</u>					
Paddy (glutinous)	11	290	7975	2365 (660)	5610
<u>Dry Season</u>					
Paddy (non-glutinous)	3	350	3150	750 (255)	2400
Vegetables	0.3		1500	510 (250)	990
<u>Uplands</u>	4				<u>4000</u>
<u>Total</u>					13000
<u>With Project, at full development</u>					
<u>Rainy Season</u>					
Paddy (glutinous)	11	400	11000	3850 (1650)	7150
<u>Dry Season</u>					
Paddy (non-glutinous)	4.4	500	6600	2200 (990)	4400
Soybean	3.3	200	3630	1320 (660)	2310
Vegetable	1.1		5500	2200 (920)	3300
<u>Uplands</u>	4				<u>4000</u>
<u>Total</u>					21160

<sup>15/</sup> All areas in rai, values and costs in Bahts

<sup>16/</sup> Total cash cost = Seeds, fertilizer, chemicals, contract ploughing, hired labour - between brackets cost of seeds, fertilizer and chemicals only.

Table 5.3

Peoples' Irrigation Systems  
Agricultural Development

Year	1	2	3	4	5	Total
Additional ha.	0	0	2 100	3 600	4 300	10 000
Total ha.	0	0	2 100	5 700	10 000	
Additional farms	0	0	1 190	2 045	2 445	5 680
Total farms	0	0	1 190	3 235	5 680	
Extension agents farm level No.	0	0	3	8	15	
Cost '000 B(1)	0	0	240	640	1 200	2 080
Extension supervision No.	0	0	1	2	3	
Cost '000 B (2)	0	0	100	200	300	600
Extension Manager No.	0	0	1	1	1	
Cost '000 (3)	0	0	235	235	235	705
Farm credit '000 B (4)	0	0	5 020	8 630	10 320	23 970
Total '000 B	0	0	5 595	9 705	12 055	27 355
'000 US\$	0	0	245	420	525	1 190

1. 1 for 400 farms, annual cost B 80 000
2. 1 for 5 village level extension staff, annual cost B 100 000
3. Annual cost B 235 000
4. Credit for cash inputs through BAAC (seed, fertilizer, chemicals) at B 4 220 per farm.

D. Summary Costs and Benefits

5.27 Cost estimates have been made for a 10 000 ha module. These costs are necessarily tentative and will vary somewhat from location to location. The 10 000 ha module can be multiplied in light of available funds both local and external and implementation capability as determined at the time of preparation. There are several thousand PIA in the northern region covering an estimated 300 000 ha.

5.28 A breakdown of costs is given in Table 5.4 These costs are:

	<u>(B Million)</u>	<u>(US\$ Million)</u>
Pre construction cost	18.8	0.82
Major construction costs	125.0	5.45
Supervision and Administration	21.6	0.94
Extension and production	27.4	1.20
Total	192.8	8.41

5.29 In addition participating farmers in PIA's would undertake the rehabilitation of tertiary channels, limited land levelling and drainage improvement. An estimated 40 man days per rai would be needed at an assumed opportunity cost of Bh 40/day. The total value of this for a 10 000 ha scheme would be Bh 10 million or US\$ 440 000. The rate of Bh40/day is the assumed opportunity cost for labour as assessed by NESDB.

5.30 Total project cost per ha developed thus would be US\$ 880. Cost per participant excluding labour input US\$ 1 475.

5.31 Table 5.3 gives an estimated phasing of development and modular costs.

5.32 Project costs are exclusive of physical and price contingencies. Foreign exchange cost of the project are estimated at around 50% of total costs excluding farm labour.

E. Benefits

5.33 In an assumed 10 000 ha project total incremental production and its value of farm gate - 1983 prices could be estimated at:

	<u>(B Million)</u>	<u>(US\$ Million)</u>
Glutinous Paddy 6875t at B 2.5/kg =	17.2 =	0.75
Non " Paddy 6500t at B 3.0/kg =	19.5 =	0.85
Soyabean 3700t at B 5.5/kg =	20.4 =	0.86
Vegetables	22.7 =	1.00
Total	79.8	3.46

An additional project benefit would be the savings in annual repairs of temporary weirs. These savings can be estimated at B 100 000 for labour/weir and B 225 000 (US\$ 4 500 and 9 900 respectively) worth of material/weir (Table 5.5.). A project area of 10 000 ha would encompass about 14 weirs (720ha/weir), so total savings would be B 4.6 million or US\$ 200 000 per year. Total direct benefits would thus be around US\$ 3.7 million/year.

5.34 There should be no problem in marketing the rice, glutinous rice locally to the expanding population, nonglutinous rice within Thailand or abroad, soyabeans within Thailand as import substitution and vegetables in Thailand and abroad.

5.35 The total number of beneficiaries in a 10 000 ha project would be around 5 700 families or some 32 500 people directly involved plus an unknown number of indirect beneficiaries through the spinoff from the project through greater income in villages, additional trade in products etc.

5.36 In addition to the directly measurable benefits there would be a number of social and other benefits. These include: continuous use of logs and bamboo, etc., would no longer be needed for regular weir repairs, improved water availability to downstream farmers of project areas as a result of better water management on projects, and a decrease of seasonal migration as a result of increased income to the farmers.

Table 5.4

Irrigation Improvement Individual Cost Items  
Baht per PIS of 720 ha (4 500 rai)

	<u>Cost</u> <u>(B)</u>	
Topographic and other basic surveys	100/rai	
Design and contract preparation	200/rai	
Construction of weir and head regulators	8 million	
Construction and rehabilitation of major canals	0.5 million	
Construction of other major structures	0.5 million	
Total	10.35 million	
Supervision and administration	15%	
Total	11.90 million	
	US\$	523 000
For a 10 000 ha development module total costs would thus be:		
	B	166 600 000
	US\$	7 322 000

Table 5.5

Annual Cost of Repairs to Temporary Weirs B per Weir per Year

	<u>Cost (B)</u>
Material: (a) Rocks 500 cu.m at B 250 cu.m	125 000
(b) Logs and bamboo 200 pieces at B 500 piece	100 000
Total material	225 000
Labour weir construction	55 000
Desilting of canals (incremental labour)	45 000
Total labour	100 000
Total savings	325 000

F. Organization and Management

5.37 The project will have the nature of a subsector programme loan. A successful first phase project could easily be replicated covering new PIA's. Programme loans sometimes run into implementation problems if they are too complex and diffuse in design and/or if they suffer from lack of clear and autonomous management or insufficient internal control and reporting. The issue is that during project preparation no new alien components be added to the project, project phasing be geared to implementation capacities and that project management be given maximum degree of autonomy with clear lines of internal and external responsibility and communication.

5.38 The project would involve a number of Government departments so that no single department should take on full responsibility for project implementation. The project would also most likely operate in more than one province. Organizational structures would thus be required at national and provincial levels. It should also be borne in mind that a national rural development system has been developed aiming at effective coordination among government agencies and full participation by beneficiaries. The project organization would have to be linked to that system.

5.39 A basic criteria for project organization is maximum organization autonomy permitting rapid decision making. Also required would be simple lines of internal communications. To achieve these goals the following structure might be considered:

(a) At national level:

- (i) Government would appoint a project director with full responsibility in project implementation. The director would report directly to the Permanent Secretary, MOAC.
- (ii) A Project Coordination Committee would be established composed of representatives from: Royal Irrigation Department, Department of Agricultural Extension, Department of Land Development, Department of Agriculture, Bank for Agriculture and Agricultural Cooperatives, Ministry of Finance, National Economic and Social Development Board, Bureau of Budget, Civil Service Commission, and other line departments such as Fisheries Livestock, Forestry as required. The chairman should be the Permanent Secretary of MOAC and the project director would act as non voting secretary of the Committee. The Committee would be appointed by the Agricultural Policy and Planning Committee which is chaired by the Minister for MOAC.
- (iii) Both the Minister and the Permanent Secretary for MOAC are members of the National Rural Development Commission and therefore would provide linkage to the national body.

(b) At Provincial Level

- (i) The provincial representatives of MOAC (existing position) would be responsible for project coordination at provincial level through the existing Provincial Rural Development Committee chaired by the provincial Governor. This would automatically provide linkage of the Project with the rural development system at provincial, district and tambon levels.
- (ii) The project manager for each project site would be appointed by the Permanent Secretary MOAC with recommendations from the Project Director. The project managers would report to the Project Director and also inform provincial, district and tambon representatives of MOAC.
- (iii) Participation of PIA in the coordination process would be through Tambon Council and village development committee.

5.40 The Committee would have responsibility for project policy formulation and would approve annual development plans as formulated by the project director. The Committee would entrust the Agricultural Economics Bureau with the monitoring of the project. The project director with assistance of the Bureau would be responsible for regular reporting - at least half yearly - these reports would be submitted to the Permanent Secretary MOAC and through him to the donor agency. Individual project managers would submit regular reports including half yearly work programmes to the project manager.

G. Project Implementation

5.41 RID in consultation and agreement with farmers' organizations would undertake by force account or through local contractors the construction of the permanent weirs, head regulators and principal water distribution structures. RID would also be responsible for the rehabilitation of main canals where excavation depth is more than one and half metres (the maximum for effective hand digging). Local contractors would be given equal preference in awarding contracts, wherever they are available.

5.42 PIA's would be fully responsible for the rehabilitation of other existing canals and for the construction of additional secondary or tertiary canals and drains. PIA's would also be responsible for land levelling where required under the technical supervision of the Department of Land Development.

5.43 The Extension Department and other line departments would be responsible for assisting and advising PIA's in aspects related to crop development etc. Local administration would cooperate in this, particularly with a view of mobilizing private enterprise to assist in input supply and produce marketing.

5.44 Responsibility for O&M would rest with PIA's. MOAC, through its line department would provide training for the proper operation of the project with particular emphasis in water management. Local Government will ensure strengthening of the PIA's in general and monitor project progress in particular.

#### H. Preparation and Organization

5.45 Royal Irrigation Department, Agricultural Department, Land Development Department, Extension Department (all from MOAC) plus the Bank for Agriculture and Agricultural Cooperatives as well as local government. <sup>17/</sup> All these units should participate and be responsible for project preparation to assure a project concept generally acceptable to the line departments and to instill from the beginning the concept of cooperation.

5.46 Project preparation will need to start with a selection by priority of peoples' irrigation schemes to be included. There are today around 5 000 PIA's in existence, all of them in the northern region, they account for approximately 300 000 ha of irrigated land. There is no precise census of these PIA's although all of them are registered under the People's Irrigation Act. It would be necessary for RID to:

- (a) identify and locate all PIA in the Upper North giving approximate area under irrigation and number of weirs;
- (b) together with other services of MOAC, particularly the Office of Agricultural Economics, identify those PIA which have already indicated an interest in Government support for improving irrigation systems.
- (c) Rank PIA's by priority for assistance inter alia, taking account of:
  - (i) Location of PIA in declared poverty districts,
  - (ii) Incidence of flooding,
  - (iii) Past support by Government for infrastructure,
  - (iv) Geographical location to assure a certain cohesion,
  - (v) Size of PIA in hectares irrigated.

5.47 As there may be more than one PIA drawing water from a tributary or creek a good estimate of river flow must be made prior to final selection to determine the water allocation for each PIA at different stages of flow. As soon as the allocation for each PIA is determined, the District Commission, or the Provincial Commission if the PIA's involved are in more than one district, must contact the officials of the PIAs to announce and

17/ Other departments of MOAC e.g. Fisheries, Forestry, Livestock might be included.

get the acceptance of the PIAs of their water allocation. The authority of the District or Provincial Commission to determine water allocation is derived from the People Irrigation Act. After agreement had been secured, the District or Provincial Commission must secure the permission, for water allocation, of the Ministry of Agriculture and Cooperatives which is empowered to do so under the Act for areas exceeding 1 000 rai (160 hectares). This procedure of determining and getting permission for water allocation must be adhered to before actual planning of the works can be started.

5.48 During the subsequent preparation a "typical" PIA would be selected and development plans for this PIA prepared. Development plans would require:

- (a) a detailed topographic survey and mapping of the whole area with contour intervals of 0.25 m,
- (b) cross section surveys of 20 m interval of all existing main and secondary canals,
- (c) cross section surveys at 100 m intervals of the stream 200 m upstream and 300 m downstream from any weir,
- (d) soil capability survey,
- (e) farm lot survey if cadastral survey results are available,
- (f) designs, drawings, specifications, layouts for the permanent weir, head regulator, water distribution structure, main, secondary and tertiary canals,
- (g) typical cropping patterns including timing of crop cycles, labour requirements, input requirements expected yield, and
- (h) cost and benefit assessment with clear unit costs.

5.49 The "typical" PIA would then be the subject of a complete feasibility study being used as a model for other schemes to be included under the loan.

5.50 The selected PIA's should be actively involved in the preparation of the Development Plan. It would have to be the aim of the project to maximise farmers' participation and during preparation the future role and responsibility of the PIA and its members would have to be fully agreed upon.

5.51 As mentioned, preparation should remain primarily the responsibility of MOAC's line departments. As part of the initial gearing up to preparation each department will need to identify staff available for preparation and special expertise that might be required to complement available staff. This will most likely relate to some of the survey requirements mentioned above. It is suggested that the required additional expertise be recruited with IFAD financial support. It is expected that the expertise can be recruited locally.

5.52 External support to project preparation could restrict itself to general guidance and supervision. It is anticipated that this could take the form of one four week visit at the start up of preparation to agree on individual terms of reference and preparation timetables, one or two visits during preparation to follow-up and assist as necessary in project preparation and a four week visit toward the end of preparation to assure completion and exactness of documentation, review report presentation and, in particular, assist in the economic analysis.

5.53 Since preparation will be a multidisciplinary effort coordination will be essential. It is suggested that the responsibility for this coordination be given the designated project director. This approach would allow the key person for project implementation to be intimately involved in all aspects of the project. The project director would be responsible to the Permanent Secretary MOAC. Alternatively, responsibility for coordination would have to be given to an official within the Permanent Secretary.

5.54 Preparation of a feasibility study for a "typical" PIA that could form phase one of project implementation would probably take up to six months. Funds would need to be included in the eventual project loan for the preparation of the detailed surveys and mappings for other PIA's to be developed as second or third phases within that loan.

#### I. Issues

5.55 PIA's are voluntary organizations who have shown their value and resilience over years. It would be the aim of the project to work through these units helping them to help themselves. This, by definition, requires an approach different to that of normal irrigation development in Thailand which is top-downwards. A project approach whereby the fabric of the association would be destroyed if the association is not allowed to be involved in the planning process. The issue is the design of a project with maximum active participation of PIA's and their members.

5.56 Related to the above is the problem of cost recovery. No water charges are levied in any irrigation projects in Thailand. On the contrary RID and other departments have the tendency of supplying services, including infrastructure development, free of charge. It would be unrealistic and unfair to expect that water charges can be levied in the case of PIA. It would appear more realistic to agree that maximum farmer participation in network construction represents a sufficient contribution by participants. The issue thus is waiving of water charges at least until a nationwide policy of water charges has been introduced. On the other hand, the existing system of payment in kind by farmers to PIA management should be maintained.

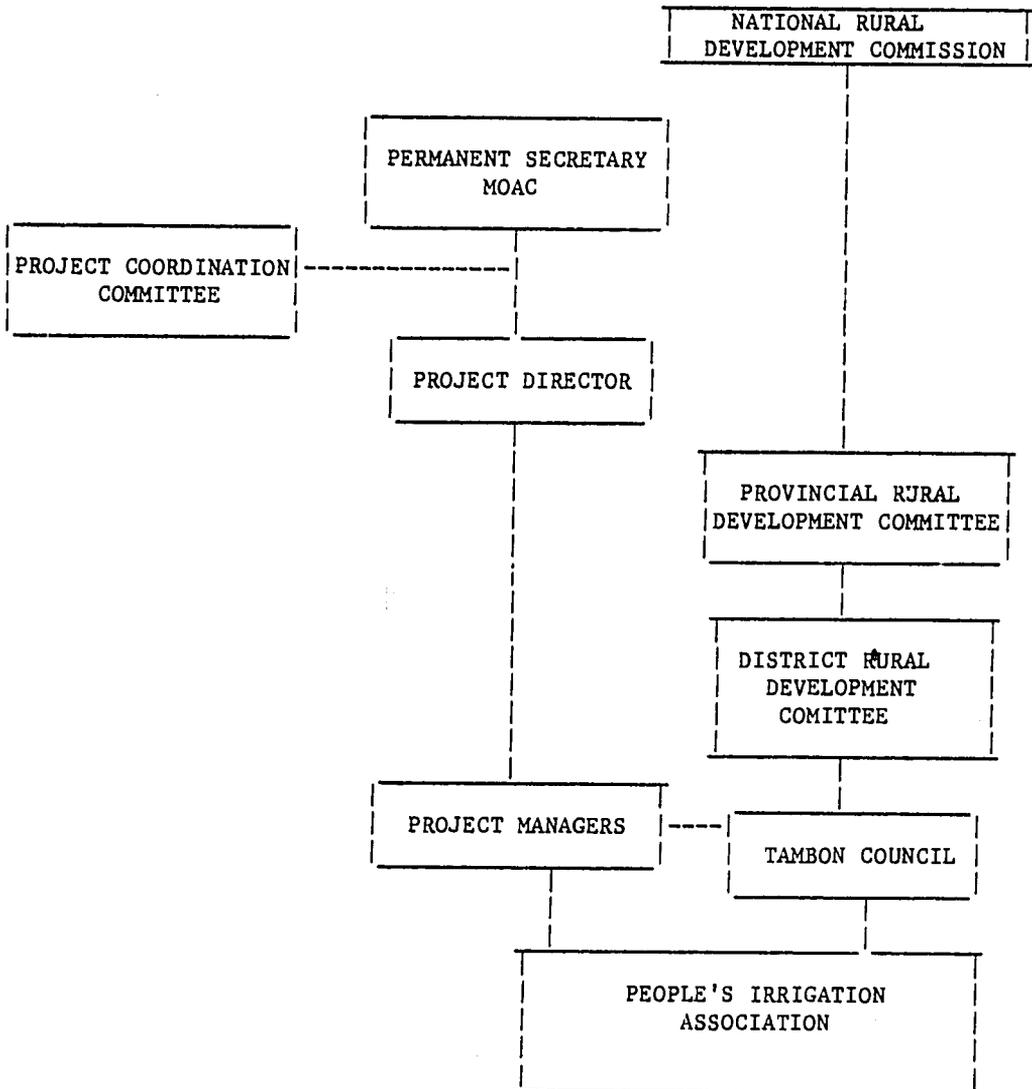
5.57 RID as the only technical line institution competent in irrigation would have to play a major role in project preparation and implementation. RID is very heavily engaged in other schemes not least the national small scale water development programme. The issue is the ability of RID to take on additional responsibilities.

5.58 The success of the project will depend upon support services such as extension, input and credit supply, being available more readily and more effectively to the farmers in the project area. The issue is to design and agree upon a special autonomous project status which would allow greater assurances of reliable input supply, extension, training etc.

Chart 1

ORGANIZATION CHART

Implementation of Peoples Irrigation Schemes



## VI. AGRICULTURAL DIVERSIFICATION PROJECT NORTH-EAST REGION

### Background

6.01 Chapter IV summarizes the general agricultural conditions and development constraints for the North-East Region. The principle elements are - climate and soils are poor; water availability for irrigation is limited and thus double cropping is hardly existant; off-farm employment for some members of the family is common during the dry season; farmers have shown themselves to be particularly adept to adjust production to market influences. The basic conclusion that can be drawn from those elements is that developing projects based on increased double cropping or introduction of new crops would be difficult and probably not cost effective. In the case of double cropping, the demand for labour in dry season cropping would be such that off-farm employment by some farm family members would no longer be possible, yet returns from dry season cropping would not be commensurate with returns from off-farm employment. Introduction of new crops might be more a question of proper marketing channels and availability of marketing facilities than of policy decisions. At the same time there are many ongoing projects of MOA aiming at crop improvement in the region, projects that also aim at improved supply of inputs, marketing, etc. It appears therefore that increased farm income and labour productivity should best be based upon provision of year round incremental farm employment not exceeding the seasonal underemployment of that part of the farm family that remains on the farm during the dry season.

6.02 The north-east has the largest concentration of cattle and buffaloes and has a tradition of silk production. There is also recent experience with village fishery development and with village woodlot development.

6.03 The project would be designed so as to complement ongoing activities sponsored by other donor agencies.

6.04 Project Objectives: The project would aim at improving farm incomes through the strengthening of perennial farming activities complementary to ongoing cropping systems. In achieving this, some of the poorest members of Thailand's rural community would benefit. The project would thus also help Government in achieving its declared policy aim of narrowing the income gap.

6.05 The project would also assist in increasing animal protein supply to the rural population through improved poultry and fish production and to the nation as a whole through improvements in large ruminant production. Furthermore, the proposed village woodlot component would help in slowing down deforestation and in improving soil conservation by, using fuelwood where possible, plantations for windbreaks and planting them along contourlines.

6.06 The silk production component would help an existing domestic industry and would be export oriented. Silk production, like village poultry, would particularly involve women.

6.07 Geographical Location. The exact areas of concentration for this project have not yet been decided. However, it is suggested that the most

promising areas within the northeast region are the provinces of Loei, Udon Thani, Nong Khai, Sakon Makhon, Nakhon Phanom and Mukdaharn with total population of about 4 million or 23% of the regional total. These provinces constitute a belt south of the Mekong with similar agro-economic characteristics. Major agricultural pursuits being cassava, tobacco, cattle, buffalo and silk with glutinous rice as staple food. These provinces have been less exposed to past internationally supported agricultural development projects than the provinces around Khon Kaen.

6.08 Target Group. Most of the farmers in the suggested project area are growing a single crop of rainfed paddy a year. Only some of those living within five km from the Mekong river are benefitting from pump irrigation. More than 90% of total agricultural lands are owner-operated. Average farm size is 27 rais (4.3 ha). Paddy yields vary between 145-300 kg/rai (900 to 1875 kg/ha) depending on climatic conditions. More than 70% of the farmers keep livestock, but only 30% have more than three heads. With average family size of 5.7 persons, per capita income varied between 1976-81 from B 877 (US\$ 38) to B 2,566 (US\$ 111) depending on crop yields. Some farmers diversified from pure paddy growing into field crops, thereby increasing farm incomes.

6.09 In about 83% of all farm families, family members migrated. The incidence of migration being particularly high on pure rainfed paddy farms. Reasons for migration are inadequate income from farming and lack of job opportunity in the village. The migration usually takes place after paddy harvesting in January. It consists of a move to a more agriculturally advanced area, mainly the eastern part of the Central Plains. Migrants work in sugarcane, cassava and pineapple plantations. Females seek household work in Bangkok or in factories in towns. Most of the jobs are agriculture related, therefore seasonal. Migrants return after 3 - 8 months. A 1981 NESDB <sup>18/</sup> survey revealed that net cash savings per migrant varied from B 100 (US\$ 4.30) to more than B 2,000 (US\$ 87), exclusive of value of consumer goods purchased by the migrants.

6.10 In addition to crop growing and livestock raising under traditional practices, people in the Upper Northeast also are engaged in several small scale cottage industries such as weaving cloth from cotton and silk, broom making, carpets and so on. Thus, farmers in the area have clearly shown their eagerness to improve their lot and can be expected to partake in any project that is economically attractive.

6.11 Link to Government Policy. Agricultural diversification to increase the income of farmers in rainfed areas and to reduce underemployment in the Northeast is one of the basic development strategies clearly stated in the Fifth Plan. This is further emphasized by a Cabinet decision in June 1983 relating to unemployment eradication parallel to poverty eradication. The proposed project is clearly in line with this policy.

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<sup>18/</sup> Source: Economic and Social Journal, NESDB, May-June 1982.

### Project Description

6.13 The project would assist in the implementation of a number of subsector activities integrated into the farming system. The project would thus have the character of a programme loan. Project components would include:

- (a) agricultural development and credit
- (b) cattle and buffalo development,
- (c) village poultry development,
- (d) silk production,
- (e) fuel wood production, and
- (f) fisheries production.

Interest in these six components has already been demonstrated by the population in the North-East. Some experience with implementing such subprojects exists and could be used during project preparation. Technically and economically sound subprojects could be developed.

#### A. Agricultural Development and Credit

6.14 The poor farmers in the region have so far been left out from the main stream of development efforts initiated by the government either exclusively or with the help of foreign assistance. As a result, the agricultural production has virtually become stagnated with a declining trend in productivity for almost all crops including livestock and fisheries. Immediate reversal of this situation would need a structural readjustment and reordering of development priorities in order to enable the agricultural institutions to be able to extend their full budget support to the need of small farmers in rainfed areas. This could be achieved: (a) by providing short, medium and long term credit to small farmers, (b) by redirecting the agricultural support service agencies to cater to the need of poor farmers: (c) by providing supplementary irrigation facilities in order to permit double cropping, wherever possible, and (d) by encouraging the Government programme to strengthen the links between research; extension and credit.

6.15 Coordination is particularly important in the context of increasing yield; improving technologies where elements of a production package of support services reinforce each other. Bank for Agriculture and Agricultural Cooperatives (BAAC) would be an appropriate institution to translate these objectives into practice. IFAD, in its first credit project, has provided a technical assistance to assist BAAC to develop and design a credit system that would effectively and efficiently serve the interest of poor farmers in rainfed areas. The findings would become the guiding principle of this project. It is envisaged that about 65 000

farmers would receive funds channeled through BAAC under this project. The project is expected to support the production of all crops that could be suitably and profitably integrated into the farming systems of small farmers. Cost for the credit component has been estimated at US\$ 20 million.

#### B. Livestock Sub-project

6.16 Background; The North-east has the greatest concentration of cattle and buffalo and accounts for 45% or around 8 million tons of Thailand's cassava output. The sub-project would aim at introducing better feed for cattle. This would include utilization of locally available cassava as well as utilization of farm by-products e.g., cassava leaves, rice straw, etc., and improvements of pastures. Parallel to the animal nutrition component the sub-project would aim at herd improvement. It is suggested that this best achieved through provision of bulls for natural mating in villages. Artificial insemination (AI) would also be used for this purpose.

6.17 The related fields of animal health and research as well as institution building and senior staff training form part of other ongoing or planned projects, in particular the IBRD assisted Support Services Project. It is suggested that the proposed IFAD assisted project would not duplicate these actions. Rather, IFAD support would help in spreading and accelerating research results developed through the Department of Livestock Development (DLD).

6.18 (i) Herd Development. The Government of Thailand over some decades has made attempts to improve the genetic quality of the domestic cattle herd. This herd consists of animals based on a cross of Indian Zebu and Chinese Zebu, a breed established throughout mainland south-east Asia as well as Indonesia.

6.19 Past attempts by DLD in genetic improvement have resulted in limited success partly because these attempts have been far too limited in scope to show any impact and partly because close follow-up and rigid control measures were lacking.

6.20 Project support to herd development would take two forms:

- (a) expansion of AI to produce bulls required;
- (b) provision of improved bulls to the farming community.

6.21 Artificial Insemination is currently carried out in the North East by staff of the former Northeast Livestock Development Project. This estimated, that not quite one percent of all cattle calves and 0.6% of buffalo calves born come from AI through some 22,500 inseminations. This minute performance reflects the novelty of AI, the lack of extension efficiency and the difficulties farmers have in discovering when their

cows and even more so the buffalo cows are in heat and the limited geographic coverage of AI service. AI should thus not be seen as a sinecure for herd development but rather as one possible means of providing bulls for villages.

6.22 AI in the northeast is based upon the 'train' system whereby a district field officer follows a set daily routine itinerary over 15-20 km covering some 15 villages. Farmers take their animals to the nearest 'train stop' for AI service. The system is simple for DLD and avoids problems of farmers contacting AI centres and the resulting 12 to 24 hour delays. It does require farmers to walk with their animals up to 4 km to the next 'train stop' and then wait for the DLD inseminator. Costs of the 'train' AI service have been estimated at B 333/insemination and it is further estimated that these costs could be reduced as a result of greater efficiency and economies of scale to about B 200 (US\$8.80)/insemination.

6.23 It is suggested that under the proposed project the private sector be entrusted to provide with AI through village based inseminators. Initial training would be provided by DLD and the village inseminator would be given credit to purchase necessary equipment including a motorcycle. Semen would be sold to him by DLD and the inseminator would in turn charge farmers for each insemination. As an added incentive inseminators would receive a "premium" for every bull calf borne from AI performed and selected by DLD for the natural mating programme. Exact costs and charges would need to be determined. The essential condition would be that total net returns to the inseminator be competitive with returns from farm and non-farm employment. The advantage of the system would be closer proximity and better timeliness of AI service, particularly important for buffalo cows which frequently come into heat during the night and early mornings. The other advantage would be that DLD could reduce overheads. However, it must be borne in mind that the aim of this sub-project should not be blanket herd coverage but the production of improved bull calves from selected female animals.

6.24 Project components for AI would thus include support to expand bull stations (semen centre) including financing of suitable bulls. Approximate costs would be US\$ 750 000 for a bull station plus animals, equipment, incremental extension, one supervisor and vehicles. Total cost is estimated at US\$ 1 million. In addition a revolving credit fund to supply credit to village inseminators would be required, roughly estimated at B 30,000/inseminator (US\$ 1320).

6.25 Natural mating will continue to be the main basis for herd development. Attempts to herd development through a "loan bull programme" - a DLD owned bull lent to a village for two years before it is returned to DLD for recovery - has not been successful. Farmers look at the bulls as Government property for the care and upkeep of which they are not responsible.

6.26 Instead of giving bulls on loan, animals would be sold to selected farmers who would keep the animals for serving cows of neighbours. DLD staff would have to select the most promising cows to be served as matter of priority. Bulls would be sold on credit and the bull owners would charge for their services. Again, bull owners might be given a premium for any progine bull that is taken on for further spreading the village bull programme. DLD would provide advice and health inspection possibly

free of charge during the initial years. Assuming a mating season of 5 to 6 months, one bull per around 75 cows would be required, i.e., one bull per village would suffice. The cost of a quality bull is estimated at around B 30 000 (US\$ 1.320). During preparation the capacity of DLD herds to produce quality bulls would have to be assessed.

6.27 The total cost of the herd improvement sub-component is assessed at US\$ 2 million. This would include costs for extension staff of one per 125 villages. Benefits would come from improved performance parameters of the herd i.e. increased conception rates and calving rates.

(ii) Animal Nutrition Improvement

6.28 Traditionally bovines in northeast Thailand are kept close to the house under conditions of near zero grazing during the wet season and are left to roam during the dry season. During neither season is feed plentiful and quality of feed always poor. There is no tradition of supplementary feeding of animals. The project would concentrate on improved utilization of locally available feed, particularly cassava, but would also look into usage of farm by products for animal feeding as well as development of pastures. Special forage production has been introduced only very recently through the North-East Livestock Development Project but its impact is still very limited.

6.29 However, the afore-mentioned Livestock Development Project provided valuable information on possibilities and constraints to pasture development. The project assisted in sowing more than 86 500 ha to pasture and also established Stylosanthes hamata, guinea grass and Leucaena as the most useful pasture and forage tree species. Of the total area sown nearly 75 000 ha were communal pastures, some in inaccessible areas. Another 15 000 ha were sown along road sides. The success of this component was limited with inaccessible areas left undergrazed, accessible areas overgrazed, infringed upon (cassava) and generally neglected. Much more successful was the development of private mixed pasture and backyard forage plots.<sup>19/</sup> The Project did not address itself to utilization of cassava and by-products.

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<sup>19/</sup> The Project Completion Report summarizes that "communal pasture sown by hand and helicopter in bush areas totaled 59,582 ha, but only contributed 465 t of incremental liveweight gain annually. However, roadside pasture which covered an estimated total area of 15,100 ha has had a greater benefit per hectare. The annual benefit was estimated to equal approximately 472 t of additional liveweight. Two other types of pasture development, which were both successful, were private mixed pasture and backyard forage plots. In both cases the ability to manage one's own land encouraged persistence of pasture, leading to the private pastures producing an estimated 2,661 t additional liveweight per year while backyard forage plots produced an estimated 111 t additional liveweight. Leucaena hedges contributed 41 t annually. These privately controlled pastures were considered to be of greatest long-term benefit to farmers and total cattle production"  
Source: IBRD Livestock Development Project (Loan 1199 T-TH) Project Completion Report, Page 15, July 29, 1983.

6.30 The proposed sub-project would provide technical assistance for the development of cassava based feed rations and for the utilization of farm by-products for feed. It would complement the proposed research work under the Agricultural Support Services Project. It would also assist in private pasture development, promoting communal pastures where villages or farmers' associations have clearly shown their interest in such ventures and their willingness to maintain pastures.

6.31 Incremental seed requirements for the project would be produced in addition to and parallel with the seed production included in the Agricultural Support Services Project. The approach to seed production should be the same as that proposed under the Agricultural Support Services Project. Namely: production would be based on contract multiplication by farmers along the lines developed in I.B.R.D.'s previous project. Contracts for the production of seed by farmers would guarantee a price for acceptable seed delivered to a point designated by DLD. Transportation costs for seed to reach the center would be borne by farmers or farmer groups. This would lead to seed producers being concentrated around the agreed collection point and therefore facilitate DLD servicing producers and allow regulation of the expansion of seed production. Seed produced by farmers groups need to be examined in order to ensure its quality, prior to its sale to other farmers. Selling price would represent full cost i.e. B 2 700 per ton (US\$ 1 200).

6.32 Total costs for the animal nutrition sub-component are estimated at US\$ 2 million including technical assistance, staff training extension, applied research and pasture development.

### C. Village Poultry Production Sub-project

#### Background

6.33 Poultry production, primarily chicken and ducks, is widely but thinly spread throughout the region. Estimates are that in the northern provinces, with the exception of Sakon - Nakhon, there are only 1 to 2 animals per capita. In Sakon-Nakhon poultry density seems to be marginally higher.

6.34 Village poultry is of mixed origin and mostly non-descript. Major diseases are prevalent including newcastle, fowl cholera and fowl pox. Little or no attention has been given until recently to the village poultry sector, development emphasis by the private sector was and remains concentrated on commercial poultry production. In 1982 DLD started a few Village Small Animal Improvement Projects with the main objectives to prevent diseases affecting poultry, to encourage the raising of poultry, and to demonstrate poultry-raising methods. DLD staff vaccinate chickens in villages twice a year. In the first year the state pays for the vaccinations and in subsequent years the farmers pay costs themselves. DLD demonstrates vaccination methods to farm leaders. The projects have very limited coverage. At present there is no organized method for birds feeding. They survive through scavenging and consequently their productivity is very low.

### Sub-project Objectives and Justification

6.35 The proposed sub-project would assist DLD in the expansion and improvement of the programme. In this, it would initiate parallel action to complement the activities that are undertaken under the Agricultural Support Services Project.

6.36 The aim of the sub-project would be to improve availability of animal protein to rural populations and increase the cash income of these populations. This would be achieved through improved productivity of village poultry and reduction of losses as result of diseases.

6.37 The beneficiaries would be small scale farmers already keeping poultry as a farm enterprise albeit with extremely limited management input. Markets for poultry meat in the rural areas exist. To some extent these markets are seasonal with peak demand around Chinese New Year when poultry prices tend to increase more than twofold i.e. from an average of B 25/kg live bird to over B 50/kg (US\$ 1.10 and 2.20 respectively)

### Sub-project Outline

6.38 The sub-project would assist DLD in the establishment of DLD poultry units. These units are essentially extension and poultry promotion stations through which DLD staff can introduce and monitor disease and pest control of village flocks and assist in a programme of genetic upgrading.

6.39 Basically DLD would

- (a) provide vaccines against Newcastle disease, fowl pox and fowl cholera to participating farmers. The farmers would be responsible for vaccination following suitable training. Vaccines would initially be distributed free of charge. A later system of cost recovery might be introduced at a later stage;
- (b) provide improved parent stock to selected farmers. Chicks from these flocks would be available for further distribution to other farms, this distribution would initially be made through the services of DLD, later on a commercial basis directly between farmers;
- (c) provide improved feed for parent stock on key farms;
- (d) provide training to farmers in poultry management.

6.40 The project would not aim at introducing modern commercial poultry production but rather at introducing an intermediate technology for smallholder poultry management.

6.41 Sub-project Benefits. The project would have a threefold impact upon flock production.

- (a) Mortality as a result of pests and diseases would be reduced by an estimated 50% from current levels;

- (b) Laying performance would be increased as a result of improved genetic material and better feeding. Parameters are estimated at 75 eggs/year/bird to-day raising to around 150 eggs/ year/bird.
- (c) Weight at time of slaughter would increase from an estimated 1.5 - 2 kg at full maturity say 8 months, to 2.5 kg at the age of around 4 months.

6.42 Project Costs. A tentative cost estimate for five poultry units is B 5.6 million or US\$ 250 000.

#### D. Sericulture Sub-project

##### Background

6.43 Silk production is a traditional activity in the North East, well adapted to the physical, economic and social conditions. There is a large market for Thai silk. Average production per family is 3 kg of silk reeled on the farm and used for weft (B 500 or US\$ 22 per kg). The main factors limiting silk production are: poor productivity of mulberry trees, diseases of the worms because of bad hygiene, small size of cocoons of the native breeds.

6.44 Research has shown that silk production can be developed either with foreign hybrid silk worms or with improved local silk worms. Foreign hybrid silk worms require high investment and sophisticated techniques because they are very susceptible to diseases and cannot stand the hot temperatures prevailing most of the rainy season in the North East. Consequently this type of production is limited to settlement schemes with close extension supervision rather than to the improvement of existing silk rearing in traditional villages scattered throughout the region.

##### Sub-project Objectives and Outline

6.45 Improved local silk worms are hardier and can be reared by farmers interested in silk production with better yielding mulberry trees, modern rearing techniques and a reasonable standard of hygiene. High yielding mulberry have been selected. Root-rot diseases remain a serious problem which can be overcome with grafted plants and good manuring. It is estimated that one rai of these mulberry trees produces enough leaves to feed 8 annual cycles of production by batches of 20 000 worms each. Silk worms would be kept in specially built rearing houses which can be easily cleaned and disinfected after each cycle while traditional silk worms were kept under the family house. Silk worm eggs would be produced by the research stations for each cycle; egg production is easier for the improved local breed which is polyvoltine than for the hybrid silk worm which is bivoltine. The production of cocoon per rai of mulberry trees is estimated at 10 to 15 kg of cocoons per cycle or 100 kg per year. Cocoons of improved local silk worms would be reeled by hand on the farm since they are too small for machine reeling. The annual production of silk

would be 10 kg per rai (1 kg of silk from 10 kg of cocoons) which can be sold for weft at B 500 per kg. An average family can manage one rai of mulberry trees and the corresponding silk production, most of it during the rainy season since few leaves can be harvested in the dry season.

6.46 Specialized extension staff would be necessary. One agent could support 150 silk producers during the first five years, 300 producers thereafter. Facilities for the production of eggs should be expanded on the silk research station at Khon Kaen. Costs have been tentatively estimated at Bhat 850 000 for 1000 families (US\$ 38 000).

6.47 Investment costs per family (one rai) are estimated as follows:

3000 cuttings of mulberry trees	<u>B</u>	<u>US\$</u>
at B 0.25 each	750	33
Rearing house (for 20 years)	6 000	264
Sprayer (one for 3 families) at B 6.000 (for 4 years)	2 000	88
Rearing Equipment (for 3 years)	<u>3 000</u>	<u>132</u>
	11 750	517

The annual cost of production (excluding family labour) would be:

Chemical fertilizer	350	15
Disinfectants	500	22
Eggs (8 boxes)	50	2
Amortization and maintenance of investment	<u>2 000</u>	<u>88</u>
	2 900	127

The value of production would be 10 kg of silk at B 500/kg or B 5 000, leaving a gross return of B 2 100 per family.

Returns from traditional silk production can be estimated per family at B 1 250.

Value of production	<u>B</u>	<u>US\$</u>
	1 500	66
less cash cost of production	<u>500</u>	<u>22</u>
	1 000	44

Improved silk production would therefore increase farm income by B 1 000 annually.

6.48 Total sub project costs would depend upon the total geographical area covered. In the six northern most provinces there are an estimated 65 000 farm families raising silkworms. With an assumed one sixth of these farm families interested in expanding silk production approximate total costs would be US\$ 6 million.

### E. Village Woodlots Sub-project

6.49 Background. Wood is by far the most important fuel for rural families in N.E. Thailand. Due to increasing population pressure and a total absence of organized reforestation, fuel supply is decreasing rapidly. On the one hand, this leads to rapid increases in prices and distances to be travelled to find wood; on the other hand it results in erosion and soil degeneration as a result of deforestation. Government has started a programme of village woodlots and pilot projects have shown that small woodlots planted with various imported tree species can economically provide fuel for the rural population.

#### Sub-project Objectives and Outline

6.50 The annual firewood consumption of a family is estimated at 5.25m<sup>3</sup> round wood (7.5 m<sup>3</sup> stacked volume), that of poles for construction at 0.75 m<sup>3</sup> round wood. Most of this wood is now illegally cut in national forests, thereby resulting in their rapid destruction.

6.51 The project would help villages in becoming self-sufficient in wood by assisting farmers in planting communal woodlots. Regrouping tree plantations in one place for the village would allow better prevention from dry season fires which are the main risks. These woodlots would be managed by a village association.

6.52 Experience in similar projects has shown that mixed plantings of Eucalyptus and Leucaena yield an average of 2.5m<sup>3</sup> (round wood) per rai per year (15m<sup>3</sup> per ha). A communal woodlot of 240 rais (38 ha) would cover the needs of an average village of 100 families.

6.53 The location of the woodlot would be selected in agreement with the villages on soils unsuitable for agricultural production. It would be cleared by the participating farmers (15 days per family for its share of 2.40 rais). Seedlings in polythene bags would be supplied free by the Royal Forestry Department; planting density would be 200 trees per rai (1.250 per ha). Special emphasis would be given to planting woodlots as wind breaks and along contour lines as part of general erosion control and land development.

6.54 During the first 3 years farmers would grow cassava on individual plots in the planted area. Yield per rai can be estimated at 1.5 tons (9 tons per ha) worth B 750 with a cash cost of production (fertilizer mainly) of B 150 giving a net return of B 600 (US\$160 per ha). Trees would receive some fertilizing, 100 g per tree costing B 100 per rai after planting (US\$ 30 per ha). The maintenance of firebreaks would require about 400 days per year (4 days per family).

6.55 The first cutting would be done in the fifth year and then on a 5-year rotation. The woodlot would be replanted after the third coppice cutting, in the 25th year. Based on the average value of B 50 per m<sup>3</sup> of stacked wood, the annual production would be B 175 per rai (US\$ 50 per ha). It is estimated that the cutting and transport of firewood would require about 10 days per rai.

6.56 The Royal Forestry Department would have to establish nurseries close to the project area so as to save on transport costs. It is estimated that 900m<sup>2</sup> of nurseries would produce enough seedlings for planting one woodlot of 240 rai at a cost of B 250 per rai (US\$ 70 per ha) for all labour and materials.

6.57 For an assumed total sub-project area of say 19000 ha total cost would be US\$ 2.6 millions including 1/3 of the farm labour for land clearing estimated at US\$ 40/ha. The value of land is not included in the cost.

#### F. Fisheries Sub-Project

##### Background

6.58 Fish is the major source of animal protein in Thailand, yet availability of fish has been stagnant during the last 5 years (1977-79) average 2.1 million tons, 1980-82 1.9 million tons). Consumption of fish in the north-east is below national average indicating inadequate supplies. The potential for expanded fresh water fishing in the north east rests on rehabilitating and stocking of the numerous small tanks constructed for various water uses, possibly combined with additional construction of fish ponds.

6.59 Another possibility for expanding fresh water fish production in the region is through rehabilitation of medium sized lakes. One such project is ongoing another has been identified. Lastly and not restricted to the North East is the problem of a so far unidentified fish disease which threatens aquaculture throughout the Kingdom.

##### Subproject Objectives and Justification

6.60 The objectives of the sub-project would be to increase fish production from both existing and new constructions. The sub project would continue to support an ongoing programme for fresh water fish production started in 1982. Production of fish would on the one hand help diversify agricultural production of small farmers and thereby increase their labour productivity and income, on the other hand it would increase animal protein availability in areas where protein intake is very short.

##### Sub-project Outline

6.61 The sub-project would help in the construction of new fish ponds of around 2 ha, it would also help in the rehabilitation of existing larger community ponds. Selection of new sites would be the responsibility of local communities, supervision of construction and rehabilitation would be the responsibility of the Department of Fisheries (DOF). Actual construction and rehabilitation would be carried out by local contractors and farm labour. Operation and maintenance, including restocking, would be the responsibility of the tambon or village society. This village effort would also help in stimulating farm cooperation.

6.62 The ponds would be stocked with fingerlings from existing DOF hatcheries or from private producers. It is assumed that total fingerling production would be sufficient for the sub project, an assumption that

needs verification during preparation. Exploitation of ponds would be through organized 'fishing days' set by the tambon or village council. Farmers would be expected to pay a basic fee, sufficient for covering maintenance and restocking costs. The DOF would be responsible for training of villagers and tambon committees, for general supervision and monitoring.

6.63. A separate item of the sub-project might be the financing of the feasibility study for Lake Chaiya Phum rehabilitation. Details of this are presented in Chapter VIII A.

6.64 Lastly the subproject might provide external technical assistance to DOF in identifying causes of the fish disease that started in 1983 and that threatens the industry throughout the Kingdom and in developing means and methods for its control.

#### Total Project Costs and Benefits

6.65 Project costs will entirely depend upon the final selection of areas of concentration, the subproject mix and the number of villages-farmers that are to be covered. The six northern most provinces of the North-East contain an estimated 3 250 villages. It is assumed that 500 of these villages would participate in project activities. With an average of around 100 families per village and an active participation of about 30% of village families, the total number of direct beneficiaries would be 15 000 farms or around 85 500 people. The agricultural development and credit component would have a much wider coverage, including about 65 000 farmers (para 6.15).

6.66 Costs for the various sub-projects are indicated in Table 6.1. They include investment and operating costs but not physical and price contingencies. The foreign exchange component is estimated at 40%. Costs are based on those prevailing in 1983/84, the phasing of subproject development assumes an even implementation schedule.

6.67 Total costs are estimated at US\$ 37 million over a five year project period. It is clear that at this early stage in the project cycle costs are more indicative than definite.

6.68 Benefits: The project would result in substantial measurable and many immeasurable benefits. Table 6.2 summarizes measurable benefits. Basically the project would lead to a significant impact on agricultural production and quality which would result in increased farm incomes. Increased supply of animal protein would help mitigating the nutritional deficiencies of the rural population in the project area as well as elsewhere in Thailand. Benefits from the herd development component would primarily result in an increase in the value of animals. There would be some increase in the calving rates but these would occur slowly. The A.I component would also lead to a reduction in the incidence of diseases of the reproductive organs, thereby improving calving rates. They have been ignored in the benefit calculations. Total benefits from the herd development component at full development are estimated at US\$ 3.2 million. Those from the animal nutrition improvement would be primarily through increased live weight. Again, the impact upon total herd parameters has been ignored. Benefits from the poultry component are

estimated at US\$ 0.07 million through improved flock performance, the multiplication effect from distributing improved chickens more widely has not been included. The annual value of incremental silk production is estimated at US\$ 1.5 million. The annual value of the fuelwood component at US\$ 0.9 million at full development with a return of US\$ 3.7 m/year during years 1 to 3 through the production of cassava. The value of the possible fisheries component is not estimated. Total known and measurable benefits from the project are US\$ 5.6 million/year. This does not include benefits from the agricultural development and credit component.

Table 6.1  
Summary of Estimated Project Cost  
('000 Bhat)

<u>Activity/Year</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Total</u>
A. Agricultural Dev.	28000	50000	95000	125000	160000	458000
B. Livestock Dev.	32552	18515	21354	16985	16800	106206
C. Poultry Dev.	2601	3226	1216	1476	1446	9965
D. Silk Production	11410	14245	32620	43255	51480	153010
E. Village Woodlots	3000	9000	15000	21000	12000	60000
F. Fisheries	<u>6658</u>	<u>18608</u>	<u>18016</u>	<u>12016</u>	<u>6016</u>	<u>61314</u>
TOTAL	<u>84221</u>	<u>113594</u>	<u>183206</u>	<u>219732</u>	<u>247742</u>	<u>848495</u>
TOTAL US\$ '000	<u>3677</u>	<u>4960</u>	<u>8000</u>	<u>9595</u>	<u>10818</u>	<u>37050</u>



Table 6.3

Details of Project Costs

Livestock Development Sub-project  
( '000 Bhat)

i) Artificial Insemination

<u>Year</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Total</u>
Equipment for Inseminators <u>24/</u> (Credit)	750	750	750	600	450	3300
Semen and liquid nitrogen <u>25/</u>	1875	3750	5625	7500	9375	28125
Bull station Management and supervision <u>26/</u>	17062	-	-	-	-	17062
	<u>235</u>	<u>235</u>	<u>235</u>	<u>235</u>	<u>235</u>	<u>1175</u>
TOTAL	<u>19922</u>	<u>4735</u>	<u>6610</u>	<u>8335</u>	<u>10060</u>	<u>49662</u>
US\$ '000						<u>2183</u>

24/ 125 villages, repayment over 7 years with 2 years grace.  
25/ At B 300 per insemination and 250 inseminations/year/inseminator  
26/ Salary for one supervisor(PC7) 9 000  
 Allowances 3 500  
 Transport 7 000  
 Total 19 500/month or 234 000/year

ii) Bull Programme

<u>Year</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Total</u>
Credit for bull purchase <u>27/</u>	1500(50)	2250(75)	3000(100)	2700(100)	750(50)	10200
Veterinary service <u>28/</u>	<u>90</u>	<u>90</u>	<u>180</u>	<u>270</u>	<u>270</u>	<u>900</u>
TOTAL	<u>1590</u>	<u>2340</u>	<u>3180</u>	<u>2970</u>	<u>1020</u>	<u>11100</u>
US\$ '000						<u>530</u>

27/ One bull each in 375 villages at 30 000/bull repayment over 7 years with 2 years grace.  
28/ One veterinary extension officer PC.3 for 125 villages and bulls:  
 Salary 2 900  
 Allowances 2 700  
 Transport 2 000  
 Total 7 600/month or 91200/year

iii) Animal Nutrition

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Total</u>
Technical Assistance	5500	5500	5500	5500	5500	27500
Extension Services	40	40	64	90	120	344
Seed production and processing facilities and management	<u>5500</u>	<u>5900</u>	<u>6000</u>	<u>100</u>	<u>100</u>	<u>17600</u>
TOTAL	<u>11040</u>	<u>11440</u>	<u>11564</u>	<u>5680</u>	<u>5720</u>	<u>45444</u>
US\$ '000						<u>2000</u>
Total Subproject (B'000)	<u>32552</u>	<u>18515</u>	<u>21354</u>	<u>16985</u>	<u>16800</u>	<u>106206</u>
US\$ '000						4670

Poultry Development  
( '000 B)

<u>Year</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Total</u>
Equipment for poultry units	2000	2000	-	-	-	4000
Operation and maintenance	250	500	500	500	500	2250
Animal feed and vaccines	75	150	150	150	150	675
Imported animals (Poorest stock)	100	100	-	-	-	200
Distribution of chicks*	10	40	40	30	-	120
Extension service						
PC.3	90	360	450	720	720	2340
PC.4 8	<u>76</u>	<u>76</u>	<u>76</u>	<u>76</u>	<u>76</u>	<u>380</u>
TOTAL	<u>2601</u>	<u>3226</u>	<u>1216</u>	<u>1476</u>	<u>1446</u>	<u>9965</u>
US '000						<u>440</u>

\* Six chicks per farmer = B 30 to 4000 farmers = 120 000

Silk Development Sub-project  
(500 Village x 20 Families 10 000 Families)

<u>Year</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Total</u>
Families No.	500	1000	2000	3000	3500	10000
Families Total	500	1500	3500	6500	10000	
Extension Cost '000 B	835	1595	3070	5305	7205	18010
Farm Invest. <u>29/</u>	5875	11750	23500	35250	41125	117500
Operating Annual Cost '000 <u>30/</u>	450	900	1800	2700	3150	9000
Egg Production Investment <u>31/</u>	<u>4250</u>	<u>0</u>	<u>4250</u>	<u>0</u>	<u>0</u>	<u>8500</u>
TOTAL	<u>11410</u>	<u>14245</u>	<u>32620</u>	<u>43255</u>	<u>51480</u>	<u>153010</u>
US\$ '000						<u>6655</u>

29/ B11750 per family.

30/ 900 per family, revolving fund for credit.

31/ In research station, operating cost included in farm operating cost.

Silk Extension Cost ('000 B)  
(500 Villages x 20 Families 10000 Families)

<u>Year</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Total</u>
Families	500	1000	2000	3000	3500	10000
Total	500	1500	3500	6500	10000	
Extension Staff Village level No		5	12	25	45	65
Cost '000 B	400	900	2000	3600	5200	12160
Supervision No	2	4	6	10	13	
Cost '000 B	200	400	600	1000	1300	3500
Management No	1	1	2	3	3	
Cost '235	<u>235</u>	<u>235</u>	<u>470</u>	<u>705</u>	<u>705</u>	<u>2350</u>
TOTAL	<u>835</u>	<u>1595</u>	<u>3070</u>	<u>5305</u>	<u>7205</u>	<u>18010</u>
US\$ '000						<u>783</u>

Village Woodlots Sub-project  
(500 Villages - 240 rai (38 ha) per village)  
( '000 B)

<u>Year</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Total</u>
No. woodlot	0	50	100	150	200	500
Ha	0	1900	3800	5700	7600	1900
Nurseries <u>32/</u>	3000	6000	9000	1200	0	30000
Fertilizer <u>33/</u>	0	1200	2400	3600	4800	12000
Labour <u>34/</u>	<u>0</u>	<u>1800</u>	<u>3600</u>	<u>5400</u>	<u>7200</u>	<u>18000</u>
TOTAL	<u>3000</u>	<u>9000</u>	<u>15000</u>	<u>21000</u>	<u>12000</u>	<u>60000</u>
US\$ '000						<u>2650</u>

32/ B 250 per rai or B 60000 per woodlot.

33/ Fertilizer for trees B 100 per rai or B 24000 per woodlot.

34/ 1/3 of labour for clearing, 5 days per rai or 1200 days per woodlot at B 30 per day or B 36000 per woodlot or US\$ 40 per ha.

Fisheries Development  
( '000 Baht)

<u>Year</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Total</u>
Fishpond						
Construction	6000	18000	18000	12000	6000	60000
( ) numbers	(10)	(30)	(30)	(20)	(10)	(100)
Credit for stocking	300	600	-	-	-	900
	(30)	(60)				
Extension service	8	8	16	16	16	64
Lake feasibility study	175	-	-	-	-	175
T.A. for fish disease control	<u>175</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>175</u>
TOTAL	<u>6658</u>	<u>18608</u>	<u>18016</u>	<u>12016</u>	<u>6016</u>	<u>61314</u>
US\$ '000						<u>2700</u>

Assumption: 200 villages have ponds, 100 have land for construction available. Size 2 ha, depth 2 m construction cost B 600,000.  
Seasonal credit to start pond at B 10,000/pond.  
One PC3 officer for 150 villages.

### Project Organization

6.67 The project in its nature would be close to a programme loan with a number of clearly defined yet mostly different development targets. Implementation of each of these targets would be the responsibility of the specific departments within the Government including its line agencies at the field level. Central project management unit would be established for ensuring coordination, planning and monitoring of these various sub projects and components. The fact that the project would be operating in a number of provinces would not constitute a major organizational problem.

6.68 At national level a project coordination committee would be established through the Agricultural Policy and Planning Committee of MOAC. Members of the Committee would be representatives of the line departments directly concerned with the project i.e., Department of Livestock Development (bovine and village poultry components); Department of Agriculture (silk production component); Royal Forestry Department (village woodlots component), Department of Fisheries (fish pond and lake rehabilitation component). In addition other concerned departments/agencies, who are directly or indirectly needed for implementation of the sub-projects such as: The Department of Agricultural Extension, the Agricultural Economics Officer, Land Development Department, Department of Public Welfare, BAAC, NESDB, Bureau of Budget and Civil Service Commission would also be represented in the committee. Chairman of the Committee should be the Permanent Secretary MOAC or his designated representative.

6.69 A project manager to be appointed by the Permanent Secretary MOAC, would be responsible to the Committee and would be in charge of the day to day operation. He would also be responsible for coordination and supervision. The project manager would act as non-voting secretary to the Committee.

6.70 Monitoring and Evaluation of the project would be undertaken by the Agricultural Economics Office, MOAC who would be supported in the field by local government and the office of the provincial government. During preparation it would have to be ascertained regarding the nature, type and extent of support needed by this office to fulfill the M&E function. This assessment would particularly have to take into account the support to be provided to Agricultural Economics Office under the proposed Agricultural Support Project.

6.71 At provincial level the technical officers of the different line departments would be responsible for implementation of the project. Horizontal coordination would also be ensured between Livestock, Fisheries, Forestry, etc. departments to expediate project implementation. To strengthen active farmer participation with credit utilization and control, the project would encourage establishment of farmers' cooperatives and other voluntary groupings of farmers.

6.72 Technical reporting would be from field staff of line departments through provincial governors to the Director General (DG's) of the line departments and through them to the Project Coordination Committee.

### Project Preparation

6.73 It is in the nature of the proposed project that primary responsibility for preparation would rest with the various line departments. Their effort would need to be coordinated by somebody not directly linked to any of the technical departments but supported by the Office of the Permanent Secretary MOAC and the Agricultural Economics Office of MOAC. It is suggested that, similarly to the proposals made in Chapter V, this responsibility be given to the project manager designate.

6.74 External support to project preparation would ideally be restricted to general guidance and direct participation in presentation and economic analysis. On the other hand, line departments might require specialized assistance for the preparation of development packages. Consideration should be given for such assistance, which could be found locally, to be financed by IFAD as part of project preparation support.

6.75 To facilitate project preparation, MOAC would appoint a working group headed by the project manager designate or such other person the Permanent Secretary of MOAC might decide. The working group would consist of technical staff from the line departments directly responsible for preparation. The Agricultural Economics Department, MOAC, would act as secretariat. The Department of Cooperatives Development and BAAC, would participate on an ad hoc basis.

### Issues

6.76 The primary issue in project preparation and later implementation would be a clear geographical demarcation of areas of project activity. Ongoing or planned projects generally sponsored by other agencies touch upon or cover activities proposed under this project. Carrying out similar activities sponsored under different projects in the same district and affecting the same farming community would be counter-productive. Allocating a clear geographical mandate is considered a sine qua non for project success.

6.77 The success of the cattle and buffalo component will depend to a large extent upon improvements in livestock marketing and slaughtering. Marketing and slaughtering are constrained by the monopolistic role of municipal slaughterhouses. A reorganisation of livestock slaughtering is under consideration, findings and recommendations would affect the proposed component. Marketing and pricing of silk or cocoons on farms might be an issue. During preparation detailed assessments of silk marketing constraints need to be carried out.

6.78 The livestock component could only successfully be implemented if DLD would change its current system of AI as a free service and discontinue its loan bull programme. Basic policy decisions to livestock development would have to be taken including a change away from reliance on American Brahmin as source for genetic upgrading.

CHAPTER VII - AGRICULTURAL DEVELOPMENT PROJECT NORTH EAST

Background

7.01 Description of socio-economic conditions and constraints to agricultural development in the Northeast region are provided in Chapter IV. The basic problems are poor climate and soils and the lack of long term off-farm job opportunities. Rural-rural and rural-urban migrations are common phenomena. Rural-rural migration has primarily been from poor areas to more agriculturally advanced areas. Irrigated areas and rainfed field crop areas have contributed to seasonal employment to some extent.

7.02 Agricultural irrigation in Thailand started in 1904 with the establishment of the Royal Irrigation Department (RID)<sup>35/</sup>. From 1904 to the present, more than US\$ 5 billion have been invested in irrigation development. Early efforts were concentrated in the Central and North until the year 1939 when investments in irrigation started in the Northeast. As a result, construction of six large dams was completed with a total irrigable area of about 205,000 ha. (Table 7.1). These schemes are in different stages of development. Their construction are financed through local and external funds.

Table 7.1  
Large irrigation dams in the Northeast

	Irrigated Areas (ha)	Irrigable Areas (ha)	Storage Capacity (million cu meter)	Irrigated Areas as % of Irrig- able Areas
Lam Pao	10,000	54,080	1,340	18.5
Nam Pong	15,000	48,320	-	31.0
Lam Praplerng	5,000	9,120	149	54.8
Lam Takong	5,000	38,080	310	13.1
Nam Une	5,000	32,000	524	15.6
Lam Domnoi	5,000	24,000	-	20.8
TOTAL	45,000	205,600	2,323	21.9

7.03 Over the last five years, the Government also embarked on a national construction programme of 1000 small scale projects per year. The region gets a share of about 300 projects per year. In this programme, other agencies of Government also participate although RID undertakes about 60% of the whole. These projects have also attracted bilateral financing from several donor countries.

7.04 Further, over the last 20 to 30 years R.I.D constructed in the Northeast several hundred medium sized structures or small reservoirs. These have a potential to irrigate some 240 000 ha. However, due to

<sup>35/</sup> For further information on R.I.D. and irrigation in Thailand see Annex VIII.

faulty design, incomplete construction and deficiency in O&M only about 75% of the design service areas can be irrigated during the rainy season. There appears thus to exist a wide field for improving irrigation in the Northeast building upon existing incomplete and/or underutilized structures which could be considered as sunk costs.

### Project Objectives

7.05 The project would assist small farmers in the North East in increasing production and farm productivity through making irrigation water available during the rainy season. In particular the project would make use of a scarce resource in the North East - water, that today is stored in reservoirs and not being used. Thus the project would complete and complement past investments by Government.

7.06 Increased agricultural production would help improve rural incomes and improve the social conditions in the project region. Incremental production, largely glutinous and non glutinous rice, would be absorbed by the domestic or foreign markets.

7.07 The project would concentrate on completing several medium sized irrigation schemes, each with a potential service area of 700 to 1.000 ha.

### Geographical Location

7.08 Medium sized tanks are found throughout the North East region. However, to facilitate implementation, the project would concentrate on a number of provinces only, in particular the 6 northern provinces (see Chapter VI). Specific sub-project selection would be based upon economic and social criteria and in particular upon a declared interest by farmers in participating in the proposed development. Of specific importance in sub-project selection would be the environmental impact of the scheme with particular reference to the problem of soil salinity.

### Target Group

7.09 Beneficiaries would be people in the Northeast, the poorest region in the country. The region has a population of around 15 million or 33% of the Kingdom's population. Most of the population is living in absolute poverty - consequently 145 out of the total 259 districts have been declared poverty areas. Farmers in the region are lacking cash for investment and dry season irrigated agriculture is new. There are about 92 Water Users' Associations but most of them have not been able to perform as well as the People's Irrigation Associations in the North. Farm incomes being extremely low, project sponsored farm development activities would involve minimum cash investment initially. Support to building up farmers' institution would be given priority.

### Consistency with Government Agricultural Policies

7.10 The Fifth Plan calls for the utilization of physical infrastructures in which Government has already invested in the past. MOAC's policy on irrigation is thus to minimize new investment in large scale irrigation

projects, maintain investment in new medium scale projects and continue small scale irrigation. In addition, RID is to strengthen its operation and maintenance of existing schemes. The proposed project thus fits into the policy of the Government.

### Project Description

#### (a) Irrigation

7.11 The project would involve the rehabilitation and upgrading of existing tank irrigation projects in the Northeast. The project would be limited to medium scale projects with a storage capacity of not less than 1 million cubic meter and a service area of not less than 700 ha.

7.12 This would involve preliminary selection and thereafter detailed survey and inventory of existing facilities and a review of the hydrology of the selected projects. The existing survey of the Asian Institute of Technology <sup>36/</sup> would provide some of the basic information required.

7.13 The civil works would include minor repair to the dams if there are no seepage problems, construction or repair of headworks, rehabilitation/upgrading of distribution and drainage canals, concrete lining where necessary, on-farm facilities and feeder roads.

7.14 RID would be responsible for all the preliminary and final designs as well as implementation of the project pertaining to dam repair and for improvement of headworks, main distribution and drainage canal repair and upgrading.

7.15 The farmer-users would initially be organized and formed into an association similar to that in the North's PIA's. They would participate from the initial planning and finally approve the development scheme, participate in the implementation and later, operate the projects. Farmers' construction participation envisaged in the project are those pertaining to the tertiary canals for irrigation and drainage.

7.16 It would be necessary to involve local administration officials, the provincial and district officers, in the organization of a strong farmers association.

7.17 The O&M would be organized similar to the PIA's in the North with a committee whose chairman is elected by all the members and with all village heads as members. Sub-committees would also be set up at the village level. While initially RID would be responsible for the O&M, a transition period of a year should be set up for training of operation personnel to be appointed by the Association.

7.18 An O&M charge of around 7 kg of paddy per rai would be introduced initially to enable the association to pay salaries of permanent operations personnel and to provide for some emoluments to committee and sub-committee officials.

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<sup>36/</sup> Asian Institute of Technology: Water for the North-East, Assessment and Rehabilitation of Tank Irrigation Project, Bangkok September 1983.

(b) Agriculture

7.19 A more reliable water supply from irrigation would alleviate the main risk in present farming which is rainfall deficiencies. Irrigation would first stabilize yields and then justify increased use of cash inputs (improved seed, chemical fertilizing, mechanical ploughing)

7.20 During the rainy season irrigation would allow rice transplanting to be delayed until mid-August by using the new high-yielding varieties of glutinous rice which have a shorter vegetative cycle. Therefore, a first crop of legume, mungbean for instance, could be sown in May with the first rains, to be harvested in July. It would receive supplementary irrigation during dry spells.

7.21 Water left in the tank at the end of the rainy season would not be available for irrigation, it would be used for human and livestock needs. Therefore no dry season cropping would be planned.

7.22 At full development on the basis of yields achieved on well irrigated farms, gross profit per rai would increase to B 1075 (US\$ 290 per ha) an increase of B 675 or 168% by comparison to the present situation.

Table 7.2  
Calculated Benefits from Irrigation Schemes

<u>Cropping Patterns</u>	<u>Area</u>	<u>Unit Yield</u> kg	<u>Total Value</u> <u>of</u> <u>Production</u> <u>B</u>	<u>Cash Cost</u> <u>of</u> <u>Production</u> <u>B</u>	<u>Total Gross</u> <u>Profit</u> <u>B</u>
<u>Present Situation</u>					
Rainy season Glutinous rice	1	195	488	88	400
<u>With Project</u> <u>at full</u> <u>development</u>					
<u>1st crop</u>					
Rainy season mungbean 2nd crop	1	150	900	400	500
Rainy season glutinous rice	1	350	875	300	575
					<u>1075</u>

Issues

7.23 The project would undoubtedly face a number of important technical constraints. In particular irrigation water availability would at best be sufficient for rainy season cropping only. Irrigation during the dry season would be possible in exceptional instances only. Also dry season cropping faces the strong competition from off-farm employment.

7.24 Any scheme to be developed would have to be based on full farmer participation with farmers taking on responsibility for field development and operation and maintenance. Two issues arise a) the existing policy and operating methods of R.I.D. would need to be discussed, (b) farmers' institutions, practically non-existent today would have to be developed prior to handing operation and maintenance responsibilities to farmers.

7.25 Watersheds of most "Tanks" in the Northeast are in areas under cultivation and therefore the problem of high sedimentation rate cannot be ignored. This factor has to be identified and quantified in order to determine the remaining useful life of the reservoir. There may be a need to include erosion control component in the projects selected.

7.26 MOAC and to a lesser extent NESDB gave rather low priority to the project because of governments greater emphasis on rainfed farming, relative low rates of returns on investment and the declared interest by other agencies in assisting in the development of medium sized irrigation schemes.

## VIII. SECOND GENERATION PROJECTS

### A. Chaiyaphum Lake Rehabilitation Project

#### Background

8.01 The project idea was presented by the Fisheries Department of the Ministry of Agriculture and Cooperatives. The idea for the rehabilitation of the lake developed from the local farming/fishing community and was presented to MOAC by the local district officer. The proposed project fits into Government's declared policy of revitalizing Thailand's fishing industry with a view of increasing animal protein supplies to rural populations and at the same time improving employment opportunities in some of the depressed regions. As such the project would parallel other lake rehabilitation projects under preparation such as the Bung Boraped in the central region, the Payao in the North and the Nong Han in the north east for which the Asian Institute of Technology (A.I.T.) has prepared feasibility studies. The studies were financed by OECF and NESDB. A full feasibility study for the Lake Chaiyaphum would be required.

#### Project Objectives

8.02 The aim of the project would be to:

- (a) Develop the lake for increased fishery production through dyking and/or dredging.
- (b) Increase the storage capacity for the development of limited irrigation and increased water supply for human needs.

- (c) Establish a fishery station for the production of fingerlings primarily herbivorous varieties such as grass carp, silver carp, tilapia etc. Fingerlings would be supplied to farmers for stocking of existing fish ponds as well as for stocking the lake.

#### Technical Description

8.03 The lake, locally known as Nong Raharn , covers a depression at the southern bank of the river Chi some 25 km south-west of the provincial capital of Chaiyaphum. The lakes' potential surface is around 3 000 ha but a considerable area is swamp, only around 400 ha having year round water. Water inflow is primarily gravity flow from a medium sized, undetermined water shed. The lake drains north into the Chi river except during flood periods when lake water is replenished from the river which is connected to the lake by a link canal.

8.04 In 1974, as part of the Northeast Rural Development Fund Project, a dyke of some 450 m was constructed in the north to increase year round water depth, however, the impact was limited. To date minimum water depth during the dry season is only around 1.5m, during the peak of the wet season the maximum depth is 4 m.

8.05 The lake is badly infested with aquatic weeds including Water Hyacinth, Hydrilla and Nilambo. In the absence of some organized weed control the lake might become congested.

8.06 The lake is used today by about 50 full time and 900 part time fishermen from nine villages which are scattered around it. Estimated fish yield today is 300 to 500 tons/year. The fish is sold fresh to the rural and urban populations around the lake and in Chiaphoum. Lake water is also used for supplying the town Jattarat with drinking water, today around 800 m<sup>3</sup> of water are pumped out of the lake daily. Demand for water is increasing and there are tentative plans to increase water outtake fourfold. Furthermore, water is used for the retting of kenaf, for limited irrigation of vegetable gardens, seed beds etc. and for livestock.

#### Cost and Benefits

8.07 Costs for lake rehabilitation are tentatively estimated at B 200 million (US\$ 8.8 million). Benefits would stem from sharp increases in fish production, probably double today's catch with an incremental value of B 7 million (US\$ 300 000) at B 15-20/kg fish. There would in addition be benefits from possible additional irrigation and social benefits from improved water supply. Feasibility studies for other lake developments, e.g., Bung Borapad have shown internal rates of return of around 20%. Costs for a feasibility study are estimated at US\$ 160 000-200 000.

### Preparation and Organization

8.08 Available base data are very limited and the suggestion for consideration of this project is based primarily upon the results of AIT's feasibility studies for other lake rehabilitation schemes. The Fisheries Department has been requested to assemble additional base data, a request that would need to be repeated should IFAD be interested in principle in the project and in financing the feasibility study. Government's interest in the project is definitely given, the project would compliment ongoing schemes.

8.09 A team for preparing a feasibility study for this project would have to include: an economist/team leader, a water resources engineer, a fresh water fisheries development expert and, possibly short term agronomist - irrigation specialist. It is expected that a study could be completed within a four months period provided all base data are previously assembled. Most of the expertise required would be locally available. The AIT might be a logical agency for the execution of such a study.

8.10 Financing of the study could be facilitated within the framework of any IFAD assisted project. Government has been informed in writing that financing of the feasibility study would not per se commit IFAD to project financing.

### B. Chomtong Agricultural Land Reform Project

#### Background

8.11 Recently the government has degazetted lands from forest reserves as the lands are no longer under forest and as they are technically suitable for agriculture. Once degazetted, the lands are to be distributed to farmers and developed for agricultural purposes. In line with the above policy, the Agricultural Land Reform Office (ALRO) is currently implementing, with the assistance from IBRD, a project to develop encroached public lands suitable for agriculture in nine locations scattered over in the North, Northeast and the Central Regions. The Chomtong Agricultural Land Reform project as proposed by ALRO intends to expand on-going activities of ALRO into a new area. Chomtong is a district in Chiang Mai in the Upper North and has been classified as a poverty district. The project, thus, would serve the poverty eradication objective and the concern for better utilization of land resources and security of land tenure of the farmers by the government. Settlers have been preselected.

#### Project Objectives

8.12 The project would help

- (a) To equitably distribute the degazetted land to low income farmers who are classified as landless farmers by provincial authority;
- (b) To help the farmers to develop the land for agricultural purposes.

### Technical Description

8.13 The Chomtong national forest reserve, which has been degazetted, covers a total area of 2 610 ha. The ALRO has declared the area to be a land reform area. In addition, ALRO bought another 120 ha. of private land adjacent to the above, bringing the total project area is 2 730 ha.

8.14 Preliminary land classification of the area indicates suitability for upland crops and fruit trees. Previous cropping has been mainly field crops during the rainy season. Possibility exists for partial irrigation development from nearby rivers. Initial development proposals are over-ambitious aiming at total irrigation although water resources are limited, water transport expensive and soils not everywhere suited for irrigation. Much simpler development proposals need to be worked out based on tree crops, pasture and limited irrigation for subsistence use. Double cropping would be limited and probably restricted to vegetable growing.

8.15 Development of the area would involve construction of weirs and of irrigation canals, land levelling, soil erosion control on the slopes and road construction. As a first step a detailed survey of the area would be required and farm plots defined. Given relative low land productivity, average plots would probably have to be around 20 rai (3.2 ha) indicating a total settlement potential for around 800 farmers.

### Cost and Benefits

8.16 The cost for physical infrastructures is estimated at about US\$ 6 million. Total cost of the above project is estimated to be around US\$ 10 million. Economic and social benefits would accrue to about 800 farm families living in absolute poverty. Feasibility studies for other land reform areas have shown internal rates of return of around 15%. Costs for a feasibility study is estimated at US\$ 200 000.

### Preparation and Organization

8.17 Basic data are limited. Mapping is fundamental to ALRO's land distribution and physical development work. ALRO in cooperation with Land Development Department should be able to prepare these basic data in advance of feasibility study start up. MOAC's interest in the project is given, the project would complement ongoing schemes.

8.18 A team for preparing a feasibility study would have to include: a water resource engineer, a rural works engineer, soil conservationist, agronomist, and economist. It is expected that the study could be completed within 6 months. Most of the expertise required would be locally available. Financing of the study could be included within the framework of any IFAD assisted project.

### C. Watershed Development Project

#### Background

8.19 In the highlands of the Northern Region, i.e. in areas above 700m a.m.s.l., uncontrolled logging accompanied by shifting cultivation, frequently moving into logged-over areas, has seriously affected natural vegetation and development potential. The affected areas are often in watersheds of rivers and streams important for irrigation and water supply in the lowlands. Increasing population pressure has accelerated destruction of flora, fauna and soils. Some of the tribes, such as the Karens practice a land conserving long bush fallow rotation, other tribes a more destructive form of cultivation. In both cases greater population densities have led to rapid depletion of resources and erosion with consequent serious silting problems downstream.

8.20 The threat to the economic life of downstream irrigation as a result of the erosion and sedimentation, has caused considerable concern to Government. Protection of land resources in the watersheds and increasing incomes of the hill tribe population is an important Government objective. For the country as a whole it was estimated that in 1961 about 6% of total areas or 56 million ha was covered by forest. In 1982 satellite photos indicated that the existing forest area in the country was only 30.5% or 15.6 million ha. This persuaded the Government to formulate a policy of active forestry development and also make the public understand the need to preserve forestry resources. Legislation exists today to manage and control logging and to undertake reforestation. However, this legislation has rarely been enforced. Reforestation is presently being done by the Royal Forestry Department (R.F.D.) through a series of small projects in the uplands. The success of Government's policy will depend upon the enforcement of legislation on logging in existing watershed forestry and the implementation of well planned reforestation programmes.

#### Project Objectives

8.21 The project would assist in:

- (a) complementing ongoing reforestation programmes of R.F.D. through land development and through agricultural programmes assisting the hill tribe populations;
- (b) improving of the incomes and living standards of the resident population in the watersheds.
- (c) reforesting of denuded watersheds to improve storage capacity of soils and prevent further erosion and siltation (Emphasis on this component depends on the degree of completion in ongoing projects).
- (d) preventing downstream irrigation facilities drying out.

### Project Areas

8.22 The Watershed Management Division (WMD) of the R.F.D. takes full responsibility for most activities concerning basin management all over the country. Presently, project implementations are mainly in the northern region; in the basins of River Ping, Wang, Yom and Nan which are the tributaries of the Chao Phraya River, the life line of the country. A general description of the northern region is given in Chapter III.

### Target Group

8.23 Residents of the northern watersheds are mostly hilltribes. The main groups are Hmong, Lahu, Yao, Lisu and Karen. The hilltribes live in isolated villages at higher elevations than the local Thai people. The size of villages range from a few to more than one hundred households. Family size also varies according to the culture of tribes. The annual income for the hill tribe people is estimated at US\$ 60-90 per capita. The very poor resource base, their shifting cultivation practices, the lack of Government services and inaccessibility of their villages have so far limited development.

### Project Components and Activities

8.24 WMD decided in 1975 to set up field operation units for implementation of the headland areas of degraded watersheds. Presently there are 35 units working in the Northern Region developing selected watersheds with a total of about 10,000 ha. Main emphasis would be to support ongoing activities undertaken by the field operation units through strengthening the agriculture oriented activities. Due to budgetary constraints these activities have so far received very little attention. The project would also support development of relatively small and well-defined watersheds through strengthening the existing works capabilities. Project development and execution would be carried out in association with the hill tribe people. The project would not envisage to provide means for access roads. This is provided by other government services.

The hill tribes live in villages averaging 50 households. Each unit under the reforestation programme would involve about 10 villages in the following agricultural activities:

The project would be:

- Conducting proper land use planning on the basis of soil survey and classification. Suitable land for the hilltribes would be identified with regard to cultivation potential and available water sources.
- Providing extension service on cultivation practices to the hilltribe farmers by emphasizing soil and water conservation. The development of cropping systems would meet the economic needs of the farmer whilst maintaining soil stability and nutrient levels. Modifying land forms by installation of bench

or step terraces would also be introduced to the hilltribes. Government services would provide support to improvement of production of paddy, which is the main subsistence crop. Main efforts in this project would be to support subsistence requirements. The second most important crop to support would be maize.

- Construction of village reservoirs for household usages and for some farm irrigation. These reservoirs would also serve as sources of fish protein for the hilltribes.
- Providing the hilltribe farmers with communal grazing land to support their livestock. For this purpose, new species of grasses and legumes would be introduced. Grazing alternative within forest plantations where trees are tall enough to withstand grazing pressures would also be allowed.
- Planting of village woodlots as a source of fuelwood, lumber, agricultural tools and of other fiber needs. The woodlots would be either natural forest or plantation of fast growing species.

The project would not address itself to reforestation but support development activities in areas where the Royal Forestry Department has already undertaken reforestation activities.

#### Project Cost and Benefits

8.25 Project activities would be conducted by a field operation units. Total cost for the agricultural component for one unit has tentatively been estimated to US\$ 0.5 million. The project would support the 7-10 units in their ongoing work. Activity under one unit would support about 500 households (3,000-3,500 people). The project would exclusively focus on resource poor areas, both in ecological and human welfare terms. This means that the incremental production benefits from individual activities are for the most part financially marginal. Nevertheless, benefits from the project would come from

- (a) increased agricultural production leading to improved food and nutritional status in poor hill tribe areas, assuming that the main part of incremental production would be consumed on farm;
- (b) generation of employment leading to increased income and stimulation of local economic activity and reduced migration to over-crowded urban areas.

#### Preparation and Issues

8.26 The project would complement ongoing activities of the Watershed Management Division supported by I.B.R.D. and other agencies. The progress and efficiency of work so far undertaken would need to be evaluated to be able to formulate a detailed project proposal. The WMD

would be requested to furnish tentative project formulation to IFAD during 1984. This formulation would form a base for an IFAD Fact-Finding/Preparation Mission. Most important would be to develop viable development plans and select the areas to be supported based upon access and resource potential.

8.27 The hilltribe people are traditional in their nature. Development of the watersheds and improving these peoples' welfare would have to be done gradually and carefully. Proposed improved technologies would have a slow rate of adoption during a long duration of time.

8.28 The implementation capacity of the Water Management Division and its coordination with other agencies is an extremely important factor that requires attention during preparation.

8.29 Project activities would be based on results of past and ongoing programmes. Technical packages that are economically viable would need to be developed. Preparation would probably have to be stretched over several years.

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Part II - Note of Understanding
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- ANNEX VIII         Irrigation
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Marketing Organization for Farmers

Mr. Pramut Bunasiri Director

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Mr. Chamlong Tohtong General Manager  
Mr. Suwon Trighol Deputy Manager  
Mr. P. Lightfoot IFAD Consultant advisor

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U.S.A.I.D., Bangkok	Mr. J.J. Wood
European Economic Community, Bangkok	Mr. R.H. Bennison
I.B.R.D., Bangkok Office	Mr. R.E. Burrs
	Mr. R. Morton
U.N.D.P.	Mr. W.P. Prattley, Res. Rep.
	Mr. C.H. Larsimont Depty. Resrep.
	Mr. S. Natsame
FAO	Dr. J.A. Gartner

Part I . Departmental Project Suggestions

In preparation for the IFAD agricultural project identification mission, MOAC requested its various departments to formulate project proposals. These proposals and the mission's reactions which were fully discussed with MOAC are summarized below:

(a) Department of Fisheries:

- (i) Fresh-water Aquaculture Development Project. The proposed project is to be executed in the Central Region and thus lies outside IFAD's declared geographical area of interest.
- (ii) Chaiyaphum Lake Rehabilitation Project. The mission visited the proposed project site. This could be one of the "second generation" projects. Funds for the required feasibility study might be included in the first project IFAD might wish to assist.

(b) Department of Land Development:

- (i) Small Scale Water Resources and Land Development for Agriculture.  
  
This proposal falls within the ongoing, very large, small-scale water development programme financed by Government Agencies.
- (ii) Management of Shallow Groundwater Resources Research. This is of particular interest for the northeastern region. Inclusion of funds for technical assistance might be considered as part of an agricultural development project in that region.

(c) Department of Agriculture:

Development of Farming Research Institute. Although of interest, the proposed project does not fit into the broad terms of reference of the mission. Furthermore, IFAD is already engaged in agricultural research development in Thailand through a project which apparently faces implementation problems.

(c) Cooperative Promotion Department:

Northeast Agricultural Development through the Strengthening of Agricultural Cooperatives. It is suggested that cooperative

development should commence with clear-cut simple development responsibilities given to individual cooperatives and their members. The mission proposes that encouragement of agricultural cooperatives form part of wider agricultural development projects, rather than being tackled in isolation.

(e) Department of Livestock Development:

Beef Cattle Development in Southern Thailand. The geographical limitation of the project in the south rules it out for Mission consideration.

(f) Agricultural Land Reform Office:

Chomtong Agricultural Land Reform Area. The mission visited the project site. This is another possible second generation project requiring a feasibility study.

(g) Office of the Rubber Replanting Aid fund:

Accelerated Rubber Replanting in southern Thailand. The project does not fit into IFAD's mandate.

(h) Royal Forest Department:

Village Woodlot Development. This action could be of interest as part of a wider agricultural development programme.

In a meeting with the Permanent Secretary MOAC, the mission was informed of the priority areas as seen by the MOAC and NESDB. These are soyabean production in the north and livestock and fish development in the north-east. IFAD assistance to small-scale irrigation was not given priority. At the same time the mission agreed with MOAC that projects to be identified for eventual IFAD participation would fit into Government's development policies particularly the recently launched Rural Poverty Eradication Programme. The target group for all projects would be the small farmers and rural poor as identified by the Government. In this programme the Government has already recognized the importance of supporting the absolute poorest communities in Thailand, which are concentrated in the northern, northeastern and southern regions. The Government has identified 71 districts out of 182 districts in the northern region and 172 districts out of 259 districts in the northeastern region as rural poverty areas. Farmers in the poverty areas have a land-holding averaging 0.8 ha compared to the national average of 5 ha. Average annual income of the poverty group is estimated at about US\$ 100 compared to national average of US\$ 860.

THAILAND: AGRICULTURAL PROJECT IDENTIFICATION

Note of Understanding

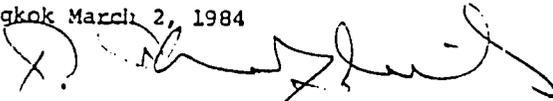
- 1) On Friday, March 2, 1984, The International Fund for Agricultural Development (IFAD) agricultural project identification mission met with senior staff of the Ministry of Agriculture and Cooperatives (MOAC) to discuss mission's findings and the general follow up. The meeting was chaired by Permanent Secretary for MOAC. List of department attending the meeting is attached, most departments were represented by their Director Generals.
- 2) The basic document for the meeting was the memorandum proposed by the mission and addressed to Dr. Thalerng, a copy of the memorandum is attached.
- 3) The mission summarized the nature and scope of projects identified. Discussion concentrated on three schemes:
  - a) Land and water development (People's Irrigation System)
  - b) Agricultural diversification
  - c) Agricultural development in the North East.
- 4) The ministry, Through Dr. Thalerng, expressed its priority interest in the agricultural development project based upon the improvement of people's irrigation system in the North (project a). Second priority was given to the suggested Agricultural Diversification Scheme in the North East (project b). The proposed agricultural development centered around utilization of water resources from already existing dams and dykes in the North East (project c) was given low priority given the cost and complexity of implementation.

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- 5) The discussion did not focus on the priorities of "second generation projects" as it is understood that emphasis will be given on the preparation of the first scheme. During this preparation the IFAD - Thai dialogue on future cooperation will continue.
  
- 6) It was agreed that the IFAD mission upon return to Rome will prepare a letter to Dr. Thalerng summarizing IFAD reaction, proposals for preparation and preparation time table. IFAD's active assistance in project preparation is assumed.

Bangkok March 2, 1984



\_\_\_\_\_  
Dr. Thalerng Thamrongnavasawat



\_\_\_\_\_  
Robert Ellenger

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Listing of Participating Agencies

1. Permanent-Secretary
2. Royal Irrigation Department
3. Agricultural Extension Department
4. Agricultural Economics Office
5. Bank for Agriculture and Cooperatives
6. Department of Fisheries
7. Agricultural Land Reform Office
8. Land Development Department
9. Marketing Organization for Farmers
10. Livestock Development Department
11. Royal Forestry Department
12. Rubber Replanting Aid Fund Board
13. Department of Agriculture
14. Department of Agricultural Extension
15. Agricultural Cooperatives Promotion Department

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THAILAND  
AGRICULTURAL PROJECT IDENTIFICATION  
GOVERNMENT DEVELOPMENT POLICY  
ANNEX III

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THAILAND AGRICULTURAL PROJECT IDENTIFICATIONGOVERNMENT DEVELOPMENT POLICYTwo Decades of Growth and Development: 1960 - 1980

1. During the last two decades, Thailand experienced a remarkably rapid and sustained rate of economic growth with real GDP growth at 7-8% per annum. During the 20 years of planned development under the past four National Economic and Social Development Plans (1961-1981), GDP expanded 14 fold from 60 billion baht (US\$ 3 billion) in 1961 to 817 billion baht (US\$ 41 billion) in 1981. Meanwhile, per capita income in 1972 constant terms increased eight times during the same period from 2 200 baht (US\$ 110) in 1961 to 17 200 baht (US\$ 860) in 1981, and exports rose 16 folds from 9 900 million baht (US\$ 495 million) in 1961 to 163 000 million baht (US\$ 2 150 million) in 1981.
2. However, the rapid economic growth has created many problems. It has adversely affected basic economic resources including land, water resources, forest and fishing grounds which have been exploited or wastefully utilized without any conservation effort. Furthermore, the past development and economic progress only benefited certain parts of the country. Development benefits were not evenly dispersed as a large portion of the population is still living in absolute poverty.
3. Moreover, world economic changes during the past decade, particularly the rise in energy prices, the international financial crisis, high inflation and low economic growth have greatly affected the Thai economy which is heavily dependent on international trade and imports of energy, capital and many other factors of production. The problems are compounded by political tensions in neighbouring countries which have created greater economic tension and a larger defence burden.
4. Over the last 20 years Thailand also witnessed a rapid transformation in its structure of production, with the share of agriculture declining from 40% in the 1960's to 25% in 1982. The growth of Thai agricultural production was rapid by international standards with an average of 5% per annum, but by the late 1970s a definite decline in growth rates was apparent.
5. The transformation of the Thai economy has been less rapid in terms of its labour force than in terms of its structure of production. In 1980 the agricultural sector still accounted for three quarters of Thailand's labour force. An estimated 86% of the Thai population remained in rural areas in 1980, virtually the same proportion as in 1960.
6. Associated with the Kingdom's rapid economic growth, was a fast expansion in trade, the share of exports in GDP increased from an average of about 18% during 1960s to 25% in 1980, while imports increased from 19-22% during the 1960s to 30% by 1980. At the same time, the composition

of trade changed with an increased share of oil in total imports on the one side, and a reduced role of Thailand's traditional principal export commodity, rice, in total exports.

7. The overall incidence of poverty<sup>1/</sup> was reduced from about 57% in the early 1960s to 31% in the middle 1970s, and to about 22% in the early 1980s. Poverty, however, remains largely a rural phenomenon and mostly concentrated in the Northeast and parts of the North where the fertility of the land is low.

#### The Fifth-Five-Year Plan and its Objectives

8. In September of 1981 the Cabinet approved the Fifth National Economic and Social Development Plan covering the period October 1981 - September 1986. According to the Plan, and in response to the challenges posed by a less favourable world environment and accumulated internal economic and social problems, a set of interrelated development objectives and policies were designed to simultaneously address structural adjustment needs and broader issues of the development process. The Plan objectives are:

- (a) restoration of the country's economic and financial position,
- (b) structural adjustment, increased economic efficiency, and balanced regional growth,
- (c) completion of social infrastructure and more equal distribution of social services,
- (d) poverty alleviation in areas with high concentration of population below the absolute poverty line,
- (e) improvement in national security through better coordination between general development efforts and security management, and
- (f) institutional reforms and deconcentration of ownership and wealth.

#### Agriculture and Rural Economy

9. Out of the total population of 48 million, some 40 million live in rural areas and earn their livelihood mainly in agriculture. There are at the present about 5 million farm households. The rural sector of Thailand has always been a major net exporter of food. The performances of the agricultural sector has been the determining influence behind the dynamism of the nation's economy.

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<sup>1/</sup> Criteria US\$ 100 per capita per year as determined by IBRD in Income Growth and Poverty Alleviation in Thailand, 1980.

10. Agricultural production (GDP in constant terms) grew at an annual rate of about 5% during 1960-80. In 1982, agriculture contributed about 25% of GDP and 64% of total exports, and provided full or part-time employment for more than 73% of the country's labour force. In addition, strong agricultural performance has contributed to a substantial reduction of rural poverty.
11. The key factors in agricultural development have been the efficiency of the private sector to expand markets and the responsiveness of the farmers themselves to opportunities in world trade. These have led to the rapid expansions of cultivated area and diversification into production of high-value crops. The expansion of the cultivated area by 4% per annum has been the main force behind the development of Thai agriculture and accounted for most of the 5% growth in output, while yield increases played a relatively minor role.
12. Recently, however, the growth of the agricultural sector has fallen off. Agricultural GDP in constant prices gradually fell to about 3.5% in 1983. The slowdown was most pronounced in the crop subsector which is of major significance since crop production contributes about 74% of agricultural GDP. The slower growth in crop production was due to expansion of cultivated areas into poorer marginal lands resulting in further stagnation of crop yield per unit area. A slowdown in agricultural growth will clearly make any attempt to reduce the incidence of poverty more difficult to achieve. In addition, if agriculture is allowed to grow at a slow rate, and with the 3% annual increase in labour force which creates the need for some 0.7 million new jobs each year, unemployment in rural areas will grow leading to more serious income disparities.
13. A significant feature in agriculture has been its ability to diversify production. The contribution of rice and rice products as a proportion of crop GDP, at constant prices, has declined from 53% in 1960 to 39% in 1980. At the same time, the contribution to crop GDP of upland crops (corn, sugarcane, cassava, rubber, beans and other), has increased from 8% in 1960 to 19% in 1980. The livestock subsector, responsible for about 14% of agricultural GDP, developed unevenly. Poultry production for export rose steeply, pork production declined and large ruminant production remained more or less constant. Fisheries with about 10% of agricultural GDP showed an overall decline over the past two decades, particularly through a fall in deep sea catch, but with significant increase in sea food canning for export. The forestry subsector showed a definite downward swing resulting from a policy to conserve forests through termination in granting new concessions and withdrawal of permits for further logging in cases where contracts were abused.
- Government Rural Development Policies and Administrative Procedures
14. All Thai administrations have over the last two decades consistently demonstrated a commitment to rural and agricultural development. However, most of the attempts have been made without locational

specificity, therefore, target groups have been vague and benefits from government assistance have accrued to better off farmers rather than to those who really need the assistance. At the same time, a single set of rural development policies has been applied to all farmers who in reality are very heterogenous in the economic and social setting. Consequently impacts of the policies and programmes on the small and needy farmers have not been ascertained. In addition, programmes and projects for rural development have been designed and implemented without proper coordination among government agencies and without beneficiaries' participation in the process, resulting in impacts frequently falling short of the planned targets.

15. Overall, rural development in the Fifth National Economic and Social Development Plan calls for four basic objectives.

- (a) to eradicate rural poverty,
- (b) to increase the capability of rural populations to help themselves,
- (c) to increase agricultural production efficiency,
- (d) to conserve natural resources.

16. NESDB through cooperation and assistance from technical departments and universities, selected 286 districts and subdistricts (34% of the total) to be poverty areas. Out of these, 32 districts are in the South, 32 districts are in the North and 172 in the Northeast. So that 45% of the total districts in the North are classified as poverty areas, and 66% of the total districts in the north east are in the same category. The total target population affected is about 8 million, living in 12 555 villages. Selection of the districts was based mainly on crop productivity index, soil fertility, land tenure situation, off farm employment opportunities, and assistance previously received from government. The selection was based on the premises that people are poor because they have to depend on the unproductive resource base and lack of services from the Government. Income was not a selection criteria.

17. It is the policy of the present government that assistance from the government will be directed toward these poverty areas first. Five principles have been adopted by the government as policy guidelines in formulating programmes for poverty areas:

- (a) Development efforts must be specific in locality and primary consideration must be given to poverty districts.
- (b) Develop poverty areas so that the people will have enough to eat and to cloth themselves. Sufficient basic public services will be made available.
- (c) Initiate people's self-help programmes.

- (d) Solve the poverty problems in all localities with emphasis on low-cost and self-help techniques.
- (e) Encourage the maximum participation by the people in solving their problems.

18. Within the overall framework of rural development programmes eight sub-programmes have been identified and designed for various specific localities.

- (a) Poverty Areas Programme: this is designed to provide basic needs and community development consisting of three sub-programmes. Village based Activities: are directed at group attempts for resource development e.g. village fish ponds, livestock exchange programme, village woodlot and water resource development. Social and Physical Infrastructure: include health and sanitation, human development, and physical local infrastructure. Production Support Activities: Intended to assist individual farmers improve their productions.
- (b) Rural Employment generation programmes: this is aimed at providing off-season income through labour intensive employment.
- (c) Security Areas Programme: for the areas with problems of local insurgency or their nearness to the border with countries having political troubles.
- (d) Water Resources development programme: aimed at coordinating small scale irrigation projects for appropriate distribution.
- (e) Regular programmes of Ministry of Agriculture and Cooperatives (MOAC)
- (f) Regular programmes of Ministry of Interior.
- (g) Regular programmes of Ministry of Education.
- (h) Regular programmes of Ministry of Health.

19. People in poverty areas are entitled to all eight programmes whereas people in non-poverty areas are not.

20. The new rural development attempt has been designed to improve the efficiency of rural development by targeting funds on poverty areas where they are most needed, and by improving the procedures for Government agencies and local communities to increase the cost-effectiveness of their participation in rural development. To achieve this the National Rural Development Commission (NRDC) has been established to draw up national plans and priorities and to appropriate special budgets for initiating projects. The commission is chaired by the Prime Minister himself indicating strong commitment to the programme. The National Rural Development Coordinating Centre (NRDCC), institutionally located within NESDB, will coordinate the project in its capacity as secretariate for the NRDC.

21. The planning process has been designed with the aim of coordinating bottom up and top down planning systems. At the grassroot level, the Tambon council reviews suggestions put forward by individual village development committees. Those accepted are put forward to the District Development Committee who sets the priorities and provides comments on their suitability before forwarding them to the Provincial Development Committee. Annual provincial plans are then drawn up which should be in conformity with the five-year plan of the province. The provincial plans are forwarded to NRDC who in turn reviews and sends the plans with comments to the ministries and departments to be included in their annual budget requests. In the event that a disagreement arises between the province and the line agencies concerned, a provision exists for the province to petition the NRDC directly to seek additional funding.

22. For the poverty eradication programmes the planned incremental expenditure during the Fifth Plan amounts to B 8 593 million baht (US\$ 374 million) with B 7 193 million (US\$ 313 million) from Government budget and B 1 400 million (US\$ 61 million) from external sources. From the planned budget for the poverty eradication programme, MOAC would get about 34%, Ministry of Interior 23%, Ministry of Public Health 37%, Ministry of Education 5% and NESDB/NRDC 1% of the total.

#### Agriculture for Poverty Areas

23 The annual agricultural output in poverty areas increased by an average of 1% during the 4th Plan. Thus, in the Fifth Plan, an increase of 2% per annum is aimed at. To achieve this, special agricultural projects for poverty areas are needed in addition to the regular projects of MOAC. The projects have to be in line with the two main sub-programmes for poverty eradication i.e. the village based activities and production support activities.

#### Village based Activities

- village fish ponds with the help of the Fisheries Department,
- village water resources,
- village small animals,
- cattle/buffalo bank,
- village agricultural water resources,
- village fish pond in the south with the help of the Ministry of Education and with the help from the Fisheries Department,
- village woodlots.

#### Production Support Activities

- food production for nutrition,
- upland Rice,
- soil improvement through organic fertilizer,
- soil salinity problems in the north east,
- rainfed rice,
- livestock improvement,

- alkalinity and salinity problems in the south,
- soil conservation in the north,
- upland crop improvement,
- backyard tree crop promotion,

24. General indications on agricultural potentials in the poverty areas are that agricultural resources are unproductive to the degree that investment to increase production to higher levels is uneconomical. Therefore, agricultural development projects are aimed at "reasonable" improvements only, and also at improving community cooperation.

#### Agriculture for Non-poverty Areas

25. The basic characteristic of agriculture in non poverty areas which distinguishes it from that of the poverty areas is the "marketable surplus" of farm produce that is generated. This "surplus" might lead to marketing problems and private sector participation.

26. Past performance of agriculture in the non-poverty areas indicates six main problems.

- (a) continuing decline in production growth rates due to low productivity and deterioration of natural resources;
- (b) water resources have not been utilized fully;
- (c) forest destruction and inefficient land use;
- (d) high production costs compared to farm gate prices;
- (e) weak marketing position of farmers and price distortions through government taxation on major export crops (paddy and rubber); and
- (f) weak cooperatives and farmers' associations with very limited farmer participation.

27. The Fifth Plan, therefore, aims basically at productivity improvement to reduce costs of production and at agricultural diversification to reduce marketing risks and improve utilization of land and labour. In this connection, the main policy guidelines include:

- (a) restructure the agricultural production process from extensive (area expansion) to intensive (yield improvement);
- (b) improve cost returns to the producers;
- (c) secure land tenure;
- (d) expand institutional credit;
- (e) strengthen farmers' institutions.

28. To achieve the above objectives, the following measures are needed:

(a) Improvement in the efficiency of natural resources utilization:

- better use of existing irrigation facilities including promotion of private sector investment in the irrigated area for better management leading to higher agricultural production and higher incomes to the farmers;
- agriculture diversification to include crops, livestock and fisheries for better land and labour utilization;
- land reclassification and land titeling to provide suitable land and ownership to farmers;
- strict protection of watershed areas;
- subsidized appropriate inputs;
- strengthening research and extension activities.

(b) Marketing and pricing policies in conformity with production policies for improved prices to the farmers:

- facilitate exports;
- protect from import competition for a period of time long enough to encourage local production those goods and commodities which have potentials to be produced locally;
- remove bottlenecks in marketing channels;
- intervene only where and when the market is not competitive.

(c) Improve farmers' cooperatives emphasizing better management.

(d) Increase institutional credits to the farm sector from BAAC and commercial banks and by providing special government funds to BAAC.

(e) Increase the role of the private sector in technology transfer and in joint investment with the farmers.

#### Main Thrusts of Rural Development Policies

29. In the interpretation of the rural development policies the following conclusions regarding the main emphasis can be made:

(a) Distribution of development benefits to the people who have been bypassed in the past is reflected in the poverty eradication programme.

- (b) Natural resources have become scarce as a result of population increase, there is a need for better management and better utilization.
- (c) Thai agriculture relies on world trade and is facing strong competition, therefore, to have a competitive edge, the costs of production and marketing must be kept at a minimum. Strong attention is drawn to an improvement in production efficiency.
- (d) The unemployment problem receives much attention, and the agricultural sector has been called upon to solve seasonal unemployment through agricultural diversification and second cropping where possible.
- (e) Better coordination among government agencies in rural development is a key feature in both poverty and non-poverty areas to achieve greater impact upon the rural population. A better coordination is achieved through linking national plans with provincial plans and Tambon plans, and eliminate the profusion of decision making bodies existing today, establishing only one high level committee in their stead.
- (f) People participation is strongly stressed and provision is made for rural populations to identify their own problems and needs, to formulate their plan for their community development, to select services they want from the government, and to identify their own localities for government project sites.
- (g) Better cooperation with the private sector is also needed. Marketing functions are better performed by the private sector. Therefore, the public sector will only facilitate and regulate marketing, leaving the private sector the responsibility for physical marketing of products. Recently, the present Prime Minister in his capacity as the Chairman of the Joint Public and Private Sectors Consultative Committee (JPPCC) in a public statement declared his new policies aimed at encouraging the private sector to invest in agricultural production in areas where government has already invested in irrigation facilities. The Prime Minister assigned the minister for MOAC to formulate a typical agricultural project in which local middlemen would be able to participate in production input distribution in a systematic manner. As a direct result the soyabean programme is now under preparation and should be completed within the next 2 to 3 months.

Decision Making Process in Agricultural Development

30. There are a total of 14 ministries with 165 departments and state enterprises in the Thai Government system. Most of them, one way or the other, are involved in rural affairs. As far as agriculture is concerned the MOAC is responsible for agricultural production promotion, the

Ministry of Commerce (MOC), is taking care of agricultural marketing, while the Ministry of Industries (MOI) looks after agro-industries. The activities of MOC and MOI are primarily policy formulation, while most of the development projects are implemented by MOAC.

31. MOAC has 11 departments and 8 state enterprises. Their terms of reference relate to specific functions or commodities. Policy decisions are formulated by the Agricultural Policy and Plan Committee chaired by the Minister of MOAC. Decision making in each state enterprise is done through its executive board but annual investment budgets must get approved by NESDB.

Departments

- The Royal Irrigation Department - responsible for construction and maintenance of large and medium scale irrigation projects, and construction of small scale irrigation projects.
- Land Development Department - responsible for land classification, soil conservation and land and water utilization.
- Agricultural Land Reform Office - is a coordinating agency in land reform activities.
- Department of Agriculture - responsible for crop research.
- Department of Agricultural Extension - responsible for seed production, crop promotion and establishment of farmers' associations.
- Department of Fisheries - in charge of fisheries research and extension.
- Department of Livestock Development - responsible for livestock research and extension responsibilities.
- The Royal Forest Department - responsible for protection and development of public forests.
- The Cooperatives Promotion Department - deals with farmers' cooperatives establishment and management.
- Department of Cooperative Auditing - works in cooperation with the Department of Cooperative Promotion in auditing financial transaction of cooperatives.
- Office of Agricultural Economics - is the planning arm of MOAC and serves as secretariate to the Agricultural Policy and Plan Committee.

State Enterprises

- Marketing Organization for Farmers set up to buy and sell farm produce and production inputs from and to the farmers. Direct purchasing of farm produce has been done in accordance with government's policy on price support.
- The Forest Industry Organization supervises forest concessions and actually carried out some reforestation.
- The Dairy Promotion Organization of Thailand is responsible for promotion of dairy farming and operation of dairy processing plants.
- The Fish Marketing Organization is in charge of provision of fish landing facilities and of helping fishermen to obtain fair prices.
- The Cold Storage Organization is intended to distribute fish as a source of low-cost protein to remote areas and to remove surplus supply from markets to avoid price drops.
- The Office of the Rubber Replanting Aid Fund assists rubber growers in their replanting with new improved varieties. Funds are obtained through the rubber export cess.
- The Thai Plywood Co. Ltd., produces plywood for sale.
- The Rubber Estate Organization promotes new rubber planting and conducts research on rubber processing.

32. Policies, programmes and projects for rural poverty eradication are proposed by or requested from NRDC of NESDB. NESDB in turn will bring its recommendations to the attention of NRDC for decision making. If approved by NRDC, NESDB will inform Cabinet of this decision. This is generally paramount to Cabinet approval.

33. Agricultural policies, not involving rural poverty, are sent to NESDB which serves as a non member secretary to the Council of Economic Ministers. The Council is chaired by the Prime Minister and meets every Monday. NESDB will review, add necessary information and comments and present to the Council proposals for decision making. The Council is acting on behalf of the Cabinet on economic affairs.

34. Agricultural development projects seeking funds from both the government budget and external borrowing, are submitted to NESDB for appraisal against the National Development Plan. The projects with recommendations are forwarded to Executive Board of NESDB and thus to Cabinet for approval. The Board meets every two weeks and the Cabinet meets every Tuesday.

35. Agricultural issues involving the private sector are forwarded to NESDB which serves as member and secretariate of Joint Public/Private Sectors Consultative Committee (JPPCC) chaired by the Prime Minister. The Committee meets once a month. NESDB reviews and provides comments for decision making. The decisions made by the Committee cannot be taken as final since JPPCC serves as a consultative group only. Matters are forwarded to the Council of Economic Ministers for final decisions.

Planning to Guide Resource Allocation

36. Thailand has set ambitious development goals with regard to its financial situation. Effective utilization of available resource is imperative. Dialogue and understanding among donor agencies, line agencies and central agencies have become more critical than ever. In this context, NESDB has developed a 3-year rolling plan for better utilization of external assistance. The Plan identifies: the maximum annual borrowing capacity of the Kingdom; top priority projects for all sectors; stage of project development and tentative loan negotiation date. The Plan is useful in providing an overall scenario of external borrowing, trade off among sectors and projects. At the same time it is useful as a tool to monitor project preparation progress.

37. Government annual budget ceilings are determined by a committee consisting of NESDB, Ministry of Finance, Bank of Thailand and Budget Bureau. The ceiling is approved by the Cabinet. Ceilings for individual ministries are also included. Budget allocation within each ministry is determined by the ministry. To ensure that high priority projects would get enough financial support, NESDB prepares a "Pink Book" annually, providing information on evaluation of previous year's performances, identifying major shortfalls, and recommending important projects.

THAILAND  
AGRICULTURE PROJECT IDENTIFICATION  
RESOURCE ALLOCATION TO THE AGRICULTURAL  
SECTOR DURING THE FIFTH NATIONAL ECONOMIC  
AND SOCIAL DEVELOPMENT PLAN 1982/1986

ANNEX IV

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THAILAND AGRICULTURAL PROJECT IDENTIFICATION

RESOURCE ALLOCATION TO THE AGRICULTURAL SECTOR DURING THE  
FIFTH NATIONAL ECONOMIC AND SOCIAL DEVELOPMENT PLAN  
1982/86.

Total Amounts from Various Sources

1. A total of about US\$ 2.9 billion, from both the public and private sectors, were allocated to the agricultural sector in 1982. Out of this total, credit from commercial banks account for about 52% (Table 1).

Government Annual Budget

2. During 1977/84 the agricultural sector received about 8.4% of the total government annual budget. Annual budget allocations to the Ministry of Agriculture and Cooperatives (MOAC) increased from US\$ 290 million in 1977 to US\$ 700 million in 1984 with an average growth rate of 10% per annum (Table 2).

3. During the same period, MOAC allocated on average 60% of its annual budget to irrigation development. Non-irrigation activities such as land and forest improvement, livestock, fisheries, and crop research and extension sharing the remaining 40% of the total.

Table 1

Agricultural Financing in 1982

Source	US Dollar Millions	%
<u>Public Sector</u>	1,420.2	100
Government budget	588.6	41.5
State enterprises	70.3	4.9
Farmers' Aid Fund	157.7	11.1
BAAC <sup>1/</sup>	338.5	23.8
External Loans	200.0	14.1
External Grants	65.1	4.6
<u>Private Sector</u>	1,512.2	100
Commercial banks	1,512.2	100
- directly to farmers	(748.8)	(49.5)
- through BAAC	(363.2)	(24.0)
- for agribusiness	(400.2)	(26.5)
<b>TOTAL</b>	<b>2,932.4</b>	

<sup>1/</sup> Bank for Agriculture and Agricultural Cooperatives.

Table 2

Government Annual Budget, 1977-84

Year	<u>Total</u>		<u>MOAC</u>		
	Million US Dollar	Growth Rate	Million US Dollar	Growth Rate	Percent of Total
1977	2,990.9		290.9		9.7
1978	3,521.7	17.7	304.7	4.7	8.7
1979	4,000.0	13.5	331.7	8.9	8.3
1980	4,980.7	24.5	410.4	23.7	8.2
1981	6,087.0	22.2	521.2	26.9	8.6
Aver. 1977/ 81	4,316.1	19.5	371.8	16.1	8.4
1982	7,000.0	15.0	588.6	12.9	8.4
1983	7,695.6	9.9	658.0	11.8	8.5
1984	8,347.8	8.5	697.4	5.9	8.3
Aver. 1982/ 1984	7,681.2	11.1	648.0	10.2	8.4

Farmers' Aid Fund

4. Export taxes on rice and sugar are the main revenues of the Fund. During 1978-83, the export tax on rice varied between US\$ 40 million to US\$ 74 million per year and on sugar between US\$ 0.4 to US\$ 27 million. In addition, the Fund receives interest from bank saving deposits. The Fund is managed by a committee chaired by the Permanent Secretary of MOAC. Its aim is providing assistance to farmers over and above that provided by the Government budget and by outside financial assistance. Between 1978-83, the committee approved allocation of the Fund between US\$ 50 million to US\$ 157 million a year for various projects. More than 80% were used for direct purchasing of paddy under the Government's price support programme. The remaining twenty percent was used for a host of small-scale development schemes covering practically all agricultural sectors.

External Assistance

5. Grants Thailand received technical assistance grants from USA, United Nations, Colombo Plan, ASEAN, Third Countries, Non-Governmental Organizations, EEC, and Volunteers valued at US\$ 160 million in 1982. Out of this, about US\$ 65 million were for the agricultural sector aiding numerous projects.

6. Loans The Thai Government allocated US\$ 650 million or 9% of the total external borrowing to the agricultural sector during the 4th National Economic and Social Development Plan (1977-1981). Sixteen projects, funded through loans and started in the 4th Plan will continue into the 5th Plan. Of these 10 were irrigation projects and 6 non-irrigation projects. The non-irrigation projects were:

- (a) Rainfed Agriculture Pilot Project/IBRD - US\$ 3 million
- (b) National Aquaculture/ADB - US\$ 42 million
- (c) Northern Agricultural Development Project/IBRD - US\$ 25 million
- (d) National Agricultural Research Project/IBRD/IFAD/Australia - US\$ 55 million
- (e) National Agricultural Extension Project/IBRD/USAID - US\$ 70 million
- (f) Farmers' Cooperatives Credit/OECF - US\$ 42 million.

7. For the 5th Plan (1982-86) about US\$ 1 500 million or about 11% of the total external borrowing have been earmarked for agricultural development. During the first two years of the Plan, US\$ 416 million in foreign aid were allocated to the following projects:

- (a) Tree Crops Phase 2/IBRD/CDC - US\$ 160 million.  

The project emphasizes rubber replanting in the south and in the eastern part of the central region. The assistance also covers coconut and other tree crops.
- (b) Land reform/IBRD - US\$ 17 million.
- (c) Medium Scale Irrigation Package Phase 1/ADB - US\$ 40 million.
- (d) Mabtaput/Dograi Irrigation/OECF - US\$ 25 million.
- (e) Small Scale Irrigation Phase 3/OECF - US\$ 10 million.
- (f) Irrigation Engineering Services/OECF - US\$ 4 million, the project aims at improving operation and maintenance of the existing irrigation systems.
- (g) Crop Seed Multiplication Phase 2/USAID - US\$ 6 million. The project complements assistance from Japan. It aims at strengthening the seed production programme of the Department of Agricultural Extension to annually produce 6 600 tons of paddy seed, 2 400 tons of maize, 1 300 tons of soyabeans, 600 tons of groundnuts, 350 tons of cotton, and 70 tons of sorghum.

- (h) Small Swamp Inland Fisheries/OECF - US\$ 29 million. The project aims at improving on-going activities of the Department of Fisheries related to the rehabilitation of small natural swamps in the northeast and the north.
- (i) Large Swamp Fisheries/OECF - US\$ 1 million. The Cabinet approved plans by the Department of Fisheries to rehabilitate three large natural lakes for fisheries production. These lakes are Payao lake in the north, Nong Han in the northeast and Bung Borapet in the central region. The OECF funds were used for necessary feasibility studies which have been completed.
- (j) Small Scale Irrigation/KfW - US\$ 4 million.
- (k) Irrigation Improvement/KfW - US\$ 5 million. The Royal Irrigation Department is shifting its emphasis from the construction of new irrigation schemes to an improvement in operation and maintenance of existing facilities. The assistance by KfW is for setting up a central equipment pool in the north east to provide such services.
- (l) Rural Credit/IBRD/IFAD - US\$ 90 million
- (m) Agricultural Credit/OECF - US\$ 22 million
- (n) Songkla Lake Development/ADB - US\$ 3 million. Assistance is provided for the formulation of master plans for a comprehensive development of the water basin.

8. In 1984, the following projects have so far been approved by the Cabinet:

- (a) Small Scale Irrigation : Phase 5/OECF - US\$ 28 million.
- (b) Nam Pang Irrigation Improvement/KfW - US\$ 4.6 million.
- (c) Agricultural Credit/ADB/OECF - US\$ 72 million.

9. The following are projects in the pipeline for the rest of the Fifth-Plan period:

- (a) Medium Scale Irrigation Package Phase 2/ADB - US\$ 58 million. The project aims at water resource development in the South. The appraisal has been completed. The executive board of NESDB requested MOAC to review the project on the ground that the unit costs are too high, inadequate emphasis is given on agricultural production promotion and the proposed organizational structure for the necessary coordination among various government agencies is too weak. A revised project is to be submitted for consideration by the executive board of NESDB in March 1984.

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- (b) Medium Scale Irrigation Phase 3/IBRD - US\$ 47 million. The project would concentrate on the north and the central regions. The project appraisal has been completed. NESDB is reviewing the project and an initial reaction indicates similar concerns to those expressed on the ADB's project. The project will be considered by the executive board of NESDB in March 1984.
- (c) Agricultural Technology Transfer/USAID - US\$ 5 million. The project document has been completed. Basically the project aims at providing funds for broad research activities to be administered by MOAC emphasizing exchanges of information and experience gained abroad and adapting them to the Thai situation. Discussions between MOAC and NESDB concluded that grant, not loan funds should be sought for such activities.
- (d) Dairy Plant Improvement/Denmark - US\$ 2 million. The Dairy Promotion Organization, a state enterprise under MOAC, is seeking soft term credit funds for replacing old equipment in its processing plant in the central region. The project has been submitted for NESDB consideration.
- (e) Land Use Improvement/Denmark - US\$ 5.2 million. The Land Development Department (LDD) intends to expand its services in acid sulfate soil improvement in the central region, land reshaping and levelling, and land conservation in the north and northeast, for this purpose LDD wants to establish an equipment pool with the help of the Danish Loan. The project has been forwarded for consideration of NESDB. The need for public sector investment in establishing an equipment pool to provide free service is questioned by staff of NESDB. The project is therefore unlikely to materialize.
- (f) Irrigation Improvement/IBRD - US\$ 50 million. The Government of Thailand indicated clearly its desire to postpone construction of new large scale irrigation projects and to direct funds for the better utilization of existing irrigation facilities. The World Bank is looking into a possible project for bank financing in line with the new policy. Such a project is tentatively scheduled for the 1985 lending programme.
- (g) Medium-Scale Irrigation Phase 4/ADB - US\$ 50 million. Several medium scale irrigation projects in the South were submitted for the Bank's considerations.
- (h) Nam Kam Irrigation/KFW - US\$ 5.7 million. The German Government is interested in providing credit for the implementation of medium scale water resource development programmes, in the northeast. A feasibility study is underway.

- (i) Agricultural Support Services/IBRD - US\$ 100 million. The main goal of the project is to strengthen the ability of MOAC to plan and to implement programmes in the agricultural sector. The proposed project aims at improving the institutional infrastructure to better enable MOAC to assume effective and full responsibility for policy formulation and public resource allocation for the agricultural sector. The project would provide support to the Office of Agricultural Economics for investment analysis, programme planning and budgeting, monitoring, evaluation and collection of agricultural statistics. Support would also be given to three other MOAC departments - Land Development, Livestock Development and Fisheries - for improving financial planning and reporting systems, programmes and project planning, preparation and monitoring, manpower training and resources planning. The project would also strengthen selected technical support services of the three departments. For the Land Development Department activities would include land classification, acid sulfate soil improvement and northern upland development. The technical support services for the Livestock Department would include non-dairy cattle and buffalo field services, improvement in applied research in animal nutrition, genetic upgrading and disease control. For the Department of Fisheries the project would include an improvement in extension services for community fish ponds and fish culture production systems, research to upgrade genetic material, and expansion of seedfish production. The project was appraised in Mid-1983.
- (j) Agricultural Credit/IBRD - US\$ 70 million. The aim is to provide further assistance to BAAC in extending credit to small farmers.
- (k) Aquaculture Phase 2/ADB - US\$ 22 million. The Bank is interested in providing further assistance to the Department of Fisheries, Cooperative Promotion Department, and BAAC in aquaculture extension work. Project preparation is scheduled to begin once the fisheries sector report by ADB has been accepted by the Thai Government and experience gained from the Phase 1 has been analysed.
- (l) Tree Crops Phase 3/IBRD - US\$ 120 million. The project is scheduled for 1986. Project preparation would begin in 1984, it most likely will emphasize rubber replanting in the South.
- (m) Large Swamp Fisheries/OECF - US\$ 22 million. The engineering design is expected to be completed in 1984 and project implementation to start in 1986.
- (n) Forestry/IBRD - US\$ 40 million. The project identification by a Thai University is completed. Activities suggested include

improvement in watershed management, promotion of private sector participation in reforestation and woodlot development as part of overall rural development schemes.

- (o) Northern Irrigation Development/OECF - US\$ 180 million. Project identification has been completed, the project would finance large scale irrigation in the North.
- (p) Agricultural Credit - US\$ 110 million. This project is in the very early stages of development. Government might seek funding from OECF, ADB and possibly IFAD to provide funds for expanded BAAC credit operations to small farmers in 1986.

10. As can be seen, much of the external borrowing is still directed toward irrigation development. Out of the total planned investment in agriculture during the Fifth Plan, US\$ 50 million have been earmarked for small scale irrigation which by Thai definition refers to a project with an investment cost of less than US\$ 174 000 and a construction period of one dry season. In addition, during the last few years, the small scale irrigation programme has been receiving very strong government support so that in 1984 there are more than 10 departments carrying out more than 4 000 projects with a total government budget of about US\$ 170 million.

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ANNEX V

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THAILAND AGRICULTURAL PROJECT IDENTIFICATIONAGRICULTURAL CREDITI. Introduction

1. The rapid expansion of the Thai agricultural sector, starting in the late 1950's, required integration of the banking sector into the rural areas to satisfy the rapidly increasing credit demand. The commercial banking sector developed a rather satisfying and efficient system to meet this demand. However, commercial banks, operating according to strict banking criteria of creditworthiness, helped the most viable medium and large scale farmers, leaving the less viable farmers to the informal credit sources. The overall scarcity of capital in this informal, non-institutional credit market was reflected in the high cost of capital which made it even more difficult for small and medium scale farmers to receive loans for inputs and long term investments. The Government concluded that even though the agricultural sector was performing well in terms of overall growth and in terms of poverty alleviation, the income and welfare gap between large and small scale farmers was steadily increasing. To change this trend the Government decided to intervene aiming at increasing the overall flow of money to the rural areas and the agricultural sector. Since another basic aim was to direct credit to the relatively poorer farmers, government wanted to create a window for lending at a rate considerably below the prevailing commercial bank lending rates.

2. To achieve these objectives, the Government decided to use the following means:

- (a) Establish a specialised institution, Bank for Agriculture and Agricultural Cooperatives (BAAC), to channel credit to the farming community at low interest rates and
- (b) Increase control over commercial bank lending through mandatory allocations of loanable funds to agriculture at interest rates equivalent to the market rates for non-agricultural borrowers.

II. BAAC

3. BAAC, established in 1966 as a state enterprise bank to provide credit to farmers at concessionary terms, is today the only credit institution in Thailand serving exclusively farmers. Its operations have expanded rapidly especially since 1975 as a result of a Government decision to channel more funds into agricultural credit. BAAC is presently the largest single agricultural credit supplier in the country. Its loans are limited to individual farmers and to group lending through agricultural cooperatives and farmers' associations. Infact, the group lending delivery system is also in some cases applicable to

individual farmers who can be required to join an informal joint liability client group before being eligible to apply for a loan. Farmers who are able to provide collateral are, however, eligible without having to join such a liability group. The regulations under which BAAC operates specify the different types of borrowers, activities to be supported, interest rates, loan amounts and repayment periods. An estimated 66 percent of Thailand's total short and medium term credit needs in agriculture is now met from institutional sources of which BAAC contributes approximately half, commercial banks the other half. While the scale of BAAC's operations has increased substantially (26 percent in real terms between 1976-80) the bank has managed to improve or maintain the repayment rate which currently is about 70 percent for individual farmers but rather lower for cooperatives and farmers' associations (see para 16).

#### Institutional Network

4. BAAC operates through 64 branches and 536 field offices and is active in all 73 provinces, covering 640 of the total 716 districts in the country. By the end of the fiscal year 1982 (31 March 1983) BAAC extended credit to more than 2.1 million farm families or nearly one half of the total number of farm families in Thailand. Of the total 1.1 million were direct client farmers, 0.8 million members of agricultural cooperatives and 0.2 million were members of farmers' associations.

5. As of the end of the fiscal year 1982 the Bank had a total staff of 5 770 of which about 20% were at the head office in Bangkok and about 80% at the branches and field units. A high portion of the representation and lending is in the northern and northeastern regions which are amongst the poorest in the country

#### BAAC's Operations

6. Whilst the commercial banks are playing a significant role in agricultural credit, the farmers benefitting (about 200 000) belong to the most creditworthy category. BAAC, although not lending to uncreditworthy and unviable farmers, has a mandate to direct its credit resources to the creditworthy medium scale and small scale farmer who would be unable to receive credit through commercial channels and therefore would be left with the unofficial money market charging rates estimated at about 5% per month in rural areas. BAAC's credit disbursement in fiscal year 1982 reached B 11 800 million (US\$ 515 million) an increase of 10.7% over the preceding year. Of the total, 75.9% (B 8 959 million - US\$ 391 million) was extended to individual or joint liability group farmers, 23.6% (B 2 783 million - US\$ 122 million) was extended to agricultural cooperatives and 0.5% (B 57 million - US\$ 2 million) to farmers' associations.

Lending to Individual Farmers/Joint Liability Groups

7. BAAC extends loans only for agricultural purposes, excluding agro-industries. Specified activities include crop production inputs, livestock and poultry production, investment in agricultural machinery and farm buildings, investment in land for agriculture and irrigation infrastructure and investment in marketing facilities.
8. For loans available to smaller, less viable farmers who are unable to provide collateral, BAAC requires them to form joint liability groups consisting of at least 5 farmers. The enforced discipline arising from the liability groups makes it safer for BAAC to approach small farmers directly (not belonging to cooperatives, or farmers associations). Each member is liable for his/her own loan and for loans extended to other members of the group.
9. Short, medium and long term loans are extended by BAAC. Short term loans are offered to farmers mainly under two categories. Firstly, for seasonal production expenses incurred to produce main agricultural commodities of which the most important are rice, cassava, maize, sugarcane, cotton and various tree crops. Secondly to assist farmers in helping to avoid post harvest sales during periods of seasonally depressed market prices. The maximum loan amount for a group member is B 30 000 (US\$ 1 310) or 60% of the expected marketable surplus, whichever is the lower. Farmers willing to mortgage their assets with BAAC are eligible to borrow up to B 1 000 000 (US\$ 43 670). The maturity period for all short term loans is one year with possible extension up to 6 months. The interest rate charged is 14%. Short term loans amounted to B 6 699 million (US\$ 292 million) or about 75% of all loans extended to individual farmers/joint liability groups, during fiscal 1982.
10. Medium term loans are provided for the purchase of assets such as farm machinery and equipment, draught animals, agricultural land and for construction or renovation of farm buildings and refinancing of old debts. Collateral requirements and interest rates are the same as for short term loans. Maturity period is 3-5 years. Medium term loans disbursed during 1982 amounted to B 1 073 million (US\$ 47 million) or 12% of disbursement to client farmers.

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11. Long term loans are provided for refinancing old debts or for long term investments in agriculture. Loans for refinancing old debts are provided to enable farmers to redeem or repurchase land which has been unfairly mortgaged or forfeited to private landlords or money lenders. For long term investment farmers are obliged to mortgage their assets with the BAAC and furnish an equity contribution of at least 20% of total investment costs. Repayment period is maximum 20 years. Interest rate 14%. Credit under special agricultural development projects planned and implemented in cooperation with Government agencies is included under this category. The rate of growth for long term investments is considerably higher than the average rate of BAAC's total lending. During 1982 fiscal year, the increase was 37% over the previous year compared to an average rate of growth of 26% recorded over the past five years for all lending. Average loan size amounted to B 43 200 (US\$ 1 886). The strict eligibility criteria on long term loans excludes long term lending to most small farmers.

#### Lending to Cooperatives and Farmers Associations

12. By 1983 a total of 1 089 cooperatives had been established of these 853, with a total membership of about 800 000 farm families were clients of BAAC. Loans to cooperatives are for short term and medium term only. The loans are offered under a line of credit arrangement which is extended for five years and reviewed annually. Loan amounts are based upon cooperatives' capability classification for the previous year and the business competence and accountability of the management. The loan purposes include (a) onlending to members, (b) purchasing and marketing members agricultural products, (c) purchasing agricultural inputs and equipment for resale to members, (d) long term loans for investments. The loan amount may not exceed 12 times the cooperative's own capital. BAAC charges cooperatives the concessional rate of interest of 11%, whilst cooperatives charge members 14%.

13. Farmers associations are organized along the same lines as cooperatives. During 1982 BAAC extended loans to 1 162 out of the total of 3 827 farmers associations. In accordance with policy directives from the Government the number of farmers associations is expected to gradually diminish since they have not succeeded in playing the role assigned to them. The member farmers are instead expected to be assisted by BAAC through the client farmer joint liability groups. Loans to farmers associations are offered for the same activities as in the case of cooperatives. Interest rates are the same but the line of credit is only for 3 years. Loanable amounts are fixed annually by the BAAC and do not exceed B 1 000 000 in the case of associations having less than 150 members and B 2 000 000 for associations with 150 or more members.

Repayment Position

14. The repayment for individual farmer loans in FY 1982 was 71%. The close mutual supervision amongst borrower members of joint liability groups seems to ensure that repayment is kept at this relatively high level.
15. Most of the overdue loans are fully paid within 5 years. Reasons for farmers inability to repay on time is under continuous observation by the BAAC. Crop losses due to natural calamities and sudden falls in market prices for agricultural commodities are stated to be the most common reasons for defaults. However, given the fact that BAAC loans are carrying a relatively low interest rate compared to other sources, there is also a lack of incentive for the farmer to repay BAAC compared to other creditors.
16. The repayment of loans for cooperatives and farmers associations was 44% and 29% respectively. This rate is extremely low and improvements will have to be made if BAAC is to remain viable.
17. In the case of cooperatives the reasons for the poor repayment performance is generally attributed to lack of firm management by cooperative administrators who have no real incentive or power to recover loans from members. Financial mismanagement and corruption has also been discovered. BAAC hopes that with continuous training and corrective measures, repayment performance will gradually improve.
18. The repayment rate for farmers associations is steadily decreasing. BAAC has imposed very strict control on lending activities with farmers associations. The bank suspends any further loan provision when there are clear cases of misappropriations of funds.

Financial Position

19. The BAAC is an instrument for agricultural and rural development rather than a profit making commercially operated institution. The operational framework is fixed by the Government but even so the bank is expected to be a financially self-sustaining institution. Its operating fund has expanded at an annual average rate of 14.3% over the past five years. The structure as of 31 March 1983 was:

<u>Source</u>	<u>Amount Million Baht</u>	<u>Percent</u>
Own capital funds	2290	10.9
Deposits from the general public	3318	15.7
Deposits from commercial banks	8641	40.9
Borrowers (domestic and foreign)	2908	13.8
Promissory notes from the Bank of Thailand	3500	16.6
Others	452	2.1
Total	21109	100

20. More than 40% of the banks' resources come from in mandatory deposits from commercial banks. This feature was introduced in 1975 by the Government as a means to augment financial resources available in rural areas. The Bank of Thailand (BOT) assures that all commercial banks allocate a fixed percentage of their total deposits as loans directly to farmers or by depositing the funds with the BAAC. The quota has steadily increased since 1975 from 5% to 11% at present. Since in practice only a few large banks which have extensive up country Branch networks manage to directly extend agricultural credits in the required volume, the majority of the smaller banks take the less complicated alternative of depositing the bulk of the required allocation with the BAAC. Set against the government regulated interest rate ceiling on all bank loans, which was brought down from 19% to 17.5% in the beginning of 1983, the BAAC is lending at subsidised interest rates of 14% reflecting another government means to channel more funds to farmers at a low cost.

21. The promissory notes from BOT are another means by Government to ensure BAAC's viability even though the bank is operating with low lending interest rates. This facility was extended to BAAC at the level of 3.5% interest during FY 1983 and represents B 3 500 or 16.6% of the BAAC's operating fund.

22. The BAAC's overall financial performance has remained at a satisfactory level over the years since its establishment. Parallel to the expansion of the loan portfolio, the banks net income has increased at an average annual rate of 21%; from B 168 million (US\$ 3.71 million) in 1978 to B 168 million (US\$7.34 million) in 1982. However, the promissory note facility from BOT and the mandatory allocations from the Commercial banks makes it somewhat difficult to draw conclusions about BAAC's actual viability.

Table 1  
Interest Rate Structure on Loans to Client Farmers

Type of loan	Interest rates commencing April 1, 1982*
Short term loan	1. 14% simple interest
- for main-crop production	2. 14% simple interest -
- for other agricultural purposes	for loan amounts not exceeding 300 000 baht. 15% simple interest for loan amounts exceeding 300 000 baht (for cash credit line contracts)
Medium term loan	3. 9% simple interest for loans from the Special Agricultural Promotion Fund **
Short term loan for postpone- ment of sale	14% simple interest
Long term loan for refinancing old debts	13% simple interest
Long term loan for investment in agriculture***	14% simple interest for loan in agriculture*** exceeding 300 000 baht. 15% simple interest for loan amounts not exceeding 1 million baht, 16% simple interest for loan amounts exceeding 1 million baht

- Footnotes: \*
- A penalty rate of interest of 3% per annum is added to the normal rate of all types of loans in the event that the loan falls past due for reasons other than force majeure (effective April 1, 1980).
- \*\* In response to a Government directive, BAAC borrowed 83.80 million baht from this Government Fund, for onlending to farmers participating in special government projects.
- \*\*\* Loans utilizing the proceeds of borrowings from the OECF are the sole exception at 12% per annum.

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Table 2  
Interest Rate Structure on Loans to  
Farmers' Cooperative Institutions

Type of loan (by institution)	Interest rates (commencing April 1, 1982*)
<u>Agricultural Cooperatives</u>	
- for onlending to members	11% compound interest
- for purchasing agricultural inputs	11% compound interest
- for marketing agricultural products	14% compound interest
- long term loan for investment in agriculture	11% simple interest
<u>Farmers' Associations</u>	
- for onlending to members	11% compound interest
- for purchasing agricultural inputs	11% compound interest
- for marketing agricultural products	14% compound interest
- long term loan for investment in agriculture	11% simple interest

Footnote:

\* A penalty rate of interest of 3% per annum is added to the normal rate on all types of loans in the event that the loan falls past due for reasons other than force majeure (effective April 1, 1980).

Table 3  
Client Farmers and Farmers' Institutions Serviced  
by the BAAC  
Fiscal Years 1978-1982

Fiscal Year	BAAC Client Farmers (families)	Agricultural Cooperatives Serviced by BAAC		Farmers' Associations served by BAAC		Combined Total (families)
		Number of Cooperatives	Membership (families)	Number of Associations	Membership (families)	
1978	780 514	722	673 748	1 574	283 785	1 738 047
1979	886 218	794	731 090	1 622	272 725	1 892 033
1980	960 465	822	773 918	1 474	254 953	1 989 336
1980	1 038 103	841	791 483	1 308	230 728	2 060 314
1982	1 110 692	853	798 446	1 162	208 017	2 117 155
Average Growth	9.0	4.0	4.3	-7.9	-7.6	4.9
Increase/Decrease over Fiscal Year 1981	7.0	1.4	0.9	-11.2	-9.8	2.8

Table 4  
Lending Operations Classified  
By Operating Region and Lending Category  
Fiscal Year 1982

Operating Regions	Individual Client Farmers		Agricultural Cooperatives		Farmers' Associations		Total	
	Number of clients (families)	Disbursement (million baht)	Number of members (families)	Disbursement (million baht)	Number of members (families)	Disbursement (million baht)	Number of farm families	Disbursement (million baht)
Northern	297 971	2 285	210 474	681	64 531	36	572 976 (27.1)	3 002 (25.4)
North-Eastern	373 654	2 665	255 179	733	68 307	3	697 140 (32.9)	3 401 (28.8)
Central	114 070	1 266	102 888	490	10 184	3	227 142 (10.7)	1 759 (14.9)
Eastern	69 547	938	60 951	345	15 908	4	146 406 (6.9)	1 287 (10.9)
Western	101 598	1 023	81 253	340	30 288	3	213 139 (10.1)	1 366 (11.6)
Southern	153 852	782	87 701	194	18 799	8	260 352 (12.3)	984 (8.3)
Total	1 110 692 (52.5)	8 959 (75.9)	798 446 (37.7)	2 783 (23.6)	208 017 (9.8)	57 (0.5)	2 117 155 (100.0)	11 799 (100.0)

THAILAND  
AGRICULTURE PROJECT IDENTIFICATION  
AGRICULTURAL MARKETING AND PRICING  
ANNEX VI

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THAILAND AGRICULTURAL PROJECT IDENTIFICATIONAGRICULTURAL MARKETING AND PRICINGMajor Commodities and Their Markets

1. Rice, rubber, maize, sugar, cassava, tobacco and shrimps were the main export commodities of Thailand during 1979-82. The average annual quantities and value of export during the period are presented in Table 1.

Table 1 Major Agricultural Commodities  
Production and Export 1979-82

Crops	Export		
	Total Production (million)	Export Quantities (million)	Value (million) US\$
Rice	9.5	3.12	913
Rubber	0.6	0.5	480
Maize	3.0	2.5	318
Sugar	2.3	1.5	330
Cassava	6.0	5.9	663
Tobacco	0.06	0.03	70
Shrimps	-	0.02	98

Sources: 1/ Department of Customs, Ministry of Finance.

2/ Agricultural Economics Office, MOAC.

2. Other commodities for export include kenaf and jute, mungbean, sorghum, soybean, castor seed, swine, cattle, buffalo, fresh fish and teak. Thai agriculture is thus geared to export. Therefore, the agricultural economy and the economy of the Kingdom as a whole are closely linked to world commodity market developments and the performance of the Thai agricultural economy depends very much on the ability to adjust itself to the continuous changing world situation.

3. The market shares of Thailand in world trade are small and are insufficient to really influence world trade as shown in Table 2.

Table 2 Market Shares of Thai Commodities  
in World Trade  
Average 1978-81 in percentages

	<u>Quantity</u>	<u>Value</u>
Rice	21.2	18.3
Maize	4.1	2.9
Rubber	14.3	14.1

Source: FAO Agricultural Year Book.

4. Annual agricultural imports are valued at about US\$ 1 billion which represent about 10% of total imports, and 27% of total value of agricultural exports. The main import items are fibre crop (13% of total), paper products (12%), fertilizer (10%), food crops (9%), tobacco (7%), dairy products (7%), animal feed (6%), rubber (4%), pesticides (6%), farm machinery (3%), and various other items. The main imported food crops are wheat, malt and cocoa products, and the fibre crops imported are cotton and cotton products.

Market Structure and Recent Government Policy on Agricultural Marketing

5. Marketing of agricultural produce in Thailand is predominantly in the hands of private enterprise. It is carried out through at least three layers of middlemen. One layer is at the village, tambon and district levels acting as sub-agents for merchants in big cities. At the village level there are usually large numbers of buyers where accessibility by pick-up trucks is possible and where supplies of products are big enough. The traders mostly deliver goods to wholesalers in town where the commodities are assembled and stored before transporting to central markets in Bangkok. Most of the agricultural goods are transported by trucks. In Bangkok, there is another set of traders who take over the responsibility of selling commodities to exporters or local manufacturers or retailers in Bangkok. Exceptions are of course known i.e. vegetable oil producers and animal feed producers are competing for soybeans consequently they each contract big local middlemen in the cities and bypass the middleman in Bangkok.

6. The marketing system in Thailand is quite efficient and thus the government has adopted a free trade policy and is concentrating its role on the improvement of basic marketing infrastructures such as transportation and communication systems. Exceptions of trade restrictions include the premium on export of rice, the export tax on rubber, the export quota on maize and cassava, and domestic marketing restrictions on livestock. However, since 1981 the export quotas for maize were discontinued, the ban on white sugar export was lifted, cassava export controls were relaxed, the export tax on rubber was reduced by a third and the rice premium was reduced by one-half.

7. At present there are three types of export tax on rice: an advalorem duty (5% of export price); a fixed export fee in the form of rice premiums at 250 baht (US\$ 10.99) per ton; and the reserve requirement which is a form of tax on exporters who are obliged to carry minimum stocks. Cassava export controls were mainly intended to regulate supplies of cassava to the EEC market in accordance with a Government-EEC agreement. The government regulations banning the private slaughter of livestock is under review and is expected to be lifted. This should remove the primary constraint on export of livestock products other than poultry.

8. Government intervention in agricultural marketing aims at an improvement in market intelligence abroad, liberalization of government control particularly at exporters' level, improvement of marketing information at farm level, and protection of those commodities for which the government wishes to encourage domestic production. Export taxes have been reduced or entirely abolished, rules and regulations on agricultural export have also been reduced. Embassies abroad have been reporting back on agricultural production and marketing in various countries.

Radio and television programmes are including more information on agricultural marketing outlooks. Import taxes and import controls have been imposed on some commodities, for example the import tax on soybeans is 11% plus another 10% of the value of this tax as import duty resulting in a total tax of 12.1% of import prices. Imports of other oil crops and garlic are under quantitative control.

Prices and Terms of Trade

9. Producer prices for agricultural products have shown increasing trends during 1973-82 period, Table 3. Local price fluctuations are very much in line with changes in the world market.

Table 3.

Farmgate Prices in US\$/kg 1973-82

	First Grade Rice	Maize	Soybean
1973	.06	.06	.17
1974	.09	.09	.19
1975	.09	.08	.18
1976	.09	.07	.22
1977	.09	.06	.27
1978	1.04	.07	.24
1979	1.08	.08	.24
1980	1.30	.10	.24
1981	1.49	.09	.29
1982	1.25	.09	.27

10. The agricultural to non-agricultural terms of trade index during 1962-80 showed general improvement for the agricultural sector. However, seasonal price fluctuations, with lower prices during peak harvesting months than in other months, remained.

Table 4. Agricultural Terms of Trade Index 1962-80

<u>1962-70</u>	<u>1970-75</u>	<u>1975-80</u>
89	97	102

Source: NESDB

Marketing of Farm Inputs

11. Thailand is among the lowest users of fertilizer in the region with an average annual consumption of about 0.8 million tons or about 16 kg per ha. About 60% is used on rice, 19% on upland crops and 21% on tree crops and vegetables. The most popular fertilizer is ammophos (16-20-0). The growth rate of fertilizer use has declined since 1977. Given the importance of agricultural intensification, this trend is of concern.

Table 5

Trends in Fertilizer Use 1975-83

Year	Annual Use (1000 tons)	Average Annual Growth Rate
Average 1975-77	646	16.8
1978-80	763	5.7
1981-83	800	1.6

However, fertilizer use in dry-season paddy in irrigated areas is relatively high.

Average Application Rate of Chemical Fertilizer for dry-season  
Crops of Paddy in 1983  
(Kg/ha)

Whole Kingdom	310.75
Central	331.12
North	177.12
Northeast	151.37
South	204.75

Source: Office of Agricultural Economics, MOAC

12. Virtually all chemical fertilizers are imported as compound fertilizers or as individual nutrients for local mixing. There are about 41 companies mixing fertilizers, the largest one is Thai Central Chemical Ltd. Marketing of fertilizers is handled mainly by two groups of companies. Importation of fertilizers is not subjected to taxation, except urea on which a 17% ad valorem tax has been levied as substantial quantities of urea are being used for industrial purposes.

13. To increase the use of fertilizer, and since the price of chemical fertilizer is about twice the price of paddy, the government, through the Marketing Organization for Farmers, has been distributing almost 200 000 tons of fertilizer a year at Bangkok wholesale prices fully subsidising transport costs; the subsidy amounting to about US\$ 15.21 a ton. The government has been obtaining fertilizer by bartering corn and cassava against fertilizers from various countries. Some fertilizer is sold to farmers through BAAC as credit in-kind.

14. The decline in growth rate of fertilizer use in recent years has been related to (a) stagnation in the expansion of irrigation systems, (b) less fertilizer promotion activities from the private sector due to competition from MOF, and (c) inadequate extension work of the government itself. Therefore, future increases in fertilizer use depend very much on extension services from government agencies and the private sector.

15. Marketing of insecticide, fungicide and herbicide are entirely done by the private sector with little intervention by the government. Herbicide use has increased because of the successful introduction of a new technology in advanced irrigated areas in the Central Region - broadcasting of pregerminated seed of paddy instead of transplanting. The increase in demand from the farmers was met by private companies.

16. Sale of farm machinery is also done by the private sector and the use of farm equipment for land preparation through "tractor contracting", and purchasing of two-wheeled tractors by the farmers have been widespread during the last decade. Government restricts imports of machinery that directly competes with domestically produced equipment as a means to protect the local industries. However, the policy is being reviewed since it is believed to adversely affect the farmers interests as domestic machinery is more highly priced than imports.

THAILAND  
AGRICULTURAL PROJECT IDENTIFICATION  
AGRICULTURE IN THE UPPER NORTH AND NORTHEREASTERN REGIONS

ANNEX VII

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THAILAND AGRICULTURAL PROJECT IDENTIFICATIONAGRICULTURE IN THE UPPER NORTH AND NORTH EASTERN REGIONSI. Upper North Region

1.1 Physical Conditions: The Upper North Region covers 102 000 km<sup>2</sup>, about 20% of the total country. It has a marked relief with long ranges of mountains along a north - south alignment which induces considerable variations in rainfall patterns and soil characteristics throughout the region. The variety of climates and soils in the upper north region results in a very wide range of crop and of agricultural potential from paddy and tropical fruits to wheat, barley and temperate fruits.

1.2 Climate: Because of the monsoons the climatic year can be divided into 3 seasons, a wet and warm season from July to November which receives most of the rainfall, a cool and dry season from December to March with large variations of temperature during the day, a hot season from April to July with some storms.

1.2.1 Average annual rainfall is 1,100 to 1,800 mm but in some parts, located in the rain shadow of the mountains, it is as low as 900 mm. Interannual fluctuations are notable particularly at the outset of the rainy season. In the Chiang Mai valley for instance the probability of sufficient rainfall is not more than 50% in June-July <sup>1/</sup> when the main cropping season begins.

1.2.2 Temperatures average 26°C to 28°C over the whole year but monthly minima are 13°C to 19°C during the cool season in the lowlands. Average temperature decreases, as usual, by about 1°C for each 200 to 250 m in elevation. Solar radiation is high enough throughout the year to cover plant requirements.

1.2.3 The main cropping season is from July to November. Low temperatures in December and January can be detrimental to the flowering and growth of tropical crops. Irrigation is required by most crops from November to April. Supplementary irrigation in the rainy season is also advisable to offset rainfall variations.

1.3 Soils; Lowland soils cover only 10% of the region. They are derived from recent alluviums. Their texture varies from clay loam to silty loam resulting in good water holding capacity and slow drainage. Their fertility is good because of their organic matter content, available phosphorous and calcium exchange capacity. Most of these soils have been levelled and bunded for rice cultivation to which they are well suited. At slightly higher elevation soils are derived from older alluviums which have been highly weathered. Although their characteristics are similar to those in the flood plains these soils are less fertile. They are also used for paddy cultivation.

1/ An interdisciplinary perspective of cropping systems in the Chiang Mai Valley - Faculty of Agriculture - Chiang Mai University 1980.

1.3.1 Upland soils cover about 20% of the region. They are mainly Acrisols with a sandy to sandy loam texture in the upper horizon and a finer texture in the lower horizon. Their organic matter content and calcium exchange capacity is low resulting in moderate fertility which can be easily exhausted by rainfed agriculture without proper fertilization.

1.3.2 Highland soils cover 70% of the region. They are mainly red-yellow podzolic soils and lithosols weathered from the underlying parent rock. These soils which have never been studied as extensively as the two previous groups, reflect the diversified geology of the region. Highland soils are well drained, heavily leached and acidic, their fertility depends on the parent rocks, higher on basic volcanic rocks, lower on sandstone and granite. Because of the slopes they are highly susceptible to erosion particularly when they are shallow. Shifting cultivation as usually practiced on these soils requires long fallows under natural vegetation to maintain some fertility.

1.4 Vegetation. Dry dipterocarp forestry and deciduous monsoon forests covered most of the region outside the lowland plains. At higher altitudes in the more humid areas natural vegetation is either hill evergreen forests or, in some places, coniferous forests.

1.4.1 Shifting cultivation by lowland farmers has now destroyed a large part of the natural vegetation on the upland terraces. In the highland the problem is less acute on average although it tends to become serious where hill farmers have reduced the fallowing period because of population pressure on land resources. The Royal Forestry Department estimates that about 3% of the forest cover is destroyed each year.

2. Farm Characteristics

2.1 Total population is about 4.8 million in the upper north region, 10% of the whole kingdom with a density of 48 per km<sup>2</sup> compared to a national average of 96. Rural population is 3.1 million. It has increased by more than one-third over the last 20 years in large part because of internal migration. The agricultural population density is 30 per km<sup>2</sup> of total area. However, after deduction of highlands unsuitable for intensive cropping (about 46 million rai or 74 000 km<sup>2</sup>) the agricultural density becomes 100 per km<sup>2</sup> which is very high.

2.2 Lowlands and Uplands <sup>2/</sup> The total number of farms is 635 000 of 5.2 persons each. The average farm size is 15 rai (2.4 ha) much smaller than the national average of 27 rai (4.3 ha). About 55% of the farms are

under	10	rai	(1.6	ha)	and	14%
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<sup>2/</sup> Data in these paragraphs are taken from the "Upper North Upland Agricultural Development Feasibility Study" Chiang Mai University and "Agricultural Statistics of Thailand" MOAC 1983.

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over 20 rai (3.2 ha). Most farmers own their land, in most cases without any title (56% of the area and 64% of the farms). Only 15% of the cropped area is rented.

2.3 Most of the farmers have a buffalo (average 1.2 buffalo per farm) for ploughing and cattle (0.9 head per farm). They also keep pigs and poultry.

2.4 Agricultural mechanization has been largely adopted by the farmers since there are more than 4 000 tractors and 20 000 power tillers, i.e. about one machine for 300 rai (50 ha) as well as 46 000 pumps (one for 14 farms).

2.5 Average farm income is estimated at B 16 900 (US\$ 735), much lower than the national average B 26 000 (US\$ 1135). Cash income is estimated at B 14 300 (US\$ 620) of which half is derived from agricultural activities (82% from crops, 14% from livestock, 4% from miscellaneous activities) and half from off-farm employment. However, part of this off-farm income (one tenth to one fourth) is nothing more than accounting for labour exchanges between farmers and is off-set by an equivalent expenditure in the farm budget. About three fourths of cash income is spent on household needs (food, clothing etc.) and one-fourth for production costs (labour and services, debt servicing, taxes and cash inputs).

2.6 Highlands Population of the highlands is estimated at 440 000 people mainly from the hill tribes and about 10% of Thai who migrated from the lowlands because of lack of land. The estimated number of farms is 65 000 (5 to 7 persons per household).

2.7 The average number of large animals owned by a farm is two but unevenly distributed between ethnic groups. Cattle and buffaloes are generally not used for work. Farmers also keep pigs and poultry.

### 3. Crops and Cropping Patterns

#### 3.1 Lowlands and Uplands

Land Use Pattern Upper North

Table 1

	'000 rai	'000 ha
Lowland fields	7600	1200
Upland fields	2000	320
Orchards	200	30
Rangeland	800	130
Forest	48700	7800

Source: NESDB

3.2 Irrigation schemes have been built for about one fourth of the lowland areas.

Table 2

Main Annual Crops Upper North Region  
1982

	AREA '000 RAI	UNIT YIELD KG PER RAI	TOTAL PRODUCTION '000 tons
Paddy	6920	290	2000
Maize	1000	335	340
Soyabean	570	125	70
Peanut	510	195	100
Tobacco	200	170	35
Mungbean	140	90	15
Cotton	70	200	14
Sugarcane	40	6800	272
Sesame	20	110	2

Source: NESDB

3.3 The main production is glutinous rice, staple food in the north; its production is 1.5 million tons of paddy. Non glutinous rice is also grown and its production is about 0.5 million tons of paddy.

3.4 A number of other annual crops are also grown on a much smaller scale: Sorghum, wheat, barley. Fruit trees, mainly longan and litchee, may be important in some areas (Chiang Mai and Chiang Rai provinces). Some pineapple production exists.

3.5 Cropping patterns are extremely diversified in relation to soil and water resources as well as marketing outlets. In the lowlands they are based on paddy transplanted in August when the rains are more reliable and harvested in November. When irrigation is available a second crop of vegetables (garlic, onion) soyabean or mungbean is grown from December to March. In the most intensive areas tobacco or sweet corn is grown in the early season from April to June-July.

3.6 Upland fields have not been terraced and are planted only during the rainy season. Farmers grow mixed crops of paddy (glutinous or non glutinous), maize, chilli, peanuts and soyabean from June to October. Shifting cultivation is practised in upland fields where population density is low enough to allow it.

3.7 Farmers use modern inputs (improved seed, fertilizers, plant protection chemicals, mechanical ploughing). A survey by Chiang Mai University shows a direct relation between the use of modern inputs, farm size and unit yields. As expected smaller farmers use more inputs and get higher yields per rai. However, quantities used in this region are below the national average.

Farmers Use of Modern Inputs Survey

Table 3

	<u>1</u>	<u>2</u>	<u>3</u>
Average farm area, rai	7	12	24
percent of farmers using improved varieties	54	29	48
Chemicals	70	15	4
Fertilizers	87	16	28
Mechanical ploughing	56	30	28
Lowland paddy yield (kg per rai)	650	370	550

3.8 Highlands: The main crops are paddy and maize grown for home consumption. Several groups grow poppy and Thai migrants produce miang tea from enriched natural stands of tea trees, both productions being sold. No data are available on the total quantity of crop produced. Cropping patterns are based on shifting cultivation. The natural vegetation is slashed and burnt during the dry season, paddy and maize with some food legumes are sown at the beginning of the rainy season. Groups who do not produce opium cultivate their fields for one year only, left afterwards under natural vegetation for 10 to 15 years. This system maintains the fertility as long as the population density does not exceed 15 to 20 persons per km<sup>2</sup>. Over that limit, population pressure on land resources entails a reduction of the fallow period and fertility decreases rapidly compounding the problem further. Opium producing groups grow maize in the upper slopes, paddy being sown at lower altitudes. After maize sown in May and harvested in August, poppy is sown from September to February on part of the fields. Since the same field is cultivated for several years and poppy is regularly weeded this cropping pattern is highly destructive and forest cover disappears completely.

3.9 Highland farmers do not use modern inputs. Yields are extremely variable depending upon location and the cropping systems. Estimates of rai vary from 400 kg of paddy (2450 kg per ha) to 75 kg (450 kg per ha).

#### 4. Main Agricultural Problems

4.1 Lowland and Upland Farms. Farmers in the lowlands and in the uplands have demonstrated their interest in agricultural development and their willingness to adopt new techniques whenever they are made available and are profitable; improved seeds, fertilizers and equipment are known and used by these farmers who respond to market incentives as shown by the expansion of vegetables for instance. Although agricultural research has made impressive progress, farmers still face a number of serious problems.

- (a) The major risks in agriculture comes from rainfall deficiencies particularly at the time of planting. Delayed transplanting disrupts the whole cropping calendar; seedlings kept too long in the nurseries while waiting for the rains, give a much reduced yield; moreover, planting late in the season reduces the yield of the photosensitive varieties of paddy which are used by the farmers. Rainfall statistics available for the North show that at TAK for instance the variability of July rainfall is 43% of the average (167 mm), which means that 1 year out of 3 rainfall would not be more than 100 mm, much less than required for land preparation and transplanting. Rainfall irregularities also have an indirect negative effect on unit yields since farmers facing such risks are reluctant to use as

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much fertilizer as advised to get maximum production. A secure water supply on farmers' fields is a prerequisite for sustained intensive agriculture. The development of irrigation in the lowlands from the headworks to the farm channels including proper water management should be the first objective because of the suitable topography and water resources.

- (b) Because of the population pressure in the lowlands many farmers have cleared fields in the adjoining uplands where they started shifting cultivation on forest land. However, in many areas following under normal vegetation is no longer possible because of the population density. Permanent cultivation has seriously depleted soil fertility and caused heavy erosion as a result of insufficient manuring and fertilizing and in the absence of any erosion control structures. A World Bank financed project following a bilateral Thai-Australian pilot operation has started upland development based on anti-erosion contour banks on 30,000 ha. Participating farmers would be issued land titles. Contour banks may be only a transitory form of land development. Permanent cultivation in Thailand usually comes with levelling and bunding which is the safest way of checking erosion and storing rainfall water. Bench terracing requires 100 days per rai on slopes up to about 6% and much more on steeper gradients. Therefore no farmer would invest that much labour as long as he is not given some form of security in land tenure. Upland encroachment by lowland farmers being mostly illegal in the beginning, no investment is made in terracing. Later on when most of the fertility has been destroyed land is reclassified as agricultural area and titles are issued. A more efficient development progress might be considered which would grant land titles on uplands to farmers on the condition they level and bund their fields.
- (c) Modern inputs (high-yielding seeds, rhizobium inoculum, fertilizer, plant protection chemicals) are not always available in due time to the farmers. Most of the seed is kept from the previous harvest or bought from neighbours who may or may not have access to the seed exchange programme of the Agricultural Extension Department. It is common experience that farmers apply on rice or soyabean fertilizer they receive for tobacco as part of their contract because they could not find the right formula. The Department of Agriculture has invested 40 millions Baht in a modern plant for the production of rhizobium inoculum for soybean and other legumes. The cost of a dose of inoculum for one rai is B 5 and gives an incremental yield of 10% to 20% worth B 90 to 150. However, because of the poor performance of the Marketing Organization for Farmers (MOF), very few farmers can actually use it. From a technical standpoint, in a farming society like Thailand's, when farmers are competent and respond to market incentives,

agricultural development relies, first and foremost, on an increased use of good seeds, proper fertilizing and suitable chemicals. A concerted effort is required between the Agricultural Extension Department, MOF and village dealers to make these inputs available to the farmers at the time they need it.

- (d) Pest and disease can take a heavy toll on prospective harvests. The most dangerous are: blast, leaf hoppers, rats and crabs in rice fields, downy mildew on maize, bean flies and leaf hoppers on legumes. Disease resistant or tolerant varieties have been bred particularly for paddy and maize. Chemicals and equipment exist which can control major pests in cereals and cotton. However, it is not evident that enough qualified staff is available to help the farmers. Early warning of potential outbreaks of main pests by periodical checking of their population in relation to weather conditions would be useful. This would allow the programming of treatments before instead of, as now, after heavy damages are registered. On cotton ultra-low-volume (ULV) spraying is not used although it is easier and cheaper than the current practice of knapsack spraying. It would require a change in the timing of treatments (before sunrise when there is no wind). Weeds also limit yields particularly in dry seeded paddy and in legumes. It has been estimated in the CHIANG MAI valley that rice yields can be reduced by 20% because of weed competition. Hand weeding is long, costly when done with hired labour and difficult when fields are broadcast. Pre-emergence herbicides could be used more liberally particularly between two crops in irrigated fields or at the beginning of the rainy season.

4.2 Highlands. Because of the lack of roads highland farmers have no easy access to markets where they could sell their production and buy farm inputs. It is therefore not surprising that most of their production is for home consumption. The construction of roads is an essential prerequisite of any development programme to allow farmers to sell their surplus production and to buy farm inputs.

4.3 New agricultural techniques have not yet been fully developed for the highlands by the research department. The most important problems are: The breeding of cold-resistant and high yielding varieties of rice; screening of wheat and barley varieties adapted to local conditions; soil mapping and fertilizing recommendations according to soil types. Another problem is the outlet of new productions such as wheat or barley which are of little interest to the food industry as long as they are available in limited quantities only. As suggested by the CHIANG MAI Faculty of Agriculture, highland farmers could usefully be taught how to use these  
new cereals in their diet.

## II. Northeastern Region

### 1. Physical Condition

1.1 The Northeastern region which covers 170 000 km<sup>2</sup>, 33% of the whole country, is a plateau sloping to the Southeast without marked relief.

1.2 Climate Climatic patterns are similar to those in the North. Annual rainfall varies from more than 1,400 mm in the eastern part to 1,100 mm in the west because of the rain shadow from hills in the north and in the south-west. Total rainfall and its distribution during the year are extremely unreliable, particularly in the drier parts. Over more than half of the region the total number of drought days for paddy exceeds 80 from May to October <sup>3/</sup>. As in the Northern Region, minimum temperatures during the dry season, particularly in January, may be critical for some crops.

1.3 Without irrigation paddy cultivation is subject to high risks even during the rainy season over most of the region.

1.4 Soils. Soil types can be classified according to their location in the undulating topography of the Northeastern plateau: lowlands in the valleys, low and middle terraces, high terraces, hills.

1.5 Lowland soils which cover about 10% of the arable land<sup>4/</sup> are recent alluviums. Their characteristics are similar to those of the Northern Region although less fertile because of their origin. They are subject to flooding where irrigation structures have not been built.

1.6 Soils of the low and middle terraces which cover 45% of the arable land are derived from older alluviums. They are low humic gley soils. Their texture in the surface horizon varies from sandy loam at higher elevation to loam at the bottom of the slope. Their fertility is rather poor with low levels of exchangeable cations and of available phosphorous. Because of the nature of their clay elements, their water holding capacity is low and they dry out quickly after the rains.

<sup>3/</sup> An agroecosystem analysis of Northwest Thailand Faculty - of Agriculture - KHON KAEN University, 1982.

<sup>4/</sup> Data from KHON KAEN University as quoted by the World Bank report on 'Programme and policy priorities for an agricultural economy in transition' 1982.

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1.7 Soils of the high terraces are the most common, covering about 44% of arable land. They are orthic or gleyic acrisols heavily leached. Their texture is sandy to sandy loam. Their fertility and water holding capacity are very low. Large areas, particularly in the plains of the Chi and Mun rivers are affected by salinity because of underground salt deposits.

1.8 Hill soils are marginal both in terms of area they cover (mainly in the southern and eastern parts of the region) as well as in terms of potentialities. They are ferralic cambisols or orthic acrisols. These soils are deep, well drained, with a rather coarse texture and a very low fertility.

1.9 Vegetation. Most of the natural vegetation belongs to the dry dipterocarp forest and only covers 16% of the total area in the Northeastern region, the smallest percentage in the whole country., Large areas are burnt every year and turn progressively into grasslands with only scattered trees. Over the last 5 years the area under forest has decreased more than 40%.

## 2. Population and Farm Characteristics

2.1 Total population is estimated at 15.5 million about 1/3 of the country and the population density at 90 per square kilometre. The agricultural population is estimated at 12.1 million on 1.8 million farms averaging 6.5 persons each.

2.2 The average farm size is 28 rais (4.5 ha) varying from 36 (5.75 ha) in the dryer provinces to 20 (3.2 ha) in the more humid areas. Land is rather evenly distributed, only 7% of the cultivated area is rented.

2.3 The Northeast is the main livestock area of Thailand where 65% of the buffaloes and 40% of the cattle are kept. It is estimated <sup>5/</sup> that 21% of households have cattle and 74% have buffaloes. Farmers owning large animals have an average of 2.5 cattle and 4.8 buffaloes. Lack of grazing land is the main reason why farmers do not have large animals.

2.4 Agricultural mechanization has not yet been adopted on a large scale. The number of tractors is estimated at 14 000 with 21 000 power tillers - i.e. one machine for 1 100 cultivated rais (175 ha).

2.5 Average farm income was estimated<sup>6/</sup> at B 20.200 (US\$ 875) in 1982 of which 54% from rice, 19% from cash crops, 10% from livestock and 17% from off-farm work. Variations in farm income seem to be related to the number of workers in the family rather than to the size of the family holding.

5/ Traditional farming systems in Northeast Thailand. PREEDA PRAPERTCHOB and PAITONN KACHAMART - Faculty of Agriculture KHON KAEN - 1983.

6/ Handbook of NEBAD Tambons - Northeast Regional Office of Agriculture and Cooperatives - KHON KAEN 1982.

### 3. Crops and Cropping Patterns

3.1 Paddy is the most important food crop, mainly glutinous except in the South West provinces where non-glutinous varieties are grown. The major upland crop is cassava (58% of the national production) which has replaced kenaf as the main source of agricultural income; its area has increased 4 times over the last 10 years. Cassava is sold to processors who dry the roots as chips or pellets for export. The area under rubber, which is grown only in this region, has been reduced by 40% during the last 10 years; formerly grown for fiber it is now also sold as whole logs to the paper mill. Maize is after cassava the main upland crop, particularly in the West. Sugar cane is grown where the mills are located. Most of the cotton is grown in LOEI province.

3.2 In the lowlands, lower and middle terraces paddy is grown during the rainy season followed with mungbean, peanut, maize or vegetables. In the uplands residual moisture for irrigation allows it. Lower terraces and lowlands are planted first; at higher elevation farmers wait for the rains before planting well established. In the uplands cassava planted from March-April and October is grown during the whole year. Kenaf also planted in the uplands is sown with the first rains, harvested in September-October and followed by a short-cycle field crops (beans or peanut).

3.3 It is estimated that 1.500.000 rai (240.000 ha) are irrigated, of which 1.200.000 rai (190.000 ha) by gravity from tanks and storage ponds and 320.000 rai (50.000 ha) by pumping from the main rivers (MEKONG and MUN). Only a small percentage (20%) of the farms are in irrigated areas.

Table 4

Main Annual Crops Northeastern Region 1982

	<u>Area</u>		<u>Average Unit Yield</u>	
	<u>1000 rai</u>	<u>1000 ha</u>	<u>kg per rai</u>	<u>kg per ha</u>
Paddy				
rainy season	28 950	4 630	195	1 220
dry season	140	20	375	2 340
Cassava	4 360	700	2 150	13 400
Maize	2 585	415	285	1 780
Kenaf	1 115	180	165	1 030
Sugar cane	375	60	6 400	40 000
Cotton	175	30	205	1 280
Peanut	155	25	165	1 030
Mungbean	90	15	105	660
Sorghum	35	5	175	1 090
Soybean	40	5	175	1 090
Total paddy	29 090	4 650		
Total Field Crops	8 930	1 435		
	38 020	6 085		
	=====	=====		

Source: NESDB

3.4 Most of the paddy varieties grown are traditional, tall and photosensitive varieties which are harder and more resistant to drought but also less productive and less responsive to fertilizing. A farm survey <sup>7/</sup> has shown that average fertilizer application is rather low: about 2 kg per rai (12.5 kg per ha) of paddy land and 7 kg per rai (44 per ha) of cash crops with extremely large variations from village to village (from 0.1 to 15 kg per rai, 0.6 to 95 kg per ha).

3.5 Consequently, paddy yields are low by comparison to national average, 195 kg per rai against 265 (73% only). Field crops suited to the region fare better, maize unit yields are comparable to the national average, cotton unit yield is 10% higher.

<sup>7/</sup> Handbook of NERAD Tambon - KHON KAEN 1982.

4. Main Agricultural Problems

4.1 Farmers in the Northeast have devised cropping patterns well adapted to unfavourable physical conditions. Average unit yields are low because an erratic rainfall does not justify heavy fertilizing and high yielding varieties. However with irrigation on the more fertile soils and with efficient supporting services farming can be intensive. For instance farmers on contract to Adam International which supplies seeds, fertilizer and technical advice produce excellent tobacco and hybrid tomato seed which is exported to the USA. Farmers also are responsive to market demand as demonstrated by the expansion of cassava.

- (a) The main problems are linked to rainfall fluctuations. In Chayaphum the standard deviation of August rainfall is 43% around an average of 113 mm. Accordingly rainfall might be less than 80 mm 1 year out of 3 which is insufficient for transplanting. During these dry years transplanting is delayed which much reduces unit yields of the photosensitive varieties used by the farmers. Moreover, farmers may not be able to plant rice in the upper terraces which do not receive enough run-off water. Provincial statistics of paddy production show the results of such unreliable rainfall. Over the last 9 years the average production of paddy was 287 000 tons with a standard deviation of 48% (comparable to rainfall variation). A more detailed analysis shows that these fluctuations came more from variations in the area planted (standard deviation 37%) than from unit yield fluctuations (standard deviation 22%). In the whole province it can be estimated that staple food production does not cover basic needs 1 year out of 3 or 4. The actual range of variation should even be wider on individual farms. Irrigation is unfortunately not a feasible proposition to offset rainfall fluctuations in the Northeast where it has been estimated that 80% of the farms are outside of irrigable areas. Perennial streams are the exception. The flat topography is not suitable for building storage tanks which would flood large areas of agricultural land to irrigate a few hectares. Moreover, there is a risk of salinization of the stored water from salt deposits in the subsurface soil layer of the tanks. The best solution is in the diversification of income sources practised by the farmers. Drought resistant rainfed crops as kenaf and cassava, tree crops as mulberry and kapok, livestock are important supplements to rice growing.
- (b) Floods are a serious risk in the low lying areas. Submersion for more than one week in turbid water can destroy rice or, at least, much reduce the yield. No data on floods are available but their frequency can be tentatively estimated from meteorological records. In Khon Kaen, for instance, September rainfall exceeds 300 mm 1 year out of 4 probably due to heavy storms. During these years it is likely that lowland rice is severely affected. Since the lowland area is limited, flood control works would be costly per ha because of the topography

and might not be economically justified. The best solution, as practised by the farmers, is to plant traditional varieties instead of short-stalked high yielding rice.

- (c) In rainfed agriculture the timing of farm operations depends on actual precipitations much more than in irrigation schemes where cultivation can be programmed in advance to some extent. On an average farm with the equivalent of 3 workers (monthly maximum output 55 agricultural work days) cultivating 16 rais of paddy, 3 rais of cassava and 2 rais of kenaf the family labour balance can be estimated as follows:

	A	M	J	J	A	S	U	N	D
Labour required <sup>1/</sup> (Man/days)									
Paddy	8	16	48	72	16	8	16	64	56
Cassava	15	12	3	6	3	2	2	2	2
Kenaf	2	3	0	0	0	17	12	0	0
Total required	25	31	51	78	19	27	30	66	58
Available	55	55	55	55	55	55	55	55	55
Balance +	30	24	4		36	28	25		
-				23				11	3

<sup>1/</sup> Source: Work and days: an intensive recordkeeping study of irrigated and rainfed farmers in Northeast Thailand - F. von Fleckenstein, FAO. 1980

The table shows two labour peaks in July (for the preparation and transplanting of rice fields) and in November-December for paddy harvesting. When the rainy season starts late the July peak is transferred to August and is then much higher. During the rest of the rainy season family labour is underemployed. The mechanization of land preparation and of paddy threshing would reduce labour bottlenecks but its cost is still prohibitive for low income farms. The best solution is again in the diversification of non-crop activities such as livestock, sericulture, handicrafts which have a more regular pattern of employment.

- (d) Poor soil fertility limits unit yields. The low potential of the traditional rice varieties and the risks incurred under rainfed cultivation do not justify high applications of chemical fertilizers. Livestock development would allow a more intensive use of manure which is advisable in these soils. The introduction of legumes (peanut, cowpea) in rotation with upland crops (cassava or kenaf) and in paddy fields has been tried<sup>2/</sup>. In upland crops the rotation

<sup>2/</sup> An agroecosystem analysis of North East Thailand. Faculty of Agriculture. Khon Kaen University, 1982.

appears to be profitable where fertility has been severely depleted after many years of cassava monoculture. With kenaf, which would have to be cut earlier for planting the second crop, returns from legume do not make up for the loss of fiber. In paddy fields results are not yet conclusive because of the irregular rainfall pattern. Planted with the first rains before paddy it may be impossible to harvest the legume crop if the main rains are early. Planted after paddy, residual moisture may be insufficient if total rainfall is below average. The rice-legume rotation appears feasible only in limited areas.

- (e) Plant protection in the Northeast raises the same problems as in the North. Weed infestation is particularly severe in rainfed fields. Herbicides could be used more intensively in the middle terraces where unit yields are more stable because of a better rain water supply.

THAILAND  
AGRICULTURE PROJECT IDENTIFICATION

IRRIGATION

ANNEX VIII

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## THAILAND : AGRICULTURE PROJECTS IDENTIFICATION

## IRRIGATION

Regions and River Basins

1.02 There are wide differences in resources, socio-economic conditions and production potentials between Thailand's four major regions - North, Central, Northeast and South. Historically, economic development has tended to concentrate along the major rivers of the Central Region, a trend that has been reinforced over the past century by the growth of Bangkok as a major port and commercial centre. The construction of railroads, followed by extensive highway networks built over the past twenty years, has stimulated and diversified economic development of the Thai regions. A major government objective is to reduce income disparities between regions.

1.03 The Chao Phya Basin is the largest and most important geographic unit in terms of land and water resource development. It covers a large area in both the North and Central Regions. Four northern tributaries, the Ping, Wang, Yom and Nan join together about 200 km north of Bangkok to form the Chao Phya. The Chao Phya Plain contains one of the world's largest network of navigation, drainage and irrigation canals, some dating back to the 1890's.

1.04 Second to the Chao Phya Basin in size is the Mae Klong Basin in the western part of the Central Region. The Kwaie Yai and Kwaie Noi rivers originate near the Burma border and join to form the Mae Klong, some 80 km from the Gulf of Thailand. Several water resource developments are now in various stages of completion in this basin. Other important geographic units of the North and Central Regions are the Bang Pakong Basin, a major part of which is a southwest extension of the Chao Phya Plain and the area in the north drained by tributaries of the Mekong River.

1.05 The Northeast Region has fairly well-defined boundaries; the Mekong to the north and east, and mountain ranges to the south and west. Virtually all of the region is drained by tributaries of the Mekong.

1.06 The Southern Region extends from the west of the Mae Klong Basin to the Malaysian border. Most of its land and water resources are on the east coast. Major river basins are the Pattani and the Ta Phi-Phun Duang.

Royal Irrigation Department

2.01 The first large scale water control projects were begun in Chao Phya in the 1890's as private enterprises. In 1904, the Royal Irrigation Department (RID) was formed as the agency responsible for water resource development throughout Thailand. Later, responsibility for hydro-electric development was transferred to the Electricity Generating Authority of Thailand (EGAT).

2.02 RID is still essentially responsible for all irrigation development in Thailand except for the very wide range of small schemes in which various other agencies of the government also participate.

2.03 There are also several thousand farmer groups (Peoples' Irrigation Associations) that have been constructed and are operating small schemes in the North which serve about 250 000 hectares in Chao Phya Basin and some 50 000 hectares in the Mekong Basin.

2.04 Through the 1930's, RID concentrated on the construction of a network of navigation/drainage canals and control structures over an area of more than 500 000 ha in the Southern Chao Phya Plain. In 1950, following a wartime slowdown in construction, RID began a programme to develop gravity irrigation systems covering 600 000 ha in the Northern Chao Phya which continued through the early 1980's. At the same time, navigation/drainage systems of the Southern Chao Phya were extended to nearly 200 000 ha in the adjacent Bang Pakong Basin. Also, in parallel with the development of the Northern Chao Phya, were the construction of the Bhumiphol and Sirikit Storage Dams to control the flow of Chao Phya's northern tributaries.

2.05 Over the past 30 years RID has turned its attention to other river basins and regions. Major developments have been undertaken in the Mae Klong Basin. In the Northeast some large reservoirs have been constructed with their distribution systems in various stages of development. Hundreds of smaller schemes are also being built in the North, Northeast and South every year.

2.06 As of 1982, RID had completed and started projects totalling 4 240 000 ha of which 460 000 ha are small scale projects and 3 780 000 ha are in the category of medium and large scale projects.

2.07 RID is now organized in 26 functional divisions and 12 regional offices under a Director General. There are Three Deputy Director Generals, one Chief Civil Engineer and one Chief Mechanical Engineer. A review of the organization was made recently (1976). The aim was to improve RID's organization with emphasis on reinforcing its capability in project selection, planning, execution, evaluation and operation, and maintenance (O&M). Only a partial implementation of the recommendations of the study has been accomplished so far.

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2.08 Responsibility for identification, design and implementation of small-scale irrigation projects as well as the O&M of medium and large scale projects has been delegated to regional offices. RID sub-divided the Northern Regions and the Northeastern Regions into 3 regional irrigation offices, the Central Region into 4 and the Southern Region into two.

2.09 In the past RID has often, only partially completed projects, i.e. storage dams and main and secondary canals, which include kilometers of concrete lined canals flowing full of water but not reaching the farms except those that are a few meters from the canal banks. Recently, massive investments have been made to add on-farm canals to the systems. Hence, the pressure on RID to provide the necessary O&M for these additional facilities has been tremendous.

2.10 In addition, the ongoing massive programme for the construction of small-scale water development projects, where RID contributes about 600 out of 1000 projects a year, has added to the burden of the regional irrigation offices. Steps are now being taken to strengthen the capability of these offices.

2.11 RID's definition of a small project is one that costs not more than B 4 million (US\$ 640 000), with a service area of less than 500 ha and that can be completed in one year. Recently, RID came up with a definition of medium scale projects to be those with a service area of 500 ha. - 10 000 ha and large scale projects as those with a service area of more than 10 000 ha.

2.12 RID is one of the 12 departments in the Ministry of Agriculture and Cooperatives. It operated in 1983 on an annual budget of US\$ 376 million against the whole ministry's US\$ 658 or 57% of the total budget. Added to this are loan funds for projects financed with external assistance. RID has a work force of 46 544.

2.13 In late 1970, RID embarked in the recruitment of young engineers to improve its technical capability. However, it encountered difficulties both from budget constraints and lack of incentives to attract applicants.

2.14 The use of local consulting firms, therefore, was resorted to in collaboration with expatriate consulting firms. Thus RID was able to embark on the massive developments on the Chao Phya' stages I and II, Phitsanalok, Northeast Irrigation Projects Stages I and II, Mae Klong - Right and Left Bank and the Pattani Projects.

2.15 The projects mentioned above are being implemented on a project management basis. Each project has a project manager, design and construction supervision staff, and project coordinating committees composed of different departments of the MOAC.

2.16 However, inspite of the same membership in Coordinating Committees and Project Management Organizations, progress in project implementation varies widely. The Chao Phya project is an outstanding example of the implementation capability of RID in rehabilitation of irrigation schemes and construction of on-farm facilities at a rate of 16 000 ha per year. Probably this is the only project financed by IBRD in Thailand to be completed on schedule.

2.17 Other projects are floundering primarily due to land acquisition difficulties. This is indicative of lack of rapport between farmers and RID during preparatiion of the designs. In Lam Takbong, one of the main canals had to be abandoned due to objection of the farmers resulting in a considerable reduction of the project's service area.

2.18 The present procurement procedures set-up by government has likewise stunted the progress of on-going projects particularly those involving civil work contracts. To ensure timely completion of projects the current procedure must be changed to facilitate resolving speedily diverging opinions of government agencies involved in contracts approval.

### Peoples Irrigation Systems

3.01 Peoples Irrigation Systems or Traditional Irrigation Systems as they are also known, have flourished in Northern Thailand since the King Meng Rai period (1258-1317). There was a law called "Meng Rai Code", which governed the organization and operation of these systems. In 1939, the Government issued the Peoples Irrigation Act which basically adheres to the Meng Rai Code. There are several thousand of these systems in Northern Thailand covering some 300 000 ha. The average size of these systems is 4 500 rai (720 ha) with 3 000 members.

3.02 A PIS is based on cooperation of people who need water for cultivation. A PIS would have a weir of about 2-3 meters high, 50-80 meters long and a diversion canal, distribution canals and on-farm canals, and a few control structures.

3.03 The weir is normally made up of logs or bamboo to form a box structure to hold dumped riprap to serve as a diversion weir but does not have any head regulator on the canal intake.

3.04 The very temporary nature of these weirs and the denudation of the watershed requires repeated repairs every year, normally after each severe flash flood. This is not only inconvenient but also requires substantial amounts of money. Some years back the government lent assistance in converting some weirs into permanent concrete structures. However, the current government programme is concentrating only on projects costing up to B 4 million. This policy has practically put to a halt assistance in construction of permanent weirs for PIA's.

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3.05 The PIS's are operated, maintained and repaired by the members. They elect their officers and contribute labour and money not only for maintenance and repair of the system but also to provide a modest emolument to people managing the PIS.

3.06 In each PIS, there is a written agreement between the leaders (officers) and the water users on the rules and regulations governing the association. The agreement is renewed every time there is a change in leadership. Among other things, the agreement deals with labour, material, financial obligation of members; a system of fines for non-compliance or violation and adherence to water allocation during the dry season.

3.07 In view of the limited area that a weir can serve, one will find a PIS approximately every 2 kilometers along a stream.

3.08 The construction of permanent weirs and head regulators may encounter problems with PIA's with respect to the sizing of intake openings as this will tend to control the volume of water that PIA's divert from a stream. This particular problem will likewise have a ripple effect on the other PIS's on the same stream. Further, the overall development plan may suggest the elimination of some weirs on a particular stream. For example, PIS's with weirs on the same stream which are less than 2 kms apart and whose service areas are less than 720 ha, should be consolidated into one system whenever technically feasible. The merging may encounter objection from the PIA's.

3.09 Likewise, to be able to attain the expected benefits from a project, the PIA's must also complete the required improvements on the distribution, drainage and tertiary canals as well as any land levelling necessary at the same time as the works to be performed by RID.

3.10 To minimize these problems (para. 3.08 and 3.09), there is need for continuous dialogue with the PIA's, not only individually, but as a group who are drawing their supply from a particular stream. The provincial and district officers should chair these presentation meetings as they are in the best position to arbitrate and resolve disputes particularly those referring to water allocation.

3.11 To ensure successful implementation of a project, no work must be started unless there is 100% agreement to the plans drawn-up by all the PIA's drawing water from a particular stream. Besides leap-frogging construction operations would mean ending up with higher costs.

3.12 The PIAs now levy a fee of 7 kg/rai (43.75 kg/ha) of paddy annually. This amount is utilized by the association for the operation of the system and for purchase of materials needed in the repairs. All labour needed for such repairs are furnished free by members. This practice must continue. The association must also be made to agree to a covenant to increase these levy should they find it inadequate in the future.

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3.13 Care must be exercised to preserve the present organization, its tradition and attitude of the members. Any project assisting PIA; must strive to strengthen and not destroy the present association.

ANNEX IX

SOCIO-ECONOMIC DATA NORTHERN REGION;

UPPER NORTH

Table 1

Agricultural Population of the Upper North - 1969-1980

Province	1960	1970	1975	1976	1977	1978	1979	1980
Chiang Mai	536,860	581,880	634,325	667,341	693,669	718,487	595,850	632,341
Chiang Rai	602,846	804,232	889,028	853,680	668,690	618,361	687,204	987,697
Payao					259,433	253,039	275,533	
Lamponn	187,387	214,798	214,163	221,450	223,929	224,357	222,276	219,664
Lampang	342,019	392,931	457,223	472,250	503,710	520,117	518,402	519,173
Phrae	277,959	245,926	239,009	248,102	251,358	257,986	264,634	272,713
Nan	216,403	245,369	238,399	243,078	252,896	301,121	285,136	285,203
Mac Hongson	57,499	68,470	80,465	79,066	68,283	92,264	86,622	84,683
Tak	121,768	142,564	143,922	142,864	145,147	157,470	116,900	152,238
Upper North (Total)	2,292,783	2,696,172	2,896,534	2,927,831	3,067,115	3,211,262	3,052,563	3,144,712

Source: Computed from National Statistic Office and Office of Agricultural Economics.

Table 2

Agricultural Area and Average Farm Size in the 9 Provinces of the Upper North1975-1980

Province	Total agricultural area (rai)		Total Agricultural household		Average farm size/Household (rai)		Percentage change in farm size 1975-1980	Annual Percentage change in farm size
	1975	1980	1975	1980	1975	1980		
Chiang Mai	1,040,440	1,146,530	132,704	130,406	7.84	8.79	12.12	2.02
Chiang Rai	2,194,393	2,929,395	159,610	183,735	13.75	15.9	16.00	2.67
Payao								
Lamphoon	320,005	396,017	45,085	46,245	7.01	8.56	22.12	3.69
Lampang	1,017,552	855,928	90,182	102,401	11.29	8.36	(-25.96)	4.33
Phrae	502,925	472,206	48,678	55,205	20.34	8.55	(-17.32)	2.89
Nan	543,734	514,005	46,112	55,165	11.80	9.32	(-21.02)	3.51
Mae Hongson	130,430	113,190	16,388	30,206	7.96	6.56	(-17.59)	2.94
Tak	548,185	505,334	28,556	17,247	19.20	16.73	(-12.87)	2.15
Total	6,297,665	6,932,605	567,318	620,610	11.10	11.17	0.63	0.11

Notes: 1) Figures in parentheses indicate a net reduction.

2) Chiang Rai Province includes Payao Province.

Table 3

Percentage Distribution of Households  
by Average Farm Size by Province in  
the Upper North, 1975.

Province	Less than 10 Rai	10-19.9 Rai	20-29.9 Rai	30-39.9 Rai	40-49.9 Rai	More than 50 Rai
Chiang Mai	56.80	35.35	4.79	2.69	0.37	-
Chiang Rai	30.97	41.21	14.28	7.64	3.18	2.72
Lampon	77.51	19.91	2.58	-	-	-
Lampang	76.10	20.21	2.63	-	0.64	0.19
Phrae	48.86	36.20	11.94	1.00	0.3	1.7
Nan	40.87	37.44	11.46	6.33	1.29	2.61
Mae Hongson	78.52	18.67	3.41	-	-	-
Tak	35.20	28.78	16.18	7.6	2.95	2.29
Total	55.60	29.70	8.38	3.16	1.09	2.06

Source: Results of Study of Agriculture, Land Use, Water Resources,  
and Forest Resources, Bangkok: National Economic and  
Social Development Board, 1979, p.33.

Table 4  
Percentage Distribution of Agricultural  
Land by Land Tenure Status by Province  
in the Upper North, Crop Year  
1981/1982

Province		Land Tenure Status			
		Own	Rent	Other	Total
Chiang Mai	Rai (%)	806,308 (63.43)	280,453 (22.06)	184,511 (14.51)	1,271,272 (100)
Chiang Rai	Rai (%)	1,461,916 (71.19)	264,250 (12.87)	327,282 (15.94)	2,053,458 (100)
Payao	Rai (%)	659,334 (76.20)	72,213 (8.35)	133,744 (15.45)	865,291 (100)
Lamphoon	Rai (%)	245,531 (64.30)	92,494 (24.22)	43,818 (11.48)	381,843 (100)
Lampang	Rai (%)	705,844 (82.31)	62,408 (7.28)	89,318 (10.41)	857,570 (100)
Phrae	Rai (%)	393,858 (79.28)	82,282 (16.56)	20,626 (4.15)	496,766 (100)
Nan	Rai (%)	408,240 (67.66)	12,942 (2.15)	182,149 (30.19)	603,331 (100)
Mae Hongson	Rai (%)	78,446 (55.83)	18,860 (13.42)	43,213 (30.75)	140,519 (100)
Tak	Rai (%)	482,050 (87.36)	51,171 (9.28)	18,548 (3.36)	551,769 (100)

Source: Agricultural Statistics of Thailand, Crop Year 1981/1982

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Farmers' Cash Income from Agriculture and Other Sources

by Farm Size in the Upper North,

Crop Year 1978/79

Province	(Baht/household)								
	Farm size								
	Less than 2 rai			2-9.9 rai			10-19.9 rai		
	Agriculture	Other sources	Total	Agriculture	Other sources	Total	Agriculture	Other sources	Total
Chiang Mai	2,079	4,510	6,589	6,584	7,304	13,888	13,143	4,009	17,152
Chiang Rai	11,062	3,448	14,510	2,699	6,928	9,627	9,418	8,023	17,441
Payao	127	10,592	10,719	3,763	8,648	12,447	8,243	12,819	21,819
Lamphoon	2,405	16,132	18,537	4,273	5,141	9,414	12,848	4,337	17,185
Lampang	1,545	9,392	10,937	2,749	8,954	11,703	7,259	7,854	15,113
Phrae	-	1,200	1,200	4,414	8,033	12,447	10,556	6,599	17,155
Nan	728	17,535	18,445	1,647	5,477	7,124	5,537	6,115	11,652
Mae Hongson	838	2,047	2,885	2,726	2,836	5,112	7,811	10,150	17,961
Tak	910	17,535	18,445	1,647	5,477	7,124	5,537	6,115	11,652
Upper North	2,640	8,412	11,052	4,111	6,338	10,449	9,609	6,872	16,561
Northern Region	4,562	9,189	13,751	5,129	6,736	11,865	9,360	7,239	16,599

Source: Office of Agricultural Economics, Ministry of Agriculture and Cooperatives.

Farmers' Cash Income from Agriculture and Other Sources  
by Farm Size in the Upper North, Crop Year 1978/79

Province	Farm Size					
	20-29.9 rai			30-39.9 rai		
	Agriculture	Other sources	Total	Agriculture	Other sources	Total
Chiang Mai	10,814	23,778	34,592	-	-	-
Chiang Rai	11,206	7,076	18,282	24,010	6,831	30,841
Payao	12,057	10,554	22,611	28,477	11,438	39,885
Lampon	-	-	-	-	-	-
Lampang	10,072	14,354	24,426	-	-	-
Phrae	18,326	22,880	41,206	-	-	-
Nan	5,942	457	5,499	10,300	-	10,300
Mae Hongson	2,000	1,400	3,400	7,200	1,700	8,900
Tak	14,582	3,399	17,981	8,903	7,878	16,781
Upper North	11,052	11,374	22,426	22,126	8,362	30,510
Northern Region	13,769	11,525	25,294	42,139	8,420	50,559

Source: Office of Agricultural Economics, Ministry of Agriculture and Cooperatives.

Farmers' Cash Income from Agriculture andOther Sources by Farm Size in theUpper North, Crop Year 1978/79

Province	40-49.9 rai			50-59.9 rai		
	Agriculture	Other sources	Total	Agriculture	Other sources	Total
Chiang Mai	-	-	-	-	-	-
Chiang Rai	36,100	6,000	42,100	28,788	644	29,432
Payao	30,000	23,350	53,350	-	-	-
Lamphoon	-	-	-	-	-	-
Lampang	-	-	-	-	-	-
Phrae	-	-	-	-	-	-
Nan	-	-	-	-	-	-
Mae Hongson	-	-	-	-	-	-
Tak	-	-	-	-	-	-
Upper North	31,061	20,458	51,474	28,788	644	29,432
Northern Region	27,626	21,053	48,679	31,284	644	31,928

Source: Office of Agricultural Economics, Ministry of Agriculture and Cooperatives.

Farmers' Cash Income from Agriculture and  
Other Sources by Farm Size in the Upper  
North, Crop Year 1978/79

Province	Over 60 rai			Average		
	Agriculture	Other sources	Total	Agriculture	Other sources	Total
Chiang Mai	-	-	-	9,533	6,577	15,110
Chiang Rai	-	-	-	8,683	7,577	16,260
Payao	30,820	10,680	41,500	11,032	11,522	22,554
Lamphoon	-	-	-	4,871	7,146	12,017
Lampang	-	-	-	4,008	8,954	12,962
Phrae	-	-	-	6,375	8,385	14,760
Nan	-	-	-	3,025	2,248	5,273
Mae Hongson	-	-	-	2,750	3,454	6,204
Tak	-	-	-	4,437	6,924	11,361
Upper North	30,820	10,680	41,500	7,107	7,202	14,309
Northern Region	40,307	9,662	49,969	15,653	7,188	22,841

Source: Office of Agricultural Economics, Ministry of Agricultural and Cooperatives