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THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

STAFF APPRAISAL REPORT

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East Asia and Pacific Regional Office

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CURRENCY EQUIVALENTS

US\$1.00	=	Baht (B) 20.00
B 1.00	=	US\$0.5
US\$ 1 million	=	B 20 million
B 1 million	=	US\$50,000

WEIGHTS AND MEASURES

Metric System

1 kilogram (kg)	=	2.20 pounds
1 metric ton (1,000 kg) (ton)	=	0.98 long tons
1 meter (m)	=	39.4 inches
1 kilometer (km)	=	0.62 miles
1 hectare (ha)	=	2.47 acres
1 square kilometer (sq km)	=	0.39 square miles
1 cubic meter (cu m)	=	35.3 cubic feet

ABBREVIATIONS

BAAC	Bank of Agriculture and Agricultural Cooperatives
CCDPB	Central Changwat Development Planning Board
DOAE	Department of Agricultural Extension
DOAT	Department of Agricultural Techniques
HTWD	Hill Tribe Welfare Division
LDD	Land Development Department
MOAC	Ministry of Agriculture & Cooperatives
MOF	Ministry of Finance
MOI	Ministry of the Interior
OUSMA	Office of the Under Secretary of State of MOAC
OUSMI	Office of the Under Secretary of State of MOI
PWD	Public Welfare Department
RFD	Royal Forestry Department
TALD	Thai-Australian Land Development Project
TRC	Tribal Research Center
WMD	Watershed Management Division, RFD

GOVERNMENT OF THAILAND
FISCAL YEAR

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I. BACKGROUND

A. The Agricultural Sector

1.01 About 80% of Thailand's population of 44 million reside in rural areas. Structural change in the Thai economy has been rapid in recent years, but agriculture (including fisheries and forestry) continues to employ more than three quarters of the labor force, contributes about 30% of GDP and accounts for over 70% of goods exported. Agricultural GDP in 1970-76 grew by 4.3% p.a., down from 5.4% p.a. in 1960-70, with about 75% of output accounted for by crop production, 4% by forestry and the balance by livestock and fisheries. Much of this recent growth has come from an expansion of cultivated area, as major crop yields and cropping intensities have changed little on a national basis. Rice has become relatively less important in agricultural value added (declining from 51% in 1960 to 39% in 1975), while some upland crops, particularly maize and cassava, have contributed larger shares to total output. Maize and cassava exports together are now almost double the value of rice exports. The Government adopted a policy of investing in infrastructure (roads, water control, ports, electric power, etc.), while allowing relatively free prices and a vigorous private sector to operate. Agricultural support services such as research and extension have until recently been given less emphasis.

1.02 The increase in average farm size during the early years of the 1960-76 period and higher relative prices for farm products in recent years, resulted in annual average incomes of agricultural households being nearly doubled in this period to US\$950. But variations around that mean are large, with the highest incomes being realized in the irrigated agriculture of the Central Region and the lowest in the North and Northeast. Agricultural employment has grown less rapidly than the rural labor force, resulting in substantial rural-urban migration and the growing importance of rural nonfarm employment and income. In 1970 about 30% of average national gross farm family income came from off-farm sources.

1.03 Despite agriculture's overall good performance during the past 15 years, large numbers of the rural population remain poor in absolute terms. Moreover, as readily accessible arable land reserves are exhausted, continued rapid growth of this sector will be more difficult to maintain. The period of easy accessibility to new land is rapidly drawing to a close and, in the presence of continued rapid growth of the rural population, the national average farm size may already have begun to decline. It is estimated that a third of all agricultural households (or nearly 9 million people) remain in absolute poverty (defined as having annual incomes of no more than US\$99 per capita in rural areas), with many having had little or no improvement in real incomes since 1960. About two-thirds of all poverty households live in rural areas of the North and Northeast where the major source of family livelihood is the growing of low-yielding rice under rainfed conditions. It

is in these areas where the land constraint is increasingly severe, where physical infrastructure is least adequate and where agricultural and social support services tend to be the weakest. It is also here that opportunities for nonfarm employment are the poorest.

B. Government Policy

1.04 There is growing concern in the Government over these and other emerging issues of longer-term development of the agricultural sector. The Government is increasingly stressing the need to achieve greater spatial balance in economic growth and to ensure that all socioeconomic groups benefit from the growth process. The latest development plan (the Fourth National Economic and Social Development Plan, 1977-81) states that "several basic policy reforms are considered necessary for promoting greater economic security for the nation and creating a more equitable economic and social order which would mean an eventual eradication of poverty among large segments of the population." National development objectives of the plan include accelerated economic growth, reduced income disparities, reduced population growth, expanded employment, improved management of natural resources, greater national cohesion, and expanded decentralization of development management.

1.05 The plan sets out the Government's strategy to achieve these objectives. A target annual growth rate of 5% has been set for the agricultural sector. Agricultural diversification is to be promoted through expansion of the livestock, coastal fisheries and fruit and vegetable subsectors. Emphasis is to be given to integrated agricultural development through programs to undertake land development, improve on-farm irrigation, expand agricultural credit, improve input delivery systems and strengthen the extension service. An annual reforestation target of 0.5 million ha has been established. Particular emphasis is to be given to regional planning and to expanding and decentralizing public utilities, transportation and communication services. The plan also calls for the revision of pricing policies for these services to promote improved distribution of income across regions and socioeconomic groups, and proposes expanded social services among lower-income classes.

1.06 Although valuable as statements of Government policy, national development plans generally have not been effective guides to government agencies in establishing priorities and implementing programs. The institutional complexities of national planning in Thailand, the weakness of planning units in the major developmental ministries, and the lack of coordination among agencies has meant that the plans are often disregarded in the allocation of financial and administrative resources. Moreover, present institutional arrangements, particularly the highly centralized administrative structure, are not conducive to equitable economic and social development and the eradication of poverty. It is difficult for agencies and departments located in Bangkok to identify and respond to the differing needs of farmers in various parts of the country.

1.07 Full participation of all socioeconomic groups in the future development of the agricultural sector can only be ensured if appropriate policies and programs are developed and if certain institutional and administrative changes are made:

- (a) Land Productivity. Because new land coming under cultivation is increasingly of low-yield potential, the main source of increased production must come from higher yields and cropping intensities on land already under cultivation. This will require, in particular, more effective agricultural support services such as research, extension and marketing.
- (b) Rainfed Agriculture. This subsector presents the most acute problems of poverty, low yields and natural resource degradation, particularly in rice-growing areas, and development efforts by the Government need to be expanded. This requires investment in road construction to improve accessibility to isolated areas, soil and water conservation works, programs of applied research and extension to meet the needs of farmers in different ecological conditions and an accelerated program of land titling to provide tenure security and the motivation to pursue more advanced and less destructive cultural practices.
- (c) Fertilizer. Fertilizer use in Thailand is relatively low as a result of low product/fertilizer price ratios, irregular supplies, and the lack of appropriate types of fertilizers. These conditions in turn derive from the high cost, limited capacity characteristics of the domestic fertilizer industry and export taxes on certain crops, particularly rice. Government is aware of this problem and is in the process of formulating a new fertilizer policy; the Bank is undertaking an analysis of the fertilizer subsector.
- (d) Natural Resource Management. A national land use policy and plan should be formulated, focussed on the North and Northeast. Areas formally designated as forest areas but suitable for agricultural development should be allocated to the latter use; conversely, areas not presently reserved for forest development but unsuited to agriculture should be allocated to forestry. In the development of agriculture on marginal lands, particular care must be exercised to introduce appropriate water and soil conservation measures. Management of forest resources should produce maximum output on a sustained basis while at the same time conserving water and soil resources affecting downstream agriculture.
- (e) Agricultural Credit. Despite the rapid expansion in the amount of institutional credit made available to agriculture, the small farmer in Thailand still has difficulty in obtaining adequate production and investment credit on reasonable terms. The expanded use of purchased inputs needed to intensify production in already

cropped areas will add to credit requirements. Greater emphasis on lending to smaller farmers will add to the costs of institutional credit programs.

- (f) Government Institutions. Inadequate planning, implementation and monitoring capacity for both development projects and supporting services restricts Thailand's future agricultural development. The highly centralized nature of the Government, as well as functional duplication and inadequate coordination among government agencies. The roles of various agencies involved in land development, settlement and land reform need to be defined more clearly.

C. Bank Involvement

1.08 There is basic agreement between the Bank and the Government on the problems and development prospects of the agricultural sector. The Bank's lending emphasis has evolved in recognition of the changing character of these problems. Until the early 1970s, Bank lending concentrated on transportation infrastructure and irrigation, which accounted for about 60% of total Bank lending to Thailand in 1973. Lending for irrigation was the Bank's only activity in the agricultural sector until FY75. The initial emphasis was on improving water control through low-cost development in the country's major irrigation areas. Subsequent lending in irrigated areas provided for improved supporting services, roads and on-farm development.

1.09 Recently the Bank has supported the strengthening of Government institutions involved in agricultural and rural development and the diversification of the agricultural sector. Bank lending has provided finance for national extension, livestock, rubber replanting, northeast rural development, and two northeast irrigation projects. In addition to the proposed project, a second agricultural extension project has been appraised and an agricultural research project and a rural credit project are under preparation. A primary aim of these projects is to strengthen essential rural institutions. The livestock and rubber projects also contribute to the diversification of the agricultural sector while the northeast rural development project includes an initial effort to develop improved production technologies for rainfed areas.

1.10 A major focus of future Bank lending in the agricultural sector will be on raising incomes among the poorest farmers in rainfed areas. This can be done by bringing more marginal lands into permanent production through techniques which improve productivity while conserving the natural resource base. At the same time, efforts to diversify agricultural production and strengthen Government institutions will continue. Projects in rainfed areas typically are the most difficult to prepare and implement because of the lack of well-developed technology packages and the high risks confronting small farmers. Preparation and implementation of such projects will require a concerted effort on the part of the Government and substantial collaboration by the Bank.

1.11 The proposed project is consistent with the Government policies discussed above and would be the first of its type to be supported by the Bank. It would demonstrate on an expanded scale the viability of technology packages for certain areas and of techniques for reaching low-income farmers. The project would also assist the Government in expanding its planning and implementation capacity at the provincial level and would support the preparation of further high priority projects and the testing of technology packages for rainfed areas.

II. THE UPPER NORTH

2.01 The Upper North ^{/1} covers about 20% of the country but contains only 12% of the population (of which 94% live in rural areas) and contributes a mere 8% of GDP. Only 10% of the region has relatively flat, fertile plains; 30% is undulating uplands and the remaining 60% is mountainous. Some farmers have access to irrigation, but the great majority cultivate under basically rainfed conditions, and a typical holding is only 2 ha compared to the national typical holding of about 3.5 ha. Because of the scarcity of readily cultivable land, many farmers practice slash-and-burn agriculture in the uplands, but yields are declining and increasing erosion problems are occurring in some areas.

2.02 The typical farmer in rainfed areas of the Upper North (representing 80% of agricultural households), has a net income of about US\$450 (1976 prices). This is only 75% of the national typical farm income and is similar to the income level of subsistence rice farmers in the Northeast. Approximately 80% of this income derives from the farm and 20% is obtained through off-farm employment. The income level has increased only about 25% in real terms since the early 1960s, almost exclusively as a result of an increase in livestock income caused by changes in relative prices. Holding size had no impact on income over the period, since it remained unchanged, and yields may have declined as a result of decreasing productivity in upland areas. Since the typical farmer in rainfed areas does not produce a rice surplus, he also did not benefit from the relative increase in the rice price during the period. The overall level of government services in the Upper North (particularly in the rainfed areas) remains well below the national average, partly as a result of difficult transportation conditions. Literacy rates are among the lowest in the country, and the index of access of the typical farm household to secondary schools rates somewhat above 80 in comparison with the national average at 100. Access to rural health centers at about 90 is comparatively better. In summary, the typical farmer in rainfed areas of the Upper North is among the poorest in the country.

^{/1} The ten northernmost provinces of Mae Hong Son, Chiang Mai, Chiang Rai, Phayao, Nan, Phrae, Lampang, Lamphun, Sukhothai and Uttardit.

2.03 As of 1975, there were about 1.0 million ha of land available for cultivation in the North ^{/1} in comparison with 5.3 million ha in farm holdings. But much of this additional area was slopeland under shifting cultivation and if it is to be developed for stable agriculture would require clearing, mechanical land preparation, and soil conservation measures. In the Upper North, for example, it is estimated that about 500,000 ha of upland areas (slopedland ranging in altitude from about 250 to 500 m) currently cultivated on a shifting basis could be developed for annual cultivation with the introduction of such measures. Since irrigation opportunities are limited in the Upper North, increasing the intensity of land use will involve primarily this transformation from shifting to stable agriculture in the upland areas. Average yields in the Upper North have been declining as a result of the expansion into upland areas, but even within the uplands, yields have been falling because of the decreasing fallow period caused by rising population pressures. This trend can be arrested only through the use of appropriate cropping patterns and fertilizer, in combination with soil conservation measures, to maintain soil fertility.

2.04 In the absence of a concerted development effort, the prospects for the vast majority of farmers in the Upper North are bleak. Those in the limited irrigated areas should fare reasonably well by extending the area under double cropping and even moving into triple cropping. However, those in rainfed areas will face increasing pressure to break up their holdings, and declining rice yields, together with limited opportunities for diversification, will contribute to the reduction in output. Some will migrate, but they will find few jobs outside of agriculture. As a group, these farmers could find their incomes declining in real terms.

2.05 In order to prevent such an occurrence, the Government will have to focus its assistance on these low-income farmers in rainfed areas. In addition to the transfer of land from forest to agricultural use and vice versa (para. 1.07), titles will need to be issued to farmers to encourage their improvement of the land. Land development programs will have to be supported with public funds because of the long-term nature of the benefits, the accrual of indirect benefits to downstream farmers (decreased flooding and reduced siltation of irrigation works), and limitations of capital availability. Further research will be needed to develop a range of cropping systems and conservation farming systems suited to the varying upland areas. Strengthened extension services will be required to transfer technology to farmers, and improved credit facilities must be made available to enable farmers to finance cash inputs. Road access needs to be extended to additional areas in order to permit the flow of goods and services essential for development. Local government institutions must be strengthened

^{/1} The 17 northernmost provinces: the 10 listed previously for the Upper North plus Tak, Kamphaeng Phet, Phitsanulok, Petchabun, Phichit, Nakhon Sawan, and Uthai Thani, constituting the Lower North.

so that they more accurately reflect local needs and so that the capability for implementation of programs can be expanded at the local level. If actions along the above lines are undertaken, as in the proposed project, farm incomes can be expected to rise by 50% or more over a period of 15 years, in contrast to a possible decline without these efforts.

III. PROJECT AREA

A. Upland

3.01 The gross area for development in the uplands under the proposed project (rolling terrain up to about 500 m elevation next to valley lowlands) is approximately 50,000 ha, located in various sites in seven provinces of northern Thailand (Map IBRD 13843). This area represents about 2% of the upland area in the North. Of this gross area, 30,000 ha would be under agricultural development, and 4,050 ha of the remainder would be developed for forestry. Some 20,000 ha of land has been specifically identified as suitable for upland agricultural development; the remaining 10,000 ha would be identified during the project period for development in the last two years. Slope is the primary constraint on agricultural development in the project area. Thus the area to be developed for agriculture under the project consists of land with a maximum slope of 15%, on which appropriate erosion control works would be constructed, while the remaining area consists mainly of steep slopes better suited to forestry development.

3.02 The soils in the upland sites are alluvial or residual and are derived from granite and limestone. They are mostly dark to light brown sandy loams with moderate permeability and fertility, which are suitable for upland crops. Annual rainfall ranges between 1,000 and 2,000 mm, almost all of which occurs in the months May through October. The cool dry season is November through January, while the hot dry season is February through April (temperatures in the North vary generally from a mean daily minimum of 12°C in January to a mean daily maximum of 36°C in April). The growing season is generally mid-April to mid-December.

3.03 Virtually all of the area is under damaged forest and is not classified as reserve forest. Farmers living in neighboring lowlands practice shifting cultivation in the uplands, with about 25% of the area planted each year to rice, maize, peanuts, and mungbeans. The average crop/fallow rotation period is about four years. As a result of this land use pattern, ground cover in fallow areas varies from stubble to shrubby forest, bamboo, and Imperata grass (Imperata cylindrica).

3.04 About 15,000 ethnic Thai farmers who are prospective project beneficiaries live in the neighboring lowlands, where some 60% have legal tenure, 10% operate on the basis of traditional rights, and 30% are tenants. About 50% of these farmers have legal tenure to half of the upland area,

while the remainder is utilized according to traditional rights. The average family of about six is composed of three adults and three children, and can mobilize about three adult labor units for farm work.

3.05 The typical prospective beneficiary utilizes about 2.4 ha of land, of which 0.4 ha is lowland and 2.0 ha is upland, 0.5 ha of the latter being cultivated each year and the remaining 1.5 ha being left in fallow. Irrigated rice, tobacco, vegetables, soybeans, and peanuts are grown in the lowland area, while mainly rice and some maize and peanuts are grown in the upland area. Upland yields are low: 800 kg/ha for unmilled rice, 600 kg/ha for maize, and 400 kg/ha for peanuts. The farmer's annual net income is about US\$420, of which some US\$240 is in cash, thus placing him well below the absolute poverty level of about US\$595 for a family of six.

B. Highland

3.06 Development in the highlands (over about 500 m elevation) would occur in eight catchments in five provinces in northern Thailand, covering a total of some 172,000 ha (about 3% of the highland area), of which perhaps 34,000 ha are suited to stable agriculture and the remaining 138,000 ha are suited to forestry development.

3.07 Within the highland sites, the valley bottom land (up to 3% slope) accounts for about 3% of the area, footslopes (between 3% and 35%) cover perhaps 17% of the area, and the remaining 80% of the area consists of more steeply sloped land (over 35%). The level areas can be developed for irrigated agriculture, while the footslopes can be developed for rainfed agriculture with the use of bench terraces to control erosion. Most of the more steeply sloped land is better suited to forestry development.

3.08 The soils are mostly residual, derived from varying parent material (including granite, sandstone, and limestone). They are mainly well-drained dark brown to reddish or yellowish brown loams. In the valley bottoms, the soils have sufficient clay content for the construction of irrigation bunds and will support annual cropping. On the footslopes, the soils will also support annual cropping, provided that appropriate soil and water conservation measures are taken.

3.09 Annual rainfall is generally in the upper part of the 1000 to 2000 mm range cited for the uplands, and the seasonal pattern is about the same as in the uplands. The seasonal temperature pattern also is similar, although cooler on average because of the higher altitude, and frosts occur in some remote locations. The overall growing season for annual crops is about April through November, although opium poppies are planted in September and harvested December through February.

3.10 Partially damaged forest covers 71% of the highland sites, while 23% is under forest fallow. The area under crops in a given year accounts for the

remaining 6%, with food crops under shifting cultivation occupying 3.5% of the area, poppies under shifting cultivation 0.4%, irrigated rice 0.6%, and miang tea 1.5%. Thus the area under shifting cultivation or fallow is about 29% of the total.

3.11 There are about 200 villages in the highland sites with some 6,500 families (perhaps 8% of the highland population), 28% of which are ethnic Thais and the remaining 72% hill tribe families. These areas are generally classified as forest reserve, and cultivation is undertaken on the basis of traditional rights. Because of increasing population pressure, fallow periods are being shortened, with a consequent deterioration of soil fertility and structure and a decline in production. The average family of about six has three adult labor units available for farm work.

3.12 There are perhaps three main cropping systems practiced by farmers in the highland sites. The first involves about 60% of the farmers and is characterized by shifting cultivation based on rice. The second is practiced by some 20% of the farmers and is based on shifting cultivation of rice, maize, and poppies. The remaining 20% of farmers produce Miang tea under permanent tree crop conditions.

3.13 As an example of the highland farm unit, the typical rice farmer may cultivate annually about 1.3 ha, consisting of 0.2 ha of irrigated rice and 1.1 ha of swidden crops (mostly rice). He utilizes a total of 7.9 ha, including the cultivated area of 1.3 ha and forest fallow of 6.6 ha, based on a rotation period of seven years. About one out of every two such farmers has a head of buffalo or cattle, and, on average, each farmer has some two pigs and seven head of poultry. The buffaloes are used for draft power for irrigated rice production, but all other farming activities are undertaken by hand, often using rudimentary tools. Virtually no purchased inputs are utilized. Yields are 2,000 kg/ha (unmilled) for irrigated rice and 1,250 kg/ha (unmilled) for swidden rice. The farmer's net income is about US\$390, of which approximately 65% is derived from agriculture, 15% from off-farm employment, and 20% from other sources (handicrafts, etc.). Perhaps US\$220 of the total is in cash.

IV. THE PROJECT

A. Objectives

- 4.01 The principal objectives of the project are to
- (a) raise the standard of living of the rural poor by increasing and stabilizing farmer incomes and by providing minimal social services in highland areas;
 - (b) expand agricultural production through intensification by the progressive replacement of shifting agriculture with stable agriculture;
 - (c) conserve water, soil, and forest resources;

- (d) enhance national cohesion by strengthening links between hill tribes and ethnic Thais;
- (e) demonstrate, on an expanded scale, permanent rainfed conservation cropping systems which can be replicated widely in suitable areas of the North;
- (f) assist the Government in its program to decentralize planning and implementation activities and accelerate rural development;
- (g) facilitate the preparation of high priority projects; and
- (h) test technology packages for rainfed areas of the North and Northeast.

4.02 In addition to expanding agricultural production and increasing farmer incomes, the transition to stable agriculture is expected to reduce opium poppy production in highland areas. Conservation structures and practices introduced under the project would increase agricultural yields and production within the project areas. These conservation measures also would have a beneficial impact on other areas of the North and in the central plain as well, through moderation of the water runoff pattern and reduction of silt levels in rivers. Hill tribes in highland areas have remained isolated from the mainstream of Thai society, but the project would foster the development of additional economic and social links between hill tribes and ethnic Thais. The project would make a substantial contribution to the strengthening of the institutions involved. Furthermore, it seeks to heighten the responsiveness of the central and provincial governments to the needs of the rural poor. This would be done by assisting the Government to achieve its objective of greater decentralization of development management through identifying ways of improving planning and coordinating public sector activities at the provincial level. Finally, the monitoring and evaluation element incorporated in the project would provide the basis for designing subsequent larger-scale projects with similar objectives. It is expected that this project would be the first in a series of projects in the North of Thailand, a region with one of the highest priorities for development and one in which the World Bank Group previously has not been involved.

B. Origin

4.03 The proposed project was identified by a Bank reconnaissance team which visited Thailand in June/July 1976. Preparation of the project was undertaken by the Government with the assistance of the FAO/IBRD Cooperative Program, which sent teams to Thailand in February/March 1977, May/June 1977, and January/February 1978. The major project components were appraised in June/July 1978; preparation/appraisal of the remaining components was undertaken in November 1978 and January 1979.

C. Brief Description

4.04 The project would be implemented over a five-year period in various sites in eight provinces of northern Thailand. In upland areas, consisting of rolling terrain up to about 500 m elevation, next to valley bottomlands, it would involve agriculture and forestry development affecting a total of 15,000

ethnic Thai families. Of a gross area of about 50,000 ha, some 30,000 ha would be developed for stable agriculture, while 4,050 of the remainder would be developed for forestry. The project also would involve agriculture, social, and forestry development aimed at about 6,500 mainly hill tribe families in highland areas above about 500 m containing valleys with narrow floors and steep sides. The eight highland sites cover a total of some 172,000 ha, of which perhaps 34,000 ha are suitable for stable agriculture and 138,000 ha have conditions suited to forestry development. The project would also include components for the improvement of provincial planning, the preparation of additional high priority development projects, and the testing of technology packages for rainfed agriculture in pilot operations.

4.05 In the upland areas, agriculture development would represent basically an expansion of the ongoing Thai-Australian Land Development Project (TALD), administered by the Land Development Department (LDD) of the Ministry of Agriculture and Cooperatives (MOAC). Forestry development would be modelled after the community forest activities of the Royal Forestry Department (RFD) of MOAC. In highland areas, agriculture and social development would be essentially an expansion of the Zonal Development Program of the Public Welfare Department's (PWD) Hill Tribe Welfare Division (HTWD). Forestry development in these areas would build on the experience gained by the Watershed Management Division (WMD) of the Royal Forestry Department (RFD) in its watershed management program.

4.06 Upland agriculture development would include farm development (land clearing, erosion control works, and initial cultivation on 30,000 ha), seed supply, applied conservation research, access tracks (750 km), and technical services. Crops grown in the upland areas would be primarily rice and some maize, groundnuts, and mungbeans. Forestry development in the uplands would involve the establishment of village woodlots (4,050 ha) and the provision of technical services. In the highlands, agriculture and social development would comprise farm development (800 ha of irrigation for food crops, mainly rice, 1,300 ha of terraced land for rainfed annual crops, and 1,300 ha of terraced land for coffee), small social infrastructure works such as schools (80) and health posts (32), access tracks (500 km) and technical services. The main crops grown on developed land in the highland areas would be rice and coffee, while secondary crops would include maize and soybeans. Forestry development in the highland areas would involve establishment of village woodlots (3,100 ha), rehabilitation of degraded forest (4,600 ha), protection of forest areas (1,730 km of firelines, firefighting equipment, and training of farmers), access tracks (345 km), and technical services.

4.07 Primary responsibilities for implementation of the project would be as follows: LDD for upland agricultural and forestry development; HTWD for highland agricultural and social development; RFD for highland forestry development, the Office of the Under Secretary of State of the Ministry of the Interior (OUSMI) for provincial planning, the National Economic and Social Development Board (NESDB) for project preparation, and the Office of the Under Secretary of State of the Ministry of Agriculture and Cooperatives (OUSMA) for pilot operations.

D. Detailed Features

Upland Agriculture

4.08 Farm Development. The Thai-Australian Land Development (TALD) Project has demonstrated that stable agriculture can replace shifting agriculture and double the yields, based on the introduction of appropriate conservation works, improved seed, fertilizer, mechanized land preparation, and improved cultivation practices. In the case of upland rice, for example, average yields of 600-900 kg/ha with shifting agriculture have increased to 1500-2000 kg/ha after development. The land is first cleared, partly with chains and partly with cutting blades, roots are removed with rippers, and the brush is collected and burned. Contour banks of about 1.1 sq m cross section and an average of 40 m separation are then formed, the land is ploughed with heavy disc harrows, and the farmers are provided with improved seed adapted to upland conditions. In subsequent years, farmers hire tractor services for mechanical land preparation and fertilizer is added which, together with the cereal/ legume cropping pattern, serves to maintain yields. LDD began with a small experimental plot of 40 ha in 1968 and a larger area of 350 ha in 1969. The Australian Government initiated its support in 1970, and the area developed each year was expanded until the current rate of about 1,500 ha per year was reached. The total area developed to date is about 8,500 ha. The land development has been undertaken by force account, and budgetary restrictions have limited the rate. The proposed project would utilize the technology package which has evolved under TALD and is now considered suitable for application on a wider scale. Under the project, land development would be implemented by contractors.

4.09 About 15,000 ethnic Thai farmers are expected to participate in the upland agriculture component of the proposed project. Conditions among these farmers are sufficiently similar that a single farm model is adequate. The typical farmer (para. 3.05) presently utilizes about 2.0 ha in the uplands, 20% of which is in rice, 5% in maize and peanuts, and 75% in bush fallow. Project activities would include surveying, land clearing, root ripping, stick removal, construction of conservation works, and initial cultivation. LDD would ensure that an adequate supply of improved seed and fertilizer was made available to the farmer, and technical assistance would be provided to him on appropriate conservation farming practices (para. 4.15). The Bank for Agriculture and Agricultural Cooperatives (BAAC) would provide production credit for seed, fertilizer, and tractor services for land preparation after the first year (para. 4.56). Following the introduction of stable agriculture, the typical farmer would utilize about 2.0 ha of upland, of which some 40% would be in rice, 30% in maize, 10% in peanuts, and 10% in soybeans or mungbeans. The remaining 10% would be occupied by conservation works and access tracks. A second crop would be grown on perhaps 20% of the area, with half in peanuts and half in soybeans or mungbeans. At full development in the fourth year, the farmer's annual net income would increase to about US\$680, compared to US\$420 at present and the absolute poverty level of US\$595.

4.10 In the aggregate, this component of the project would include the following activities:

- (a) a land classification survey covering the gross area of approximately 50,000 ha, and socio-economic, boundary, and conservation works surveys for the 30,000 ha to be developed for agriculture;
- (b) procurement of specialized equipment for land development to be leased to contractors (anchor chains, Fleco-type root ploughs, brush rakes, and Rome-type heavy offset disc harrows);
- (c) land clearing, root ripping, stick removal and construction of contour banks on 30,000 ha (2,500 ha, 4,500 ha, 7,000 ha, 8,000 ha, and 8,000 ha for project years 1-5, respectively);
- (d) initial cultivation of the 30,000 ha.

4.11 LDD would undertake a land classification survey to divide the gross area into zones suitable for agriculture and those which would be left for forestry. It would also undertake a socio-economic survey to identify project beneficiaries and to generate base line data for the monitoring and evaluation activities (para. 4.43). After allocation of land to project beneficiaries by the local government authorities, LDD would carry out a boundary survey and prepare a map of each site. These maps would be submitted to the District Land Office to facilitate acquisition of titles by farmers. LDD also would assist in the formation of farmer groups to increase the efficiency of land development, advisory service, and credit activities. Finally, LDD would align and peg the contour banks. Land clearing, root ripping, and construction of contour banks would be undertaken by contractors retained by LDD, using 200 hp tractors, and LDD would supervise stick removal by the farmers. Since thorough land preparation and the use of appropriate material inputs are essential to the successful establishment of the new cropping system, LDD would contract for the initial land preparation (which would be undertaken with the heavy offset disc harrows). It would provide proper amounts of improved seed to farmers, and would closely supervise the final seedbed preparation and planting by the farmers. Maintenance of the contour banks would be undertaken by LDD during the project period. Subsequently, LDD would assist the farmers in maintaining the contour banks. An assurance was obtained at negotiations that LDD would ensure that the conservation works were properly maintained.

4.12 Access Tracks. This component would consist of the construction of 25 m of access track per ha of agricultural area, or about 750 km in total. Each track would provide access to a group of farm plots and would intersect with the existing all-weather roads which form a satisfactory network in the area of the upland sites. Grassed waterways would be constructed on either side of the tracks to serve as part of the drainage system for the conservation works described above.

4.13 The tracks would be 4 m wide and would not be surfaced. They would be constructed with heavy tractors and graders after initial ploughing of the farmland. The waterways would be 3 m wide, with a concave cross-section, and

would be formed by graders. Design and layout of the tracks and waterways would be undertaken by LDD while construction would be carried out by contractors retained by LDD, normally the same ones retained for the land development work. LDD would arrange for maintenance of the tracks by contract during the project period, while the farmer groups would assume responsibility for maintenance thereafter, with LDD's guidance. Farmer groups would maintain the waterways during and after the project period. An assurance was obtained at negotiations that LDD would ensure that the tracks and waterways were properly maintained.

4.14 Technical Services /1. This component would involve the expansion of the unit established by LDD to implement the TALD project. It would

- (a) provide the overall management for upland agricultural development;
- (b) implement the land classification, socio-economic, boundary, and conservation works surveys;
- (c) procure the specialized equipment required for land development;
- (d) retain and supervise contractors to undertake land clearing, root ripping, establishment of soil conservation works, initial cultivation, and construction of access tracks;
- (e) ensure the provision of adequate improved seed and fertilizer to farmers;
- (f) provide technical assistance on conservation farming systems to farmers;
- (g) implement conservation farming research;
- (h) provide training for its staff; and
- (i) retain consultants to assist in the expansion of the unit's capacity and the training of staff.

4.15 Information on the organization and management of the unit is given in Chapter V; farm development and access tracks are discussed in paras. 4.08 to 4.13 above. In order to ensure an adequate supply of improved seed, the unit would provide foundation seed to selected farmers for multiplication. Equipment and facilities for cultivation of the foundation seed and for seed processing and storage would be provided under the project. One man-year of technical assistance would be provided for every 450 farmers during the first three years of development, or a maximum of 26 man-years in the fifth year of

/1 Technical services include project administration, technical assistance to farmers, consultant services, seed supply, and conservation farming research.

the project. The technicians providing this assistance would help farmers in forming groups of perhaps 25 farmers each, and would advise them on the new conservation farming system. As part of this task, they would assist farmers in applying for production credit, and they would arrange and supervise the annual contract ploughing of fields. LDD would provide this technical assistance to farmers in coordination with the Department of Agricultural Extension (DOAE). For each farmer, LDD would provide the technical assistance for a period of three years, during which time it would also train DOAE extension agents in conservation farming practices, both in formal sessions and in field work with the farmers. After the new conservation farming system had been established, at the end of the three-year period, DOAE would assume responsibility for providing regular extension services to farmers. (An assurance on this matter was obtained at negotiations.) Current research on improved cultivation methods, cropping systems, and conservation structures and practices for sloping terrain would be expanded, in coordination with the Department of Agricultural Techniques (DOAT). Equipment and facilities would be provided to support this effort. Foreign training in the form of study tours would be provided to selected staff to review land development contracting procedures and conservation farming practices. LDD would retain five specialists in conservation works and practices, land development contracting, rainfed farming systems, soil fertility, and seed production and processing, to assist in expanding the overall capacity of the unit and participate in the training of staff.

4.16 A maximum of 112 additional professional staff would be required by the unit to undertake the activities described above. Housing would be provided for the additional staff, as would offices and equipment. A total of 105 vehicles would be required, consisting of 6 cars, 10 pickups, 30 four-wheel drive (4WD) vehicles, 55 motorbikes (125 cc), 2 wheeled tractors, 1 truck, and 1 grader.

Upland Forestry

4.17 Village Woodlots. The clearing of forest fallow and the replacement of shifting agriculture with stable agriculture in the upland sites would reduce the farmers' supply of fuelwood and timber. In order to meet their needs, 90 woodlots covering a total of 4,050 ha of land adjacent to the areas to be developed for agriculture would be established by village woodlot associations with assistance from LDD and the Royal Forestry Department (RFD). LDD, under the guidance of RFD, would help the farmers of the upland agriculture component organize the associations and establish the woodlots. Although woodlots are a recent development in Thailand, they have been introduced in about 25 forest villages. The experience gained will be useful in providing assistance to the village woodlot associations under the project.

4.18 A typical village woodlot association would include about 120 farm families and would establish a woodlot of some 45 ha, sufficient to supply perhaps 80% of the families' fuelwood and timber requirements. (The families

would continue to obtain the remaining 20% from natural scrub forest areas.) Approximately 70% of the woodlot would be planted with species suitable for firewood, 20% would be planted with timber species, and 10% would be existing forest managed primarily for fuelwood production.

4.19 A nursery would be established, and the woodlot planted and operated, by the village woodlot association as assisted by LDD, with the advice of RFD. In order to protect the woodlot, the association would establish a fireline around each planted area at the rate of 200 m/ha, or about 8,000 m for the entire woodlot. In addition, the association would form a fire brigade which would be provided with simple fire fighting equipment. Members of the association would be instructed in fire control practices. After the disbandment of the temporary nursery, RFD would provide seedlings for the maintenance of the woodlot from its regular nurseries.

In the aggregate, then, this component would involve:

- (a) establishment of 90 temporary nurseries;
- (b) establishment of 90 woodlots covering a total of 4,050 ha;
- (c) construction of 720 km of firelines; and
- (d) provision of 90 sets of simple fire fighting equipment.

4.20 Technical Services. This component would involve the provision of advisory services to village woodlot associations by LDD, under the guidance of RFD. They would:

- (a) assist farmers participating in upland agricultural development to organize village woodlot associations;
- (b) advise the associations on the establishment and management of nurseries and woodlots;
- (c) advise the associations on the construction of firelines; and
- (d) instruct association members on fire control practices.

4.21 About 9 additional professional staff would be needed to undertake the above activities. Of this total, 8 would be required to serve as woodlot advisors, and about 12 man-months of specialist input (species selection, silviculture, fire protection, etc.) would be needed each year. Ten vehicles would be provided, consisting of two 4WD vehicles and 8 motor-bikes (125 cc).

Highland Agriculture and Social Development

4.22 Farm Development. The Zonal Development Program of the Public Welfare Department's (PWD) Hill Tribe Welfare Division (HTWD) has been developed over a period of some 15 years. It is aimed at assisting the hill tribes to raise their standard of living in terms of income, education, health, and social institutions, and it is designed to continue until the line agencies are able to provide the needed services. Implementation of the program is effected through teams of vocational school graduates (agricultural, education, health and social workers) which are based in key villages and service satellite villages within about five hours' walk. At present, there are some 185 teams serving 625 villages containing approximately 100,000 hill tribe people. On the basis of the confidence which evolved between the teams and the hill tribes, the latter have been encouraged to adopt stable agriculture and reduce their reliance on shifting agriculture (including poppy cultivation). Thus, given the essential ingredient of trust, it has been demonstrated that stable agriculture, incorporating appropriate conservation structures and the types of cropping patterns foreseen for the project, can be established in the highland areas. The necessary requirements are an adequate supply of seed, the selective use of fertilizer, the utilization of appropriate cultivation practices, and the provision of technical assistance to farmers. Minimal education and health facilities and services help achieve the necessary level of trust and contribute directly to an improvement in the farmers' quality of life. The medications provided through the health services serve to reduce the use of opium as a medicine. The Zonal Development Program has been operating in each of the sites to be developed under the proposed project, although its impact has been limited by a lack of resources. The highland agricultural and social component of the proposed project would provide the necessary resources in the selected sites and would ensure the teams had adequate administrative and technical support.

4.23 This component of the project would affect about 6,500 farm families (mostly hill tribes) living in eight highland sites covering a total of 172,000 ha. In the aggregate, it would include the following major elements:

- (a) a land classification survey in the eight highland sites encompassing a total of 172,000 ha;
- (b) a socio-economic survey of the potential project beneficiaries with established residence in the eight highland sites and registration of these beneficiaries (about 6,500 families);
- (c) issuance of land-use permits to the approximate 6,500 project beneficiaries;
- (d) establishment of perhaps 160 small irrigation schemes covering a total of about 800 ha, primarily for rice production;
- (e) construction of 1,300 ha of bench terraces for rainfed annual crops; and

- (f) construction of bench terraces and establishment of coffee on 1,300 ha.

4.24 The land classification survey would be undertaken by LDD to delineate the zones within each site which are suitable for stable agriculture and those which should be developed for forestry. An assurance was obtained at negotiations that land designated as suitable for stable agriculture by LDD would be allocated to that purpose promptly after submission of LDD's report. In the course of its work, LDD would assist HTWD in the selection of specific areas within the agricultural zone for the construction of irrigation schemes, rainfed annual crop terraces, and coffee terraces. HTWD would implement a socio-economic survey in each site to identify project beneficiaries and provide a benchmark for monitoring and evaluation (para. 4.43). It would then register those families with established residence and identified as project beneficiaries, and would transmit this information to RFD for the issuance of land-use permits by RFD. At negotiations, an assurance was obtained that RFD would issue such land-use permits promptly on receipt of the registration information from HTWD. HTWD would retain a local engineering firm to assist in designing and supervising construction of the irrigation schemes, construction being undertaken by the beneficiaries. Beneficiaries also would construct the bench terraces, under the guidance of HTWD. Assistance in the establishment of coffee and the cultivation of irrigated rice and soybeans, rainfed annual crops, and coffee would be provided to farmer beneficiaries by HTWD through the project period (para. 4.34). Maintenance of the irrigation schemes and terraces would be undertaken by the farmers under the supervision of HTWD. An assurance was obtained at negotiations that HTWD would ensure that the schemes and terraces were properly maintained.

4.25 There are basically three farming systems which are utilized by highland beneficiaries: shifting agriculture based on rice; shifting agriculture based on rice, maize, and poppies; and Miang tea farming. About 60% of highland project beneficiaries would be employing the first system, and a typical farmer of this group presently utilizes about 7.9 ha of land, of which perhaps 2% is in irrigated rice, 13% in swidden rice, 1% in other swidden crops, and 84% in regenerating forest fallow (para. 3.13). Under the project, in addition to participating in the construction of the main elements of the irrigation system, the farmer would level and bund his own field, and would construct feeder and drainage ditches for his field. He would also construct his own terraces for rainfed annual crops and coffee. HTWD would provide planting material and fertilizer to the farmer, receiving payment in kind, and an HTWD technician would advise him on appropriate agricultural practices. After implementation of the project, the farmer would be utilizing about 4.1 ha of land, of which 8% would be in irrigated rice, 6% in rainfed annual crops on terraces, 5% in coffee on terraces, 8% in swidden crops (mostly rice), 49% in regenerating forest fallow, and 24% in his share of the village woodlot (para. 4.38). A second crop of soybeans would be grown on perhaps one third of the irrigated area. Thus a substantial decrease of 70% would occur in the area under swidden crops and forest fallow. At full development in year seven, the farmer's annual net income would increase to about US\$685, compared to US\$390 at present. (The absolute poverty level is about US\$595.)

4.26 About 20% of highland project beneficiaries would be using the second system. A typical farmer of this group presently utilizes approximately 12.2 ha of land, of which some 1% is in irrigated rice, 4% in swidden rice, 5% in swidden maize, and 90% in forest fallow. A second crop of mostly poppies is grown after maize. The farmer's participation in the construction and maintenance of project facilities, and the involvement of HTWD, would be the same as described above. After implementation of the project, the farmer would be utilizing about 7.4 ha of land, of which approximately 4% would be in irrigated rice, 3% in maize on terraces, 3% in coffee on terraces, 4% in swidden rice, 4% in swidden maize, 68% in forest fallow, and 14% in his share of the village woodlot. A second crop of soybeans would be grown on about one half of the irrigated area, a second crop of mostly soybeans would be grown on perhaps one third of the terraced maize area, and a second crop of primarily poppies would be grown on the swidden maize area (on land not developed under the project). The reduction in swidden and fallow area would be 54%, and the reduction in poppy area and production would be approximately 50%. At full development in year seven, the farmer's annual net income would increase to about US\$690 from approximately US\$470 at present.

4.27 The remaining 20% of highland project beneficiaries would be employing the third system. A typical farmer of this group presently utilizes about 2.0 ha of land, all of which is under Miang tea cultivation. Under the project, this farmer would replace part of his tea stand with coffee, requiring the construction of terraces and the establishment of the coffee stand. HTWD would provide inputs and assist the farmer as described above. After implementation of the project, the farmer would be utilizing about 2.7 ha of land, of which 56% would be in miang tea, 7% in coffee, and 37% in his share of the village woodlot. At full development in year seven, the farmer's annual net income would increase to about US\$650 from approximately US\$520 at present.

4.28 Social Infrastructure. This component would consist of the construction of small social infrastructure works, comprising primarily some 80 schools and 32 health posts, by villagers under the direction of HTWD, mostly using local materials.

4.29 The schools would be located in villages where population density warrants and would be used for both primary and adult education. Education for children would be provided through the lower primary grades, after which students wishing to continue their education would transfer to provincial schools. The curriculum is aimed at instilling basic literacy and arithmetic skills; fostering a rudimentary understanding of the natural environment, nutrition, and personal hygiene; and promoting a sense of national identity.

4.30 A health post would be established in each of 32 key villages, with mobile service to be provided to surrounding villages. Only simple diseases would be treated, with more serious cases being referred to provincial health posts or hospitals. The emphasis would be on the treatment of common ailments such as internal parasites and malaria, the treatment of opium addiction, and education in nutrition, hygiene, and family planning.

4.31 Access Tracks. This component would involve the construction or rehabilitation of some 500 km equivalent of hill tracks which would provide access from the existing network of all-weather roads to the areas to be developed for stable agriculture in each of the highland sites. These tracks would be 4 m wide, with a backslope into the hill and a small drainage ditch on the hillside, and would not be surfaced. They would be formed by heavy tractors with bulldozer blades and with graders. Local materials would be used for crossings and for drainage ditch diversions.

4.32 Design and layout of the tracks would be undertaken by HTWD with the assistance of an engineering consultant firm (para. 4.34) and construction would be carried out by contractors retained by HTWD. Maintenance also would be implemented by contractors, both during and after the project period, although HTWD would establish a small maintenance unit at each one of the eight Zonal Development Centers to undertake minor and emergency maintenance. An assurance was obtained at negotiations that HTWD would ensure that the tracks were properly maintained.

4.33 Technical Services. This component would involve the expansion and strengthening of the organizational unit of HTWD currently implementing the Zonal Development Program. This unit would:

- (a) provide the overall management for highland agricultural and social development;
- (b) register families with established residence in each highland site;
- (c) assist farmers in establishing the small irrigation schemes, terraces and coffee stands;
- (d) ensure the provision of adequate planting material and fertilizer to farmers;
- (e) assist villagers in constructing simple schools and health posts;
- (f) provide agriculture, education, and health services to farmers;
- (g) retain and supervise contractors for the construction, rehabilitation, and maintenance of access tracks; and
- (h) retain consultants to assist in the expansion of the unit's capacity and the training of staff.

This component also would include support for LDD in carrying out the land classification survey for each highland site and for the Tribal Research Center (TRC) in implementing the socio-economic surveys.

4.34 Information on the organization and management of the HTWD unit is given in Chapter V, while its activities relating to farm development, social infrastructure, and access tracks are described in paras. 4.22 to 4.32 above. The unit would supply farmers with improved seed, fertilizer, and

agricultural chemicals, receiving payment in kind. In the case of coffee seedlings, the unit would establish a nursery at each key village with materials provided under the project. Farmers would receive seedlings in exchange for labor contributed to the construction and operation of the nurseries. Agriculture, education, and health services would be provided to farmers by the village center teams in coordination with the line agencies (DOAE, the provincial governments, the Ministry of Education, and the Ministry of Public Health). With an agriculturalist, a health worker, and a social science specialist on each of the 32 teams, there would be a technician of each type for every 200 families, on average. The 80 education instructors on the teams would each serve an average of 2.5 villages. These services to villagers would be provided by HTWD during the project period and until the line agencies were in a position to provide them. (An assurance on this point was obtained at negotiations.) Staff would undergo pre- and in-service training, including foreign study tours for selected subject matter specialists. HTWD would retain an engineering consultant firm to strengthen its capacity for designing and supervising the construction of irrigation systems and access tracks. Two consultants would also be retained by HTWD, one in highland agronomy and advisory services and the other in smallholder coffee production. They would assist in expanding HTWD's general capacity for project implementation and would participate in the training of staff.

4.35 A total of 193 additional professional staff would be required to undertake the activities described above. The major specialists needed would be agriculturalists, education instructors, health workers, and social science workers to form the key village center teams. Housing, offices, and equipment would be provided for the additional staff. About 159 vehicles would be required, consisting of 31 4WD vehicles, 120 motorbikes (125 cc), and 8 tractors (for minor maintenance).

Highland Forestry

4.36 The Watershed Management Division (WMD) of RFD currently operates 33 watershed management units which cover an area of perhaps 330,000 ha, primarily in the North. The rehabilitation, woodlot development, protection, and track construction activities undertaken by these units form the basis for the highland forestry component of the proposed project. As in the case of the upland forestry component, village woodlots are a recent innovation, but in the highland component they would be established and operated by WMD until the villagers were in a position to assume responsibility for them. Considerable experience has been accumulated in the rehabilitation of watershed areas, and some 33,000 ha have been planted.

4.37 Rehabilitation. Of the total area of about 138,000 ha in the eight highland project sites which is suitable for forestry development, about 30% is under cultivation or in forest fallow, while the remaining 70% is partly degraded forest subject to continued encroachment. During the project period, the transition from shifting to stable agriculture would release approximately 26,000 ha, of which 7,700 ha, or about 30%, would be rehabilitated through the establishment of plantations or developed for village woodlots. The rehabilitation component would consist of, in the aggregate:

- (a) the establishment of 56 nurseries, and
- (b) plantation of 4,600 ha, of which about 1,600 ha (35%) would be in broadleaf species and 3,000 ha (65%) in pine.

The nurseries would be constructed by WMD using local highland labor. WMD would also establish and maintain the plantations, using local highland labor. The plantations would be located on deforested land where natural regrowth was scarce or absent, such as recently-abandoned swidden areas or areas invaded by Imperata grass. WMD would coordinate with HTWD on the determination of the amount of land released from shifting agriculture and thus available for rehabilitation, and the selection of areas to be rehabilitated each year. In the case of the broadleaf plantations, a first thinning would be made after five years, producing about 70% fuelwood and 30% construction timber. A second thinning after ten years would produce 30% fuelwood and 70% construction timber. The pine plantations would be thinned initially after ten years. Assurances regarding the maximum use of local highland labor and coordination on the identification of areas for rehabilitation and for village woodlots were obtained at negotiations.

4.38 Village Woodlots. The progressive replacement of shifting agriculture with stable agriculture in the highland sites would, as in the case of the upland sites, result in a gradual reduction of readily-accessible forest resources for fuel and timber and warrant the establishment of village woodlots. However, there would be a substantial difference between uplands and highlands in the degree to which this phenomenon occurs. This is because the entire area of the highland sites suitable for stable agriculture would not be developed in the context of this project, and some villages will be close to natural forest areas, even in the long run. Therefore, the 3,100 ha of woodlots planned for this component would meet only about 30% of the villagers' total wood requirements, compared to 80% for the upland areas. The nurseries to be established by WMD, as indicated above, would be used to supply seedlings for both the rehabilitation plantations and the woodlots. The woodlots would be introduced on deforested land adjacent to villages and within the area designated for forestry. About 90% of each woodlot would be devoted to species suitable for fuelwood production, and the remaining 10% would be for timber production, using the same broadleaf species to be planted in the rehabilitation plantations. The woodlots would be established and operated by WMD, using local labor, since the concept of managed forest resources would be novel to most highland villagers. However, WMD would assist the villagers to form village woodlot associations which would, eventually, assume responsibility for management of the woodlots under the guidance of WMD. An assurance on this last point was obtained at negotiations.

4.39 Protection. Protection activities would be focussed initially on the rehabilitation plantations and village woodlots but eventually would be extended to cover the entire area of approximately 138,000 ha to be developed for forestry. The specific items to be included in this component are

- (a) 1,730 km of fire lines, of which 430 km would form the boundary lines between agricultural and forest land and 1,300 km would be for protection of rehabilitation plantations and woodlots, and
- (b) simple fire-fighting equipment.

The fire lines would be cleared of trees and brush to a width of 4 m and would have a strip of bare soil, 2 m wide, in the middle. They would be constructed and maintained by WMD using local highland labor. The fire-fighting equipment would be under the control of forest guards, to be hired by WMD, who would patrol the forest area and mobilize crews to fight fires within or close to rehabilitation plantations or woodlots.

4.40 Access Tracks. This component would consist of the construction of about 345 km equivalent of tracks which would provide access to areas to be rehabilitated or developed for woodlots. They would be of the same standard as the access tracks in the agriculture areas and would also be designed, constructed, and maintained in a similar manner, with WMD retaining the engineering consultant firm and contractors. An assurance was obtained at negotiations that WMD would ensure that the tracks were properly maintained.

4.41 Technical Services. This component would involve the expansion and strengthening of WMD's capacity to implement forestry development activities in the highland sites. As part of the project, WMD would:

- (a) issue land-use permits to project beneficiaries for agriculture plots within the areas designated as suitable for stable agriculture;
- (b) establish nurseries for seedling production;
- (c) rehabilitate deforested areas;
- (d) establish woodlots in forest areas near villages;
- (e) construct firelines to serve as boundaries and protect planted areas;
- (f) introduce other fire control measures and train farmers in controlled-burning techniques; and
- (g) retain and supervise contractors for the construction, rehabilitation, and maintenance of access tracks.

Information on the organization and management of WMD is given in Chapter V.

4.42 The additional professional staff required by WMD to implement its part of the project would be 23, with major requirements being for foresters to manage the field units in the highland sites and for forest guards. Each highland site would have about three foresters and seven forest guards. In-service training would be provided to newly-recruited staff. WMD would retain an engineering consultant firm to assist it in the design, layout, and supervision of construction of access tracks. Housing, offices and equipment

would be provided for the additional staff. About 25 vehicles would be required, consisting of 9 4WD vehicles, 8 motorbikes, and 8 tractors (for minor maintenance).

Monitoring and Evaluation

4.43 Because of the gravity of the problems to which the project is addressed, the consequent importance of the project as one means of attacking these problems, and the dearth of experience with this type of project on the scale proposed, a substantial monitoring and evaluation effort is foreseen. Information would be collected on inputs such as equipment, seeds, and technician visits to farmers; on outputs such as the area of land developed, the length of tracks constructed, and the number of woodlots constructed; and on project impact on farm income, school enrollment, access/use of health services, forest degradation, etc. The monitoring and evaluation system would be designed by consultants retained by the National Economic and Social Development Board (NESDB), working in collaboration with LDD, HTWD, and RFD. Data collection for monitoring and evaluation would be undertaken primarily by the staff involved in the implementation of the project under the supervision of the Land Policy and Planning Division (LPPD) of LDD, the Planning Section and the Tribal Research Center (TRC) of HTWD, and the Planning and Coordination Division (PCD) of RFD. These units would analyze the information, providing feedback for management purposes and input for the evaluation effort under the guidance of consultants retained by NESDB. Evaluation would be undertaken by the NESDB consultants. Project support for these activities would include three 4WD vehicles (one each for LPPD, TRC, and PCD) and consultant and data processing services. (See Working Paper C5 for additional details.) Assurances were obtained at negotiations that the respective agencies would monitor and evaluate the project and that by September 30, 1979, NESDB would retain consultants for design of the monitoring and evaluation system whose qualifications and experience, terms of reference, and conditions of employment were agreed upon with IDA. An assurance was also obtained that NESDB would, by January 31, 1980, provide a report on the proposed system for review by IDA.

Provincial Planning

4.44 The failure of a significant proportion of the rural population, exemplified by the intended beneficiaries of the Northern Agricultural Development Project, to participate meaningfully in Thailand's economic and social development has become a source of increasing concern. The Government has recognized that its highly centralized administrative structure and decision-making processes, its traditional reluctance to delegate authority to local administrations and the lack of coordination between line agencies operating in the field have contributed to this problem. Planning has always been undertaken from the top down. These institutional arrangements have impaired the ability of the Government to perceive and respond to the real needs of the rural poor.

4.45 The Government has accordingly embarked on a program to create a decentralized planning and development management capability. In the past three years provincial planning units consisting of between 4 and 10 posts

each, depending on the size of the province, have been established in all 71 provinces. They have been staffed by officials selected mainly from the Department of Local Administration (DOLA) and the other departments of MOI. Provincial planning personnel received some initial training in planning procedures organized by the Office of Policy and Planning in MOI and by the National Institute for Development Administration (NIDA). Operating under guidelines issued by the Central Changwat Development Planning Board (CCDPB), appointed to supervise the introduction of provincial planning, the provincial planning units have completed the preparation of the first plans for their respective provinces.

4.46 The Government has determined that the provincial development plans will in future constitute the framework through which all development activities occurring in each province will be coordinated. It intends to channel increasing amounts of its own resources through the provincial administrations, for the implementation of local development projects, rather than through the line agencies of the central government. To this end, the Government appropriated 1% of its national budget in FY79 for the funding of small projects included in provincial development plans not otherwise departmentally financed. These resources were allocated to provinces towards the end of 1978 roughly in accordance with need. If these funds are effectively utilized, the Government proposes to make larger block allocations available to provincial administrations and hopes that external aid agencies will also program resources for the implementation of small rural development projects in this way. Provincial planning units will clearly play a crucial role in the coordination and monitoring of development activities as well as in the preparation of provincial plans. The quality of these plans and the efficiency of the provincial units in relation to planning, project preparation and appraisal and development management, will thus determine the extent to which resources directly allocated to provinces can be absorbed and efficiently utilized for development purposes.

4.47 The present arrangements for planning and development management at the provincial level require substantial modification before larger volumes of development resources could be channelled through provincial administrations for the implementation of rural development projects. The initial plans produced by the new provincial planning units contain only a brief description of the principal features of each province and a summary list of all projects proposed by district officers, line departments and district councils. Little attempt was made to make an assessment of the resources available to the province, to identify social and economic problems, or to formulate simple development strategies. Projects included in provincial plans are not subjected to sufficiently rigorous technical or economic appraisal. The ability of the provincial planning units to supervise and coordinate the activities of the many agencies operating in the provinces is also weak. The strengthening of provincial planning offices is recognized by the Government as being a prerequisite to the achievement of greater decentralization of development management.

4.48 The provincial planning component of the project would thus seek to identify weaknesses in the present planning arrangements, to develop practical proposals to remedy existing deficiencies, and to demonstrate the advantages to be gained from improved planning and project preparation at the provincial level. Three inter-related elements are involved, as follows:

- (a) Training. Government funds are being provided (para. 4.46) and external funds are also becoming available to finance development projects in rural areas. However, well conceived and prepared projects are needed to utilize these funds effectively, and therefore a training program in project identification and preparation would be introduced for officials at provincial, district, and subdistrict levels. Consultants would be retained to assist in the design of the program, the training of trainers, and the implementation of the program. This effort would constitute an important step toward expanding the absorptive capacity for development funds at the lower levels of Government.

- (b) Pilot Planning Studies. Pilot planning studies would be undertaken in four representative provinces of the North and Northeast regions. A small team of planning specialists would work in close association with the provincial planning units and the representatives of line agencies at the provincial level. The idea is to demonstrate the kinds of plans that can be produced and the benefits to be achieved from improved planning. It is anticipated that the pilot planning exercises would assist in identifying any critical institutional, data, staffing or technical constraints which will need to be overcome if provincial planning is to be strengthened. They will also define more clearly the future role and training requirements of provincial planning offices. Consultants will be engaged to develop these pilot plans. It is expected that such plans - and similar plans subsequently developed for other provinces - would form the basis of programs which could attract external financing. The provinces would be selected by the Government in consultation with IDA by reference to their relative poverty and development prospects.

- (c) Evaluation of Provincial Planning. An evaluation of provincial planning and development management capabilities would also be undertaken with a view to formulating a program to further decentralize development management. This study would include an evaluation of the past performance of provincial planning units, a review of existing provincial plans, and an examination of the legal, institutional and procedural implications of greater devolution of responsibility for development planning and coordination. A group of planning experts and management consultants drawn from institutions familiar with provincial planning in Thailand would conduct this study and make recommendations to the CCDPB for the strengthening of provincial planning and development coordination. The expert group would benefit from the experience gained by the consultants engaged to carry out the pilot planning studies.

Project Preparation

4.49 Broad-based rural development that benefits all the people has been constrained not only by institutional problems such as the highly centralized administrative structure, but also by a failure to develop enough projects that

benefit the poorer regions. The project preparation capability of many agencies has been significantly improved over the last few years but most of these agencies are concerned with traditional infrastructure sectors. Technical assistance is still urgently required if new projects are to be developed which directly benefit the rural poor.

4.50 The project preparation component would therefore provide funds for medium and short-term consultant services to be used for identifying and preparing high priority projects, particularly in the field of rural development. The funds would be used partly for the analysis and detailed preparation of projects identified as a result of the provincial planning process. But the use of the funds would not be restricted to studies arising out of the provincial planning process; proposals from line agencies for studies to identify and prepare high priority projects would also be considered. The development of small water resource projects is one particular area where the need for detailed studies has already been identified.

Pilot Operations

4.51 Major concentrations of the absolute poor are in the rainfed areas of the North and the Northeast regions. Agricultural development under rainfed conditions poses difficult technological problems, and while some preliminary research findings on raising productivity are beginning to emerge, generally they have not been tried at the farm level. Funds would be provided to help finance small-scale pilot operations, mainly for agricultural development in rainfed areas of the North and Northeast. Such pilot operations will permit the testing of new technologies, providing a crucial bridge to full-scale projects.

4.52 One possibility for a pilot operation would be the introduction to farmers of cropping technology packages being generated by existing research programs. Preliminary results are now coming forward from ongoing research efforts in rainfed rice and upland crops being funded under Credit 461-TH and Loan 1198-T-TH. However, farm level testing is necessary before widespread application by low-income farmers who themselves have to carry the risks associated with such improved technologies. Funding would be provided for a program of support, in a small number of districts, for the introduction of a package of alternative techniques and cropping patterns and strengthened local input supply and marketing services. A second type of pilot operation might involve developing local water management techniques in rainfed paddy areas. Much of the North and Northeast of Thailand is characterized by erratic seasonal rainfall patterns. Extensive areas of the Northeast are of relatively low relief, and the capacity for storage of water for irrigation is limited. Some steps have been taken to develop shallow wells or farm ponds in such areas to allow some limited supplemental wet or dry season irrigation. A more significant impact is possible through minor watershed

alterations to assist in directing runoff to improve utilization of water in the wet season and, if feasible, increase storage for dry season use. The pilot operation would provide for the design and execution of low-cost works in a limited number of typical small watersheds in the North and Northeast.

4.53 The efforts contemplated in provincial planning, project preparation, and small-scale pilot operations in rainfed areas should enable the Government to better utilize the considerable external assistance being offered for agricultural and rural development projects that would directly benefit the poorer areas.

E. Cost

4.54 Total project cost is estimated at US\$47.5 million, of which US\$17.4 million, or 37%, represents foreign exchange requirements. The base cost estimate is based on prices for beginning CY79. Physical contingencies of 10% have been added for civil works, materials, and equipment. The price contingency amounts to 29% of total base cost plus physical contingencies, assuming the following rates of price increase:

<u>Item</u>	<u>Rate of Price Increase (%)</u>				
	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983/84</u>
Civil works	12	12	10	9	9
Equipment & services	7	7	7	7	7
Salaries	5	5	5	5	5

Taxes of US\$5.2 million, or 11%, are included in project cost. Project cost details are presented in Annex 2 and are summarized below.

Table 4.1: PROJECT COST

Component	Local	Foreign	Total	Local	Foreign	Total	Proportion of base cost (%)	Foreign exchange requirement (%)
	----- B million	----- B million	-----	----- US\$ million	----- US\$ million	-----		
<u>Upland</u>								
<u>Agriculture</u>								
Farm development	73.00	60.60	133.60	3.65	3.04	6.69	19	45
Access tracks	11.60	7.80	19.40	0.58	0.39	0.97	3	40
Technical services	68.00	38.40	106.40	3.40	1.92	5.32	15	36
Subtotal	<u>152.60</u>	<u>107.00</u>	<u>259.60</u>	<u>7.63</u>	<u>5.35</u>	<u>12.98</u>	<u>37</u>	41
<u>Forestry</u>								
Village woodlots	7.40	1.20	8.60	0.37	0.06	0.43	1	13
Technical services	3.40	0.80	4.20	0.17	0.04	0.21	1	20
Subtotal	<u>10.80</u>	<u>2.00</u>	<u>12.80</u>	<u>0.54</u>	<u>0.10</u>	<u>0.64</u>	<u>2</u>	15
Subtotal Upland	<u>163.40</u>	<u>109.00</u>	<u>272.40</u>	<u>8.17</u>	<u>5.45</u>	<u>13.62</u>	<u>39</u>	40
<u>Highland</u>								
<u>Agriculture and Social</u>								
Farm development	10.80	4.40	15.20	0.54	0.22	0.76	2	50
Social infrastructure	0.40	0.60	1.00	0.02	0.03	0.05	-	52
Access tracks	13.80	5.80	19.60	0.69	0.29	0.98	3	30
Technical services	70.40	24.60	95.00	3.52	1.23	4.75	13	26
Subtotal	<u>95.60</u>	<u>35.40</u>	<u>130.80</u>	<u>4.78</u>	<u>1.77</u>	<u>6.55</u>	<u>18</u>	27
<u>Forestry</u>								
Rehabilitation	16.40	0.60	17.00	0.82	0.03	0.85	3	3
Village woodlots	15.20	0.40	15.60	0.76	0.02	0.78	2	2
Protection	3.00	0.00	3.00	0.15	0.00	0.15	-	2
Access tracks	9.60	4.20	13.80	0.48	0.21	0.69	2	30
Technical services	25.80	10.20	36.00	1.29	0.51	1.80	5	29
Subtotal	<u>70.00</u>	<u>15.40</u>	<u>85.40</u>	<u>3.50</u>	<u>0.77</u>	<u>4.27</u>	<u>12</u>	18
Subtotal Highland	<u>165.60</u>	<u>50.80</u>	<u>216.40</u>	<u>8.28</u>	<u>2.54</u>	<u>10.82</u>	<u>30</u>	23
Monitoring and evaluation	1.40	0.80	2.20	0.07	0.04	0.11	-	38
Provincial planning	20.00	20.00	40.00	1.00	1.00	2.00	6	50
Project preparation	30.00	30.00	60.00	1.50	1.50	3.00	8	50
Pilot operations	78.00	42.00	120.00	3.90	2.10	6.00	17	35
<u>Total Base Cost</u>	<u>458.40</u>	<u>252.60</u>	<u>711.00</u>	<u>22.92</u>	<u>12.63</u>	<u>35.55</u>	<u>100</u>	36
<u>Contingencies /a</u>								
Physical	13.60	9.80	23.40	0.68	0.49	1.17		42
Price	129.40	86.00	215.40	6.47	4.30	10.77		36
Subtotal	<u>143.00</u>	<u>95.80</u>	<u>238.80</u>	<u>7.15</u>	<u>4.79</u>	<u>11.94</u>		40
<u>Total Project Cost</u>	<u>601.40</u>	<u>348.40</u>	<u>949.80</u>	<u>30.07</u>	<u>17.42</u>	<u>47.49</u>		37

/a Calculated on upland development, highland development, and monitoring and evaluation.

F. Financing

4.55 The proposed IDA credit of US\$25.0 million, amounting to 53% of total project cost (59% of project cost net of taxes), would be equivalent to US\$16.2 million of the foreign exchange requirement plus US\$8.8 million of local cost. Local currency financing is justified because of the Bank's strategy of reorienting its lending program toward projects aimed at reducing income differentials and improving productivity in subsistence agriculture. The Australian Government would finance the consultants for the upland agricultural component, the cost of which amounts to US\$0.9 million, or about 2% of project cost, and the United Kingdom would provide US\$0.3 million, or about 1% of project cost, to finance the consultants for the highland agricultural and social component. (Total external financing would amount to 50% of project cost for components other than provincial planning and project preparation.) The remaining US\$21.3 million, or 44% of project cost, would be financed by the Government. Beneficiaries would make a substantial labor contribution to project works, valued at US\$4.5 million in market prices, which, because it is a noncash item, is not included as part of project cost or financing. If this amount were added to project cost, it would represent 9% of the total. The financing for individual components of the project is summarized in the following table:

Table 4.2: PROJECT FINANCING
(Amounts in US\$ million)

Component	<u>Government</u>		<u>Australia</u>		<u>UK</u>		<u>IDA</u>		Total
	Amt.	%	Amt.	%	Amt.	%	Amt.	%	
Upland									
Agriculture	6.49	50	0.66	5	-	-	5.83	45	12.98
Forestry	0.32	50	-	-	-	-	0.32	50	0.64
Highland									
Agriculture and social	3.28	50	-	-	0.22	3	3.05	47	6.55
Forestry	2.13	50	-	-	-	-	2.14	50	4.27
Monitoring and evaluation	0.06	50	-	-	-	-	0.05	50	0.11
Provincial planning	-	-	-	-	-	-	2.00	100	2.00
Project preparation	-	-	-	-	-	-	3.00	100	3.00
Pilot operations	3.00	50	-	-	-	-	3.00	50	6.00
Contingencies	5.97	50	0.24	2	0.12	-	5.61	47	11.94
<u>Total</u>	<u>21.25</u>	<u>44</u>	<u>0.90</u>	<u>2</u>	<u>0.34</u>	<u>1</u>	<u>25.00</u>	<u>53</u>	<u>47.49</u>

4.56 The Government would make budgetary funds available to the implementing agencies on an agreed schedule. On average, the Government's contribution to the project would require an increase of 23% in the annual budget allocations of the implementing agencies during the project period and 5% after the project period, compared to current budget allocations. As a complement to the project, the Bank for Agriculture and Agricultural Cooperatives (BAAC) would make short-term production credit available in a timely manner to beneficiaries of the upland agricultural component. The maximum annual requirement of about US\$1.5 million is expected to be reached in year five of the project. BAAC would also make medium-term credit available to facilitate the expansion of tractor services in the project area. Loans would be made available for tractor sets including reversible plows or for reversible plows alone. The total amount of loan funds required for these items over the five-year period of the project is estimated at US\$1.9 million. Production and equipment credit would be granted on the basis of confirmation by LDD that the borrowers and the items to be financed were appropriate to the project. In the event that BAAC were not able to meet the entire demand for production or equipment credit, the commercial banks would provide the additional amounts required. Assurances on the provision of production and equipment credit were obtained at negotiations.

G. Procurement

4.57 Because of the unit size and nature of procurement expected for the project, ICB would not be appropriate. Land development (US\$9.8 million) and access track construction (US\$3.8 million) would be undertaken by local construction firms under contract to the implementing agencies. Since these works would be widely dispersed in time and space, the individual contracts (about US\$270,000 for land development and US\$25,000 for access tracks) would not be of a size to attract international bidders. Therefore contracts would be awarded on the basis of competitive bidding advertised locally in accordance with procedures acceptable to IDA and the Government. A substantial number of local construction firms are capable of undertaking this type of work, and they have adequate capacity to meet project requirements. To the extent practicable, works would be grouped into contracts of the size indicated above for purposes of efficient execution and supervision.

4.58 Miscellaneous civil works, including small irrigation schemes, schools, health posts, nurseries, rehabilitation plantations, village woodlots, offices and houses (US\$5.9 million), would be constructed by local contractors or, in the case of the highland sites and for part of the pilot operations, by force account by the implementing agencies themselves. For the works built by construction firms, contracts would be awarded on the basis of competitive bidding advertised locally in accordance with procedures acceptable to IDA and the Government.

4.59 Purchases of equipment, amounting in total to US\$5.0 million, would also be widely dispersed in time, location and among suppliers. Therefore, contracts would average perhaps US\$60,000 and would not be attractive to international bidders. They would be awarded on the basis of competitive bidding advertised locally in accordance with procedures acceptable to IDA and the Government. Major manufacturers of equipment to be utilized in the project are represented in Thailand or have plants in Thailand (as in the case of vehicles).

4.60 Materials and small tools, including farm supplies, amounting to US\$1.5 million, would be purchased in small quantities costing perhaps US\$25,000 each and therefore would be procured on the basis of competitive bidding advertised locally in accordance with procedures acceptable to IDA and the Government.

4.61 In order to provide a measure of flexibility in the case of small civil works, equipment items, or quantities of material which are specialized in nature or are needed urgently in the course of project implementation, prudent shopping, involving a minimum of three quotations where possible, would be applied for items costing less than US\$15,000 each and US\$500,000 in the aggregate. When bids are estimated to exceed US\$100,000, IDA's prior approval would be required before invitations to bid are issued and before contracts are awarded. Assurances on procurement procedures were obtained at negotiations.

H. Disbursement

4.62 Disbursements would be made at the rate of 100% of the foreign exchange cost of directly imported equipment, 65% of expenditures for equipment procured locally off the shelf, and 100% of the ex-factory cost of locally manufactured equipment. For consultants, training and data processing services, the rate of disbursement would be 100% of total expenditure. Disbursements for civil works (including materials and labor for force account works) would be 60% for LDD, 70% for PWD, 50% for RFD, and 50% for OUSMA. Disbursements at the rate of 70% of incremental operating and maintenance costs would be made for PWD. Disbursements for civil works to be carried out by force account and for incremental operating and maintenance costs would be made against certificates of expenditure, the documentation for which would not be submitted for review but would be retained by the respective agencies and made available for inspection by IDA during the course of project supervision. It is expected that disbursements would be completed by December 31, 1985. An estimated schedule of disbursements is given in Table T-4.

V. ORGANIZATION AND MANAGEMENT

A. General

5.01 The design of the proposed project is such that the individual components would be implemented independently to a large extent. Thus, the success of each component would depend on the effectiveness of the line agency with primary responsibility for that component. Those matters needing resolution at a higher level would be dealt with by a committee consisting of representatives of the Ministry of Agriculture and Cooperatives (MOAC), the Ministry of Interior (MOI), the Ministry of Finance (MOF), the Land Development Department (LDD), the Public Welfare Department (PWD), the Royal Forestry Department (RFD), the Bank for Agriculture and Agricultural Cooperatives (BAAC), the National Economic and Social Development Board (NESDB), the Agricultural Land Reform Office, the Department of Technical and Economic

Cooperation, the Bureau of the Budget, and the Civil Service Commission. The representative of MOAC would be chairman and the representative of MOI, deputy chairman. An assurance was obtained at negotiations that such a committee, satisfactory to IDA, would be established by September 1, 1979. Project activities at the provincial level would be coordinated through the existing provincial development committees, on which the implementing agencies are also represented.

B. Land Development Department

5.02 LDD (Chart C-2), one of the ten departments of MOAC, has a total staff of about 1,100. It has seven operating divisions: Land Policy and Planning, Soil Survey, Soil Analysis, Land Classification, Soil and Water Conservation and Management, and Engineering. LDD formulates land use policy; conducts soil, land use, and tenancy surveys; prepares soil analyses and maps; estimates land capability; and implements specific land development projects aimed at soil and water conservation. The four main projects which LDD is carrying out at present are the Thai-Australian Land Development Project (TALD), the Prachwap Khiri Khran-Phetchaburi Land Development Project, the Kamphaeng Phet Land Development Project, and the Coastal Land Development Project. As mentioned earlier (para. 4.05), TALD forms the basis for the upland agricultural component of the proposed project.

5.03 LDD headquarters for the upland agricultural component would be maintained at Chiang Mai, centrally located in the northern provinces. Direction of project activities would be effected through district centers, to be located at existing Land Development Centers near Chiang Mai, Chiang Rai, Nan, and Lampang, and through 34 village centers to be established in the main village of each development site encompassing on average 450 beneficiary farmers (Chart C-3). (See Working Paper C1 for further details.)

5.04 LDD's project staff would be headed by a project manager, appointed in consultation with IDA, assisted by a deputy project manager. Their activities would include the preparation of annual work programs for implementation of the upland agriculture and forestry components, a copy of which would be sent to IDA for comment three months prior to the start of the fiscal year. Implementation of the project would require 120 incremental professional staff, the majority of which would be agriculturalists to serve as land management advisors and agricultural engineers who would undertake the surveys and supervise the land development works (Table T-2). Assurances on the project manager appointment, annual work programs, and staffing schedule were obtained at negotiations. These staff would either be seconded to the project from LDD's various divisions or be newly recruited.

5.05 The socioeconomic, land classification, boundary, conservation works, and access track surveys would be undertaken by teams operating from headquarters. The contract supervision teams would be directed from headquarters but would set up camps in each site for the duration of the land development and access track construction work, in order to provide close supervision of contractors. Land management advisors at the village centers would operate under a training and visit system, to be organized in coordination with DOAE, and would be supervised through the district centers. For example, the chief of the district center team (a soil conservationist) and the agronomist would spend one day every two weeks visiting the advisors in

their district during the regular field work. Another day of the two-week period would be devoted to planning and training sessions with the advisors at the district centers. In turn the advisors, who would help organize the farmer groups averaging perhaps 25 farmers each, would spend a half day every two weeks with each of about 18 groups that they would be assisting and one day at the district center.

5.06 LDD's seed production unit at Hangchat (near Lampang) would be expanded to ensure an adequate supply of improved seed to project farmers. This unit would produce foundation seed which would be made available to contract growers. LDD would purchase the seed produced by these growers and provide it to project farmers for the initial cultivation of their developed upland plots.

5.07 The existing conservation farming research team, also at Hangchat, would be expanded in order to strengthen the effort being undertaken to further improve the technology package for upland development on slopeland. The broadened program would evaluate different types of conservation structures, practices, equipment, and cropping systems.

5.08 Pre-service training would be provided to all newly recruited staff, and in-service training would be integrated into the sequence of project activities. Trainees for land management advisory positions, for example, would participate in the socioeconomic surveys. After completion of this work, they would remain in the areas which they helped to survey and begin the organization of farmer groups. The consultants to be provided under the project would assist in the design and implementation of the training programs.

5.09 LDD would retain consultants to assist it in expanding its capacity in certain fields. Five specialists, in conservation works and practices (two years), land development contracting (three years), soil fertility (12 months), rainfed farming systems (three years), and seed production and processing (two years), would be retained to assist with the training programs, help design the implementation system, and assist in the execution of the project. (Four of the specialists already are working with LDD on the TALD project.) An assurance was obtained at negotiations that the consultants, their terms of reference, and their conditions of employment would be agreed upon with IDA.

C. Public Welfare Department

5.10 PWD is one of the largest departments within MOI. Among its responsibilities are social security, general welfare, hill tribe welfare, community development, and settlement. Its activities in these fields are administered by 13 divisions at headquarters and by the provincial administrations, which are under the authority of MOI.

5.11 HTWD (Chart C-4) is the division of PWD charged with the responsibility of promoting the development and welfare of members of hill tribes, with the aim of enabling them to become citizens and full participants in Thai society. HTWD implements its programs through five subdivisions in

Bangkok and through ten provincial hill tribe development and welfare centers, six of which are in the eight northern-most provinces. It also operates the Tribal Research Center (TRC), which undertakes demographic, economic, social, and anthropological studies of the hill tribes, and the Hill Tribe Training Center. HTWD has a total staff of about 900; nearly 90% are posted outside Bangkok and over 80% are working in the field.

5.12 HTWD headquarters for the highland agricultural and social component of the proposed project would be located at Chiang Mai. Direction of project activities would be effected through zonal development centers to be established in each of the eight highland sites, in close coordination with the existing provincial hill tribe development and welfare centers, and through key village centers, to be located in 32 main villages within the sites (Chart C-5). (For further details, see Working Paper C3.)

5.13 HTWD's project staff would be headed by a project manager, appointed in consultation with IDA, assisted by a deputy project manager. Their duties would include the preparation of annual work programs for implementation of the highland agricultural and social component, a copy of which would be sent to IDA for comment three months prior to the start of the fiscal year. Incremental professional staff required for the project would be 193, with the main requirements being agriculturalists, health workers, and education instructors for the 32 mobile teams operating out of the key village centers (Table T-2). Assurances on the project manager appointments, annual work programs, and staffing schedule were obtained at negotiations. Initially, the project positions would be filled primarily with experienced staff drawn from among the HTWD mobile teams operating throughout the highland areas, and newly recruited staff would be added once implementation was well under way.

5.14 Specifications for civil works, including the irrigation schemes, terraces, access tracks, schools, health posts, offices, and houses would be prepared by the agricultural engineer at headquarters, assisted by the agricultural engineers at the zonal development centers and the agriculturalists at the key village centers. The engineering consultant firm would provide outside expertise. The agricultural engineers would also be responsible for the procurement of contractor services, for the supervision of construction by the contractors and project farmers, and for the supervision of maintenance by contractors, the zonal development center maintenance units, and farmers.

5.15 Agricultural advisory services to farmers would be provided by the agriculturalists on the key village center teams, who would work with an average of 200 farmers each under the direction of the highland agronomist and smallholder coffee specialist at headquarters and the agriculturalists at the zonal development centers. The agronomist and the coffee specialist would design and implement the advisory service system with the assistance of the consultants in highland agronomy and smallholder coffee production. The system would follow the training and visit approach, in which the zonal development center agriculturalists would spend one day every two weeks working with each of the key village center agriculturalists, one day conducting in-service training courses, one day visiting demonstration plots and reviewing research activities, and four days working on specific development activities

at the village level. The agriculturalists at the key village centers would make regular visits to an average of about five villages in the neighborhood of each key village to provide advice to project farmers.

5.16 Education and health services for farm families would be provided by the education instructors and health workers on the key village center teams, working under the direction of the education and health coordinators at headquarters and the education and health supervisors at the zonal development centers. The education instructors would staff the 80 schools within the eight highland sites, while each health worker would assist an average of about 200 farm families, located in the key village and about five neighboring villages. The approach used by the health workers would follow the training and visit system, and supervision of both education instructors and health workers would utilize the techniques of this system.

5.17 Pre-service training for newly recruited agriculturalists, as well as refresher courses, would be given at the Rural Development Training Center, the Tribal Research Center, and the University of Chiang Mai, all within or near Chiang Mai. Similar courses for education instructors would be given at teacher training colleges in various northern towns, while courses for health workers would be given at established facilities near Bangkok and in the northern provinces. The courses would be organized by the relevant project specialists, with assistance from the consultants in the case of agriculture, in cooperation with the Ministry of Agriculture and Cooperatives, the Ministry of Education, and the Ministry of Public Health.

5.18 HTWD would retain an engineering consultant firm (one year) and consultants in highland agronomy and smallholder coffee development (five years each) to work with HTWD in expanding its project implementation capacity. The engineering firm would assist in the design and supervision of construction of the irrigation schemes and access tracks, while the other consultants would assist with the training programs, the establishment of procedures, and implementation of the project. An assurance was obtained at negotiations that the consultants, their terms of reference, and their conditions of employment would be agreed upon with IDA.

D. Royal Forestry Department

5.19 RFD has 11 divisions based in Bangkok and regional, provincial, and district offices. Programs are implemented through the provincial and district offices, with the regional offices acting in an advisory capacity and the divisions at headquarters providing technical support (Chart C-6). The Watershed Management Division (WMD), with a professional staff of about 180, was established in 1965 to develop and manage watershed areas. It would be responsible for the highland forestry component of the proposed project.

5.20 RFD would implement the project through its existing network of regional and provincial offices. Units of WMD would be located in each of the eight highland sites. (For further details, see Working Paper C4).

5.21 RFD would have a manager, appointed in consultation with IDA, to direct project activities. These would include the preparation of annual work programs, a copy of which would be sent to IDA for comment three months prior to the start of the fiscal year. Incremental professional staff requirements would be 23. Assurances on the project manager appointment, annual work programs, and staffing schedule were obtained at negotiations. The major need would be for foresters to staff the units in each highland site responsible for rehabilitation, village woodlot, protection, and access track development. Project positions are expected to be filled with experienced staff from within RFD.

5.22 Annual work programs would be prepared by the project manager in consultation with his field staff and would be worked out in detail at the local level for each site. RFD would undertake the rehabilitation of degraded forest areas, the establishment of village woodlots, and forest protection through its unit in each highland site, and it would employ contractors to construct and maintain the access tracks. It would retain an engineering consultant firm to assist in the design, layout, and supervision of construction and maintenance of the access tracks. RFD would instruct farmers in controlled burning of swidden fields and fire control procedures for village woodlots and natural forest areas. An assurance was obtained at negotiations that the engineering consultant firm, its terms of reference, and its conditions of employment would be agreed upon with IDA.

E. Provincial Planning, Project Preparation, and Pilot Operations

5.23 The provincial planning component of the project would be administered by the Office of the Under Secretary of the Ministry of the Interior (OUSMI) on behalf of the Central Changwat Development Planning Board (CCDPB). OUSMI would retain consultants to assist in the design and implementation of the training program, the preparation of pilot plans for the four provinces, and the evaluation of provincial planning. In the case of the project preparation component, provincial planning offices and line departments would submit proposals for use of the funds to NESDB, which would act on behalf of the project committee (para. 5.01). During negotiations, it was agreed that NESDB would prepare a list of potential projects which might be prepared in the near future under this component. The component for pilot operations in rainfed agriculture would be administered by the Office of the Under Secretary of the Ministry of Agriculture and Cooperatives (OUSMA) on behalf of the project committee. OUSMA would screen proposals for pilot operations from various departments and agencies and would select those which are likely to make the greatest contribution toward the development of technology packages which can be used on a widespread basis in rainfed areas of the North and Northeast. An assurance was obtained at negotiations that, in the case of all three components, proposals would be agreed upon with IDA before being

implemented. It was also agreed that consultants retained to assist in the design and implementation of the activities proposed for each component, their terms of reference (including detailed work programs), and their conditions of employment would be agreed upon with IDA. The responsible agencies would ensure that all necessary data and support services would be made available to the consultants in order to permit them to fulfill their assignments.

F. Accounts and Auditing

5.24 Separate accounts covering all financial transactions for the project activities would be maintained by LDD, HTWD, RFD, NESDB, OUSMI, and OUSMA. These accounts would be audited annually by auditors satisfactory to IDA, and the audited financial statements, together with the auditor's comments, would be sent to IDA within six months of the close of each fiscal year. An assurance on accounts and auditing was obtained at negotiations.

VI. MARKETING AND PRICES

A. Output

6.01 Most farm families meet their basic food needs from their own production. Much of the incremental basic food production from the project would be consumed by participating families or, as in the case of coffee, enter well-established market channels. With the exception of coffee, incremental agricultural and forestry production from the project would be a small portion of national output and would have no significant impact on national price levels. Annual incremental production at project full development (year 10) is shown below while marketing and prices are discussed in greater detail in Working Paper C7.

Table 6.1: ANNUAL INCREMENTAL PRODUCTION OF MAJOR COMMODITIES

Product	Unit	Year 5 /a	Year 10 (Full development)
Coffee	ton	130	1,040
Rice (paddy)	ton	18,500	24,200
Maize	ton	4,400	7,100
Soybean/Mungbean	ton	4,500	5,300
Peanut	ton	5,300	6,000
Miang tea	ton	-500	-1,100
Opium	kg	-1,600	-2,500
Fuelwood /b	'000 cu m	32.5	112.1
Sawlogs /b	'000 cu m	6.1	15.4
Construction poles /b	'000 cu m	-	7.1

/a Assumed to be Thai fiscal year 1984, beginning October 1983.

/b Incremental forest products in terms of standing timber at the end of year 20 (Thai fiscal year 1999) are projected to be 1.1 million cu m of fuelwood, 633,000 cu m of construction poles and 89,000 cu m of sawlogs.

6.02 There is a well established and reasonably efficient private sector marketing network for project output and production inputs in the upland areas of the project, with marketing margins for both inputs and outputs fairly commensurate with costs and risks involved. In the less well-developed marketing infrastructure of the highland areas, traders often link provision of credit and supplies to purchases of farm output. The improved road access provided by the project will reduce transport costs and improve marketing services in both upland and highland areas. Table 6.2 below provides a summary of economic and financial prices for project output. (See Working Paper C6 for further details.). Tables 1, 2 and 3 of Annex 1 detail the price structure for rice, coffee and sawlogs/construction poles, respectively.

6.03 Rice. At full development (year 10) the project would produce annually an additional 24,200 tons of paddy rice, mostly in the uplands, where the yield is expected to increase from 800 kg/ha in the base year to 1,800 kg/ha in the fourth year of development for each farm. Rice is the most important crop in the project, and production would be increased from a deficit in both the upland and highland areas to an annual marketable surplus of about 3,500 tons. This surplus would be sold to local merchants and millers. There are some 30 large rice mills in the Northern Region supplying the export market and thus linking local prices to the world market. Farm-gate prices are presently low relative to world prices but, according to Bank projections of world prices, should increase throughout the project period.

Table 6.2: SUMMARY OF ECONOMIC AND FINANCIAL PRICES OF PROJECT OUTPUT /a

Product	Unit	1 9 7 9		1 9 9 0	
		Financial	Economic	Financial	Economic
Rice (paddy)	\$/ton	100	165	127	210
Maize	"	75	91	86	104
Peanuts	"	250	293	291	341
Soybeans	"	205	223	254	276
Mungbeans	"	275	335	340	415
Coffee	"	2,100	2,222	1,870	1,977
Miang tea	"	125	115	125	115
Mixed vegetables	"	50	46	55	51
<u>Upland Forestry /b</u>					
Plantation fuelwood	\$/cu m	2.25	2.05	4.25	3.90
Plantation timber thinnings	"	2.25	2.05	4.25	3.90
Coppice fuelwood	"	2.25	2.05	4.25	3.90
<u>Highland Forestry /b</u>					
Plantation fuelwood and thinnings	"	2.00	1.85	3.80	3.50
Pine plantations /c	"	-	-	2.80	14.50
<u>Natural Forest</u>					
Fuelwood	"	2.00	1.85	3.80	3.50
Sawlogs	"	3.00	15.65	4.15	21.60
<u>Broadleaf Plantations</u>					
Thinnings	"	2.00	1.85	3.80	3.50
Construction poles	"	2.00	10.50	4.00	14.50
Sawlogs	"	3.00	15.65	4.15	21.60

/a Constant 1979 prices. These prices are at farm-gate in the case of agricultural products and are estimated on a standing tree basis in the case of forestry products.

/b Because forestry products are valued on a standing tree basis, i.e., excluding labor and other exploitation costs, the values for the products listed are identical to the value of the respective standing crop at end of the project period (1999), adjusted for changes in real prices during the project period.

/c It is assumed that pine thinnings have financial and economic values equal to plantation fuelwood but that no commercial production of pine timber is realized during the 20-year project period. The value of standing pine plantations at end of the project period is assumed to be the same as that for construction poles from broadleaf plantations.

6.04 Coffee. Coffee would be produced in the highland areas and would be the second most important crop in the project. Production is low at present; the project would add 1,040 tons by full development in year 10. For each farm, the yield is expected to increase from 800 kg/ha in year 5 to 800 kg/ha in year 7. There is little national data on domestic production and consumption, but both supply and demand are increasing rapidly. National production estimates for 1978 were about 3,000 tons with exports of about 1,000 tons. Imports fell to less than 1,000 tons in 1977. The expected annual growth rate of at least 10% over the next few years will require domestic production of nearly 10,000 tons of beans by 1990.

6.05 Robusta coffee accounts for most of the recent planting and production in Southern Thailand. Arabica coffee will be produced under the project: with larger supplies of good quality coffee, local industry plans to market a new milder low-roast coffee. The services of the coffee consultant in the project would be essential to improve the cultural and processing practices in coffee production.

6.06 Project output of Arabica coffee should be absorbed at satisfactory prices by the local or export markets. Following Bank projections of world prices, a financial farm-gate price of B 42/kg (US\$0.21/kg) in 1979, falling to about B 37/kg (US\$0.185/kg) in 1990 has been assumed (in constant 1979 values).

6.07 Maize. At full project development, annual incremental maize production is estimated at about 7,100 tons. Highest production would be in the uplands, with expected yields increasing from 600 kg/ha in the base year to 1,300 kg/ha in the third year of development for each farm. Most of the incremental production would be consumed on-farm. The surplus would be sold to local merchants for local or export markets. Real farm-gate prices for maize are projected to increase slightly in the project area but higher transport costs will keep them lower than the national average.

6.08 Mungbeans, Soybeans and Peanuts. At full development the project would produce annually an additional 4,800 tons of soybeans or mungbeans in the uplands and some 500 tons in the highlands. In the uplands, an average yield of about 900 kg/ha is expected, starting in the first year of development for each farm. Most of the incremental production would enter established local and export market channels. A portion of marketed soybeans may be absorbed by the existing processing plant in Chiang Rai Province which utilizes soybean oil to produce filled milk for local sale. This plant may expand to utilize 6-8 tons of beans/day and a second processing plant in Chiang Mai Province is planned. Real prices for soybeans and mungbeans are expected to increase.

6.09 Some 6,000 tons of peanuts would be produced annually at full project development in the uplands, with an expected yield of about 800 kg/ha beginning in the first year of development for each farm. This incremental output would be mostly available for off-farm sale and consumed domestically. There is, however, some export of shelled nuts and edible oil to neighboring countries.

6.10 Forestry Products. By the end of project implementation (year 5), incremental forestry production will still be small: about 32,500 cu m of fuelwood; and 6,100 cu m of sawlogs from improved fire protection. By year 10 expected annual incremental production would be 112,000 cu m of fuelwood, 7,100 cu m of construction poles, and 6,100 cu m of sawlogs. Pine plantations would be established and, by the end of the 20-year project period, standing timber would constitute an important forestry benefit. Commercial production is not expected during the project life.

6.11 Rapid depletion of forest resources is leading to shortages and steady increases in real prices of most timber products. The increased production of fuelwood would be used by project families in cooking and heating, substituting partially for supplies obtained illegally from forest reserve areas. There would be a ready market in the area for any excess supply as fuelwood for the tobacco-drying kilns and brick-making operations, and as sawn timber.

6.12 In nominal terms, prices of fuelwood have been rising at 12-15% p.a. in the region. Given the increasing scarcities of fuelwood, real price increases of 6% p.a. are projected during the life of the project. Following Bank projections for prices of sawn timber moving in world trade, sawlog prices are assumed to increase at 3% p.a. during this period (albeit from lower levels than projected prices of sawn timber from Malaysian dark red Meranti). The price of construction poles is assumed to move roughly in parallel to price increases for sawlogs.

6.13 Poppies. An estimated 20% of the 6,500 project families living in the highland sites produce poppies on swidden plots averaging 0.55 ha in size. With an opium yield of 7 kg/ha, about 5 tons are produced annually, most of which enters the international market. Although net returns/ha/annum from poppies are greater than practically any other crop, net returns/man-day from other crops, e.g., coffee, exceed returns per man-day from poppies. Return/ man-day appears to be an important consideration for hill tribe farmers in choosing cropping systems. Improved agricultural supporting services and transportation facilities under the project will help influence farmers to reduce poppy production by making alternative crops more attractive. Experience in the highlands has shown that the introduction of stable agriculture involving alternative crops such as coffee significantly decreases poppy production. Project education and health services would also help reduce poppy production.

6.14 Farm-Produced Home Consumption. Estimates of the volume of on-farm consumption are speculative and no reliable consumption data exist. It is likely that basic needs for families of project beneficiaries who consume much of the ongoing production, including livestock products, fruits and vegetables, are not fully met at present. The incremental project output of food staples will be used by project families and, in cases where their supplies are presently inadequate, will reduce their need to purchase food. The farm budget analysis assumes beneficiary families would consume farm-produced products at the following average annual per capita levels: rice (paddy) 250 kg; maize 15 kg; mungbeans/soybeans 12 kg; peanuts 5 kg; vegetables (uplands) 20 kg and mixed crops (largely vegetables in the highlands) 15 kg.

B. Production Inputs

6.15 With the project the use of purchased inputs would increase rapidly, albeit from a small base. Seed of project area crops would be provided from foundation seed multiplied by the Department of Agricultural Technology (DOAT), DOAE and LDD. Production from LDD sources would be expanded by the project. In highland areas, village center teams of HTWD would ensure that farmers had an adequate supply of improved maize and soybean seeds from DOAT and DOAE. Private dealers sell imported and selected seeds from local production for a wide range of crops and operate widely throughout the project area.

6.16 Coffee seeds would be obtained from DOAT and seedlings would be produced by HTWD in small nurseries throughout the highland project area. The project would, through the services of the coffee consultant, improve nursery techniques and the general quality of coffee seedlings.

6.17 Fertilizers and other agricultural chemicals are available in much of the project area, the most important source being merchants in provincial centers, many of whom distribute through village agents. The marketing system for these inputs is less well-developed in highland areas and would be strengthened both by the provision of tracks, inducing local merchants to extend their operations, and the intervention of HTWD to ensure that farmers obtain adequate supplies of these inputs.

6.18 The major tractor and farm machinery manufacturers, represented in the project area, are experiencing strong sales growth. The use of contract services in land development and preparation is well developed in upland areas and would be further stimulated by the project. Private sector contracting capacity for these services can be expanded rapidly, as additional credit is made available for this purpose through BAAC and the commercial banks (para. 4.56).

VII. BENEFITS, JUSTIFICATION AND RISK

A. Benefits

7.01 The main focus of the project, and its primary economic benefit, would be the increase in incomes of some 21,500 poor families in the Northern Region, with indirect benefits for others, through incremental production of agriculture and forestry products. This increase would help improve the distribution of benefits across regions and socioeconomic groups. A second major effect of the project would be the conservation and effective management of natural resources. The project would also improve the quality of life for highland families through the provision of health and education facilities. Important secondary benefits would include the strengthening of rural development institutions, a greater decentralization of development management, a higher rate of project preparation, and the testing of technology packages designed to raise the productivity of poor farmers in rainfed areas.

Table 7.1: FAMILY INCOME BY FARM TYPE
(US\$)

Farm type	Present /a	Future /b		Incremental /c	
		With project	Without project	Family	Per cap./d
<u>Upland Farm</u>					
Gross value of production	179	628	196	433	
Net farm cash flow /e	240	413	209	204	32
Net farm benefit /f	154	414	166	248	39
Off-farm income	265	265	265	0	0
<u>Total family income /g</u>	<u>419</u>	<u>679</u>	<u>431</u>	<u>248</u>	<u>39</u>
<u>Highland Rice Farm</u>					
Gross value of production	192	581	218	362	
Net farm cash flow	222	450	206	243	41
Net farm benefit	172	474	196	278	47
Off-farm income	218	210	218	- 9	-1
<u>Total family income</u>	<u>391</u>	<u>684</u>	<u>414</u>	<u>269</u>	<u>45</u>
<u>Highland Rice/Maize Farm</u>					
Gross value of production	344	662	360	301	
Net farm cash flow	296	447	271	176	29
Net farm benefit	318	548	334	214	36
Off-farm income	153	140	153	- 12	-2
<u>Total family income</u>	<u>471</u>	<u>688</u>	<u>487</u>	<u>201</u>	<u>34</u>
<u>Highland Miang Tea Farm</u>					
Gross value of production	437	622	437	185	
Net farm cash flow	520	647	520	127	21
Net farm benefit	413	540	413	127	21
Off-farm income	107	108	108	0	0
<u>Total family income</u>	<u>520</u>	<u>648</u>	<u>520</u>	<u>128</u>	<u>21</u>

/a Assumed to be Thai fiscal year 1979.

/b At full development, i.e. Thai fiscal year 1989.

/c Compares future "with" and future "without".

/d Assuming 6.3 members/family in the uplands and 6 members/family in the highlands.

/e Defined to exclude the value of home consumption, debt service and cash expenses, but to include off-farm income.

/f Includes the value of home consumption but excludes off-farm income.

/g Defined as net farm benefit plus the value of off-farm income.

7.02 Agriculture. As noted in the previous section, at full project development annual incremental production would be about 42,600 tons of grains and grain legumes, some of which would be consumed by project beneficiaries thereby raising their nutrition standard to an adequate level. Off-farm sales of coffee and surplus grains would further integrate beneficiary families into the monetary economy. Annual incremental production of about 135,000 cu m of forestry products would provide fuel and building materials to local populations thereby aiding both conservation efforts in public forest reserves and longer-term agricultural and timber production in the area.

7.03 Project beneficiaries are among the absolute poor, with an average net family income per year (including off-farm income and the value of farm-produced home consumption) of US\$390-520, or less than the absolute poverty level of approximately US\$595 (Table 7.1). The project would increase family income to average levels of US\$650-690, and at full development, some 15,000 families would be participating in the upland agricultural component and 6,500 families in the highland agricultural and social component (3,900 on rice farms and 1,300 families each on rice/ maize farms and Miang tea farms).

7.04 Forestry. In the upland areas, about 15,000 participating families obtain their timber products (fuel and construction materials) from nearby foothills and remnants of forests surrounding their farms. As a result of the project, much of this land now producing forest products would be cleared for intensified agriculture. In these upland areas, the project would contribute to alternative supplies of timber products by establishing 4,050 ha of village woodlots to be managed by village woodlot associations. Each woodlot is expected to provide up to 80% of local requirements of fuel and construction poles.

7.05 In the highland areas, the project would constitute a major effort to protect watersheds now increasingly subject to degradation by destructive forestry and agricultural practices. It would establish 3,100 ha of woodlots to meet 30% of the forest product requirements of the 6,500 participating families. It would also establish 4,600 ha of mixed plantations for watershed protection and wood production and, through the construction of firelines and access tracks, protect 138,000 ha of natural forest against fire and uncontrolled shifting cultivation. The additional benefit of increased fire protection in highland natural forest would reduce both the economic loss of damage to commercial timber and the loss of soil nutrients from fire, thereby enhancing growth and productivity of the natural forest. (See Working Paper C8 for details.)

7.06 Social Infrastructure. The education facilities to be introduced under the project would provide benefits to both children and adults of the 6,500 participating families in the highland areas. Children would be provided with a basic education and would have an opportunity to continue their education in provincial schools. Adult education would concentrate on functional literacy and rudimentary arithmetic skills.

7.07 The 6,500 participating families in the highland areas would also benefit from the project health facilities. The health posts to be constructed in 32 key villages would provide services for nearby families, and health workers would visit surrounding villages on a regular basis. Treatment would be provided for simple maladies, while more serious cases would be referred to provincial health posts or hospitals for treatment. Families also would be given instruction in prevention of disease, nutrition, and family planning.

7.08 Employment. The project area is characterized by much higher supplies of labor than is required on the relatively small farms. However, an active labor market provides opportunities for considerable off-farm work in handicrafts, cottage industries, logging, road construction/ maintenance, and on larger farms in nearby lowlands. At full development (year 10), labor requirements in upland agriculture would more than double to about 6.1 million man-days/year. Annual man-day requirements for upland forestry activities might total another 81,000 (say 20 man-days for each of 4,050 ha of woodlots). Total supplies of labor among upland beneficiaries probably exceed 10 million man-days. Thus, while a major effect of the project would be to substantially reduce underemployment in upland agriculture, labor supplies would permit continued substantial off-farm employment. A small increase in hired agricultural employment (about 40,000 man-days/year at full development) is also projected in upland agriculture.

7.09 In highland areas, where neither the reservoir of unskilled rural labor nor labor demand is as large, the project would result in a slight decline in agricultural labor requirements. More intensive agriculture and greater labor requirements in some crop production activities would be more than offset by reduced labor needs from declining production in Miang tea and shifting agriculture areas. Hired labor requirements would decline, again reflecting the decline in labor-intensive Miang tea production. On the other hand, labor requirements of highland forestry would increase by some 400,000 man-days/year (50,000 man-days/year for each of the eight catchment areas).

B. Environmental Impact

7.10 A major justification for the project is to slow degradation of the country's soil, water and forest resources, largely resulting from growing population pressures. At a rough estimate, some 30,000 ha of forest lands are destroyed annually to make way for shifting cultivation which now covers an excess of 2 million ha. Although shifting cultivation under carefully-managed conditions permits sustained agriculture over long periods of time, growing population pressures are reducing fallow periods and destroying the ecological balance which has been established by some hill tribes, and crop yields have begun to decline. This decline is assumed to continue without the project.

7.11 The project would have a positive impact on the environment in both upland and highland areas. In upland areas, soil conservation banks

would be built on 30,000 ha. The growing of fuelwood supplies in upland woodlots would reduce destructive scavenging on bush land and incursions into forest reserves.

7.12 In highland areas the project would encourage effective soil conservation works by assisting cultivators in the construction of small diversion weirs and distribution systems for 800 ha of irrigation development in the valley floors. Families now practicing shifting cultivation would be allocated land suitable for annual rainfed cultivation and would construct simple terraces (1,300 ha) on this allotment. Highland agricultural development is expected to reduce the area used for shifting cultivation by about 26,000 ha. The introduction of stable agriculture, together with requisite supporting services, is also expected to reduce production of opium poppies. Hill tribe leaders increasingly recognize the detrimental effects of opium on their communities, and poppy cultivation exhausts the soil.

7.13 Finally, highland forestry development would protect some 138,000 ha of watershed from burning and destructive cutting. The planting of fuelwood and timber plantations would, as in the uplands, reduce pressure for destructive cutting of forest reserves and bush areas.

C. Role of Women

7.14 Women play important roles in the food and cash crop production and processing systems in both upland and highland areas. Whereas off-farm employment is typically the domain of male family members, the women of the household frequently have dominant roles in farm activities. In its training and extension activities, the project would endeavor to channel assistance to women as well as men. LDD and HTWD have women on their advisory service staffs. Efforts would be made to ensure that female staff participate in project implementation and to ensure that the women among beneficiary families are provided with the opportunity to participate in, and benefit from, project activities, especially health and education services.

D. Economic Returns

7.15 The net present value (NPV) of the project, with benefits and costs discounted at the opportunity cost of capital of 10%, is US\$5.7 million. (Economic returns are based on upland and highland development.) Of this total, about US\$2.6 million originates in the upland agriculture component while US\$0.9 million is contributed by the highland agricultural and social component and US\$2.2 million derives from forestry. (See Annex 1 for additional details.)

7.16 The best estimate of the projected economic rate of return is about 13%. Returns to project components are: upland agriculture 14%; highland agriculture and social 12%, and upland and highland forestry 13%. (The conversion factors and shadow prices utilized in determining these rates of return are explained in Annex 1.) Project returns are moderately sensitive to changes in the level of the underlying benefit and cost streams. For the total project a decline in benefits of 21%, or a cost increase of 27%, would push the NPV to

zero or, equivalently, the economic rate of return to 10%. Project returns are also moderately sensitive to assumptions regarding yields or economic prices for rice. A 20% decline in rice yields or prices would lower the project's economic rate of return to about 10% and generate a negative NPV while a 20% increase in benefits from rice would result in an overall rate of return of nearly 17% and a NPV for the project of US\$11.9 million (Annex 1, Table 9). In the highland agricultural and social component, variations in benefits from coffee also imply moderate changes in this component's NPV, with an economic rate of return of about 8% indicated with a 20% fall in coffee prices.

E. Risks

7.17 As a first project of this type on the scale proposed in an area where neither the Bank nor the Thai Government has supported a large systematic development effort before, this project has risks of both an institutional and a technical/economic character. Project design has attempted to minimize these risks, although it is recognized that some remain which are inherent in a project of this type.

7.18 Allocation of land for stable agriculture in the highland sites is necessary for the implementation of that component of the project, and the issuance of land-use permits to highland families is important to ensure the protection of their rights over time. Assurances were obtained at negotiations that these actions would be taken promptly once the surveys and registration activities were completed (para. 4.24), but it should be recognized that such adjustments in land use pose important institutional difficulties in Thailand. The cooperation of RFD would be needed for the execution of these assurances. A substantial expansion of LDD's capability in land development would be required for successful implementation of the upland agricultural component, and consultants would be provided under the project (para. 5.09) to support this endeavor.

7.19 The technical risks relate essentially to the agricultural technology which the project would utilize. These risks are perhaps greatest in the case of coffee, a crop which grows well and the assumed project yields of which have been exceeded in small plots, but which is relatively new to the area. Production and processing risks are expected to be held to acceptable levels through the work of the coffee consultant provided under the project. Economic returns of the highland component are sensitive to variations in coffee prices, which are essentially beyond the control of the project. In both upland and highland areas the successful transition from shifting to stable agriculture will require substantial effort by the implementing agencies: farmers are uncertain about this transition and it will be difficult to persuade them to alter their traditional agricultural practices and way of life.

7.20 In the forestry component, risks are probably more institutional than technical. The extent of upland woodlot development will depend to a considerable degree on the success of LDD in assisting farmers in establishing the village woodlot associations. The technologies to be employed in project reforestation and plantation establishment are well known in Thailand,

although the controlled utilization of forest resources, as envisaged in the project, differs from the existing practice of many families in the area who view these resources as a free public good.

F. Cost Recovery

7.21 The project would not attempt to recover the relatively small on-farm investment costs from beneficiaries for two basic reasons: (a) beneficiary incomes even at full development will be at levels only moderately in excess of absolute poverty levels; and (b) a modest public subsidy is considered necessary to induce farmers to shift from swidden to stable agriculture and to introduce soil conservation works and practices, benefits of which have not been demonstrated over a wide area in the region. Furthermore, these soil conservation activities produce benefits in the form of a moderated water runoff pattern and reduced siltation of rivers, which accrue to the economy as a whole rather than to the direct beneficiaries. Project expenditures for farm production inputs will be recovered in cash or kind through existing mechanisms.

7.22 On-farm investment costs (including family labor valued at the market wage rate) are small. In the uplands, investment costs of land development, including soil conservation works on an average 2 ha plot, would be approximately US\$595, of which about US\$55 would be the value of the farmers' labor contribution at market wages. In highland areas, investment costs per farmer, involving the establishment of 0.15 ha of irrigated land, 0.25 ha of rainfed annual crop terraces and 0.20 ha of coffee on terraces, would be approximately US\$680, of which the farmers' contribution in the form of labor would be about US\$555.

VIII. AGREEMENTS REACHED AND RECOMMENDATION

8.01 During negotiations agreements were reached on the following:

- (a) LDD would ensure that upland conservation works and access tracks were properly maintained (paras. 4.11 and 4.13);
- (b) LDD would provide technical assistance on conservation farming practices to farmers in coordination with DOAE. For each farmer, LDD would provide the technical assistance for a period of three years, during which time it would train DOAE extension agents in conservation farming practices. At the end of the three-year period, DOAE would assume responsibility for providing regular extension services to the farmer (para. 4.15);
- (c) in the highland sites, land designated as suitable for stable agriculture by LDD would be allocated to that purpose promptly after submission of LDD's report (para. 4.24);

- (d) RFD would issue land-use permits to residents of the highland sites promptly on receipt of the registration information from HTWD (para. 4.24);
- (e) HTWD would ensure that highland irrigation schemes, bench terraces, and access tracks were properly maintained (paras. 4.24 and 4.32);
- (f) HTWD would transfer responsibility for providing agricultural, education, and health services in the highland areas to the relevant line agencies when the latter were prepared to provide such services (para. 4.34);
- (g) WMD would use local highland labor to the maximum extent possible in implementing the highland forestry component (para. 4.37);
- (h) WMD would collaborate with HTWD in the selection of areas for village woodlots and for forest rehabilitation in highland sites (para. 4.37);
- (i) WMD would assist highland villagers to form village woodlot associations which eventually would assume responsibility for management of the woodlots under the guidance of WMD (para. 4.38);
- (j) WMD would ensure that access tracks were properly maintained (para. 4.40);
- (k) the implementing agencies would monitor and evaluate the project, and NESDB would, by September 30, 1979, retain consultants for design of the monitoring and evaluation system whose qualifications and experience, terms of reference, and conditions of employment were agreed upon with IDA; NESDB would also, by January 31, 1980, provide to IDA for review a report on the proposed system (para. 4.43).
- (l) BAAC would provide sufficient short-term production credit in a timely manner to meet the requirements of project beneficiaries in the upland agricultural component, on the basis of confirmation by LDD that the borrowers and the items to be financed were appropriate to the project (para. 4.56);
- (m) BAAC would provide sufficient medium-term credit for tractors and reversible plows to ensure the availability of adequate tractor services for project beneficiaries in the upland agricultural component, on the basis of confirmation by LDD that the borrower and the items to be financed were appropriate to the project (para. 4.56);
- (n) the implementing agencies would follow agreed procurement procedures (paras. 4.57 to 4.61);
- (o) a project committee satisfactory to IDA would be established by September 1, 1979 (para. 5.01);
- (p) LDD, HTWD, and RFD would consult with IDA concerning appointments to the position of manager of their respective project units (paras. 5.04, 5.13, and 5.21);

- (q) LDD, HTWD, and RFD would expand their staffs according to agreed schedules (paras. 5.04, 5.13, and 5.21);
- (r) LDD, HTWD, and RFD would prepare annual work programs for the implementation of their respective components and would send a copy to IDA for comment three months prior to the start of the fiscal year (paras. 5.04, 5.13, and 5.21);
- (s) the consultants to be retained by LDD, HTWD, WMD, OUSMI, NESDB, and OUSMA, their terms of reference, and their conditions of employment would be agreed upon with IDA (paras. 5.09, 5.18, 5.22, and 5.23);
- (t) all proposals for utilization of funds under the provincial planning, project preparation, and pilot operations components would be subject to the agreement of IDA (para. 5.23); and
- (u) the implementing agencies would maintain separate accounts for the project and submit audited statements to IDA (para. 5.24).

8.02 Subject to the above assurances, the project is suitable for an IDA credit of US\$25 million.

THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Economic Analysis

Methodology

1. The economic analysis was carried out in terms of efficiency prices, with uncommitted public income measured in border prices as the common unit of account. Distortions between internal and external price levels in Thailand are generally small, but due to import taxes and other trade restrictions, the official exchange rate understates the value of foreign exchange saved, earned or spent in project implementation. Conversion factors were employed to reduce domestic currency values for nontraded project inputs and outputs and to correct for distortions in relative prices. The value of traded goods was converted to local currency at the official exchange rate of B 20 = US\$1.00, then adjusted by the appropriate conversion factor(s) to obtain the farm-gate equivalents in terms of border prices.

2. Conversion Factors. The standard conversion factor (SCF) of 0.92 (implying a shadow exchange rate of B 21.9 = US\$1.00) uses a formulation that excludes excise and business taxes on inputs and outputs. Three specific conversion factors were used to arrive at economic efficiency values expressed in local currency at border prices: (a) for fertilizers, insecticides, and agricultural machinery services, 0.90; (b) for construction and transportation services, 0.74; and (c) for trade margins, agro-industrial processing and government services, 0.70. The factor to convert labor's opportunity cost to border prices was assumed to be 1.0, though production foregone by labor includes products that have conversion factors greater than 1.0 (rice, maize, mungbeans), approximately equal to 1 (soybeans, coffee) and less than 1 (non-traded products such as fuelwood, Miang tea, mixed vegetables, construction poles). The result is an opportunity cost of labor at domestic market prices that equals its cost at border prices.

3. Opportunity Cost of Capital. The opportunity cost of capital measured in real terms is estimated at 10%. All taxes and price contingencies are excluded in the economic valuation of project output and input, but physical contingencies are included in the project's economic costs. Project costs for education are excluded since this activity is not required to realize measurable project benefits during project life. All health costs are included in the rate of return analysis.

Valuation of Project Output

4. Future financial prices of internationally traded project output are expressed in constant 1979 prices (based on Bank projections), and for products not internationally traded, recently quoted farm-gate prices were adjusted to early 1979 levels. Economic farm-gate prices for traded products are derived from Bank price projections for similar products, adjusted for quality differences, location, and the specific conversion factors needed to

obtain the farm-gate equivalent in terms of border prices (Tables 1-3). Economic prices for nontraded goods are estimated farm-gate prices in financial terms, adjusted by the SCF of 0.92. It is assumed that Thailand will continue to be a net exporter of rice, coffee, maize, mungbeans, soybeans, tobacco leaves and peanuts, for which economic valuation was made in terms of export parity prices. It is also assumed that it will continue to be a net importer of (non-teak) sawn timber, for which import parity served as the basis for calculating economic value.

Valuation of Project Inputs

5. Unskilled Rural Labor. The rural labor market in Thailand apparently operates with considerable efficiency and the market wage rate for unskilled labor is roughly equivalent to labor's opportunity cost. Excess supplies of family labor in the upland component are reduced with project activities or utilized in off-farm employment, and family labor shortages occur in some months of the year. No shadow pricing of unskilled labor is assumed in the upland component and average market wage rates per man-day range from B 15-28. However, rates in the highland areas are lower at B 15-20/man-day due to greater slack in the labor market. Because available labor is utilized less fully and labor demand will not increase as a result of the project, the economic cost of unskilled farm labor in the highlands is assumed to be 75% of the market wage, or B 11-15/day. In the forestry component, no shadow pricing of unskilled labor is assumed. The market wage of B 25/day for forestry and construction activities includes costs of housing which would not be provided to farm labor.

6. Other project inputs include planting materials, agricultural chemicals, land development activities, ploughing services and various government support services (Table 4). In calculating the economic value of land development activities, access tracks and ploughing services, the foreign exchange component was estimated at 41% of total financial costs and was converted to baht at the official exchange rate. The remaining 59% of domestic costs was adjusted to economic value in border prices using the estimated conversion factor for government services (0.70).

Results

7. The economic analysis included calculation of net present values (NPVs) and economic rates of return to the aggregate of the production components and to these components individually. It also included estimation of "switching values" for major cost and benefit streams, i.e. the percentage change in a variable which would result in the net present value approaching zero or, equivalently, which would generate an economic return no greater than the opportunity cost of capital (see Table 5-9 and Figure 1).

8. The project (aggregate of production components) generates an NPV of B 114.0 million when cost and benefit streams are discounted at 10% (para. 3). The NPV of the upland agricultural component is B 51.9 million, that of the highland agricultural component, B 18.2 million, and of the forestry components, B 43.7 million. The best estimate of the project rate of return

is 13.2% (upland agriculture 13.7%; highland agriculture and social 12.0%; and forestry 13.3%). Switching values for total project cost and benefits indicate that benefits could fall by 21% or costs rise by 27% before the NPV declines to zero, but a smaller joint change would drive the NPV down sharply. Focusing on changes in NPV, a 20% increase in total project costs would reduce the NPV from B 114.0 million to B 26.6 million (Table 9). A delay of one year in realizing benefits from the upland component would reduce project NPV to B 77.5 million and the rate of return to 12.3%. Project returns are moderately sensitive to assumptions regarding the yield or economic price of rice. A 20% decline in rice yields or prices would decrease the rate of return to 9.7% and generate a negative NPV while a 20% increase in yields or prices would result in a rate of return of 16.6% and an NPV for the project of B 238 million (Table 9).

9. For upland agriculture (Table 6), a 20% increase in costs would reduce the rate of return by 20% (from 13.7% to 10.9%) but the NPV by 75% (B 51.9 million to B 13.1 million). In the highland agricultural component, variations in benefits from coffee also imply moderate changes in the component NPV, with an economic rate of return of 7.6% indicated with a 20% fall in coffee prices. In general, a given decline in benefits has a greater effect on NPV than a similar increase in costs. For the forestry component (Table 8), a 20% decline in benefits would reduce the component's NPV by 80%, but the rate of return by only 20%. In highland forestry, the base case included indirect additional benefits from improved fire protection and the provision of access tracks; without these additional benefits, the NPV falls to B 2.0 million and the rate of return to just over 10%.

THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Price Structure of Rice (Paddy) /a
(per ton)

	1 9 7 9			1 9 9 0		
	Financial	Conversion factor	Economic	Financial	Conversion factor	Economic
f.o.b. Bangkok						
US\$ /b	295		295	374		374
Baht	5,900		5,900	7,480		7,480
Rice premium /c	700		-	887		-
Export duty /d	250		-	317		-
Municipal tax /e	10		-	10		-
Exporter's margin /f	449	0.70	314	570	0.70	399
Ex-mill price rice	4,491		5,586	5,696		7,081
Ex-mill price of paddy /g	3,296		4,100	4,181		5,197
Milling tax /h	165		-	209		-
Miller's margin /i	247	0.70	173	314	0.70	220
Price of paddy at mill,						
Bangkok	2,884		3,927	3,658		4,977
Merchant's margin	884	0.70	619	1,121	0.70	785
Farm-gate price of paddy	2,000		3,308	2,537		4,192

/a Based on the Bank's commodity price projections of June 1978, adjusted to early 1979 levels.

/b Weighted average price of exported rice is assumed to be 85% of the price of 5% broken (US\$347 in 1971).

/c Rice premium is assumed to vary proportionately with changes in rice price. The premium has been increased in 1978.

/d Estimate based on adjustments in 1978.

/e Baht 10/ton.

/f Approximately 10% of ex-mill price of rice.

/g Milling rates of 66% plus value of bran and milling tax. It is assumed that the same ratio of rice:paddy (0.734) exists in financial and economic prices.

/h Five percent of the ex-mill price of paddy.

/i Includes transport, handling costs, profit at appraisal (mid-1978), inflated by 7.0%/year to early 1979.

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NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Price Structure of Coffee
(per ton)

	1 9 7 9			1 9 9 0		
	Financial	Conversion factor	Economic	Financial	Conversion factor	Economic
c.i.f. New York, Guatemalan prime, washed, spot						
US\$/ton	2,844		2,844	2,535		2,535
Freight & insurance						
Bangkok-New York (US\$)	60		60	60		60
f.o.b., Bangkok						
US\$	2,784		2,784	2,475		2,475
Baht	55,680		55,680	49,500		49,500
Less 10% quality discount	50,112		50,112	44,550		44,550
Exporter's margin <u>/a</u>	4,176	0.70	2,923	3,341	0.70	2,339
Processing charges	1,500	0.70	1,050	1,500	0.70	1,050
Merchant's margin	2,436	0.70	1,705	2,309	0.70	1,616
Farm-gate price <u>/b</u>	42,000		44,434	37,400		39,545

/a Approximately 7.15% of f.o.b. value.

/b According to the Ministry of Agriculture and Cooperatives, the national average farm-gate price for coffee in 1977 was B 71,540/ton. By mid-1978, this had fallen to B 55,000/ton. In line with projected declines in the international price, a farm-gate price of B 42,000 is assumed for early 1979.

THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Price Structure of Sawlogs and Construction Poles from Broadleaf Plantations

	<u>1 9 7 9</u>			<u>1 9 9 0</u>		
	Financial	Conversion factor	Economic	Financial	Conversion factor	Economic
c.i.f. Bangkok, sawn timber						
US\$/cu m	107/a		107	148/e		148
B/cu m	2,145		2,145	2,960		2,960
Importer's margin	500	0.70	350	690	0.70	483
Transport, Bangkok to sawmill	500	0.74	370	690	0.74	511
Ex-sawmill price of sawn timber, North Thailand	3,145/b		2,865	4,340		3,954
Ex-sawmill equivalent value of sawlogs	1,415/c		1,289	1,953		1,779
Sawmilling margin per cu m of sawlogs	665/d	0.70	466	918	0.70	643
Value of logs at sawmill	750		823	1,035		1,136
Transportation, roadside to sawmill	100	0.74	74	138	0.74	102
Costs of logging, transportation to roadside	590	0.74	436	814	0.74	602
Government royalty (financial cost)	60			83/f		
Financial or economic prices for sawlogs	60		313	83		432
Financial or economic prices for construction poles	40		210	80		290

/a Based on observed prices of sawn timber in Bangkok, mid-1978, inflated at 10% p.a. This price refers to ordinary grade lumber which trades at a price about two-thirds that of Dark Red Maranti.

/b Corresponds closely to observed prices in North Thailand in mid-1978, adjusted for 10% p.a. inflation.

/c Assumes 45% recovery of sawn timber from round logs.

/d Includes milling costs and profit (B 300/cu m of round logs).

/e Following Bank projections for sawn timber prices, assumed to increase at 3% p.a. in 1979-90.

/f Assumed to increase at 3% p.a., 1979-90.

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NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Summary of Economic and Financial Prices of Project Inputs

	1 9 7 9			1 9 9 0		
	Financial	Conversion factor	Economic	Financial	Conversion factor	Economic
<u>Rural Unskilled Labor (B/day)</u>						
Upland areas	22	1.00	22	22	1.00	22
Highland areas	18	0.75	14	18	0.75	14
<u>Seeds (B/ton)</u>						
Paddy /a	2,200	1.65	3,630	2,791	1.65	4,605
Maize /a	1,650	1.21	1,996	1,882	1.21	2,277
Peanuts /a	5,500	1.17	6,435	6,401	1.17	7,489
Mungbeans /a	6,050	1.22	7,381	7,489	1.22	9,137
Soybeans /a	4,510	1.09	4,916	5,583	1.09	6,085
<u>Other Planting Materials</u>						
Coffee seedlings	1.15/pc	0.92	1.06/pc	1.15/pc	0.92	1.06/pc
Pine seedlings	0.5/pc	0.92	0.5/pc	0.5/pc	0.92	0.5/pc
Fuelwood seedlings	0.5/pc	0.92	0.5/pc	0.5/pc	0.92	0.5/pc
<u>Fertilizers (B/ton)</u>						
15-15-15	4,500	0.90	4,050	6,600	0.90	5,940
Ammonium sulfate	3,200	0.90	2,880	4,700	0.90	4,230
<u>Equipment & Services</u>						
Handtools (B/farm)	100	0.90	90	100	0.90	90
Tractor services (B/ha)	960	0.90	864	1,200	0.90	1,080

/a Conversion factors for these seeds are the ratios of economic to financial prices.

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NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Summary of Rate of Return Analysis

Component	Net Present Value @ 10% (B million)	Economic Rate of Return (%)	Switching Values /a	
			Benefits ----- (%)	Costs -----
Total Project	114.0	13.2	-21	+27
Upland Agriculture and Social Development	51.9	13.7	-22	+28
Highland Agriculture and Social Development	18.2	12.0	-10	+11
Forestry				
Upland	15.4	14.9	-35	+54
Highland	28.3	12.8	-21	+27
Total Forestry	43.7	13.3	-25	+33

/a Defined as the percentage change in benefits or costs which would result in a net present value which approaches zero or, equivalently, which would generate a project (or component) economic rate of return equal to the opportunity cost of capital.

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NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Incremental Costs and Benefits

Upland Agriculture

No.	Year Thai Fiscal	Incremental	Incremental	Net incremental
		costs /a	benefits /b	benefits
		----- (Baht million) -----		
1	1980	42.2	0.7	-41.5
2	1981	38.3	2.2	-36.1
3	1982	52.1	3.6	-48.5
4	1983	49.5	12.8	-36.7
5	1984	47.8	23.9	-23.9
6	1985	12.7	32.4	45.2
7	1986	4.0	34.6	30.6
8	1987	2.4	37.5	35.1
9	1988	0.5	39.3	38.8
10	1989	0.5	40.9	40.3
11	1990	0.5	41.4	40.9
12	1991	0.5	41.9	41.4
13	1992	0.5	42.5	41.9
14	1993	0.5	43.0	42.5
15	1994	0.5	43.6	43.0
16	1995	0.5	44.1	43.6
17	1996	0.5	44.6	44.1
18	1997	0.5	45.2	44.6
19	1998	0.5	45.7	45.2
20	1999	0.5	46.3	45.7

/a Includes costs of land development, access tracks, ploughing services, and agricultural support services.

/b Net of all on-farm economic costs.

<u>Sensitivity Analysis</u>	<u>Economic Rate of Return (%)</u>	<u>Net Present Value at 10% (million Baht)</u>
Base case	13.7	51.9
Costs up 20%	10.9	13.1
Benefits down 20%	10.3	3.7
Benefits delayed 1 year	11.6	21.2
Soybean prices or quantities down 20%	8.2	-0.1
Rice prices or quantities down 20%	5.3	-0.03
up 20%	20.8	163.0
Switching value for upland agricultural benefits:		-22%
Switching value for upland agricultural costs:		+28%

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NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Incremental Costs and Benefits

Highland Agriculture and Social Development

No.	Year Thai Fiscal	Incremental costs /a -----	Incremental benefits /b (Baht million)	Net incremental benefits -----
1	1980	34.0	2.0	-32.0
2	1981	21.5	2.2	-19.3
3	1982	20.6	0.5	-20.2
4	1983	14.2	0.3	-14.4
5	1984	13.7	4.3	-9.3
6	1985	19.8	12.4	-7.4
7	1986	16.8	24.9	8.1
8	1987	13.4	32.7	19.3
9	1988	13.4	37.7	24.2
10	1989	14.3	38.5	24.2
11	1990	15.6	39.4	23.8
12	1991	15.6	40.2	24.6
13	1992	15.6	41.0	25.5
14	1993	15.6	41.9	26.3
15	1994	15.6	42.7	27.2
16	1995	15.6	43.6	28.0
17	1996	15.6	44.4	28.9
18	1997	15.6	45.3	29.7
19	1998	15.6	46.2	30.6
20	1999	15.6	47.0	31.5

/a Includes only costs of access tracks, soil and water conservation and irrigation works, agricultural support services and health services.

/b Net of all on-farm economic costs.

<u>Sensitivity Analysis</u>	<u>Economic Rate of Return (%)</u>	<u>Net Present Value at 10% (million Baht)</u>
Base case	12.0	18.2
Coffee prices or quantities down 20%	7.6	-0.05
Coffee prices or quantities up 20%	15.6	55.6
Rice prices or quantities down 20%	10.6	5.0
Rice prices or quantities up 20%	13.5	31.4
Switching value for highland agricultural benefits:		-10%
Switching value for highland agricultural costs:		+11%

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NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Incremental Costs and Benefits

Forestry

No.	Year Thai Fiscal	Upland		Highland		Total Forestry		Net Incremental benefits
		Incremental costs	Incremental benefits	Incremental costs	Incremental benefits	Incremental costs	Incremental benefits	
----- (Baht million) -----								
1	1980	1.8	0	14.7	0	16.5	0	-16.5
2	1981	3.4	0	12.8	0	16.2	0	-16.2
3	1982	5.4	0	15.0	0	20.4	0	-20.4
4	1983	6.9	0.2	13.7	1.3	20.6	1.5	-19.1
5	1984	8.4	0.5	11.6	3.1	20.0	3.7	-16.3
6	1985	3.9	1.4	11.9	4.4	15.8	5.8	-10.0
7	1986	2.1	1.9	7.4	7.0	9.5	9.0	- 0.5
8	1987	1.1	2.9	8.1	8.7	9.2	11.6	2.4
9	1988	0.5	3.5	8.3	10.3	8.8	13.8	5.0
10	1989	0.6	4.2	8.3	11.4	8.9	15.6	6.7
11	1990	0.9	4.7	8.3	13.4	9.2	18.1	8.9
12	1991	1.2	6.4	8.5	14.0	9.7	20.4	10.7
13	1992	1.6	7.4	8.5	16.7	10.1	24.1	14.0
14	1993	1.6	8.2	8.4	15.5	10.1	23.7	13.6
15	1994	1.7	8.2	8.4	14.8	10.1	22.9	12.8
16	1995	1.7	11.1	13.5	20.5	15.2	31.5	16.3
17	1996	1.7	16.5	8.9	30.5	10.6	47.0	36.4
18	1997	1.7	22.7	8.6	30.6	10.3	53.4	43.1
19	1998	1.7	25.7	8.7	43.2	10.4	68.8	58.4
20	1999	1.7	64.6	8.7	359.1	10.4	423.8	413.4

<u>Sensitivity Analysis</u>	<u>Economic Rate of Return (%)</u>	<u>Net Present Value at 10% (million Baht)</u>
<u>Upland Forestry</u>		
Base case	14.9	15.4
Benefits down 20%	12.3	6.5
Costs up 20%	12.8	9.6
Benefits delayed 1 year	10.7	1.8
<u>Highland Forestry</u>		
Base case	12.8	28.3
Benefits down 20%	10.2	1.9
Costs up 20%	10.7	7.6
Benefits delayed 1 year	3.1	-37.1
No additional benefits from increased fire protection	10.2	2.0
<u>Total Forestry</u>		
Base case	13.3	43.7
Benefits down 20%	10.7	8.5
Costs up 20%	11.2	17.3
Benefits delayed 1 year	5.7	-35.3
Switching value for upland forestry benefits:	-35%	
Switching value for upland forestry costs:	+54%	
Switching value for highland forestry benefits:	-21%	
Switching value for highland forestry costs:	+27%	
Switching value for total forestry benefits:	-25%	
Switching value for total forestry costs:	+33%	

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NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Incremental Costs and Benefits

Total Project

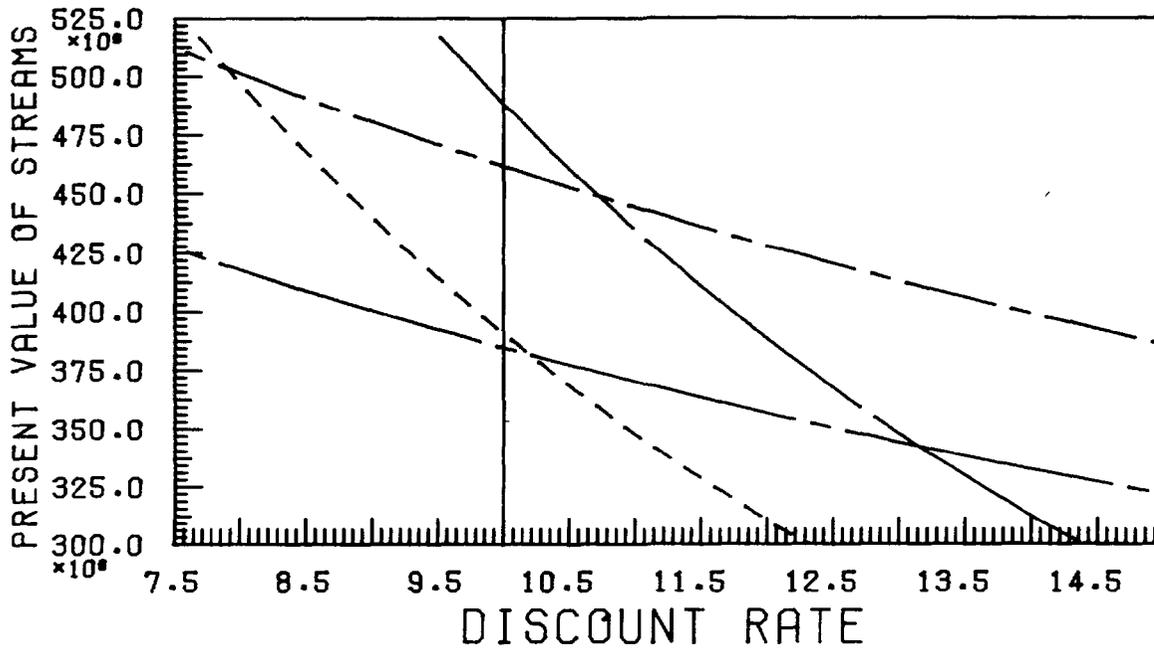
No.	Year		Incremental costs /a	Incremental benefits /a	Net incremental benefits
	Thai	Fiscal			
----- (Baht million) -----					
1	1980		92.7	2.7	-90.0
2	1981		76.0	4.4	-71.6
3	1982		93.1	4.1	-89.0
4	1983		84.3	14.1	-70.2
5	1984		61.5	11.9	-49.7
6	1985		7.0	34.8	27.8
7	1986		20.8	58.9	38.1
8	1987		15.9	72.6	56.8
9	1988		14.0	82.0	68.0
10	1989		14.9	86.1	71.2
11	1990		16.1	89.6	73.9
12	1991		16.1	92.8	76.7
13	1992		16.1	97.5	81.4
14	1993		16.1	98.6	82.5
15	1994		16.1	99.5	83.4
16	1995		16.1	103.9	87.8
17	1996		16.1	125.5	109.4
18	1997		16.1	133.5	117.4
19	1998		16.1	150.3	134.2
20	1999		16.1	506.6	490.5

/a Derived from corresponding costs in Tables 5, 6 and 7.

<u>Sensitivity Analysis</u>	<u>Economic Rate of Return (%)</u>	<u>Net Present Value at 10% (million Baht)</u>
Base case	13.2	114.0
Rice prices or quantities		
down 20%	9.7	-0.1
up 20%	16.6	238.0
Coffee prices or quantities		
down 20%	12.2	76.5
up 20%	14.1	151.0
Upland benefits delayed		
one year	12.3	77.5
Highland benefits delayed		
one year	12.4	81.5
Total benefits down 20%	10.2	5.9
Total costs up 20%	10.7	26.6
Switching value for total project costs:		+27%
Switching value for total project benefits:		-21%

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NORTHERN AGRICULTURAL DEVELOPMENT PROJECT
Present Values Versus Discount Rate



LEGEND

- = 10.00% - OPPORTUNITY COST OF CAPITAL
- = INCREMENTAL BENEFITS
- = INCREMENTAL COSTS
- = INCREMENTAL BENEFITS DOWN 20 %
- = INCREMENTAL COSTS UP 20%

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NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Farm Model Cropping Pattern, Yields and Production

Upland Farm

Crop	Base Year			Full Development /a		
	Area (ha)	Yield (kg/ha)	Production (kg)	Area (ha)	Yield (kg/ha)	Production (kg)
<u>Lowlands</u>						
Main crop						
Rice /b	0.32	2,500	800	0.32	2,500	800
Tobacco	0.04	2,500	100	0.04	2,500	100
Vegetables	0.04	8,000	320	0.04	8,000	320
Total	<u>0.40</u>			<u>0.40</u>		
Second crop						
Tobacco	0.01	2,500	25	0.01	2,500	25
Vegetables	0.01	8,000	80	0.01	8,000	80
Soybeans	0.01	800	8	0.01	800	8
Peanuts	0.01	900	9	0.01	900	9
Total	<u>0.04</u>			<u>0.04</u>		
<u>Uplands</u>						
Main crop						
Rice	0.40	800	320	0.90	1,800	1,620
Maize	0.05	600	30	0.36	1,300	468
Peanuts	0.05	400	20	0.36	800	288
Soybeans/mungbeans	-	-	-	0.18	900	162
Bush fallow	1.50	-	-	-	-	-
Bunds & tracks	-	-	-	0.20	-	-
Total	<u>2.00</u>			<u>2.00</u>		
Second crop						
Peanuts	-	-	-	0.22	600	132
Soybeans/mungbeans	-	-	-	0.22	700	154
Total				<u>0.44</u>		

/a In year four.

/b Irrigated.

1/16/79

THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Farm Model Cropping Pattern, Yields and Production

Highland Rice Farm

Crop	Base Year			Full Development /a		
	Area (ha)	Yield (kg/ha)	Production (kg)	Area (ha)	Yield (kg/ha)	Production (kg)
<u>Main crop</u>						
Irrigated						
Rice	0.18	2,000	360	0.33	2,800	924
Terrace						
Rice	-	-	-	0.22	1,900	418
Mixed	-	-	-	0.03	1,800	54
Coffee	-	-	-	0.20	800	160
Swidden						
Rice	1.00	1,250	1,250	0.30	1,250	375
Mixed	0.10	1,500	150	0.03	1,500	45
Fallow	6.60	-	-	2.00	-	-
Total	<u>7.88</u>			<u>3.11</u>		
Communal						
Woodlot			-	1.00		
Total				<u>4.11</u>		
<u>Second crop</u>						
Irrigated						
Soybeans	-	-	-	0.10	800	80

/a In year seven.

12/11/78

THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Farm Model Cropping Pattern, Yields and Production

Highland Rice/Maize Farm

Crop	Base Year			Full Development /a		
	Area (ha)	Yield (kg/ha)	Production (kg)	Area (ha)	Yield (kg/ha)	Production (kg)
<u>Main crop</u>						
Irrigated						
Rice	0.14	2,000	280	0.30	2,800	840
Terrace						
Maize	-	-	-	0.25	1,800	450
Coffee	-	-	-	0.20	800	160
Swidden						
Rice	0.50	1,250	625	0.30	1,250	375
Maize	0.60	1,000	600	0.30	1,000	300
Fallow	11.00	-	-	5.00	-	-
Total	<u>12.24</u>			<u>6.35</u>		
Communal						
Woodlot	-			1.00		
Total	<u>12.24</u>			<u>7.35</u>		
<u>Second crop</u>						
Irrigated						
Soybeans	-	-	-	0.15	800	120
Terrace						
Poppies	0.55	7	3.85	0.27	7	1.89
Mixed	0.05	1,500	75	0.03	1,500	45
Swidden						
Soybeans	-	-	-	0.08	600	48
Mixed	-	-	-	0.01	1,800	18
Total	<u>0.60</u>			<u>0.54</u>		

/a In year seven.

12/11/78

THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Farm Model Cropping Pattern, Yields and Production

Highland Miang Tea Farm

Crop	Base Year			Full Development /a		
	Area (ha)	Yield (kg/ha)	Production (kg)	Area (ha)	Yield (kg/ha)	Production (kg)
Miang tea	2.00	1,750	3,500	1.50	1,750	2,625
Coffee	-	-	-	0.20	800	160
Communal woodlot	-	-	-	1.00	-	-
Total	<u>2.00</u>			<u>2.70</u>		

/a In year seven.

12/11/78

THAILANDNORTHERN AGRICULTURAL DEVELOPMENT PROJECTStaffing Schedule
(man-years)

<u>Position</u>	<u>Grade</u>	<u>Project Year</u>				
		1	2	3	4	5
<u>Land Development Department</u>						
<u>Headquarters</u>						
<u>Office of Manager</u>						
Manger	PC-7	1	1	1	1	1
Deputy Manager	PC-6	1	1	1	1	1
Assistant	PC-4	1	1	1	1	1
Clerk	PC-3	1	1	1	1	1
Clerk	PC-2	1	1	1	1	1
Typist	UG /a	1	1	1	1	1
Drivers	UG	3	3	3	3	3
<u>Administration & Finance Section</u>						
Chief Accountants	PC-5	2	2	2	2	2
Clerks	PC-2	1	2	2	2	2
Clerks	PC-1	3	4	6	6	6
Typists	UG	1	2	2	2	2
Driver	UG	1	1	1	1	1
<u>Socio-Economic Section</u>						
Chief	PC-5	1	1	1	1	1
Clerk	PC-2	1	1	1	1	1
Typist	UG	1	1	1	1	1
Driver	UG	1	1	1	1	1
<u>Soil Conservation Section</u>						
Chief	PC-6	1	1	1	1	1
Assistant to Chief	PC-5	1	1	1	1	1
Survey Team Leaders	PC-4	5	9	14	16	16
Conservationists & Surveyors	PC-3	5	9	14	16	16
Conservationists & Surveyors	PC-2	5	9	14	16	16
Drivers	UG	7	11	16	16	16
Laborers	UG	20	36	56	64	64
<u>Contract Supervision Section</u>						
Chief	PC-5	1	1	1	1	1
Assistant	PC-4	1	1	1	1	1
Agricultural Engineers	PC-3	10	18	28	32	32
Clerks	PC-1	5	9	14	16	16
Drivers	UG	2	2	2	2	2

<u>Position</u>	<u>Grade</u>	<u>Project Year</u>				
		1	2	3	4	5
<u>Land Management Advisory Section</u>						
Chief	PC-5	1	1	1	1	1
Assistant	PC-4	1	1	1	1	1
Drivers	UG	2	2	2	2	2
<u>Seed Production Section</u>						
Agronomist	PC-4	1	1	1	1	1
Agronomist	PC-3	1	1	1	1	1
Assistant Agronomists	PC-2	2	3	5	5	5
Clerk	PC-1	1	1	1	1	1
Drivers	UG	3	4	5	5	5
Tractor Drivers	UG	1	2	3	3	3
Laborers	UG	3	5	8	8	8
<u>Provincial Land Development Centers</u>						
<u>Soil Conservationist/</u>						
Agricultural Engineer	PC-5	4	4	4	4	4
Agronomists	PC-4	4	4	4	4	4
Agricultural Economists <u>/b</u>	PC-4	4	4	4	4	4
Interviewers <u>/c</u>	PC-3	3	4	4	4	4
Clerks		4	4	4	4	4
Typists		4	4	4	4	4
Drivers		8	8	8	8	8
<u>Village Centers</u>						
Agriculturalists <u>/d</u>	PC-3	3	8	16	22	28
Woodlot Advisors	PC-2	4	5	7	8	8
Laborers	UG	3	8	16	22	28
<u>Total</u>		<u>141</u>	<u>205</u>	<u>287</u>	<u>322</u>	<u>330</u>

Public Welfare Department

Headquarters

Office of Manager

Manager	PC-7	1	1	1	1	1
Deputy	PC-6	1	1	1	1	1
Secretary	UG	1	1	1	1	1
Drivers	UG	2	2	2	2	2

<u>Position</u>	<u>Grade</u>	<u>Project Year</u>				
		1	2	3	4	5
<u>Administration Section</u>						
Chief Clerks	PC-4	2	2	2	2	2
Clerks	PC-1	4	4	4	4	4
Secretaries	UG	2	2	2	2	2
<u>Technical Service Section</u>						
Highland Agronomist	PC-5	1	1	1	1	1
Coffee Specialist	PC-5	1	1	1	1	1
Agricultural Engineer	PC-5	1	1	1	1	1
Drivers	UG	3	3	3	3	3
<u>Social Services Section</u>						
Education Coordinator	PC-5	1	1	1	1	1
Health Coordinator	PC-5	1	1	1	1	1
Drivers	UG	2	2	2	2	2
<u>Zonal Development Centers</u>						
Leader	PC-5	8	8	8	8	8
Agriculturalist	PC-4	8	8	8	8	8
Engineering Supervisor	PC-2	8	8	8	8	8
Asst. Engineering Supervisor	PC-2	8	8	8	8	8
Education Supervisor	PC-4	8	8	8	8	8
Health Supervisor	PC-4	8	8	8	8	8
Clerical Assistants	PC-1	8	8	8	8	8
Foremen	UG	8	8	8	8	8
Carpenters	UG	8	8	8	8	8
Tractor Drivers	UG	8	8	8	8	8
Drivers	UG	24	24	24	24	24
Laborers	UG	16	16	16	16	16
<u>Key Village Centers</u>						
Leader	PC-4	22	24	32	32	32
Agriculturalist	PC-3	16	24	32	32	32
Health Worker	PC-3	17	25	32	32	32
Education Instructor	UG	35	60	80	80	80
<u>Total</u>		<u>233</u>	<u>276</u>	<u>319</u>	<u>319</u>	<u>319</u>

<u>Position</u>	<u>Grade</u>	<u>Project Year</u>				
		1	2	3	4	5
<u>Royal Forestry Department</u>						
Manager	PC-6	1	1	1	1	1
Specialist	PC-4	1	1	1	1	1
Unit Chief	PC-4	8	8	8	8	8
Assistant to Chief	PC-3	-	-	6	6	6
Assistant	PC-2	8	8	8	8	8
Clerks	UG	3	3	3	3	3
Drivers	UG	18	18	18	18	18
Forest Guards	UG	24	40	57	57	57
Foremen	UG	8	8	16	16	16
Watchmen	UG	16	16	16	16	16
Janitors	UG	8	8	8	8	8
<u>Total</u>		<u>95</u>	<u>111</u>	<u>142</u>	<u>142</u>	<u>142</u>

/a Ungraded.

/b Serve as leaders of the socio-economic survey teams.

/c Serve on the socio-economic survey teams.

/d New recruits spend part of the year with the socio-economic survey teams as part of their training.

5/9/79

THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Project Cost Details and Phasing
Summary
(US\$'000)

Item	Project Year					Total	Foreign Exchange	
	1	2	3	4	5		Amount	%
Upland								
Agriculture	2,782.9	2,185.4	2,901.0	2,638.9	2,468.8	12,977.0	5,346.4	41
Forestry	61.8	95.0	133.9	154.5	198.7	643.9	97.7	15
Highland								
Agricultural and Social	1,800.3	1,341.6	1,380.9	1,159.2	856.2	6,538.2	1,764.5	27
Forestry	881.3	801.5	951.7	881.2	756.6	4,272.3	770.2	18
Monitoring and Evaluation	60.2	9.8	15.7	9.8	19.3	114.8	43.4	38
Provincial Planning	400.0	400.0	400.0	400.0	400.0	2,000.0	1,000.0	50
Project Preparation	600.0	600.0	600.0	600.0	600.0	3,000.0	1,500.0	50
Pilot Operations	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0	6,000.0	2,100.0	35
Subtotal	<u>7,786.5</u>	<u>6,633.3</u>	<u>7,583.2</u>	<u>7,043.6</u>	<u>6,499.6</u>	<u>35,546.2</u>	<u>12,622.2</u>	35
Physical Contingency/a	261.8	195.1	258.5	242.3	209.1	1,166.8	492.9	42
Total	<u>8,048.3</u>	<u>6,828.4</u>	<u>7,841.7</u>	<u>7,285.9</u>	<u>6,708.7</u>	<u>36,713.0</u>	<u>13,115.1</u>	36

/a Calculated on upland development, highland development, and monitoring and evaluation.

January 16, 1979

THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Project Cost Details and Phasing
Upland Agriculture Component
(US\$'000)

Item	Project Year					Total
	1	2	3	4	5	
Farm Development						
Land Clearing						
Chaining	13.0	23.4	36.4	41.6	41.6	156.0
Blading	45.3	81.6	126.9	145.1	145.1	543.9
Blading (light)	19.9	35.8	55.7	63.7	63.6	238.7
Subtotal	<u>78.2</u>	<u>140.8</u>	<u>219.0</u>	<u>250.4</u>	<u>250.2</u>	<u>938.6</u>
Windrowing	43.2	77.8	121.0	138.2	138.2	518.4
Root Ripping	137.7	247.9	385.6	440.6	440.6	1,652.4
Conservation Banks	129.5	233.1	362.6	414.4	414.4	1,554.0
Initial Cultivation						
Harrowing	100.5	180.8	281.2	321.4	321.4	1,205.3
Seeds	15.5	27.9	43.5	49.7	49.7	186.3
Subtotal	<u>116.0</u>	<u>208.7</u>	<u>324.7</u>	<u>371.1</u>	<u>371.1</u>	<u>1,391.6</u>
Specialized Equipment						
Anchor Chains	36.0	24.0	36.0	12.0	-	108.0
Blades	27.6	18.4	27.6	9.2	-	82.8
Brush Rakes	16.6	8.3	8.3	8.3	-	41.5
Root Rippers	40.0	30.0	40.0	15.0	-	125.0
Disc Harrows	75.0	50.0	62.5	25.0	-	212.5
Parts	19.5	16.1	17.4	7.0	-	60.0
Subtotal	<u>214.7</u>	<u>146.8</u>	<u>191.8</u>	<u>76.5</u>	-	<u>629.8</u>
Subtotal	<u>719.3</u>	<u>1,055.1</u>	<u>1,604.7</u>	<u>1,691.2</u>	<u>1,614.5</u>	<u>6,684.8</u>
Access Tracks						
Construction	79.4	142.9	222.2	254.0	254.0	952.5
Maintenance	-	1.1	3.2	6.3	8.6	19.2
Subtotal	<u>79.4</u>	<u>144.0</u>	<u>225.4</u>	<u>260.3</u>	<u>262.6</u>	<u>971.7</u>
Technical services						
Personnel /a	46.6	161.7	306.3	370.8	385.1	1,270.5
Training	198.0	102.8	52.0	25.6	3.3	381.7
Materials	127.0	2.0	127.0	2.0	2.0	260.0
Equipment	913.1	143.0	135.5	38.0	8.0	1,237.6
Facilities	301.8	164.7	130.8	60.0	-	657.3
O&M - Equipment	67.7	84.8	109.4	117.9	120.2	500.0
- Facilities	6.0	9.3	11.9	13.1	13.1	53.4
Subtotal	<u>73.7</u>	<u>94.1</u>	<u>121.3</u>	<u>131.0</u>	<u>133.3</u>	<u>553.4</u>
Conservation research	60.0	60.0	60.0	60.0	60.0	300.0
Consultants	264.0	258.0	138.0	-	-	660.0
Subtotal	<u>1,984.2</u>	<u>986.3</u>	<u>1,070.9</u>	<u>687.4</u>	<u>591.7</u>	<u>5,320.5</u>
Total	<u>2,782.9</u>	<u>2,185.4</u>	<u>2,901.0</u>	<u>2,638.9</u>	<u>2,468.8</u>	<u>12,977.0</u>
Physical contingency /b	155.7	143.4	203.0	203.0	188.2	893.3
TOTAL	<u>2,938.6</u>	<u>2,328.8</u>	<u>3,104.0</u>	<u>2,841.9</u>	<u>2,657.0</u>	<u>13,870.3</u>

/a Includes personnel travel.

/b 10% on civil works, materials and equipment.

January 15, 1979

THAILAND
NORTHERN AGRICULTURAL DEVELOPMENT

Project Cost Details and Phasing
Upland Forestry Component
(US\$'000)

Item	Project year					Total
	1	2	3	4	5	
Village Woodlots						
Equipment	1.8	3.5	6.5	8.1	13.2	33.1
Materials	10.1	24.3	40.7	49.1	64.8	189.0
Labor	9.8	25.5	43.3	53.9	77.3	209.8
Subtotal	<u>21.7</u>	<u>53.3</u>	<u>90.5</u>	<u>111.1</u>	<u>155.3</u>	<u>431.9</u>
Technical Services						
Personnel	11.5	11.0	15.0	16.0	16.0	69.5
Training	2.2	3.0	3.0	3.0	3.8	15.0
Equipment	13.1	10.1	3.0	0.8	-	27.0
Administration						
Personnel Travel	9.2	9.0	12.6	13.5	13.5	57.8
O&M	4.1	8.6	9.8	10.1	10.1	42.7
Subtotal	<u>13.3</u>	<u>17.6</u>	<u>22.4</u>	<u>23.6</u>	<u>23.6</u>	<u>100.5</u>
Subtotal	<u>40.1</u>	<u>41.7</u>	<u>43.4</u>	<u>43.4</u>	<u>43.4</u>	<u>212.0</u>
Subtotal	<u>61.8</u>	<u>95.0</u>	<u>133.9</u>	<u>154.5</u>	<u>198.7</u>	<u>643.9</u>
Physical Contingency /a	2.5	3.8	5.0	5.8	7.8	24.9
<u>Total</u>	<u>64.3</u>	<u>98.8</u>	<u>138.9</u>	<u>160.3</u>	<u>206.5</u>	<u>668.8</u>

/a 10% on materials and equipment.

5/9/79

THAILAND
NORTHERN AGRICULTURAL DEVELOPMENT PROJECT
Project Cost Details and Phasing
Highland Agricultural and Social Component
(US\$'000)

Item	Project year					Total
	1	2	3	4	5	
<u>Farm Development</u>						
Irrigation	64.9	64.9	62.5	-	-	192.3
Terraces	-	51.9	51.8	50.4	-	154.1
Coffee establishment						
Nurseries	12.0	-	-	-	-	12.0
Fertilizer	-	62.0	126.3	213.2	-	401.5
Subtotal	<u>12.0</u>	<u>62.0</u>	<u>126.3</u>	<u>213.2</u>	<u>-</u>	<u>413.5</u>
Subtotal	<u>76.9</u>	<u>178.8</u>	<u>240.6</u>	<u>263.6</u>	<u>-</u>	<u>759.9</u>
<u>Social Infrastructure</u>						
Schools	9.5	12.4	12.4	-	-	34.3
Health posts	4.8	7.6	7.6	-	-	20.0
Subtotal	<u>14.3</u>	<u>20.0</u>	<u>20.0</u>	<u>-</u>	<u>-</u>	<u>54.3</u>
<u>Access Tracks</u>						
Construction	250.7	250.7	250.8	-	-	752.2
Maintenance	-	25.1	50.2	75.3	75.3	225.9
Subtotal	<u>250.7</u>	<u>275.8</u>	<u>301.0</u>	<u>75.3</u>	<u>75.3</u>	<u>978.1</u>
<u>Technical Services</u>						
Personnel	287.6	378.4	462.9	462.9	462.9	2,054.7
Training	50.0	50.0	-	-	-	100.0
Equipment	595.5	24.0	24.0	72.0	24.0	739.5
Facilities	192.0	65.8	65.8	-	-	323.6
O&M	223.3	238.8	266.6	285.4	294.0	1,308.1
Consultants /a	110.0	110.0	-	-	-	220.0
Subtotal	<u>1,458.4</u>	<u>867.0</u>	<u>819.3</u>	<u>820.3</u>	<u>780.9</u>	<u>4,745.9</u>
Subtotal	<u>1,800.3</u>	<u>1,341.6</u>	<u>1,380.9</u>	<u>1,159.2</u>	<u>856.2</u>	<u>6,538.2</u>
Physical contingency /b	47.4	12.8	12.8	3.6	1.2	77.8
<u>Total</u>	<u>1,847.7</u>	<u>1,354.4</u>	<u>1,393.7</u>	<u>1,162.8</u>	<u>857.4</u>	<u>6,616.0</u>

/a This item includes an amount of US\$25,000 for a local engineering consultant firm which would be financed under the IDA credit. The total would be composed of salaries, US\$16,000; travel, US\$4,000; and overhead, US\$5,000.

/b 10% of civil works, materials, and equipment.

1/11/79

THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT

Project Cost Details and Phasing
Highland Forestry Component
(US\$'000)

	<u>Project year</u>					<u>Total</u>
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	
<u>Rehabilitation</u>						
Equipment	2.0	2.5	4.5	7.0	7.0	23.0
Materials	10.0	12.5	22.5	35.0	35.0	115.0
Labor	39.0	71.4	129.5	211.5	262.4	713.8
Subtotal	<u>51.0</u>	<u>86.4</u>	<u>156.5</u>	<u>253.5</u>	<u>304.4</u>	<u>851.8</u>
<u>Village Woodlots</u>						
Equipment	4.5	6.5	4.5	-	-	15.5
Materials	22.5	32.5	22.5	-	-	77.5
Labor	108.3	204.1	213.8	111.6	51.8	689.6
Subtotal	<u>135.3</u>	<u>243.1</u>	<u>240.8</u>	<u>111.6</u>	<u>51.8</u>	<u>782.6</u>
<u>Protection</u>						
Firelines	3.6	11.7	22.6	29.7	35.3	102.9
<u>Fire Fighting</u>						
Equipment	4.8	3.2	3.4	-	-	11.4
Labor	1.8	5.1	8.5	9.5	10.2	35.1
Subtotal	<u>6.6</u>	<u>8.3</u>	<u>11.9</u>	<u>9.5</u>	<u>10.2</u>	<u>46.5</u>
Subtotal	<u>10.2</u>	<u>20.0</u>	<u>34.5</u>	<u>39.2</u>	<u>45.5</u>	<u>149.3</u>
<u>Access Tracks</u>						
Construction	48.0	174.0	174.0	120.0	-	516.0
Maintenance	4.8	22.2	39.6	51.6	51.6	169.8
Subtotal	<u>52.8</u>	<u>196.2</u>	<u>213.6</u>	<u>171.6</u>	<u>51.6</u>	<u>685.8</u>
<u>Technical Services</u>						
Personnel	90.8	93.3	127.5	126.5	124.5	562.6
Training	6.0	6.0	6.0	6.0	6.0	30.0
Equipment	305.9	-	-	-	-	305.9
Facilities	72.9	-	-	-	-	72.9
<u>Administration</u>						
Personnel travel	41.2	45.4	61.7	61.7	61.7	271.7
O&M	112.7	111.1	111.1	111.1	111.1	557.1
Subtotal	<u>153.9</u>	<u>156.5</u>	<u>172.8</u>	<u>172.8</u>	<u>172.8</u>	<u>828.8</u>
Consultant /a	2.5	-	-	-	-	2.5
Subtotal	<u>632.0</u>	<u>255.8</u>	<u>306.3</u>	<u>305.3</u>	<u>303.3</u>	<u>1,802.7</u>
<u>Total</u>	<u>881.3</u>	<u>801.5</u>	<u>951.7</u>	<u>881.2</u>	<u>756.6</u>	<u>4,272.3</u>
Physical contingency /b	52.4	35.1	37.7	29.9	11.9	167.0
<u>Total</u>	<u>933.7</u>	<u>836.6</u>	<u>989.4</u>	<u>911.1</u>	<u>768.5</u>	<u>4,439.3</u>

/a The amount of US\$25,000 would be composed of salaries, US\$16,000; travel, US\$4,000; and overhead, US\$5,000.

/b 10% on civil works, materials, and equipment.

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THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Project Cost Details and Phasing
Monitoring and Evaluation Component
(US\$'000)

Item	Project Year					Total
	1	2	3	4	5	
Personnel	3.0	1.5	1.5	1.5	1.5	9.0
Equipment	37.5	-	-	-	-	37.5
O&M	9.2	4.6	4.5	4.6	4.5	27.4
Consultants	7.0	2.0	7.0	2.0	10.0	28.0
Data Processing	3.5	1.7	2.7	1.7	3.3	12.9
Subtotal	<u>60.2</u>	<u>9.8</u>	<u>15.7</u>	<u>9.8</u>	<u>19.3</u>	<u>114.8</u>
Physical contingency /a	3.8	-	-	-	-	3.8
<u>Total</u>	<u>64.0</u>	<u>9.8</u>	<u>15.7</u>	<u>9.8</u>	<u>19.3</u>	<u>118.6</u>

/a 10% on equipment.

5/9/79

THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Estimated Schedule of disbursements
(US\$'000)

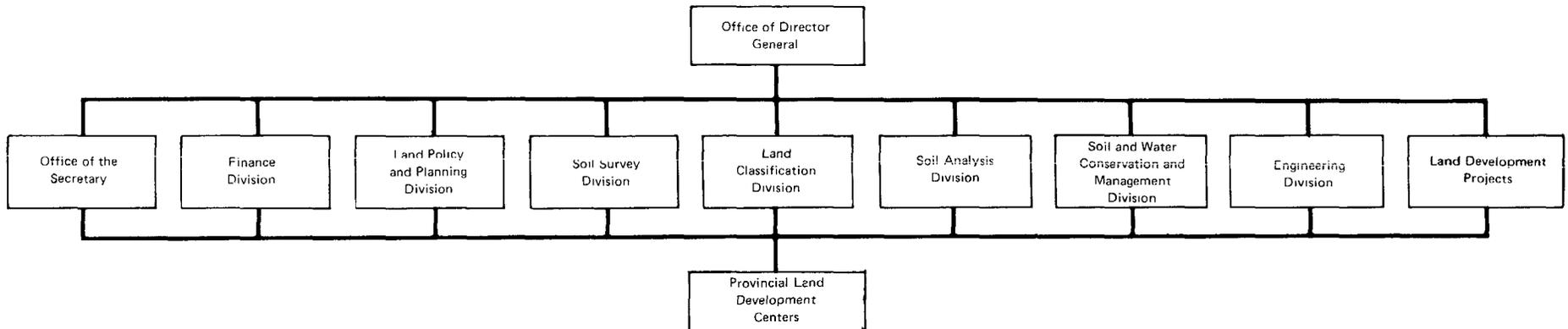
IDA fiscal year and semester		Cumulative disbursement
FY80	1st	-
	2nd	900
FY81	1st	2,000
	2nd	3,200
FY82	1st	4,600
	2nd	6,500
FY83	1st	8,700
	2nd	11,300
FY84	1st	14,000
	2nd	16,900
FY85	1st	19,900
	2nd	22,900
FY86	1st	25,000

May 9, 1979

**THAILAND
NORTHERN AGRICULTURAL DEVELOPMENT PROJECT
Implementation Schedule**

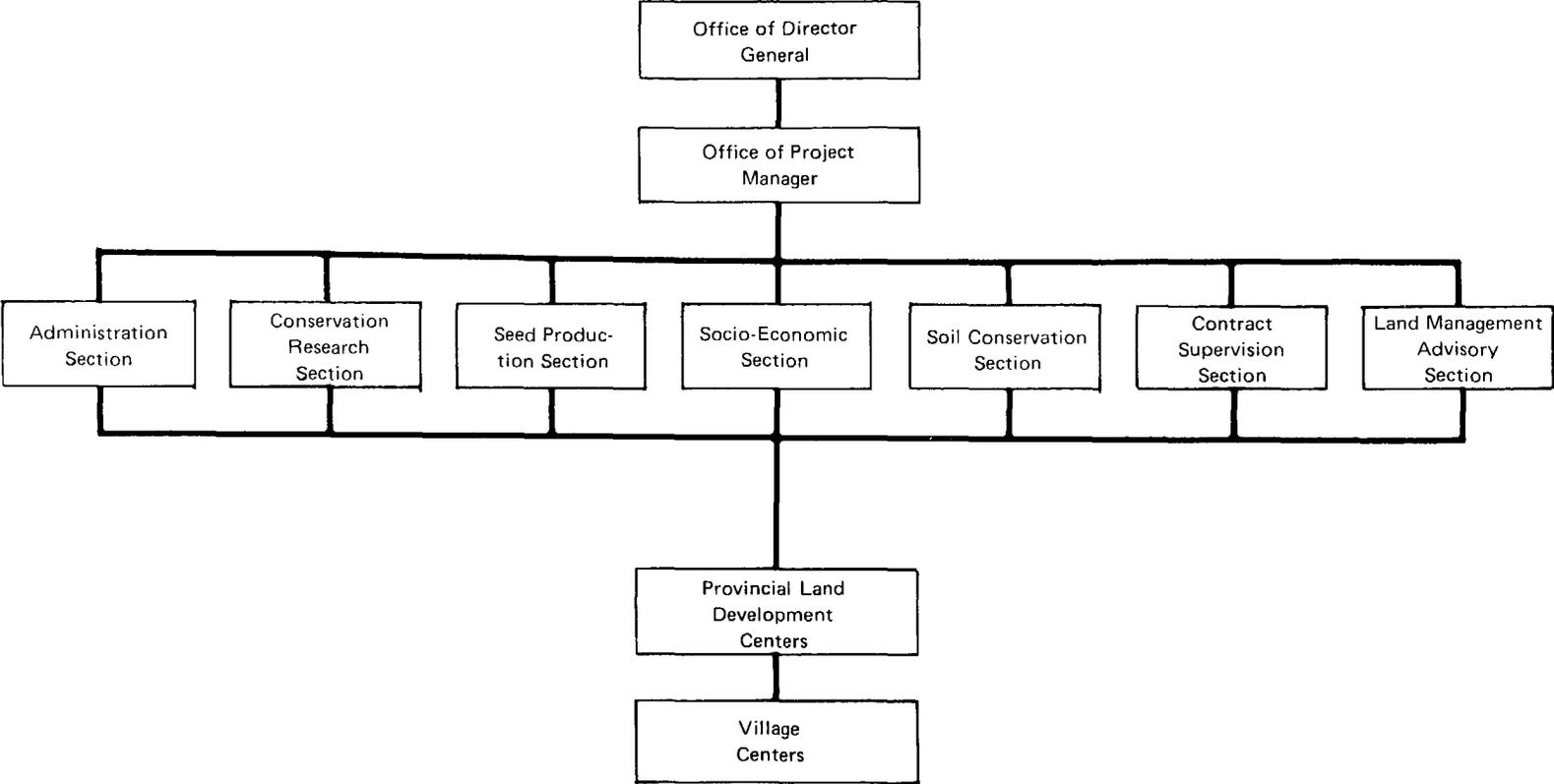
Item	Agency	0	1	2	3	4	5
		PROJECT YEAR					
UPLAND							
Agriculture							
Farm Development							
Equipment Procurement	LDD	_____					
Land Development	LDD/Farmers	_____					
Access Tracks							
Design and Layout	LDD	_____					
Construction	LDD		_____				
Technical Services							
Staff Recruitment and Training	LDD	_____					
Consultant Recruitment	LDD	_____					
Equipment Procurement	LDD	_____					
Construction of District and Village Centers	LDD		_____				
Surveys	LDD	_____					
Advisory Services	LDD	_____					
Seed Supply	LDD	_____					
Conservation/Research	LDD	_____					
Forestry							
Village Woodlots							
Equipment and Materials Procurement	LDD	_____					
Woodlot Establishment	LDD/RFD		_____				
Technical Services							
Staff Recruitment and Training	LDD/RFD	_____					
Equipment Procurement	LDD	_____					
Advisory Services	LDD/RFD	_____					
HIGHLAND							
Agriculture and Social Farm Development							
Design of Irrigation Schemes and Terracing	PWD	_____					
Construction of Irrigation Schemes and Terracing	PWD/Farmers		_____				
Coffee Establishment	PWD/Farmers		_____				
Social Infrastructure							
Design of Schools and Health Posts	PWD	_____					
Construction of Schools and Health Posts	PWD		_____				
Access Tracks							
Design and Layout	PWD	_____					
Construction	PWD		_____				
Technical Services							
Staff Recruitment and Training	PWD	_____					
Consultant Recruitment	PWD	_____					
Equipment Procurement	PWD	_____					
Construction of Zonal and Key Village Centers	PWD		_____				
Land Capability Survey	LDD	_____					
Social-Economic Surveys	PWD	_____					
Advisory Services	PWD	_____					
Forestry							
Rehabilitation and Village Woodlots							
Equipment and Materials Procurement	RFD	_____					
Planting	RFD		_____				
Protection							
Equipment Procurement	RFD	_____					
Fireline Establishment	RFD	_____					
Fire Fighting	RFD	_____					
Access Tracks							
Design and Layout	RFD	_____					
Construction	RFD		_____				
Technical Services							
Staff Recruitment and Training	RFD	_____					
Consultant Recruitment	RFD	_____					
Equipment Procurement	RFD	_____					
Construction of Offices and Housing	RFD		_____				
Advisory Services							

THAILAND
NORTHERN AGRICULTURAL DEVELOPMENT PROJECT
Organization of Land Development Department

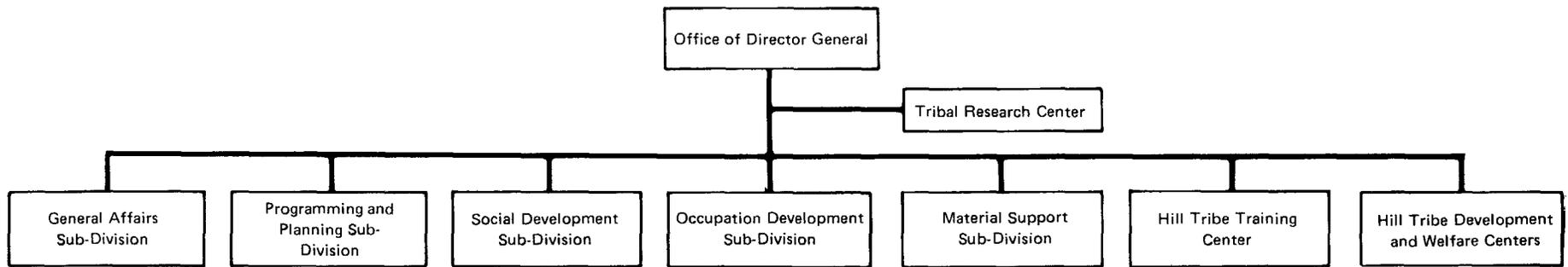


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NORTHERN AGRICULTURAL DEVELOPMENT PROJECT
Project Organization of Land Development Department



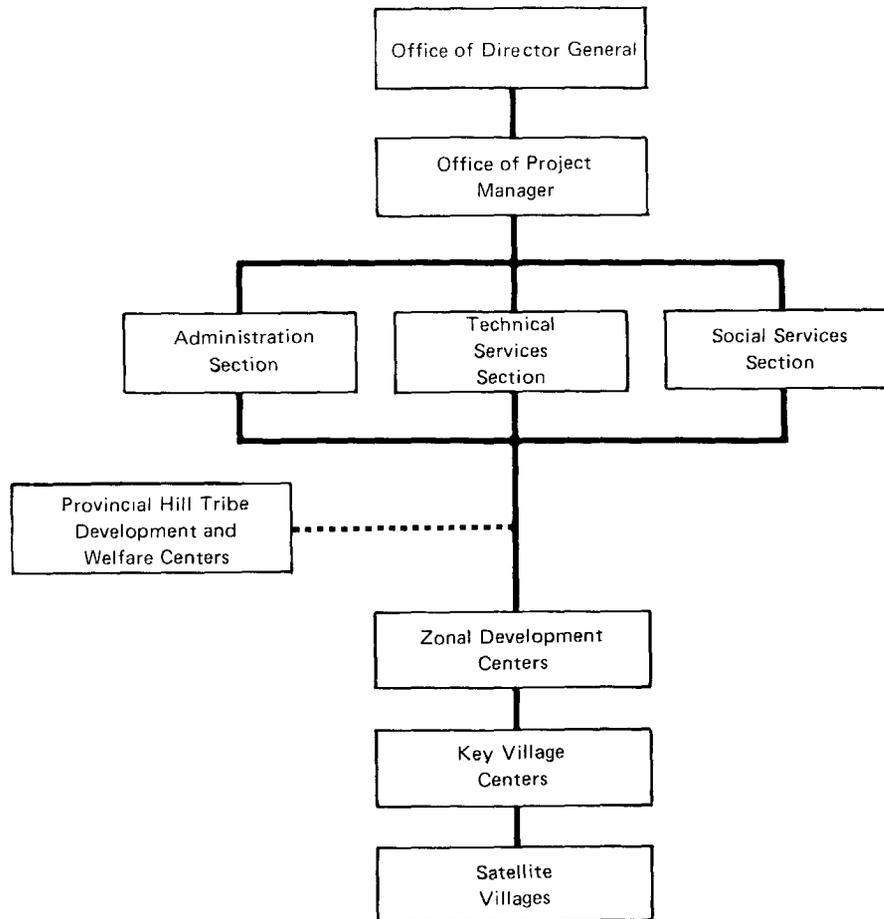
THAILAND
NORTHERN AGRICULTURAL DEVELOPMENT PROJECT
Organization of Hill Tribe Welfare Division of Public Welfare Department



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World Bank -- 19551

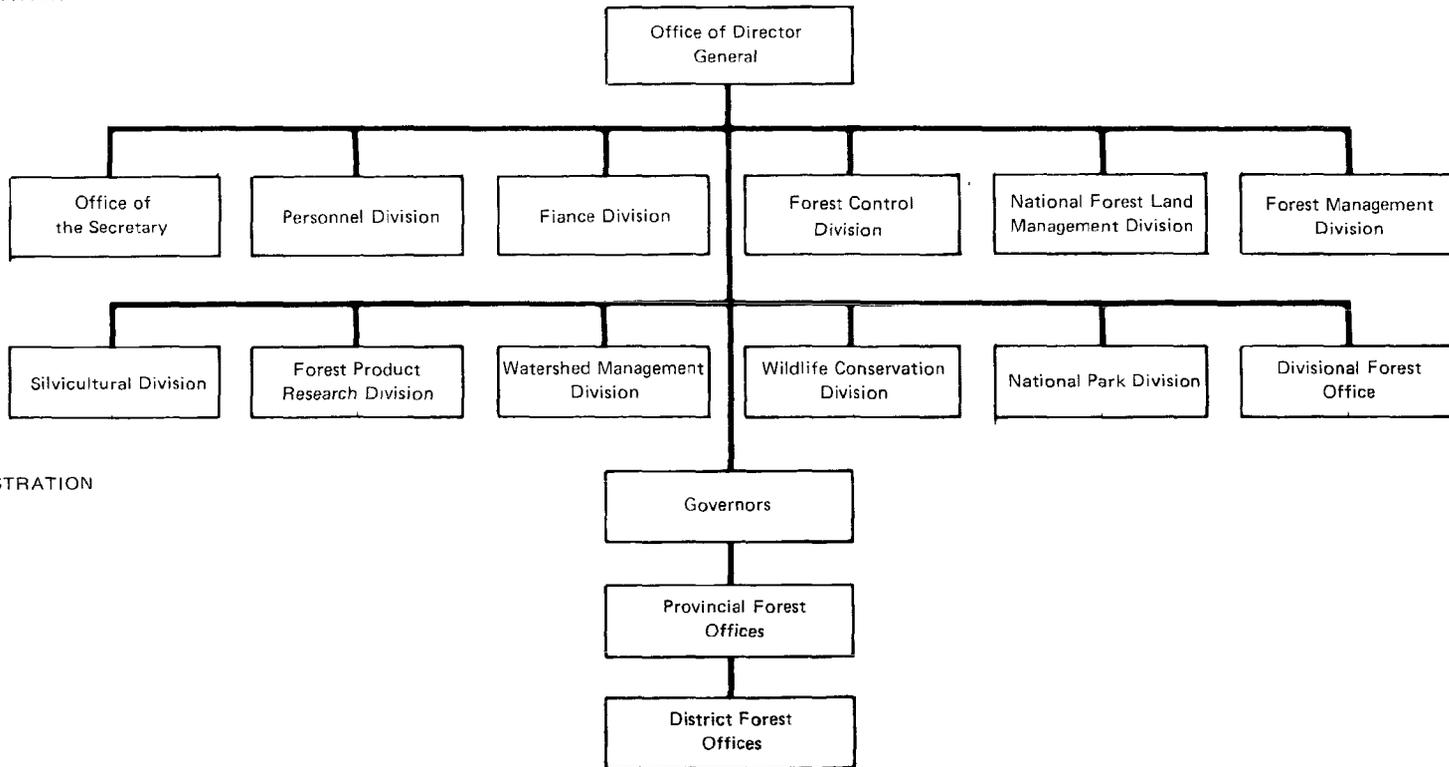
THAILAND
NORTHERN AGRICULTURAL DEVELOPMENT PROJECT
Project Organization of Hill Tribe Welfare Division



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NORTHERN AGRICULTURAL DEVELOPMENT PROJECT
Organization of Royal Forestry Department

CENTRAL ADMINISTRATION



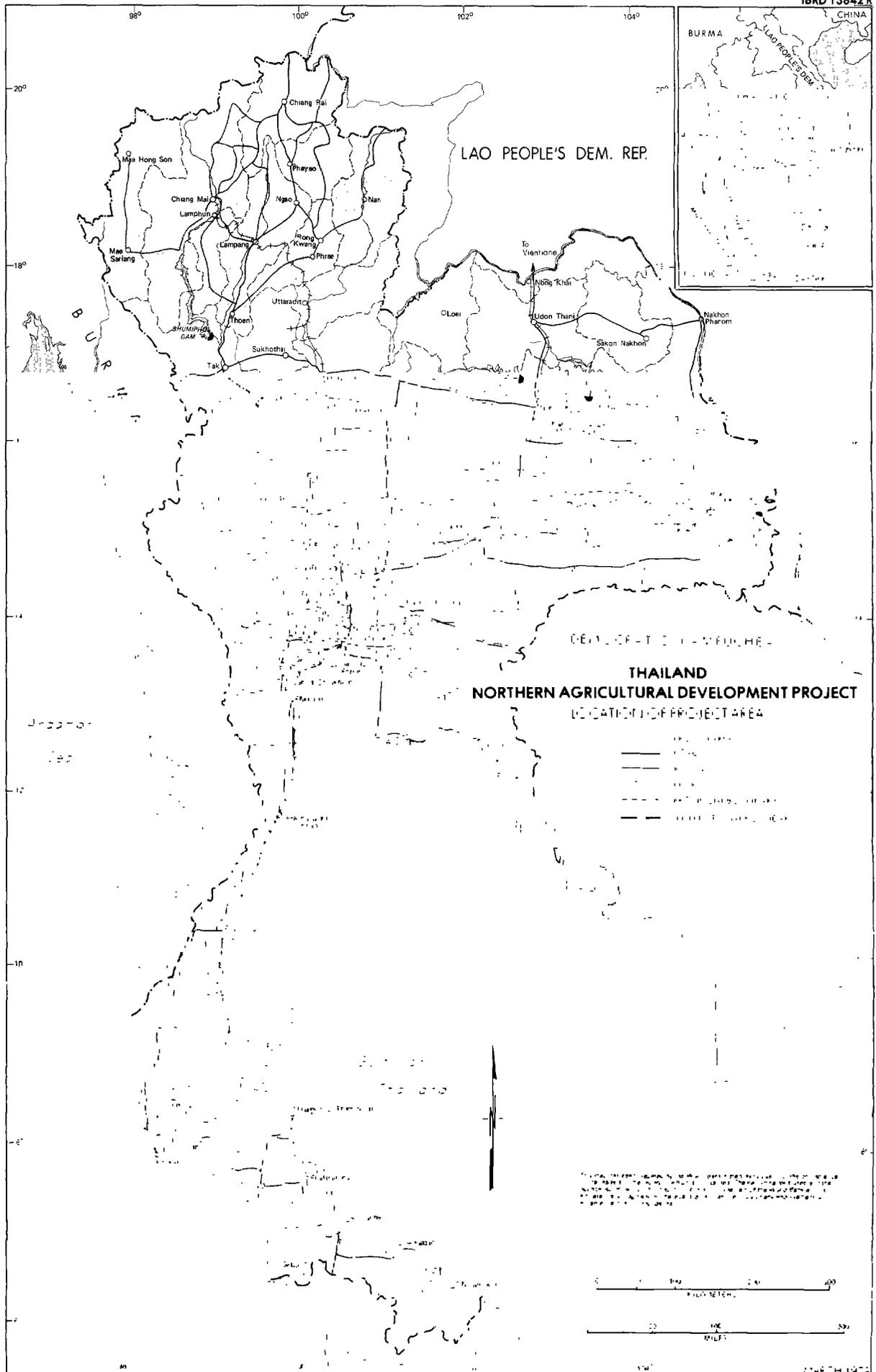
PROVINCIAL ADMINISTRATION

THAILAND

NORTHERN AGRICULTURAL DEVELOPMENT PROJECT

Selected Documents and Data Available in the Project File

- A. Selected Reports and Studies on the Sector and Subsector
 - A1. World Bank, Thailand: Toward a Development Strategy of Full Participation, May 5, 1978
- B. Selected Reports and Studies Relating to the Project
 - B1. FAO/IBRD Cooperative Programme, Northern Rural Development Project Preparation Report, May 19, 1978
- C. Selected Working Papers
 - C1. Upland Agriculture
 - C2. Upland Forestry
 - C3. Highland Agriculture and Social Infrastructure
 - C4. Highland Forestry
 - C5. Monitoring and Evaluation
 - C6. Economic Valuation of Inputs and Outputs
 - C7. Prices and Marketing
 - C8. Additional Forestry Benefits

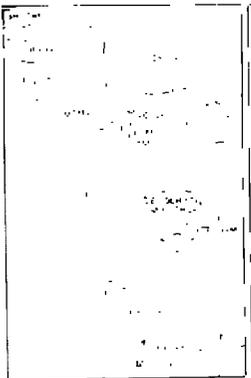


THAILAND
NORTHERN AGRICULTURAL DEVELOPMENT PROJECT
 LOCATION OF PROJECT AREA

THIS MAP WAS PREPARED BY THE EAST ASIAN DEPARTMENT OF THE INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT. THE BOUNDARIES AND NAMES SHOWN ON THIS MAP DO NOT REPRESENT THE OPINIONS OF THE BANK.

LAO PEOPLE'S
DEMOCRATIC REPUBLIC

BURMA



1. The map shows the project area in the northern part of the Lao People's Democratic Republic. The project area is bounded by a solid line and is divided into several sub-areas by dashed lines. The map also shows the borders of Burma to the west and south, and Thailand to the east. The map includes a grid of latitude and longitude lines. The latitude lines are marked at 17°N, 18°N, 19°N, and 20°N. The longitude lines are marked at 102°E, 104°E, 106°E, 108°E, and 110°E. The map also shows the location of the project area in relation to the major cities of Vientiane and Luang Prabang.

BURMA

THAILAND
NORTHERN AGRICULTURAL DEVELOPMENT PROJECT
PROJECT SITED LAND-TITLE

