APPENDIX I

PROFILES OF PROPOSED PROJECTS/PROGRAMS

Project No. AG1

1. PROJECT TITLE	Field Crops Restructuring Program
2. LOCATION	Upper and Central WSB
3. AGENCY	MOAC, MOC, and BAAC
4. OBJECTIVES	1) Increase the value-added and farm income 2)Adjust agricultural structure responsive to new market demand 3) Improve the use of natural resources, particularly water
5. PHASING	Phases I to III;

6. DESCRIPTION

1) Justification:
Sugar cane and rice occupy a large area in the WSB, respectively about 200,000 ha and 210,000 ha. These areas have been decreased continuously as sugar cane and rice are becoming less attractive and production costs rise. The process of conversion of sugar cane and rice to other crops has already taken place in the WSB, but at a slower pace. A program is required to speed up the process, and to effectively utilize land released by sugar cane and rice.

2) Components:
- Support to crop restructuring
- Support to farmers' training, group formation, and marketing
- Support to minor irrigation works

3) Beneficiaries: The program should give priority to poor and small farmers.

4) Special consideration should given to irrigated areas as they can be used to accelerate the crop diversification process.

5) Other: Final decisions on the conversion should be made by farmers themselves.

7. RELATION WITH OTHER PROJECTS	AG2 (High-value Crops for Niche Markets) AG5 (Cattle Fattening) AG6 (Dairy Production Promotion) RD1 (Rural Development Model)
8. COST (APPROX.)	Phase I = $20 million Phase II = $20 million Phase III = $40 million

AG1 FIELD CROPS RESTRUCTURING PROGRAM

I. BACKGROUND

Kanchanaburi and Ratchaburi are the major sugar cane producing areas in the WSB, accounting for 63 per cent and 29 per cent of the total sugar cane area in the region in 1995, respectively. The total sugar cane area in the WSB, estimated at about 1,242,000 rai (about 200,000 ha) in 1995, represented about 21 per cent of the total sugar cane area in Thailand. This area occupies about 18 per cent of the total farm area in the WSB.

The sugar cane area in the WSB has shown a clear declining trend in recent years. During 1992-1995, the area was reduced by about 20 per cent, and with the rate of area reduction particularly acute in Kanchanaburi. Field surveys confirm this declining trend: (i) sugar factories are moving out of the area to the northern part of the country, and (ii) farmers are losing interest in sugar cane production as the costs have increased and yields are low and declining.

Rice is another crop that occupies a large part of the agricultural area of the WSB. Area under rice production was estimated at 1.3 million. rai (213,000 ha) or about 20 per cent of the total agricultural area in 1995. Of the total rice area, more than 30 per cent (about 434,000 rai or 70,000 ha) is also used for the production of second rice, i.e., dry-season rice under irrigation. Rice together with cassava, coffee, and pepper are included in the Government's Agricultural Restructuring Program (ARP), which aims at reducing unsuitable areas under these crops.

II. PROGRAM CONCEPT/RATIONALE

In order to respond to the new requirements, i.e., (i) increasing rural income, and (ii) changing in market demand, it is imperative that this subsector be restructured. In fact, this restructuring process is not new as Thai agriculture has been restructured and transformed many times before. Indeed, the Government put substantial efforts over the last few years on diversification and restructuring of agriculture. The ARP has been implemented since 1994, with the clear objective of increasing the income of rural people by promoting high-value crops as well as upgrading the agricultural sector in response to emerging new market requirements.

The main thrust of the proposed program is to increase farmers' incomes in the WSB through the promotion of crop diversification from paddy and sugar cane for the benefit of the production of high-value crops such as fruit, and vegetables. This undertaking would increase farm incomes as well as lead to optimum use of resources such as water.

Agricultural labor is considered to be one of the major constraints on the development of agriculture in the future. In order to mitigate this constraint, two measures could be taken: (i) introduce agricultural machinery to replace labor when it is technically and financially feasible; and (ii) change cropping patterns to reflect the scarcity of labor, and promote some crops that require fewer labor inputs. Although vegetable production would generate higher value added

per unit of cultivated land area, at the same time it requires a substantial labor input. Taking these aspects into consideration, it is proposed that the balance between vegetable and fruit tree area should be carefully assessed.

III. PROGRAM DESCRIPTION

A. COMPONENTS

The proposed program would include the following components:

- Support for crops restructuring
- Support for farmers' training, group formation, and marketing
- Support for minor irrigation works

During the process of conversion, farmers will face financial constraints for the following reasons: (i) revenue from existing crops will be reduced or eliminated; (ii) funds will be needed for new investment in new crops and activities; and (iii) it will take a few years until new income can be generated, should farmers decide to plant fruit trees. Therefore, an agricultural credit line is essential to mitigate financial constraints.

In addition to the provision of credit, farmers would require technical support in order to effectively restructure their crops. Technical assistance can be identified in the following areas: (i) reviewing farmers' interest in this program and assisting them in making decisions as final decisions would have to be made by the farmers themselves; (ii) facilitating the preparation of applications for agricultural credit; (iii) assisting farmers in their efforts to introduce new crops; and (iv) assisting in water management.

In parallel with the technical support, farmers' training is considered crucial to assure the success of this proposed program. Farmers specializing only in rice production are generally less advanced compared to farmers producing vegetables and fruit. These farmers are in short of funds as well as technology and knowledge. Therefore, it is imperative to train them in all technologies relevant to the newly introduced crops. The marketing aspect has a particular role in this proposed program because the market will dictate the cropping pattern to be adopted by farmers, and market demand will be always changing depending on new requirements of consumers.

To achieve this objective, minor engineering works are deemed necessary in order to bring irrigation scheme, which was initially designed and constructed particularly for paddy and sugar cane production, to one which will adapt well to the production of vegetables and fruit. In other words, the proposed program would aim at providing "production base" for production of high-value crops. Vegetable production, and to a lesser extent fruit production, is particularly sensitive to water availability.

B. INSTITUTIONAL ARRANGEMENTS

Various Government institutions, private companies, and farmers' groups are expected to play roles in the proposed program. Government institutions would include various departments of the MOAC, MOC, and BAAC. It is recommended to establish a Steering Committee to supervise and coordinate all activities.

IV. PROGRAM ASSESSMENT

A. ESTIMATED COSTS

The cost of the proposed program is estimated at US$80 million over a 15-year period which is divided in three phases.

B. ECONOMIC JUSTIFICATION

Preliminary assessment indicates that planting vegetables and fruit trees is financially viable for farmers provided that they are supported with reasonable credit for their investment, particularly for fruit trees, which normally takes a long time to harvest its first benefit. In economic terms, production of vegetables and fruit trees generates multiple benefits to the national economy: (i) vegetable and fruit trees generate higher value added than paddy and traditional field crops; (ii) fruit trees consume less water, an input which will become scarce in region in the future; and (iii) vegetable and fruit production is likely to find good demand in the future, particularly from health-conscious consumers in urban areas.

V. RECOMMENDED ACTIONS

(1) Participation of the private sector and their initiatives should be mobilized to the maximum extent possible as they are in a better position to predict market demand and they are flexible enough to adjust to new requirements.

(2) Concerning lines of credit, it is recommended that the current agricultural loan conditions be reviewed and modified so that incentives are granted to farmers participating in this restructuring program.

(3) Priority should be given to poor and small farmers, and final decision on participation in the program should be made by the farmers themselves.

Project No. AG2

1. PROJECT TITLE	Pilot Project to Promote High-value Crops for Niche Markets
2. LOCATION	Upper WSB
3. AGENCY	MOAC, and BAAC
4. OBJECTIVES	(1) To increase the value-added and farm income (2) To satisfy to new demand in the markets (3) To minimize the health risk to consumers
5. PHASING	Phase I

6. DESCRIPTION

1) Justification :
Bangkok, with about 10 million people, is a large metropolitan area. With the growing economy, per capita income will increase. At the same time, consumers will become increasingly concerned with health. Contract farming between supermarkets and farmers' groups has already been taken place. There is a need to guide and systematize the process.

2) Components :
- Support for promotion of high-value crops
- Support for farmers' training, group formation and marketing
- Promotion of contacts between farmers' groups and private companies

3) Beneficiaries : Private companies and farmers' groups.

4) Special consideration should be given to the production of high-value-crops and chemical-free produce.

7. RELATION WITH OTHER PROJECTS	AG1 (Field Crops Restructuring) AG5 (Cattle Fattening) AG6 (Dairy Production Promotion) RD1 (Rural Development Model) WR1 (Irrigated Agriculture Intensification)
8. COST (APPROX.)	US$30 million, to be refined in a subsequent study.

AG2 PILOT PROJECTS TO PROMOTE HIGH-VALUE CROPS FOR NICHE MARKETS

I. BACKGROUND

The main characteristic of agriculture in the Upper WSB is its heavy dependence on the production of both major and second rice, and field crops represented by sugar cane. At the same time, the area is largely covered with large irrigation schemes. Water resources are available for dry-season farming over a large area. Demand for exotic vegetables, fruit and flowers are increasing in both domestic and overseas markets. Popular vegetables in the area include: asparagus, onion, spring onion, Chinese mustard, tomato, cucumber, red onion, string beans, taro root, and sweet potato.

II. PROJECT CONCEPT/RATIONALE

The main objectives of the project are:

- to increase value-added and farm income
- to satisfy new demand in the markets
- to minimize the health risk to consumers

To achieve the above objectives, the project would aim at increasing the production of high-value crops for niche markets. In addition to agronomic support, training on the use of chemical pesticides and other toxic inputs will be strengthened as consumers will be increasingly conscious about their health and food in the future. As a result, proper practices of assuring higher quality products would help secure the market for their outputs. Farmers' groupings are also deemed crucial to assure quality and guarantee that the products are chemical-free as requested by consumers. The groups would also facilitate farmers' training and marketing of output.

With a population of about 10 million people, the Bangkok Metropolitan Area (BMA) provides substantial demand for general as well as exotic fruits, vegetables, and cut-flowers. Large department stores, market operators, and restaurants in Bangkok have been promoting good quality, exotic, and chemical-free products for their consumers. Contract farming between companies in Bangkok and farmers' groups should be promoted further for the production of high-value products.

This type of contract farming for the production of high-value crops is expected to gain momentum in the future, and the Upper WSB is well placed to undertake this activity due to its proximity to Bangkok and its availability of resources. The future demand for high-value crops is promising as per capita income is increasing. And as awareness of quality of life and health become widespread, the demand for chemical-free products is expected to grow.

III. PROJECT DESCRIPTION

A. COMPONENTS

The proposed project would include the following components:

- Support for production of high-value crops
- Support for farmers' training, group formation and marketing
- Promotion of contacts between farmers' groups and private companies.

These components aim at facilitating and assisting farmers in their efforts to increase production of high-value crops. Farmers will be supported with a line of credit to meet the credit requirement during this process. The proposed credit program will be distributed mainly through BAAC, the major agricultural bank, as generally practiced in Thailand. General credit norms will be broadly the same as that currently applied by BAAC. One major aspect of these norms is that farmer should contribute 20 per cent of the total cost, while the credit portion covers at most 80 per cent of the total cost.

In addition to the provision of credit, farmers would require technical support in order to effectively upgrade their existing crops for the production of high-value crops. Farmers' training will be provided in agronomy, group formation, and marketing. At the same time, new crops which can be assured of promising demand in the market should be continuously demonstrated to farmers. And in response to the increasing awareness and concern on health issue, training on the proper use of chemicals and insecticides should be promoted. Farmers' training should not be confined only to "classroom training", field demonstrations, farmers' visits, and training from farmers to farmers should be encouraged. Training on the formation and management of farmers' groups is also considered crucial as the groups will hold the key to quality control and marketing to niche markets in Bangkok.

Farmers' groups would facilitate the marketing of outputs to buyers by giving a guaranty of quality as well as delivery time. Separate and sporadic producers would make it difficult to control quality and would increase the marketing cost to buyers. The project will also facilitate contact between these groups and buyers companies, and monitoring and witnessing fulfillment of contracts between the two parties.

B. INSTITUTIONAL ARRANGEMENTS

Various Government institutions, private companies, and farmers' groups are expected to take part in the project. Government institutions would include various departments of the MOAC, MOC, and BAAC. It is recommended to establish a Steering Committee to supervise and coordinate all activities of the project.

IV. PROGRAM ASSESSMENT

A. ESTIMATED COSTS

The cost of the proposed project is estimated at US$30 million. The proposed Kanchanaburi Agricultural Intensification Development Initiative could be considered only as a part of the overall undertaking to boost the production of high-value crops for niche markets.

B. ECONOMIC JUSTIFICATION

Preliminary assessment indicates that planting of vegetable, exotic fruit and cut-flowers is financially viable for farmers provided that they are supported with reasonable credit for their investment and adequate training. In economic terms, production of these high-value crops would generate multiple benefits to the national economy: (i) these crops generate higher value added than paddy and traditional field crops; (ii) less chemical or chemical-free vegetables would reduce the health risk to consumers; and (iii) these crops, particularly chemical free vegetables are likely to find good demand in the future, particularly from health-conscious consumers in the urban area.

V. RECOMMENDED ACTIONS

(1) The private sector, such as department stores, supermarkets, and restaurants in urban areas, should be encouraged to participate in the project as they are in a better position to understand market requirements.

(2) Concerning the line of credit, it is recommended that current loan conditions be reviewed and modified so that incentives are granted to farmers participating in this undertaking.

Project No. AG3

1. PROJECT TITLE	Program for the Improvement and Expansion of Tropical Fruits
2. LOCATION	Lower WSB (Chumphon)
3. AGENCY	MOAC, MOC, and BAAC
4. OBJECTIVES	(1) To improve the quality and increase production of tropical fruits (2) To increase tropical fruit export (3) To improve the tropical fruit marketing system
5. PHASING	Phases I and II;

6. DESCRIPTION

1) Justification:
The Lower WSB is endowed with natural resources suitable for the production of tropical fruits. There is a large tropical fruit area in the region. Taking advantage of the deep-sea port at Bang Saphan, and the newly constructed airport at Pathiu, it is strategically important to promote tropical fruit production for domestic as well as for export markets.

2) Components:
- Tropical Fruit Development
- Tropical Fruit Marketing Support
- Tropical Fruit Center

3) Beneficiaries: Farmers, farmers' groups, and market operators.

4) Special consideration should be given to the promotion of export.

7. RELATION WITH OTHER PROJECTS	AG4 (Tropical Fruits Center) RD1 (Rural Development Model)
8. COST (APPROX.)	Phase I = $62 million Phase II = $114 million

AG3 PROGRAM FOR THE IMPROVEMENT AND EXPANSION OF TROPICAL FRUITS

I. BACKGROUND

In the Lower WSB, where Chumphon province is located, agro-climatic conditions are quite favorable for tropical fruit production. The region has an annual average rainfall of 1,900-2,100 mm, about 60 per cent of which is concentrated in the rainy season from May to November. Soils and topography are also favorable for cultivation of various tree crops in the flat and sloped lands of different elevations. Chumphon province is regarded as one of the most advantageous regions for production of tropical fruit. Area under fruit production in Chumphon province in 1995/96 is shown in the table below.

Evolution of Area Under Major Fruit in Chumphon

Year	Fruit Area '000 rai	Growth
90/91	248.4	
91/92	257.0	3%
92/93	320.6	25%
93/94	398.9	24%
94/95	384.4	-4%
95/96	388.3	1%

Source : Chumphon Provincical Agricultural Office.

II. PROGRAM CONCEPT/RATIONALE

The main thrust of the proposed program is to increase farmers' income in Chumphon by optimizing the use of natural resources available in this province. This goal would be achieved through the expansion of tropical fruit production, which is well adapted in Chumphon. Another objective of expanding tropical fruit cultivation is to promote reforestation by planting tree crops. Since most of the fruit tree planting is programmed in the watershed of river basins in Chumphon province, it is regarded as one of the programs for reforestation and improvement of the environment in the province. The lower river basins in the region are subject to periodic floods, and such floods and soil erosion might be mitigated by fruit tree plantation.

The opening of Pathiu airport and the expansion of Bang Saphan deep-sea port also presents a good opportunity for the production of tropical fruit in Chumphon. Easy access to both domestic and international markets is a very important factor for fruit production. Not only the improved marketing system would increase the farmgate price to farmers, but also easy access to markets would bring into the producing area new information, technology, and other

requirements for farmers who will eventually make efforts to increase their production as well as improve the quality of their products in order to respond to the market demand.

III. PROGRAM DESCRIPTION

A. COMPONENTS

The proposed program for tropical fruit expansion would include three major components:

- Tropical Fruit Development
- Tropical Fruit Marketing Support
- Tropical Fruit Center

The proposed program would aim at expanding in the province of Chumphon about 100,000 rai (16,000 ha) of tropical fruit production over a period of 10 years. This expansion would be achieved not through the clearing of forest land, but rather through the conversion of unsuitable and low-value crops into tropical fruit area. The proposed expansion area is assumed to include all potential area for fruit production in the province including all planned area for agricultural development. This expansion represents about 26 per cent of the current tropical fruit area in Chumphon over a period of 10 years.

To streamline and improve the marketing system of the above mentioned crops in the Study Area, the following improvements are recommended: (i) establishment of the provincial fruit and vegetable market; (ii) establishment of a frozen fruit factory; and (iii) improvement of the market information system.

To support the proposed program, a Tropical Fruit Center (TFC) is also proposed. The main objective of the TFC is providing necessary technical as well as marketing support for the production of tropical fruit in the region. It will also be used as the center for co-ordination, training to farmers, and exchange of technical information among Thai researchers as well as researchers from neighboring countries, particularly from ASEAN.

B. INSTITUTIONAL ARRANGEMENTS

The proposed program would involve various institutions, namely the MOAC (agricultural extension, the Horticulture Research Institute), the Ministry of Commerce, BAAC, the Chamber of Commerce, and fruit producers' cooperative. It is proposed that each institution implement its relevant task. To harmonize activities and to exchange information, it is proposed that a Steering Committee be established to supervise the proposed program.

IV. PROGRAM ASSESSMENT

A. ESTIMATED COSTS

The total estimated cost of the program, including the TFC, is estimated at 4,400 million Baht or US$176 million over 10 years.

B. JUSTIFICATION

A broad assessment indicates that planting tropical fruit is financially viable for farmers provided that farmers are supported with reasonable credit for their investment . In economic terms, planting tropical fruit trees generates multiple benefits: (i) fruit trees generate higher value added than do paddy and field crops; (ii) fruit trees require fewer labor force which will become increasing scarce in Thailand; and (iii) Chumphon is agronomically well suited for fruit production. In addition, fruit tree plantation would provide a positive impact on the environment through promoting soil fixing and thus mitigating flood which is one of the major problem in Chumphon.

V. RECOMMENDED ACTIONS

1) Concerning the line of credit, it is recommended that loans extended by OECF to BAAC be utilized to the maximum extent. In view of the favorable environmental effects of fruit tree plantation, it is suggested that the current agricultural loan conditions be reviewed and modified so that incentives are granted for promoting tropical fruit plantation.

2) For the Tropical Fruit Center (TFC), it is recommended that the existing Chumphon HRC be expanded under technical assistance programs of international donors and the Thai government.

3) Some parts of the proposed programs should be implemented under the public and private partnership (e.g., the program for a fruit market and frozen fruit factory). It is recommended that discussion and arrangements be initiated between the public authorities concerned and the private sector on how to practically implement such programs.

Project No. AG4

1. PROJECT TITLE	Tropical Fruit Center Project
2. LOCATION	Lower WSB (Chumphon)
3. AGENCY	MOAC
4. OBJECTIVES	(1) To collect, consolidate, and disseminate tropical fruits technology (2) To promote and strengthen the marketing system (3) To provide training to farmers and exchange with ASEAN
5. PHASING	Phases I to II

6. DESCRIPTION

1) Justification:
The Lower WSB is endowed with natural resources suitable for the production of tropical fruits. There is a large tropical fruits area in the region. The proposed center will be also instrumental for Project AG3: Program for the Improvement and Expansion of Tropical Fruit . Thailand is well advanced in tropical fruit technology, and at the same time, the proposed Center will be instrumental for Thailand in its efforts to assist the upgrading of technology in neighboring countries.

2) Components:
- Technical support to consolidate and disseminate technology
- Construction of the Center
- Running training courses and promoting exchange

3) Beneficiaries: Farmers, farmers' groups, and neighboring countries.

7. RELATION WITH OTHER PROJECTS	AG3 (Tropical Fruits Improvement)
8. COST (APPROX.)	Phase I = $13 million Phase II = $6 million

AG4 Tropical Fruit Center

I. BACKGROUND

The southern part of the Study Area produces a variety of tropical fruit. A total of 229,150 tons of fruit were produced in the region and the production is increasing. The market is mainly domestic, but a high-value export market exists and is expanding particularly for tropical fruit such as mango, rambutan, mangosteen, sugar apple, papaya, guava, durian, banana, and young coconut. Thai fresh fruit is exported mainly to Hong Kong, Singapore and Malaysia, and Japan. Other export markets include European countries and the U.S.A.

The major constraint to the further expansion of export markets for fresh tropical fruit is the lack of a consistent supply of good quality produce as well as post-harvesting technology. Japanese consumers for example, have specific tastes in their fruit consumption. The country generally prohibits the import of certain types of *fresh* tropical fruits (such as rambutan, mangosteen, melon, watermelon, longan, avocado, loquat, lychee, plum, pomelo, orange, and tangerine). There is also a restriction in the American market which effectively prohibits the import of Thai fresh fruit by requiring an analysis to be done in order to prevent the introduction of the fruit flies.

II. PROJECT CONCEPT/RATIONALE

The objective of the tropical Fruit Center program is to provide the necessary infrastructure and coordinating activities for production and marketing of tropical fruit in the Study Area. It will promote the improvement of quality and production efficiencies of fruit and fruit products in the region. The proposed program will have the following project elements:

(i) establishment of a tropical fruit center;
(ii) dispatch of international experts;
(iii) research into export markets;
(iv) research into quality improvement, production efficiency, and post harvesting technology; and
(v) provision of training programs for farmers, traders, and researchers from neighboring countries.

It is recommended that the capability of tropical fruit research should be added to the existing Chumphon Horticulture Research Center (HRC) of Agricultural Department. The existing Chumphon HRC is mainly focused on perennial tree crops such as coconut. Nevertheless, more and more farmers are turning to these fruit trees in the region, and there are opportunities to improve quality and production efficiency if appropriate research and training to disseminate the research findings are provided.

III. PROJECT DESCRIPTION

A. Establishment of Tropical Fruit Center

The tropical Fruit Center will be established with the functions of research capability in various aspects of fruit production and marketing. One of the Horticultural Research Institute (in Chumphon) of the Department of Agriculture can be upgraded to include the capability of Tropical Fruit Center with technical and financial assistance, for example, from JICA. The building for the Tropical Fruit Center can be made available by Thai Government but equipment and technical assistance may be provided by grant aid from international donors. Staff of the Center will consist of the relevant government research staff, international experts, and staff from fruit exporting industries under the agreement that the research findings will be shared among the participating organizations.

B. Dispatch of International Experts

The project would finance the dispatch of international experts for one to two years in the following fields:

(i) agricultural economist;
(ii) tropical fruit experts;
(iii) marketing and export promotion expert; and
(iv) disease and pest control expert.

C. Research into Export Market

One of the main activities of the Center will be close monitoring of export markets. The research will take a close look at the world fruit market, including preferred varieties for each potential destination country. Trade barriers such as tariff and non-tariff barriers will be monitored including quarantine requirements. The marketing activity should be coordinated with the domestic and overseas tourism industries, and the preparation of advertisements to familiarize foreign tourists with fruit produced in the Study Area.

D. Research into Quality Improvement, Production Efficiency, and Post Harvesting Technology

Based on the analysis of export markets, research into quality improvement programs will be established. Such research should include:

(i) quality improvement and production efficiency;
(ii) effective sterilization methods for Thai fresh fruit against Oriental fruit flies and Melon flies; and
(iii) post-harvesting storage, grading, and packaging methods to enhance product marketability.

E. Provision of Training Programs for Farmers, Traders, and ASEAN Researchers

The Center organizes occasional seminars to disseminate research findings to fruit growers, export traders, and ASEAN researchers at a minimum cost to the participants. Field trips to successful plantations within the country and overseas will also be organized.

IV. PROJECT ASSESSMENT

The project will promote the development of export-oriented fruit and fruit products and increase the growth of agricultural sector output in the region.

Currently, there is a limitation on market facilities (such as wholesale markets or distribution centers) for fruit producers and traders. There is no standardized grading system for fruit except for that used in mango export to Japan, which is supervised by the Department of Agricultural Extension. Packaging is also an important element in fruit trading to minimize damage during transportation.

The expected cost of this project, other than land, is US$13 million.

Building	US$ 1.5 million
Equipment	US$ 2 million
International Experts (5 years)	US$ 4 million
Research Fund (5 years)	US$ 3 million
Training Material	US$ 0.5 million
Others	US$ 2 million
Total	US$ 13 million

V. RECOMMENDED ACTION

It is recommended that the existing Chumphon Horticulture Research Center be expanded by means of project-type technical assistance by an international technical cooperation agency.

Project No. AG5

1. PROJECT TITLE	Cattle Fattening Program
2. LOCATION	Upper and Lower WSB
3. AGENCY	MOAC and BAAC
4. OBJECTIVES	(1) To supplement and raise the farm income (2) To increase meat supply
5. PHASING	Phases I to III

6. DESCRIPTION

1) Justification:
About half a million head of cattle is brought into Thailand each year, particularly across the border with Myanmar. The WSB provides a good site for cattle fattening as it is adjacent to the border area. In addition, the Upper and Lower WSB are agricultural areas where agricultural by-products are available for animal feed.

2) Components :
- Technical support in animal health and diseases control
- Credit line for the investment and working capital

3) Beneficiaries : Farmers and farmers' groups.

7. RELATION WITH OTHER PROJECTS	AG1 (Field Crops Restructuring) AG2 (High-value Crops for Niche Market) AG7 (Slaughterhouse Modernization)
8. COST (APPROX.)	Phase I = $5 million Phase II = $10 million Phase III = $15 million

AG5 CATTLE FATTENING PROGRAM

I. BACKGROUND

Thailand has been for decades a major market for live animals, particularly cattle, from neighboring countries. Although the import of live animals is still regarded as illegal trade, this activity has been widespread for a long time. The best estimate suggests that about half a million head of cattle is brought into Thai markets each year. Animals imported into the WSB region come from Myanmar. Although there is no thorough study of the source of these animals, reliable evidence suggests that some animals are brought in from as far away as Bangladesh and India.

Contrary to the trend of buffalo in the region, the number of cattle in the WSB has been increasing since 1988. The total number reached about 635,000 head in 1992, which represents about 11 per cent of the total cattle population of Thailand. More than 80 per cent of the total cattle population of the WSB is concentrated in the Upper WSB. Cattle production in the WSB can be characterized as follows:

- Most of the cattle in the area is raised mainly for meat, particularly for markets in Bangkok.
- Part of the cattle is brought into Thailand across the border with Myanmar and fattened for a limited period before they can be sold to slaughterhouses.
- Part of the cattle in Kanchanaburi, Ratchaburi, and Petchaburi are milk cows that supply milk to the Nongpho Dairy Co-operative in Ratchaburi and DPO's milk plant in Pran Buri.

There are a number of constraints relevant to livestock development in Thailand, particularly in the WSB. These constraints are:

- Limitation of cheap animal feed: fodder. Increases in land price, particularly around the big cities, will make production of fodder financially less attractive.
- As noted above, animal disease is widespread, particularly FMD. The Government has made many attempts to create "diseases-free" zones in Thailand, but it will take time before such plans can be realized and become effective.
- Finally, the environmental aspect will be increasingly crucial to Thai society in the future. People will weigh the financial returns and the "quality of life" when undertaking a livestock business.

II. PROGRAM CONCEPT/RATIONALE

The main objectives of the proposed program are:

- to supplement and raise the farm income
- to increase meat supply to satisfy market demand

Demand for livestock and dairy products in Thailand is and will steadily be increasing. While Thailand already exports frozen poultry and other meat products, beef, pork, and poultry is in high demand within the country. Growing cities and the expanding tourist industry require a substantial amount of livestock products, particularly beef, which cannot be satisfied by domestic supply. To fill the gap, currently, a large number of cattle is been brought into Thailand, legally and illegally, from neighboring countries. In addition, high-quality beef is imported from the United States and Australia.

Animals brought across border are kept for fattening for about three months until they are ready for slaughtering and sale to markets. At the time the animals arrive in Thailand, the price at the border is estimated at about 2,000 to 3,000 Baht per head. After three months' fattening, this price may reach as high as 8,000 to 10,000 Baht. Cattle fattening has been quite a popular income generating activity among people living in provinces bordering on Myanmar

There are a number of constraints on promoting cattle fattening activity: (i) for new participants, the need for initial investment costs to establish a facility and to buy animals, (ii) a lack of expertise among new cattle farmers, and (iii) a shortage of fodder in some area. One of the major issues relating to the smuggling-fattening activity is that it will continue to make it difficult for the Government to control diseases such as foot-and-mouth diseases brought in with the animals.

The main thrust of the proposed program is to increase and diversify farm income by promoting the development of cattle fattening in the WSB.

III. PROGRAM DESCRIPTION

A. COMPONENTS

The program will include two main components:

- Technical support in animal health and diseases control
- Credit line for the investment and working capital

Animal health and disease control is one of the major concerns of the cattle fattening farmers, particularly new farmers. Furthermore, animals are brought across border after a long journey, and thus they are weak and susceptible to various diseases when they arrive. The technical assistance provided under the proposed program would include: (i) animal health, (ii) feeding, and (iii) disease control. The required technical expertise is largely available and provided by the Department of Livestock Development (LDL). In addition to assistance in animal health and

diseases control, new farmers would need also assistance and advice on new facilities and management know-how during the start-up period.

Farmers will also require credits to cover: (i) investment in facilities and equipment; and (ii) working capital to purchase animals and other inputs. A line of credit is considered necessary to assist farmers to meet credit requirement. The proposed credits will be handled by the BAAC, the major agricultural bank in Thailand. The LDL is expected to assist farmers and facilitate applications for credits to the BAAC.

B. INSTITUTIONAL ARRANGEMENTS

The proposed program is relatively straightforward as it involves only the fattening of cattle. As discussed in the foregoing section, the LDL and BAAC will be responsible respectively in the technical and credit aspects. However, close cooperation between the two institutions is deemed crucial for the success of the proposed program.

IV. PROGRAM ASSESSMENT

A. ESTIMATED COSTS

The total cost of the proposed program is estimated at US$30 million over Phases I to III. The proposed program would focus mainly on the Upper and Lower WSB.

B. JUSTIFICATION

Preliminary assessment of the cattle fattening program suggests that this activity is financially and economically viable if farmers receive adequate assistance on health and disease control. It is financially attractive to farmers as markets will continue to provide increasing demand for meat. In economic terms, the cattle fattening program will provide multiple benefits: It will (i) generate reasonable value added to the economy; (ii) create additional income to the rural communities; and (iii) save foreign exchange that would otherwise be used to import meat from abroad. In addition, the cattle fattening activity will generate organic matter for agricultural use in the WSB region. However, there are two negative aspects relative to this activity: (i) it might affect amenities especially if this undertaking is carried out on a large scale; and (ii) it brings in diseases, particularly if animals are imported without controls.

V. RECOMMENDED ACTIONS

(1) Pay adequate attention to amenities, particularly in areas where the Government plans to promote residential and tourism areas and the Science City.
(2) Large concentrations of this activity should be avoided in order to mitigate impacts on amenities.

Project No. AG6

1. PROJECT TITLE	Dairy Production Promotion Program
2. LOCATION	WSB
3. AGENCY	MOAC, BAAC, DPO, and Co-operatives
4. OBJECTIVES	(1) To supplement and increase the farm income (2) To satisfy the market demand and substitute import
5. PHASING	Phases I to III

6. DESCRIPTION

1) Justification:
Similar to meat products, dairy product demand is expected to increase as they have a high income elasticity of demand. Presently, increasing domestic demand is not satisfied by national products. Domestic milk supply has been encouraged to fill this gap. Dairy production has been promoted intensively in the Upper WSB through Nongpho Dairy Co-operative in Ratchaburi. However, increases in land prices and wages in the area near large cities erodes the comparative advantage of the Upper WSB. There is a need to expand milk production to the southern part.

2) Components:
- Technical assistance in farmers' training, animal health, and disease control
- Support for the establishment of common facilities such as collection points
- Credit line to farmers for investment and working capital

3) Beneficiaries: Farmers and farmers' groups.

7. RELATION WITH OTHER PROJECTS	AG1 (Field Crops Restructuring) AG2 (High-value Crops for Niche Markets) AG5 (Cattle Fattening Program)
8. COST (APPROX.)	Phase I = $5 million Phase II = $10 million Phase III = $10 million

AG6 DAIRY PRODUCTION PROMOTION PROGRAM

I. BACKGROUND

In the WSB, dairy development has been promoted through the creation of farmers' co-operatives such as Nongpho Dairy Co-operative in Ratchaburi and the establishment of the factory by the Dairy Farming Promotion Organization (DPO) in Pran Buri. However, over the past few years, private companies have started to enter the dairy business. Milk production in the WSB is concentrated in two provinces: Ratchaburi with 55,000 tons per year or 79 per cent of the total WSB production and Prachuap Khirikhan with 14,000 ton or 21 per cent.

Although the performance of Nongpho Dairy Co-operative has been impressive since its establishment in the 1970s, discussions with senior managers suggest that the co-operative is facing problems in its efforts to expand its operation, namely an increase in land prices. To cope with this structural issue, the co-operative is considering expansion of its operation to the southern part of the WSB. The DPO, operating in Pran Buri, also reveals similar concern and presently collects milk as far away as Chumphon province. Currently, DPO's headquarters is planning to establish another processing plant with a capacity of 60 tons per day in Surat Thani in the near future.

In general, there are a number of constraints on the development of milk products in the WSB. One of the common constraints on dairy production is the limited supply of animal feed. Although generally concentrate is used partly to feed the animals, natural feed is still required to supplement the concentrate. The supply of natural feed is becoming a problem in some areas as the price of land is high, and thus there is no adequate incentive for farmers to produce hay for animals. In addition, dairy farming requires a great deal of labor. In areas where wages are rising and there are job alternatives, milk production often proves to be less attractive to farmers. Furthermore, dairy production is less attractive to most farmers as this activity requires permanent labor, and thus limits their freedom to participate in other social activities.

II. PROGRAM CONCEPT/RATIONALE

Statistics on milk production in Thailand show a spectacular increase of more than 50 per cent between 1992 and 1994. Even with this high rate of growth, the supply of milk cannot satisfy the increasing demand in the country. The demand for milk is estimated at 2,000 tons per day, while the current milk supply is only about 800-900 tons per day. Per capita milk consumption has increased from about 2 liters 6-7 years ago to the current level of about 10 liters. With the new Government-supported drive to introduce milk to school children together with the increase in the purchasing power of Thai consumers, it is expected that per capita milk consumption will increase in the future.

The proposed program would aim at increasing the production of milk in the WSB in order to meet market demand. The main objectives of the program are:

- to supplement and increase farm income
- to satisfy the market demand and substitute for imports

However, encouragement of dairy production cannot be promoted without dairy factories as it is very crucial to secure marketing outlets for producing farmers. This aspect is very important, especially for new farmers as investment in dairy production is a relatively costly business. The successful experience with Nongpho Dairy Co-operative and the DPO should be carefully studied and replicated in other areas where the potential is high in terms of ample feed supply and the existence of enthusiastic farmers. Thus in planning for the expansion of dairy production in the WSB, future plans of the Nongpho Co-operative and the DPO should be incorporated and assessed.

III. PROGRAM DESCRIPTION

A. COMPONENTS

The proposed program would include the following components:

- Technical assistance in farmers' training, animal health, and disease control
- Support for the establishment of common facilities such as collection point
- Credit lines to farmers for investment and working capital

Animal health and disease control is one of the major concerns of dairy farmers, particularly new farmers. Furthermore, dairy production requires sophisticated management, higher technology, and a good understanding of marketing, hygiene, and co-operative activity. The assistance provided under the proposed program would include not only the technical aspect but also marketing and co-operative aspects. It includes: (i) animal health, feeding, and disease control; (ii) management and care of the animal; and (iii) marketing and co-operative aspects. The technical expertise is largely available and provided by the Department of Livestock Development (LDL), DPO, and relevant participants such as the Nongpho Co-operative

The program would also provide assistance for the establishment of common facility such as collecting points and other storage and marketing equipment. This assistance will be in the form of credits or grants to farmers' co-operatives, DPO, and Nongpho Co-operative to expand the collection network and processing facilities.

Farmers will also require credit to cover: (i) investment in facilities and equipment; and (ii) working capital to purchase animals and other inputs. A line of credit is considered necessary to assist farmers to meet requirements for credit. The proposed credits will be handled by the BAAC, the major agricultural bank in Thailand. The LDL, DPO and Nongpho Co-operative are expected to assist farmers and facilitate applications for the BAAC credit.

B. INSTITUTIONAL ARRANGEMENTS

The proposed program would involve farmer's co-operative such as Nongpho, DPO, LDL, and BAAC. LDL will be responsible for technical aspects, BAAC for credit, and DPO and Nongpho

for purchasing, marketing, and formation of co-operatives. Close cooperation among these institutions is deemed crucial for the success of the proposed program.

IV. PROGRAM ASSESSMENT

A. ESTIMATED COSTS

The total cost of the proposed program is estimated at US$25 million over Phases I to III. The proposed program would focus mainly on the Upper and Central WSB in Phases I and II, and the Lower WSB in Phase III.

B. ECONOMIC JUSTIFICATION

Preliminary assessment of dairy farming program suggests that this activity is financially and economically viable if farmers receive adequate assistance on health and disease control. In economic terms, dairy farming will provide multiple benefits: (i) generate value added to the economy; (ii) create additional income to the rural communities; and (iii) save foreign exchange that would otherwise be used to import dairy products. In addition, dairy farming activity will generate organic matter for agricultural use in the WSB region. However, this activity might negatively affect the amenity aspect especially if this undertaking is carried out on a large scale.

V. RECOMMENDED ACTIONS

(1) Securing the marketing outlet is deemed very crucial, and thus close coordination with existing institutions such as DPO and Nongpho Co-operative should be encouraged.

(2) The amenity aspect should receive adequate attention, particularly in areas where the Government plans to promote residential and tourism areas and the Science City.

(3) Dairy farming is a sophisticated activity and requires a higher degree of understanding. Adequate training to farmers on this matter is a prerequisite.

Project No. AG7

1. PROJECT TITLE	Slaughterhouse Modernization Project
2. LOCATION	WSB
3. AGENCY	MOAC, MOI, MOH, BOI, BAAC, and Municipalities.
4. OBJECTIVES	(1) To establish modern slaughterhouses (2) To minimize risks associated with poor hygienic conditions of meat;
5. PHASING	Phases I to III

6. DESCRIPTION

1) Justification :
Consumption of pork and beef is increasing in Thailand. Some provinces in the WSB are well suited for livestock development, but slaughterhouses in the region are too old and in poor hygienic condition. This situation limits further development of the industry as well as opportunities for meat export.

2) Components
- Study laws, regulations, and tax incentives regarding slaughterhouses
- Construct a number of modern slaughterhouses
- Modernize some existing slaughterhouses
- Increase public awareness of hygienic meat consumption

3) Beneficiaries: slaughterhouse operators and consumers.

7. RELATION WITH OTHER PROJECTS	AG5 (Cattle Fattening)
8. COST (APPROX.)	Phase I = $10 million Phase II = $13 million

AG7 Slaughterhouse Modernization

I. BACKGROUND

As domestic pork and beef consumption increases in Thailand, so does the potential for the rapid growth of the livestock industry. Some provinces in the WSB are well-suited for livestock development, but slaughterhouses in the region are too old and not in hygienic condition, which limits the further development of the industry as well as opportunities for meat export.

The Animal Slaughtering and Meat Sale Control Act of 1959 enforced by the Ministry of the Interior stipulates that: (i) a permit from the local government is required to build a slaughterhouse and that after it is built, ownership is transferred to the local government; (ii) prior to slaughtering, all animals must be inspected and issued a slaughtering permit, for which a fee must be paid; and (iii) meat from each slaughterhouse cannot be shipped outside the legal market area of the slaughterhouse (i.e., within the provincial borders). The rationale for these requirements is to ensure sanitary inspections in order to protect public health and to increase local revenues. However, this procedure is not followed rigorously.

II. PROJECT CONCEPT/RATIONALE

To provide the necessary legal, financial, and technical framework for the development of livestock industry in the WSB, the proposed project will review the institutional framework regarding slaughterhouses and meat trading, and establish modern slaughtering facilities for demonstration purposes. The proposed Slaughterhouse Modernization Program will have the following project elements: (i) institutional improvements; (ii) preparation of facility improvement plans; (iii) construction of demonstration facilities; (iv) provision of training program for meat traders; and (v) design and implementation education program.

The agencies/groups responsible for the Slaughterhouse Modernization Project will be the Municipal Governments, the Ministry of Agriculture and Cooperatives (Department of Livestock Development, or DLD), the Ministry of the Interior, the Ministry of Health, the Board of Investment (BOI), the BAAC, and private investors.

III. PROJECT DESCRIPTION

A. Institutional Improvements

Institutional improvements involve a review of the existing laws and regulations regarding animal slaughtering and meat trading. The relevant legislation are listed as follows:

(i) Animal Epidemics Act (B.E. 2499, 1956)
(ii) Animal Slaughtering and Meat Sale Control Act (B.E., 1959)
(iii) Slaughtering and Meat Market Control Act (B.E. 2535, 1992)

(iv) Regulation of Department of Livestock Development on Importing or Moving Animals or Carcass Within the Kingdom (B.E. 2537, 1994)

In early 1987, approval for private investment in slaughterhouses was granted for firms who had obtained promotion status from the Board of Investment (BOI). Several private enterprises have so far obtained promotion status and a few have actually started up slaughterhouses, but some of them have already closed operations. It is believed that this is due to the current zonal restrictions on the trading of livestock and meat. The study will also review BOI tax incentives to private slaughterhouses that can provide disease-free pork and beef to consumers.

B. Facility Improvements Plan

In accordance with the framework set by the recommended improvements in the relevant laws, the study will prepare plans for modernizing slaughterhouses in the region. The facilities may be provided either by the public or private sector, but controlled by DLD for disease and meat quality. The meat trader will also have to follow DLD guidelines to secure supply of disease-free livestock from approved farms.

The DLD control will be imposed at the following stages:

(i) Ante-Mortem Inspection;
(ii) Post-Mortem Inspection;
(iii) Carcass Inspection;
(iv) Sanitary Inspection of Water, Storage, and Equipment;
(v) Inspection of Worker Cleanliness; and
(vi) Sanitary Inspection of Meat Truck.

C. Construction of Demonstration Facilities

The study will recommend the location and specification of one or two modern and hygienic slaughterhouses within the Study Area for demonstration purposes. Currently, DLD plans to construct such facilities in Chachensao and Chumphon by involving the private sector. Assuming that these facilities will be in operation soon, this study will recommend further experiments in its financing and management based on the lessons to be learned by Chachensao and Chumphon projects.

D. Training Programs for Meat Traders

At the demonstration facilities, DLD could organize training programs for meat traders. The meat traders will learn all aspects of meat handling in accordance with international standards. Upon completing such training, DLD could issue license to each trader.

E. Public Education Program

The study will design and implement a campaign to increase public awareness of hygienic meat consumption. Brochures currently prepared by DLD will be improved and widely distributed. TV and radio programs on this subject should also be prepared and broadcast within the study.

IV. PROJECT ASSESSMENT

The project will improve hygienic standards and the quality of pork and beef produced and distributed in the region. This is expected to improve the ultimate quality of meat produced in the Study Area and increase the livestock market both domestic and overseas.

The cost of the project is estimated at US$22.5 million, as follows:

Technical Assistance	US$ 1.5 million
Construction of Two Slaughterhouses	US$ 20 million
Training Expert Meat Cutting	US$ 0.5 million
Design and Implementation of Public Education Program	US$ 0.5 million
Total	US$ 22.5 million

V. RECOMMENDED ACTION

It is recommended that the Ministry of Interior take initiative in restructuring the institutional and legal frameworks for slaughterhouse modernization, and that the related institutions cooperate in promoting modernization.

Project No. AG8

1. PROJECT TITLE — Agro-Processing Promotion Program

2. LOCATION — Upper and Lower WSB

3. AGENCY — MOAC, MOC, BOI, and BAAC

4. OBJECTIVES
(1) To supplement and raise the farm income
(2) To create rural employment opportunities
(3) To promote the sub-regional co-operation

5. PHASING — Phases I to III

6. DESCRIPTION

1) Justification:
Agro-processing is one of the major economic activities in the WSB. However, existing factories are increasingly facing the problems of a labor shortage, wage increases, and thus increasing prices of raw materials. Some factories are planning to produce raw materials in Myanmar (on the opposite side of the WSB), and bring output for further processing in Thailand. Although this move can be seen as somewhat detrimental to agriculture in the WSB, it is inevitable as subregional cooperation will be strengthened and at the same time Thailand will adopt a freer trade regime.

2) Components:
- Strengthening information on investment and exchange
- Streamlining and facilitating procedure on investment
- Provision of credit line and insurance
- Provision of technical assistance to Myanmar side

3) Beneficiaries: Agro-processing operators.

7. RELATION WITH OTHER PROJECTS
AG1 (Field Crops Restructuring)
AG3 (Tropical Fruits Improvement)
ID2 (Ago-industry Community Model)
RP12 (Subregional Links with Myanmar)

8. COST (APPROX.)
Phase I = $10 million
Phase II = $10 million
Phase III = $10 million

AG8 AGRO-PROCESSING PROMOTION PROGRAM

I. BACKGROUND

Agro-processing industry is one of the major economic activities in the WSB. The industry processes mainly raw materials available in the region (refer to Volume 7 on Industrial Development). However, existing factories are increasingly facing the common problem of a labor shortage, wage increases, and thus increasing prices of raw materials. Some factories are planning to produce and/or buy raw materials in Myanmar (on the opposite side of the WSB), and transport them for further processing in Thailand. Discussions with managers of agro-processing factories in the area indicate that presently they are increasingly facing difficulties due to wage increases and a limited labor supply. Although this move can be seen as having a negative impact on agriculture in the WSB in the long run, this situation is considered inevitable taking into consideration the speed of subregional cooperation and the progress of the Thai economy.

II. PROGRAM CONCEPT/RATIONALE

In order to provide dynamism to the rural areas and to increase farm incomes, agro-processing should be maintained and encouraged wherever feasible. Taking into account the different degrees of development between Thailand and Myanmar, agro-processing is considered to offer good potential in the WSB. As the production of various fruits and vegetables is expected to increase together with the possibility of importing raw materials from Myanmar, agro-processing capacity should be upgraded and strengthened. The canning of fruit and vegetables, and the development of other new agricultural products should be encouraged.

At the same time, the Myanmar side of the WSB offers good potential for the production of agricultural products similar to those currently available in the WSB. The main difference is that the quality of agricultural products is generally inferior, but production cost is lower due to unexploited resources and lower wages. Although initial investment and efforts are needed to raise the quality of these products to an acceptable standard, this region of Myanmar is a potential supply center for the agro-processing industry in the WSB. Development of the infrastructure to connect the two countries will surely facilitate and expand this trend. Thus, the area around Kanchanaburi and Chumphon is an ideal location to tap the opportunity for processing of agricultural supplies from Myanmar in the future.

Therefore, the development of agro-processing proposed here should be conceived broadly. Firstly, it will follow the traditional path of agro-processing, i.e., the processing of raw materials available in the area. Secondly, however, this activity will have to somehow modify its operation in order to respond to new requirements and opportunities. These include increases in wages, the limited supply of some raw materials, and the integration of the area. In the future, agricultural products can be produced on the Myanmar side of the WSB, and then shipped to Chumphon and Kanchanaburi for final use in processing factories.

The major objectives of the proposed program are:

(1) to supplement and raise farm income,
(2) to create rural employment opportunities, and
(3) to promote subregional cooperation.

III. PROGRAM DESCRIPTION

A. COMPONENTS

The proposed program would include the following components:

- Strengthening of information on investment and exchange
- Streamlining and facilitating of investment procedures
- Provision of credit lines and insurance
- Provision of technical assistance to Myanmar side

Although commercial exchanges between the two countries have already been taking place at a lower level, a more systematic approach to promote commercial exchange and to strengthening investment information should be established. This objective could be realized by establishing a bilateral committee supported by private entity such as the chamber of commerce in both countries.

Procedures on investment and exchange should be also streamlined and simplified to boost this cooperation. This task is conceived basically to review laws and regulations on investment, laws and regulations on immigration, and taxation. Officials and experts on trade and investment from both countries will handle this issue. A working group including experts from both countries is deemed necessary to address these issues.

In addition to streamlining the procedure for investment and strengthening the investment data base, a line of credit and insurance system is needed to facilitate and assist investors and minimize their risks. From the Thai side, the real investment and day-to-day management will be carried out by private companies that have accumulated adequate experience in this field. However, the Government should assist and facilitate initiation of the cooperation and provision of a legal framework for the investment. In addition, the proposed program should also provide technical assistance to Myanmar as the need for such assistance is envisaged in all areas.

B. INSTITUTIONAL ARRANGEMENTS

Various Government agencies and the private sector are expected to take part in this undertaking. These institutions include: the Ministry of Commerce, the Ministry of Industry, BOI, and MOAC. Private organization such as the chamber of commerce will play crucial role in this undertaking. The Ministry of Commerce is considered appropriate to take the lead and coordinate all efforts.

IV. PROGRAM ASSESSMENT

A. ESTIMATED COSTS

The total cost of the proposed program is estimated at US$30 million over Phases I to III.

B. ECONOMIC JUSTIFICATION

It is premature to quantitatively assess the benefits of the proposed program. In addition, this program would focus mainly on institution and legal aspects. However, it is clear that the proposed program would benefit both countries in the future, as the economic law will shape and speed up further cooperation and integration especially with the expected participation of Myanmar in the ASEAN community.

V. RECOMMENDED ACTIONS

(1) Adequate attention should be paid to the sensitive political environment and the social set-up in Myanmar. Large-scale cooperation appears limited in the short run, but cooperation should be initiated as soon as possible.

(2) Private sector initiatives should be encouraged and coordinated.

(3) The environment on the Myanmar side is well preserved, where natural resources are less exploited. These aspects should receive adequate consideration for longer term development.

Project No. AG9

1. PROJECT TITLE — Water Application Efficiency Improvement Program

2. LOCATION — All WSB

3. AGENCY — MOAC, RID, and BAAC

4. OBJECTIVES — (1) to economize water resources
(2) to improve the quality of agricultural products

5. PHASING — Phases I to III

6. DESCRIPTION

1) Justification:
Water is becoming a scarce commodity, particularly during the dry season, due to the increase in demand from various sectors. Although a water charge is not imposed on farmers at present, water has an economic cost to the national economy. The policy to introduce a water charge is desirable but politically it is not feasible in the near future. It is more realistic to technically improve and upgrade the irrigation system in order to economize water use. The program should adopt a "bottom-up" approach, i.e., to response to demands initiated and presented by private sector, farmers' groups, and farmers.

2) Components:
- Technical support for the selection of appropriate site and irrigation equipment,
- Subsidized credit line to upgrade irrigation equipment.

3) Beneficiaries: farmers, private operators

7. RELATION WITH OTHER PROJECTS
AG1 (Field Crops Restructuring)
AG2 (High-value Crops for Niche Markets)
AG3 (Tropical Fruit Improvement)
WR1 (Irrigated Agriculture Intensification)

8. COST (APPROX.)
Phase I = $10 million
Phase II = $10 million
Phase III = $15 million

AG9 WATER APPLICATION EFFICIENCY IMPROVEMENT PROGRAM

I. BACKGROUND

Agriculture in the WSB region is well diversified, and natural resources are almost fully utilized. Growth through expansion of land and natural resources appears virtually complete, and thus efforts for future agricultural development should be focused on the improvement of efficiency rather than expansion of land and other natural resources. It will be economically as well as environmentally costly to further expand agricultural operations. This situation is particularly obvious for both land and water resources. In the past, agricultural land has been expanded at the cost of depleting forested areas; and the new development of water resources will be even more economically and environmentally costly. Thus, agricultural development in the WSB should be conceived within the framework of the sustainability and availability of natural resources. Future emphasis should be placed on how to use resources more efficiently rather than expanding them (refer to Volume 9 for more details on water resources).

II. PROGRAM CONCEPT/RATIONALE

The main objectives the proposed program are:

- to economize water resources
- to improve the quality of agricultural products

At present, as water is being distributed to farmers free of charge, financially it is very hard to envisage any farmers' initiative to economize on water use, i.e., optimizing water use by shifting cropping patterns toward ones that require less water. Water shortages are prevalent in Thailand, and thus there is severe competition for water from other sectors in some areas. It is projected that the demand for water will surely increase with the expansion of economic activity, but at the same time the increase in water supply will be less promising. Policies and measures should be taken to preempt water shortages, which appear very likely in the future. The promotion of the use of pipe, sprinkler, and dripping systems should be encouraged.

Although a water charge is not imposed on farmers at present, water has its economic cost to the national economy. It is desirable from the national economic point of view to introduce a water charge, but politically it is not feasible in the near future. Therefore, it is more realistic to technically improve and upgrade the irrigation system in order to economize water use. The program would adopt the "bottom-up" approach, i.e., to respond to demands initiated and presented by private sector, farmers' group, and farmers.

A shortage of water would affect negatively the agricultural sector, because: (i) it would limit the possibility for the conversion to high-value crops as they are generally more sensitive to water availability, and (ii) the quality of the agricultural products would be hampered.

III. PROGRAM DESCRIPTION

A. COMPONENTS

The proposed program would include the following components:
- Technical support for the selection of appropriate site and irrigation equipment
- Subsidized credit line to upgrade irrigation equipment

Firstly, technical assistance would be provided to facilitate this program. Technical experts would provide assistance and advice on the selection of appropriate sites and thus appropriate irrigation equipment required. The technical experts would then endorse the requirement and assist farmers in preparing applications for credit to BAAC. This type of expertise is available within Thailand.

At the same time, a line of credit is essential to allow interested farmers to purchase irrigation equipment needed in this program. This line of credit is considered as a financial incentive to encourage farmers to adopt appropriate technology that will eventually help to improve the efficiency of water use. As described above, this grass-roots measure would be more effective if it is followed by the introduction of a water charge policy that will force users to economize water.

B. INSTITUTIONAL ARRANGEMENTS

The proposed program is a straightforward one as it includes basically one major component: improvement of irrigation. Major Government institutions involved in this program would be: RID, MOAC, and BAAC. RID would be responsible for water and related technology, MOAC for the agricultural aspects, and BAAC for the management of credits.

IV. PROGRAM ASSESSMENT

A. ESTIMATED COSTS

The cost of the proposed program is estimated at US$35 million over a period of 15 years.

B. JUSTIFICATION

Under the present circumstances, the proposed program would generate a clear economic benefit rather than a financial one. Economized water realized under this program would be used for other economic activities in agriculture as well as non-agricultural activities in Thailand. This would clearly be a positive impact to the national economy. However, in financial terms, impact of this intervention on the farm household is rather dubious as currently users do not pay water charges anyway. Investment costs associated with this program may create negative impact on them, if the investment cost is high and the subsidy on interest is low. Therefore, subsidized credit is considered necessary to attract farmers to participate in this program.

V. RECOMMENDED ACTIONS

(1) As discussed above, the present situation is quite distorted. Thus low interest credit is very crucial to attract farmers to this program. Otherwise, there will be no incentive for farmers to participate since they will be financially worse off.

(2) In the long run, water charges should be gradually introduced to eventually improve the efficiency of water use.

Project No. AG10

1. PROJECT TITLE — Coconut-based Livelihood Development Program

2. LOCATION — Lower WSB

3. AGENCY — MOAC

4. OBJECTIVES — (1) To preserve the amenity of the area
(2) To maintain and increase the rural income

5. PHASING — Phases I to III

6. DESCRIPTION

1) Justification:
Coconut plantation occupies a large area in the Lower WSB (total 138,000 ha: 74,000 ha in Prachuap Khirikhan, and 64,000 ha in Chumphon). With this large area, it is inevitable that some old plantation would need to be replaced regularly with young and better varieties. At the same time, private sector has taken initiatives to use coconut wood to produce various furniture. It has been reported that there is a high demand for credit from farmers to replace their old coconut plantation.

2) Components :
- Technical support to assess coconut area for replantation
- Promotion of furniture production using coconut wood
- Subsidized credit line for coconut replantation and production of furniture

3) Beneficiaries : farmers, and private operators

7. RELATION WITH OTHER PROJECTS — TO1 (Amenity preservation program)

8. COST (APPROX.) — Phase I = $5 million
Phase II = $10 million
Phase III = $10 million

AG10 COCONUT-BASED LIVELIHOOD DEVELOPMENT PROGRAM

I. BACKGROUND

The area under coconut plantation is substantial in the WSB, and this area is mainly concentrated in the Lower WSB (total 138,000 ha: 74,000 ha in Prachuap Khirikhan, and 64,000 ha in Chumphon). This area alone represents about 12 per cent of the total agricultural land in the WSB. With this large area, it is inevitable that old plantation needs to be replaced regularly with young and better varieties. In addition to its fruit and juice, coconut tree could be served for many purposes. The private sector has taken initiatives to use coconut wood to produce various furniture. The demand for credit from coconut farmers to replace their old plantations appears high.

At the same time, a number of coconut varieties is good for fresh consumption. It is reported that these types of coconut find increasing demand in domestic as well as export markets. Although the export volume of fresh coconut is still small, this business has started to gain momentum. This popularity is attributed to an increasing demand for natural and healthy food among consumers in urban areas. The development of the tourism industry also generates demand for fresh coconut as it is an exotic fruit and hygienically safe enough to be accepted by foreign tourists. This special feature enables coconut to replace international soft drink such as Coca Cola that are found all over the world.

II. PROGRAM CONCEPT/RATIONALE

Although there are other crops that could generate higher returns, the coconut plantation should be maintained and replanted because: (i) it promotes amenity values and thus attracts tourism, particularly along the coastal area and; (ii) there are technical limitations for the plantation of other crops as the area under coconut is generally sandy and poor. Therefore, it is considered reasonable to renew the old plantation, and keep this plantation at a more balanced composition in terms of age. In some areas, coconut is intercropped with other field crops such as pineapple and coffee. Coconut plantation can also offer a good grazing ground for cattle.

Like other perennial crops, it will take a long time from planting coconut until the first harvest. This feature tend to discourage farmers from embarking on clearing the old plantation and replanting with a new one. Although the yield of the old plantation is low and continues to decline, the owner is not keen to replace the plantation because the current revenue will be lost and the owner would have to wait a few years to receive the first revenue. In addition, funds are required to replant and maintain until the first harvest.

To mitigate this financial constraint, a number of measures could be taken: (i) fallen old coconut trees could be used to produce furniture and other products and; (ii) during the early years of plantation when coconut trees are small, other annual crops could be intercropped with the

coconut plantation. Later when coconut trees are taller, cattle could be introduced to make use of available fodder under coconut plantation.

The main objectives of the proposed program are:

- to preserve the amenity of the area, and
- to maintain and increase the rural income.

III. PROGRAM DESCRIPTION

A. COMPONENTS

The proposed program would include the following components:

- Technical support to assess coconut area for replantation
- Promotion of furniture production using coconut wood
- Subsidized credit line for coconut replantation and production of furniture

Technical support should be provided to identify and assess the need and magnitude for replacement. Coconut plantation should be classified by age and species for overall planning. Assistance would also be provided to farmers in the selection of new and promising varieties after taking into consideration future demand prospect.

Initiatives to make use of old coconut trees by producing furniture and other products has been started at the provincial level, particularly in the Lower WSB. However, efforts are still required in terms of "research and development" in order to establish the technology and image of the coconut furniture. This activity is considered very important for rural communities because it will generate off-farm income to the community as well as encouragement of the replantation of coconut plantation. As a result, the plantation will be well managed on a sustainable basis and hence amenity values will be preserved.

As described above, to meet the financial requirement for replantation and to encourage farmers to carry out this task, a line of credit is necessary. Concessional loans to farmers should be considered because: (i) the profitability of coconut plantation is rather low; (ii) it takes a long time to receive the first harvest and; (iii) coconut plantation generates other benefit to the economy by providing for example amenity values. The proposed credit will be handled by BAAC with the assistance of concerned institutions.

B. INSTITUTIONAL ARRANGEMENS

A number of Government institutions are expected to be involved in this program: MOAC, Provincial Government, and BAAC. In addition, the chamber of commerce and farmers' groups will take part in this undertaking. The institutions responsible for technical aspects will be instrumental in making assessments and assisting farmers in the preparation of credit applications.

IV. PROGRAM ASSESSMENT

A. ESTIMATED COSTS

The total cost of the proposed program is estimated at US$25 million over a 15-year period. The program would focus mainly in the Lower WSB area.

B. JUSTIFICATION

Although the proposed program would generate multiple economic benefits to the national economy, the financial benefit to farmers is rather marginal due to the following factors: (i) the profitability of coconut plantation is rather moderate and; (ii) there is a financial constraint during the early years of the new plantation. However, this proposed program would create a number of economic benefits: (i) income and employment to the rural economy; (ii) amenity values in the coastal area for tourism development and; (iii) reduced use of timber and thus mitigation of negative impacts on environment.

V. RECOMMENDED ACTIONS

(1) This proposed program should be considered in association with the development of rural area and poverty alleviation. Therefore, the benefit of the program should be considered broadly including economic, social, and environmental aspects.

(2) The interest rate should be reviewed to secure financial incentives to farmers.

Project No. AG11

1. PROJECT TITLE	Agricultural Marketing Information Project
2. LOCATION	WSB
3. AGENCY	MOAC, MOC, and Cooperatives.
4. OBJECTIVES	(1) To upgrade agricultural information system (2) To increase farmgate prices to farmers
5. PHASING	Phases I to II

6. DESCRIPTION

1) Justification:
In Thailand, a significant part of agriculture trading is performed by intermediaries. Isolated farmers are lacking market information, and thus they obtain lower prices as they do not have bargaining power. In addition, existing market information is not adequate.

2) Components:
- Establishment of a body to collect and disseminate market information
- Improvement of marketing system through the introduction of grading system
- Improvement of data collection, analysis, and dissemination

3) Beneficiaries: farmers and cooperatives.

7. RELATION WITH OTHER PROJECTS	All AG and AF projects and programs
8. COST (APPROX.)	US$ 23 million, to be refined in a subsequent study. Phase I = $10 million Phase II = $13 million

AG11Integrated Agricultural-Marketing Information System

I. BACKGROUND

The demand-and-supply trends of agricultural products change all the time and are reflected in the price of the products. The market participants have their own channels for obtaining the information required in their trading. In Thailand, a significant part of agricultural trading is performed by intermediaries who purchase agricultural produce at the farmgates. Price is often determined by these intermediaries. Sometimes, several levels of intermediaries are involved in trading products.

Market information is currently broadcast on TV and radio, but the information is not adequate because it lacks clear reference to the volume and grade of each type of product traded. The price information covers only the trade undertaken at government-owned central markets and is updated only once a week. Trade information at local or private markets are not covered, although they play a significant role, particularly in the trading of vegetables and fruit. Consequently, farmers are practically isolated from comprehensive market information, lack bargaining power, and consequently obtain lower prices for their products.

II. PROJECT CONCEPT/RATIONALE

The proposed project will examine existing problems concerning market information systems, and recommend an appropriate institutional and technical framework for integrating agricultural market information system nationwide. Particular emphasis will be placed on collecting reliable price information for domestic and international markets, and to disseminate it effectively using available media such as TV, radio, newspaper, and modern computer network technology.

Agencies/organizations responsible for the development of the Integrated Agricultural Marketing Information System will include the Ministry of Commerce, the Ministry of Agriculture and Cooperatives, the Union of Cooperatives, and media companies.

III. PROJECT DESCRIPTION

The proposed project intends to improve this situation with the following project elements: (i) review existing situation; (ii) examine required organizational framework; (iii) design and implement a pilot system; (iv) prepare a national market information systems plan; and (v) implement national plan.

A. Review Existing Situation

The project will review the existing system of agricultural market information and identify its problems in the following aspects:

(i) identification of agencies collecting and disseminating the price information;
(ii) existing organizational structure of agencies involved;
(iii) responsibilities of each agency concerning market information;
(iv) budget of agencies and revenue sources;
(v) source of price information;
(vi) frequency, method and form of price information collected;
(vii) validation mechanism;
(viii) degree of computerization;
(ix) type of tabulation, analyses performed before dissemination;
(x) form of dissemination; and
(xi) degree of utilization among producers, intermediaries, wholesalers, and retailers.

B. Examine Required Organizational Framework

Based on the assessment of existing problems, the project will examine required organizational framework. It is likely that the establishment of an authorized body to integrate collection and dissemination of market information is recommended either by strengthening the existing government agency or by involving a private data processing company. The cost and benefit of all the parties involved should also be examined.

C. Design and Implement a Pilot System

Initial pilot information system should link major Central Markets and private fruit and vegetable markets in and around Bangkok. Data entry units are placed at the offices of these markets, and at the closing time, all the trading information will be entered by trained staff.

Type of information to be entered by market operators will include:
(i) date of trading;
(ii) name of product;
(iii) grade;
(iv) appearance;
(v) volume traded; and
(vi) unit price.

Host computers at the data processing company compile the trade information sent from offices at the markets, perform necessary conversions and tabulation, and make the information available for users through traditional media and data retrieving terminals (PCs) linked to the host computer through a commercial digital network or the INTERNET. Data retrieving terminals can be placed at agricultural cooperative offices, BAAC branch offices, Agricultural Extension offices, retailers, and individual users such as farmers or local traders.

D. Prepare a National Market Information Systems Plan

Based on the results of Pilot Project described above, a national level market information system will be prepared. The national plan will include:
(i) a review of institutional framework;

(ii) systems development plan;
(iii) software development plan;
(iv) cost of the computer and network system;
(v) cost of operation;
(vi) cost sharing plans among the parties involved;
(vii) financing methods ;
(viii) expected benefit; and
(ix) implementation plan.

F. Implement National Plan

Over two to three years, the national market information systems plan will be implemented with appropriate technical assistance provided by international experts.

IV. PROJECT ASSESSMENT

The project will provide timely market information to producers and traders on agricultural products and raw materials. The project is expected to improve the bargaining power of farmers with intermediaries, to assist timely decision-making regarding production, and to improve overall marketing efficiency therefore to benefit consumers in general.

Expected cost of the project is US$23 million.

Technical Assistance for Planning and Design	US$ 3 million
Implementation of National Information System	US$ 20 million

Project No. AG12

1. PROJECT TITLE — Farmers' Lifetime Training Program

2. LOCATION — All WSB

3. AGENCY — MOAC, Rajabhat Institute, Universities, and Colleges

4. OBJECTIVES — (1) To upgrade farmers' knowledge and technology
(2) To facilitate the agricultural restructuring process
(3) To contribute to the improvement of the quality of life

5. PHASING — Phases I to III

6. DESCRIPTION

1) Justification:
Thai agriculture is in transition from traditional-mass production type to one which emphases high-value but smaller production. The later implies that the product-cycle is short, and that the cropping pattern is always changing. To respond to this new challenge, the skills of farmers have to be upgraded and prepared to cope with the new opportunities. Strengthening of formal basic education is one thing and improvement of vocational training is another. What is required in addition is a system which continuously provides practical knowledge required by farmers in their efforts to cope with the changing agricultural structure. To adequately respond to demand in the WSB, it is proposed to have three locations for training: Upper WSB (Kasetsart University), Central WSB (Rajabhat Institute in Petchaburi), and Lower WSB (Chumpon Agricultural College).

2) Components:
- Planning and formulation of the training program
- Identification of farmers' needs and farmers' grouping
- Funds to run the program

3) Beneficiaries: farmers and farmers' groups;

7. RELATION WITH OTHER PROJECTS — All proposed AG and AF projects and programs.

8. COST (APPROX.) — US$ 30 million; to be refined in a subsequent study.

Phase I = $10 million
Phase II = $10 million
Phase III = $10 million

AG12 FARMERS' LIFETIME TRAINING PROGRAM

I. BACKGROUND

Thai agriculture is facing new challenges at the moment. Continuing economic growth will increase not only per capita income but also the cost of production inputs such as land, labor, and water. This situation is being exacerbated by the migration of young farmers to urban areas, which in turn is creating a labor shortage in rural areas. Employment in the agricultural sector in the WSB has also shown a declining trend: 65 per cent in 1980, 63 per cent in 1990, and 51 per cent in 1994. While this declining trend was rather slow in 1980-1990, there has been a sharp decline since 1990.

There is a clear trend towards the globalization of the Thai economy and freer trade. It will be increasingly difficult to take protectionist stands on international trade issues. Trade among nations will be basically determined by the rule of the comparative advantage, i.e., only commodities of good quality and having competitive price will find markets. In addition, the continuing economic growth in Thailand as well as in the Asian region implies that the purchasing power of people will rise, and thus there will be increasing demand for vegetables, fruit, and meat and dairy products.

II. PROGRAM CONCEPT/RATIONALE

The main objectives of the program are:

- to upgrade farmers' knowledge and technology
- to facilitate the agricultural restructuring process
- to contribute to improvement of the quality of life

The freer trade regime combined with ever-changing consumption patterns implies that market demand in terms of quantity as well as types of commodities will be rather volatile and harder to predict in the future. To respond to this evolution so as to take advantage of emerging market opportunities, producers, i.e., farmers will have to be ready and equipped; they should be able to identify future opportunities in the market place, to change their cropping patterns, and to market their products to consumers smoothly. Inflexible and isolated farmers producing only traditional crops no matter how markets are changing will not be able to benefit from the emerging opportunities offered by the new markets.

Therefore, farmers' education and knowledge will have to be continuously upgraded and improved; this will be a time-consuming process, involving all steps in the educational system. Short-term technical training courses prepared for farmers would provide some help, but such courses would not comprehensively meet the requirements of new market opportunities. Formation of farmers' associations and establishment of a lifetime training system is therefore recommended.

In addition to technical and vocational training, lifetime training of farmers should be promoted. As a first step in this direction, a training facility should be established and opened to the general public. The Rajabhat Institute in Petchaburi, which has an Agricultural Department and an experimental farm, should be mobilized and used as a pilot case for this endeavor. This Institute has already initiated some courses for the general public during weekends. In addition to its own experimental farm, the Institute could coordinate efforts with the Horticulture Research Center and other agricultural institutions in the area, and use their facilities to demonstrate technologies to the students and general public.

This lifetime training program should not be confined only to the Central WSB, but it should be designed for the whole region. Kasetsart University should play the same role for the Upper WSB, while Chumphon Agricultural College should be the focal point for the Lower WSB. The proposed Tropical Fruit Center in Chumphon would be instrumental for this purpose in the Lower WSB. Existing facilities such as agricultural research centers should be utilized in this program. Furthermore, recent developments and innovations in communication technology such as satellite-TV education should be assessed and included in the program. A number of universities and institutes have already initiated this type of program. To this end, farmers in remote areas should be organized and equipped with common facility in order to improve efficiency and reduce the cost of training.

III. PROGRAM DESCRIPTION

A. COMPONENTS

Major components of the program would include:
- Planning and formulation of the training program
- Identification of farmers' needs and farmers' groupings
- Funds to run the program

As the proposed program will cover a large area and many people, the first priority is to plan and formulate the overall training program. Review and analysis on scale of the training, phasing of the program, appropriate technology for training such as satellite-TV, different institutions to be involved, training curriculum, and the like should be initiated. To facilitate this process, probably it is more realistic to start with an area as a pilot activity, say the Central WSB, where the Rajabhat Institute in Petchaburi could take a leading role. The process will then gradually expand to the Upper and Lower WSB.

At the same time, interested farmers and their needs would have to be identified in order to effectively plan and design the training program. Considering the nature of farmers who generally live far apart in remote areas, the introduction of new innovative communication technologies such as satellite TV would facilitate the training process. Grouping farmers into groups would lower the cost of the training as well as improve its efficiency.

To this end, a budget is required to run the proposed program. This budget would include personnel, training equipment, training facilities and other operating cost. It is preferable that part of the total requirement will be financed by the private sector.

B. INSTITUTIONAL ARRANGEMENTS

Many Governmental institutions will take part in this program, namely MOAC, and all ministries concerned with labor and educational issues. The Rajabhat Institute in Petchaburi is expected to play a leading role in the early phase for the Central WSB. Thereafter, Kasesart University and Chumphon Agricultural College will join the program.

IV. PROGRAM ASSESSMENT

A. ESTIMATED COSTS

The total cost of the proposed program is estimated at US$30 million for 15 years.

B. JUSTIFICATION

Development of human resources receives high priority in the Government's 8th Plan. Considering the gap between the urban and rural areas, promoting education in rural area will be even more crucial in the future. This undertaking is expected to allow farmers to adjust to the new requirements. In socioeconomic terms, this program would: (i) mitigate the gap between urban and rural areas; (ii) promote the agricultural restructuring process and; (iii) prepare a pool of good-quality labor for the national economy.

V. RECOMMENDED ACTIONS

(1) The program should start with a pilot project in the Central WSB in connection with the Rajabhat Institute in Petchaburi. Gradually, the program will be expanded to the Upper and Lower WSB.

(2) New innovations in communications technology should be integrated as much as possible.

Project No. AF1

1. PROJECT TITLE	Coastal Fisheries Rehabilitation Project
2. LOCATION	All WSB
3. AGENCY	MOAC, DOF
4. OBJECTIVES	(1) To assure income and job for the rural poor (2) To assure the rehabilitation and preservation of fishery resources
5. PHASING	Phases I to II

6. DESCRIPTION

1) Justification :
Promotion and vitalization of small-scale coastal fisheries is justified because: (i) it allows fish production at the least costs with better prices; (ii) it provides income and jobs to rural people; (iii) it encourages the rehabilitation and preservation of fisheries resources within a sustainable framework; and (iv) it takes advantage of the Government's efforts on artificial reef development in the past.

2) Components
- Development of artificial reefs, and study of biology and ecology in coastal areas
- Construction and rehabilitation of small infrastructure such as piers, jetties, and markets
- Upgrading of hatcheries to restock natural fishery resources
- Support of community based initiatives

3) Beneficiaries: fishermen communities.

7. RELATION WITH OTHER PROJECTS	RD1 (Rural Development Models) EV6 (Mangrove Reforestation)
8. COST (APPROX.)	Phase I = $10 million Phase II = $10 million

AF1 COASTAL FISHERIES REHABILITATION PROJECT

I. Background

Thailand's development policy for marine fisheries has been based on geographical expansion and commercialization. As a result, the country has rapidly evolved to a deep-sea fishing country possessing a large fleet of well-equipped trawlers and purse shiners. However, Thailand's fisheries sector is today at the historical crossroads due to overfishing and the resultant depletion of fish resources in its own waters, especially in the Gulf of Thailand. Small-scale coastal fisheries have had to unduly shoulder the burden of these problems.

In Thailand, small-scale fisheries are defined as fisheries using non-powered boats or powered boats less than 10 gross tons and employing traditional fishing gear such as gill nets, fish traps and hand lines. Since small-scale fisherfolk are often part-time or seasonal and can operate without modern fishery infrastructure, they are scattered over a number of coastal communities. Small-scale fisheries may account for more than 50 per cent of marine fish production in the WSB region.

II. Project Concept/Rationale

Emerging issues pose serious threats to the Thailand's fisheries sector, which calls for long-term sustainability, as opposed to short-term profit maximization. In this context, the socio-economic importance of small-scale fisheries, which have been taken lightly, should be clearly acknowledged. Besides apparent social and cultural values created from the rehabilitation of the coastal environment and resources, economic returns can be generated by small-scale fisheries that allow production at the least cost and with better market prices due to the freshness of the catch. Rehabilitation is an urgent social issue from the viewpoints of rural poverty alleviation and environmental conservation. Regarding social consideration, the project would give a priority to poverty areas identified as problem amphoes, like Bang Saphan Noi in Prachuap Khirikhan province (Refer to Project No. RD1, *Rural Development Models*). This is a challenging but unavoidable task for Thailand to set out a successful national model of coastal environment/resources rehabilitation.

III. Project Description

A. Components

(1) Construction of Artificial Reefs

Technologically, the past Government efforts concerning artificial reefs in coastal waters should be recalled. In addition, there is a unique possibility of manufacturing artificial reef modules by

utilizing a huge amount of ash from IPP coal-fired thermal plants planned in Prachuap Khirikhan province. Without such a recycle use, the ash would simply be piled up as an unwanted industrial waste.

(2) Infrastructure Development

The rehabilitation project requires the construction of basic infrastructure such as small piers, jetties, and market halls of a simple design. As an attempt to enhance artificial reefs and other conservation measures, the possibility of upgrading hatcheries to restock natural fishery resources may be considered. Setting up marine parks where fishing is restricted would naturally have positive impacts on conservation.

(3) Institutional Development

Social policies and systems are often the key factors to determine success or failure of development programs in any sector. The coastal rehabilitation project should give adequate consideration to various possibilities and potential in the following aspects:

a) exclusive marine parks and artificial reefs under private initiative;
b) territorial fishing rights for communities and/or fishermen's groups;
c) licensing all fishing boats, including small-scale fisheries;
d) fishermen education and awareness of the environment and resources conservation; and
e) provincial-level fisheries management.

B. Schedule/Phasing

(1) A master plan would be completed, covering the Lower WSB area in 1998;
(2 Feasibility studies would be completed by early 1999 on (i) a plant to manufacture artificial reef modules in the vicinity of IPP coal-fired thermal plants, (ii) artificial reefs in two to three locations, and (iii) infrastructure consolidation in two or three fishing communities; and
(3) The project would be implemented full-scale from 2000 for three years.

C. Institutional Arrangements

(1) The project would be prepared and coordinated by the Office of Agricultural Economics (OAE) and be implemented jointly by the Department of Fisheries (DOF), Office of Environmental Policy and Planning (OEPP) and IPP;
(2) The participation of local fishermen in the project would be secured as much as possible; and
(3) The artificial reef module plant would be run by IPP or other private entities.

IV. Project Assessment

A. Estimated Costs (Indicative US$ 20 million)

(1)	Consultancy services for project preparation:	US$1 million
(2)	Construction of Artificial Reefs: (Module manufacturing plant US$3 million, Artificial Modules US$2 million, and Construction Works US$1 million)	US$6 million
(3)	Construction of Infrastructure:	US$12 million
(4)	Implementation of social development activities and the monitoring and evaluation:	US$1 million

B. Economic/Financial Justification

Some experimental artificial reefs are already popular among Thai fishermen and appear to have noticeable biological effects in enhancing productivity. Artificial reefs are also expected to be useful in physically blocking push netters and trawlers from intruding into coastal waters. This project is expected to generate economic benefits in various forms, including increased incomes of small-scale fisherfolk, the reduction of costs of disposal of ash from thermal power plants, savings in law enforcement costs related to illegal fishing without artificial reefs, and the preservation of the coastal environment for the public in general and tourists in particular.

V. Recommended Actions

(1) The government should prepare the master plan study and feasibility studies. It is recommended that the master plan and feasibility studies be requested to an international agency for execution under a technical cooperation program.
(2) The government should discuss the project idea with IPP and the provinces concerned.
(3) The government should compile an evaluation on the existing artificial reefs, particularly in WSB region, as an important reference in preparing the project.

Project No. AF2

1. PROJECT TITLE	Sustainable Aquaculture Model Project
2. LOCATION	All WSB
3. AGENCY	MOAC, DOF
4. OBJECTIVES	(1) To disseminate the environmentally sustainable aquaculture practices (2) To provide supplementary income for rural people
5. PHASING	Phase I

6. DESCRIPTION

1) Justification :
Thailand has experienced crises in connection with the shrimp aquaculture. Mangrove forest was destroyed, and substantial land was abandoned due to the outbreaks of diseases. The DOF is promoting a closed system with sea-water pumping as a new production method to reduce risks of disease epidemics.

2) Components
- Construction of sea water pumping facilities
- Assistance in pond alignment, provision of equipment, and inspection of quarantine conditions
- Support to shrimp farmers in terms of training and formation of farmers' association

3) Beneficiaries : farmer communities.

7. RELATION WITH OTHER PROJECTS	EV6 (Mangrove Reforestation)
8. COST (APPROX.)	Phase I = $12 million (indicative)

AF2 SUSTAINABLE AQUACULTURE MODEL PROJECT

I. Background

Thailand is one of the leading countries in farming marine shrimp (black tiger shrimp or *Penaeus monodon*). In 1993, 168,000 tons of black tiger shrimp were produced in over 70,000 ha of ponds throughout Thailand, accounting for 27 per cent of the world production. Within the WSB region, Prachuap Khirikhan and Chumphon provinces emerged as important production areas in the 1980s; the whole WSB region produced around 7 to 8 per cent of the national total in 1991-92.

Nonetheless, shrimp aquaculture experienced its first setback in early 1980s when a huge area of shrimp ponds developed in the Inner Gulf area had to be abandoned due to deterioration of soil and water conditions only after a few years of production. More recently, shrimp aquaculture has been thrown into a second crisis when, as in many other Southeast Asian countries, viral diseases inflicted serious damage to the business, reducing, for instance, shrimp production in Prachuap Khirikhan to 4,193 tons in 1995, less than half of its production peak of 8,876 tons in 1992.

Moreover, it is no longer permissible to raise shrimp production by repeating a vicious cycle of converting mangroves into shrimp ponds and simply abandoning these ponds in a few years when they have exhausted their usefulness. Neither will it be sustainable if individual shrimp farmers continue to operate without adequate training and local coordination with their neighboring farmers.

II. Project Concept / Rationale

In order to disseminate environmentally sustainable aquaculture practices, the components of the present shrimp culture should be carefully reviewed. Alerted by the recent disease outbreaks which have spread through uncontrolled effluent from contaminating ponds to neighboring ponds, the government has set up a research unit for the problem and reemphasized sound farming practices. It has also taken some actions to introduce a closed (or semi-closed) system by constructing pilot facilities of sea water pumping in Songkhla and Nakhon Si Thammarat. The Department of Fisheries hopes to build 400 sea water pumping facilities throughout the country.

Farmers should be encouraged to adapt the closed system which minimizes their dependence on external water supply, replacing a conventional system of massive water exchange. The concept of controlled farming with sea water pumping seems effective for convincing shrimp farmers of the advantages of the closed system. In addition, since pumping facilities can supply sea water to

areas beyond mangrove stands, the conflict between shrimp ponds and mangrove conservation can possibly be alleviated. Good coordination should be also made with the private sector, including feed suppliers, buyers, and hatcheries. The project would target particularly small farms less than 2 ha, which comprise the majority of shrimp farms in Thailand but cannot adopt the new system independently.

III. Project Description

A. Components

(1) Pilot Shrimp Farms

For at least two groups of shrimp farms, one in Prachuap Khirikhan and the other in Chumphon, the project would adopt, on a pilot basis, an improved closed farming system supported by sea water pumping. Existing closed system pilot farms would be reviewed and used as a basis to further develop technology and improve facilities. Participating shrimp farmers would have to make a corresponding investment and receive necessary training to make the best use of the new system. Assistance would also be given to the farmers in the formation of viable farmers' organizations.

(2) Disease Control System

The project would provide local fisheries research stations with the equipment necessary to spot diseases and help set out a strict and regular inspection system on quarantine conditions in private hatcheries.

(3) Coastal Zone Management Scheme

With a planning framework of coastal zone management, the project would review the present use of the coastal zone in the Lower WSB area and formulate in a participatory manner a master plan to harmonize sustainable economic activities and the conservation of the coastal environment. The project would examine policies and actions useful for this purpose, including the realignment of individual shrimp ponds, the protection and reforestation of mangroves, and the establishment of small-scale coastal sanctuaries which extend both landward and seaward.

B. Schedule/Phasing

(1) A master plan would be completed within 1998, covering the Lower WSB area;
(2) Feasibility studies would be completed by early 1999 on improved closed aquaculture system through a multi-disciplinary evaluation of the existing pilot farms; and
(3) The project would be implemented from the year 2000 for two years.

C. Institutional Arrangements

(1) The project would be prepared and coordinated by the Office of Agriculture Economics (OAE) and implemented jointly by the Department of Fisheries (DOF), Royal Forest Department (RFD), and Office of Environmental Policy and Planning (OEPP);
(2) The participation of local farmers and villagers in the project would be secured as much as possible in both planning and implementation stages; and
(3) The participation of private feed suppliers and hatcheries would also be encouraged.

IV. Project Assessment

A. Estimated Costs (Indicative US$ 12 million)

(1) Consultancy services for project preparation:	US$1 million
(2) Construction of pilot shrimp farms:	US$8 million
(3) Shrimp farmer training and disease control system:	US$2 million
(4) Implementation of the coastal zone management plan and project monitoring and evaluation:	US$1 million

B. Economic/Financial Justification

Even if potential economic returns from the project are most narrowly defined as equivalent to diminished monetary costs of the similar disease outbreak which is assumed to wipe out 30 per cent of the harvest in the Lower WSB region, the returns could easily amount to around US$10 million per year. All other conceivable but unquantifiable economic benefits include, to mention a few, reducing external diseconomies -- damages to nurseries for coastal fish resources, salinization of farmland and ground water -- and lowering operational risks for shrimp hatcheries. Furthermore, it is obvious that the project would protect the intrinsic values of mangrove, coral reef, and marine bio-diversity.

V. Recommended Actions

(1) The government should prepare the master plan study and feasibility study. It is recommended that the master plan and feasibility study be requested to an international agency for execution under its technical cooperation program.
(2) The government should review the ongoing pilot shrimp farm projects carried out in Songkhla and Nakhon Si Thammarat.
(3) The government should consider legal measures to mandate periodical inspections of pathogenic conditions at private hatcheries.

Project No. AF3

1. PROJECT TITLE	Fish Processing Industrial Complex Project
2. LOCATION	Lower WSB (Chumphon)
3. AGENCY	MOAC, DOF
4. OBJECTIVES	(1) To establish a modern processing complex (2) To provide income and job opportunities to the area
5. PHASING	Phases I to II

6. DESCRIPTION

1) Justification :
Chumphon is near the fishing ground, and it is emerging as a new regional fisheries center, while Surat Thani fishing port is in decline. Development of the deep-sea port in Bang Saphan would facilitate transportation of both raw material and products.

2) Components
- Construction of food processing estate;
- Expansion of Chumpon fishing port;

3) Beneficiaries: processing operators and workers.

7. RELATION WITH OTHER PROJECTS	AF1 (Coastal Fisheries Rehabilitation) AG8 (Agro-Processing)
8. COST (APPROX.)	Phase I = $20 million Phase II = $30 million

AF3 FISH PROCESSING INDUSTRIAL COMPLEX PROJECT

I. Background

Thailand is the largest exporter of fishery products in the world, exporting US$3,404 million worth of commodities in 1993. Besides fresh and frozen shrimp, the country maintains a predominant position for canned tuna products with about 50 per cent of world market share. However, the industry which achieved remarkable growth in the past, has begun to confront serious constraints on further growth. The shortage of raw material, a slump in world markets for canned tuna, fierce competition from other Southeast Asian countries, and a labor shortage and wage hike, all have worked to undermine advantages that the industry has enjoyed over the last three decades.

The WSB region has a large number of small-scale fish processing plants for traditional products such as *Pla Too* steaming, squid drying, and fish ball making, while large-scale modern processing is concentrated in the Lower WSB region. There are one canning plant, nine fish meal plants, and three cold storages in Chumphon, while six meal plants and five cold storages are located in Prachuap Khirikhan.

II. Project Concept/Rationale

The fish processing industry in Thailand will have to comply with an extensive range of food safety regulations imposed by importing countries. This will inevitably cause the Government and processing companies to ensure the safety and quality of export commodities with a seamless system of modern post-harvest handling and technology by international standards. Development of a fish processing complex is an effective strategy to attain this goal. A new industrial complex for processing fishery and agricultural products would be developed in the Lower WSB, particularly in Chumphon, which has the following advantages:

(a) Chumphon is located in proximity to good fishing grounds and is emerging as a new center of the region's commercial fisheries;
(b) Chumphon provides easy access to the deep-sea port in Bang Saphan, which could be used as an ideal shipping port both for products and raw material;
(c) Chumphon is not too far from the BMA, in which the majority of Thailand's modern fish processing factories are now based. This location would provide a great deal of convenience to companies if they move their factories out of the BMA.
(e) Chumphon is also potentially capable of developing a processing industry for local agricultural produce, especially fruit. Synergistic effects between the processing of fishery and agricultural products would be of a considerable advantage.

III. Project Description

A. Components

(1) Construction of Fish Processing Estate
Although investments for fish processing plants would be undertaken by the private sector, it is desirable that the Government participate by investing in basic infrastructure for the estate, including roads, water supply, electricity, waste water treatment, and sewage. The complex would be constructed in an area adjacent to the Chumphon fishing port.

(2) Expansion of Chumphon Fishing Port
The complex would require adequate fishing port capacity. Rather than constructing a new fishing port, however, expansion of the existing Chumphon fishing port appears to be feasible. The expanded port would have to handle the supply of raw material fish from both the Thai offshore fleet and foreign deep-sea fishing fleets.

B. Schedule/Phasing

(1) Feasibility study on the project would be completed by early 1999
(2) After the feasibility study, the project would be undertaken by a public and private sector partnership. The project would be implemented from 2000 for three years.

C. Institutional Arrangements

(1) The project would be prepared and implemented under the guidelines of the Department of Fisheries (DOF); and
(2) The participation of the private sector in the project would be encouraged as much as possible.

IV. Project Assessment

A. Estimated Costs (Indicative US$ 50 million)

(1) Consultancy services for the feasibility study:	US$1 million
(2) Construction of the Fish Processing Estate:	US$14 million
(3) Expansion of Chumphon fishing port:	US$5 million
(4) Investment in processing plants (private sector):	US$ 30 million

B. Economic/ Financial Justification

At present, the Government is conducting a feasibility study of the establishment of a fishery complex on the Andaman Sea. Even if this complex is materialized, Chumphon would hardly be

affected since raw material for Chumphon would come from South China Sea and Pacific Ocean, while fish from the Indian Ocean would be brought to the Andaman fishery complex. In parallel with the fishery complex being studied for the Andaman Sea coast, the Government would take the actions recommended below to consider the possibility of creating another fishery complex in Chumphon.

V. Recommended Actions

(1) The Government should conduct a feasibility study and make an overall study of the two fishery complex projects.
(2) In order to coordinate the investments from the public and private sectors, the Government should carry out a series of thorough hearings participated in by fish processing companies which may be interested in the project.

APPENDIX II

KANCHANABURI AGRICULTURAL INTENSIFICATION DEVELOPMENT INITIATIVE

KANCHANABURI AGRICULTURAL INTENSIFICATION DEVELOPMENT INITIATIVE

1. BACKGROUND

The proposed initiative (project) has been selected for the preparation of an action program under the framework of the Western Seaboard (WSB) Regional Development Master Plan Study. This project aims at translating into practice some of the concepts proposed in the Master Plan Study, namely rice and field crops restructuring, and the promotion of high-value crops for niche markets. At the same time, the proposed project area is located in the existing irrigation scheme of the Great Mae Klong irrigation project. In the long term, it is expected that this project would served as a demonstration and springboard for the realization of the above concepts to a wider area of the Great Mae Klong irrigation scheme, and eventually of the Upper WSB.

The project area is located in Phanom Thuan district, Kanchanaburi province, which is situated about 100 km west of the Bangkok Metropolitan Area (BMA). The total population in Phanom Thuan reached 43,000 inhabitants in 1995. This district includes 7 tambons and 88 villages. The aggregated agricultural area in the district is estimated at about 257,700 rai (41,200 ha), of which currently 45 per cent is under paddy, 34 per cent under sugar cane, and the remaining 21per cent under various crops. Although there is a need to diversify from paddy and sugar cane to other crops, in reality the area under other crops such as fruit and vegetables in this district is still minimal. The area under various crops in Phanom Thuan is summarized in the table below.

Comparative Crops Area in Phanom Thuan and Kanchanaburi, 1994/95

Crops	Phanom Thuan		Kanchanaburi	
	Area 1/	Share	Area 1/	Share
Major rice	113.2	45%	460.3	21%
Second rice	44.2	18%	131.4	6%
Sugar cane	84.9	34%	1,039.8	48%
Cassava	4.0	2%	248.4	12%
Field crops	1.9	1%	215.9	10%
Fruit trees	0.8	0%	55.2	3%
Coconut	0.1	0%	0.8	0%
Total	249.1	100%	2,151.8	100%
Total agricultural land	257.7		3,083.7	

Source : Office of Agricultural Economics
1/ Area in '000 rai.

The main characteristic of agriculture in Phanom Thuan is its heavy dependence on the production of both major and second rice. For example, while the share of the major rice is only 21 per cent of the provincial average, the same share is as high as 45 per cent for Phanom Thuan, which is the major rice-producing area in Kanchanaburi. Although the Phanom Thuan share for sugar cane is lower than that of the provincial average, this share is still high and sugar cane is still occupying about a third of the agricultural land. The share of second rice is also high in Phnom Thuan, which indicates that a large quantity of water is being used for the production of rice rather than other crops during the dry season. As a result, in Phanom Thuan land used for other field crops and fruit crops becomes quite limited.

The demand for vegetables, fruit, and flowers is increasing in both domestic and overseas markets. Although it is not clear from the above statistics, about 26,000 rai (4,160 ha) is allocated for vegetable production in Kanchanaburi. Vegetables include: asparagus, onion, spring onion, Chinese mustard, tomato, cucumber, red onion, string beans, taro root, and sweet potato. Major types of fruit grown in this area are mangoes, sweet tamarind, bananas, and lychee. Other crops which are becoming popular among farmers are baby corn, guava, papaya, bamboo shoots and coconuts for fresh consumption. Production of baby corn is popular among farmers because young fruit can be consumed as a vegetable, and crop residue can be used for animal feed. Guava, papaya, and banana also have special popularity as these fruits are in high demand for fresh consumption as well as for canning mixed with other fruits such as pineapple.

2. PROJECT CONCEPT/RATIONALE

The main thrust of the proposed project is to increase farmers' income in the district through the promotion of crops diversification from paddy and sugar cane for the benefit of the production of high-value crops such as fruit and vegetables. This undertaking would allow an increase in farm incomes as well as optimum use of resources such as water. As discussed in the foregoing paragraph, Phanom Thuan district is well behind other districts in Kanchanaburi province in terms of agricultural diversification. The proposed project is expected to speed up the agricultural diversification process in Phnom Thuan as well as to serve as a model and demonstration for agricultural diversification in the Upper WSB in the future.

In the long run, traditional crops such as rice and sugar cane will gradually lose their comparative advantage as the result of an increase in costs of production inputs such as land, labor, and water. A decreasing trend of land used for these crops has already been

observed in the area. The agricultural structure will need to be restructured and upgraded towards the production of high-value crops in order to response to the new economic environment. The Government has adopted a policy to restructure low-value crops, including rice, cassava, coffee, and pepper, and replace them with high-value crops and other activities such as livestock and fish raising. This project aims at supporting the Government's policy and speeding up the process.

To achieve this objective, minor engineering works are deemed necessary in order to upgrade agricultural land that was initially designed and constructed particularly for paddy and sugar cane production so that it will adapt well to the production of vegetables and fruit. In other words, the proposed project would aim at providing a "production base" for high-value crops. Vegetable production, and to a lesser extent fruit production, are particularly sensitive to water availability. It is anticipated that in part of the proposed area, land consolidation is required to facilitate irrigation and drainage. At the same time, provision of simple irrigation equipment such as sprinklers should be explored in order to make water use more efficient.

Agricultural labor is considered to be one of the major constraints on the development of agriculture in the future. In order to mitigate this constraint, two measures could be taken: (i) introduction of agricultural machinery to replace labor when it is technically and financially feasible; and (ii) change in cropping pattern to reflect the scarcity of labor, and promote crops which require fewer labor inputs. Although vegetable production would generate higher value added per unit of cultivated land area, it requires a substantial amount of labor input. Taking these aspects into consideration, it is proposed that the balance between vegetable and fruit tree area should be carefully assessed.

To facilitate the planning exercise, indicative crops and cropping patterns are given below as a target for the proposed project. This target would be realised gradually over a period of five years. The current paddy area of about 45 per cent is assumed to be reduced to about 30 per cent, and the sugar cane area reduced progressively for the benefit of vegetable and fruit production. These crops and cropping patterns are only indicative as farmers will adjust their crops according to changing demand in the market place. What is important here is **the provision of an agricultural base** on which farmers could diversify and adjust their crops according to market demand. Over the period of five years, the cropping pattern in the project area is proposed as follows:

30 per cent : paddy production and later intercropping with upland crops;
30 per cent : vegetable and field crops such as baby corn; and

40 per cent : fruit trees such as guava, rose apple, banana, papaya, and mango.

Together with the provision of a production base to enable farmers to adjust their cropping patterns according to market demand, it is essential to support farmers in terms of agricultural technology as most of them were previously paddy farmers, and thus fruit and vegetable production is rather new to them. In addition to this agronomic support, they should receive proper training in the use of chemical, pesticides and other toxic inputs, as consumers will be increasingly conscious about their health and food in the future. As a result, these practices of assuring a higher quality of products would help secure market for outputs. Farmers' grouping is also deemed crucial to assure the quality and guarantee that the products are chemical-free as requested by consumers. The grouping would also facilitate farmers' training and the marketing of outputs.

The project area also presents a good opportunity to promote agro-tourism as being practiced in developed countries. The project area is located only about 100 km or about a 2 hours' drive from Bangkok, and thus it is likely that middle to upper class family from Bangkok will come to visit the area to enjoy fresh fruit as well as to educate their children on farming as well as environmental aspects. Part of the proposed fruit and vegetable area would be open to excursionists for this purpose. Farmers should be organized to promote this activity as well as to provide common facilities such as parking lots and selling points, all of which would be hard to be realized by individual farmers. This activity would increase farmgate price and bring additional income to farmers' communities.

The proposed project area is located near the main consumption center in Thailand, the capital Bangkok which has a population of about 10 million inhabitants. It is expected that the consumption of fruit and vegetables will continue to increase hand in hand with the good economic performance of the national economy. In order to fully maximize this opportunity, it is reasonable to gradually encourage the production of high-value crops such as asparagus, baby corn, and cut flowers, to the growing demand in both domestic as well as export markets. From the marketing point of view, the area is ideal for the production of high-value products to be marketed in the Bangkok niche markets. At the same time, the proposed project area has been also selected for a pilot project for rural development under which rural road, water supply, and rural markets would be supported.

3. PROJECT DESCRIPTION

3.1 Components

The proposed project would include the following components:

- Crops Restructuring and Production of High-Value Crops,
- Support for Marketing Improvement, and
- Irrigation and Land Consolidation.

3.1.1 Crops Restructuring and Production of High-Value Crops

This component aims at facilitating and assisting farmers in their efforts to reduce low-value traditional crops such as rice and sugar cane, and to expand high-value crops in order to increase their income. Three sub-components are considered essential: (1). support for the conversion of 10,000 rai (1,600 ha); (2). technical support for the conversion; and (3) farmers' training in production of high-value crops and proper utilization of pesticides.

(1) Support for the Conversion of Crops

The proposed project would support the conversion and production of 10,000 rai (1,600 ha) as a model and demonstration. Of the total, it is assumed that 3,000 rai would need land consolidation work, and the remaining 7,000 rai would be readily available for the diversification of crops. As for land use, the following is assumed:

(i) 3,000 rai will be used for paddy, and gradually intercropped with upland crops in the dry season;
(ii) 3,000 rai will be used for vegetable and field crops such as baby corn; and
(iii) 4,000 rai will be used for fruit trees.

During the process of conversion, farmers will face financial constraints for the following reasons: (i) revenue from existing crops will be reduced or eliminated; (ii) funds will be needed for new investment in new crops and activities; and (iii) it will take a few years until new income can be generated, should farmers decide to plant fruit trees. Therefore, an agricultural credit line is essential to mitigate financial constraints. Presently, the Government is promoting the Agricultural Restructuring Program, which embraces similar objectives, i.e., reducing the rice area for the benefit of high-value crops. The Government is also adopting a credit approach to achieve its objective. The proposed credit would be used to cover: (i) vegetable and field crop production of 6,000 rai; and

(ii) fruit tree production of 4,000 rai. Production costs have been estimated to include also equipment for on-farm irrigation. The estimated credit requirement is presented in the table below.

Estaimated Credit Requirement

	Unit rai	Unit cost Baht/rai	Total mil. Baht	Total mil.US$
Production of Veg./Field Crops	6,000	15,000	90	3.6
Production of Tree Crops	4,000	40,000	160	6.4
Total Cost			250	10.0
Credit Requirement 1/			200	8.0

Source : JICA Study Team.
1/ Assuming 80% of the total cost.

The proposed credit program will be distributed mainly through BAAC, the major agricultural bank, as generally practiced in Thailand. General credit norms will be broadly the same as currently applied by BAAC. One major item of these norms is that farmers should contribute 20 per cent of the total cost, while the credit portion covers at most 80 per cent of the total cost. The interest rate should be subject to further discussions. Currently, BAAC is giving loans at a 13.5 per cent annual rate, which is considered high, particularly for fruit plantation purposes. It is desirable that the favorable impacts on enhancement of the environment be taken into consideration in deciding the interest rate. Some form of financial incentive should be built in the proposed credit package in order to encourage diversification to high-value crops. It should also be noted that under the Agricultural Restructuring Program, the Government is giving loans at 5 per cent per annum.

(2) Technical Support for the Conversion

In addition to the provision of credits, farmers would require technical support in order to effectively restructure their crops. Technical assistance can be identified in the following areas: (i) reviewing farmers' interest in this project and assisting them in making decisions as final decisions would have to be made by farmers themselves; (ii) facilitating the preparation of applications for agricultural credits; (iii) assisting farmers in their efforts to introduce new crops; and (iv) water management. The following experts are considered necessary in this undertaking: (i) a horticulturist with good experience in chemical-free production; (ii) an agriculture economist/marketing expert;

and (iii) a training and cooperative expert. In principle, all experts will be also involved in farmers' training as described below.

(3) Training in Farming Practices

In addition to technical support, farmers' training is considered crucial to assure the success of this proposed project. Generally speaking, farmers specializing only in rice production are less advanced compared to farmers producing vegetables and fruit. These type of farmers are in shortage of fund as well as technology and knowledge. Therefore, it is imperative to train them all in technologies relevant to the newly introduced crops. At the same time, new crops with promising demand in the market should be continuously demonstrated and shown to farmers. And in response to increasing awareness and concerns of the health issue, training in the proper use of chemicals and insecticides should be promoted. Farmers' training should not be confined only to the "classroom training", field demonstrations, farmer's visits, and training from farmers to farmers should be encouraged. Training on the formation and management of farmers' association is also considered crucial as the association will hold the key to quality control and marketing in niche markets in Bangkok.

The cost for the technical assistance and farmers training is estimated at US$ 2.5 million over a period of five years.

3.1.2 Support for Marketing Improvement

The marketing aspect has a particular role in this proposed project because the market will dictate the cropping pattern to be adopted by farmers, and market demand is always changing depending on new requirements by consumers. Once demand for staple food such as rice is fulfilled, consumers generally look for other products which depend very much on their purchasing power, and to some extent "fashion" at a specific time. Therefore, farmers would have to be more sensitive and responsive to new market demands, particularly in urban areas. As for the marketing strategy, markets would have to be well targeted, and production would be designed to respond to a specific requirement, i.e., niche markets.

(1) Technical Support for Group Formation in Marketing

To achieve the above objective, it is essential that farmers be organized, forming groups and associations. These groups would facilitate the marketing of outputs to buyers by

giving a guaranty of quality as well as on delivery time. Separate and sporadic producers would make it difficult to control quality and would increase the marketing cost to buyers. It is proposed that farmers be formed into groups, and contract farming be encouraged between farmers' groups and buyer companies. This arrangement would make business contact simple, reduce the marketing costs, and allow the control of output quality. Quality control is particularly crucial to consumers who demand chemical-free products. It is proposed that the training and cooperative expert and the agricultural economist coordinate and place emphasis on organizing farmers into groups, on facilitating contact between these groups and buyer companies, and on monitoring and witnessing fulfillment of contracts between the two parties. The experts will also be instrumental in providing marketing information to farmers' groups.

(2) Farmers' Training in Marketing

Traditionally, farmers are individualists, and they are not used to working in association with others. Particularly, they are not familiar with the concept of marketing their products together. In addition, contract farming of high-value crops for niche markets as proposed in this project would force them to deal directly with marketing professionals from urban areas, often working in big companies. Therefore, strengthening of the marketing skill of farmers to work in groups is crucial in order to protect their interest. Farmers' training in marketing, namely farmers' groups organization and management, market development and promotion, price analysis, commercial contracts, financial management and accounting, and other necessary aspects in marketing should be implemented. The price information system would also be improved and upgraded.

Assistance should also be given to the farmers' association to establish and run a site for "agro-tourism" in the project area. Assistance would include training, establishment of simple market structure, and relevant facilities such as parking lots and play grounds. The cost for the overall formation of farmers' association, farmers' training in marketing, and promotion of agro-tourism is estimated at US$1.2 million over five years.

3.1.3 Land Consolidation

Phanom Thuan district is covered by the Phanom Thuan sub-project (53,170 ha) of the Greater Mae Klong Irrigation Scheme (GMIS, with a total area of 483,460 ha). In the Phanom Thuan sub-project area, RID completed ditch-and-dike irrigation facilities for 14,940 ha, which accounted for 28 per cent of the irritable area. On the other hand, land consolidation in Kanchanaburi province accounted for 24 per cent of the total land

consolidation area in the GMIS (70,320 ha). Consequently, the actual implementation of irrigation and land consolidation in Phanom Thuan district has been delayed substantially. The Land Consolidation Office in Kanchanaburi has a plan to execute five new land consolidation schemes, totaling 1,650 ha in 1997-2001, including an area in Tambon Rang Wai.

It is provisionally planned that irrigated upland crop farming be demonstrated on an area of 10,000 rai (1,600 ha) near Tambon Rang Wai in Phanom Thuan, where the land is predominantly used for sugar cane (about 40 per cent of irrigable area) and paddy (about 60 per cent). Land presently under sugar cane is proposed to turn into the cultivation of fruit trees such as guava, rose apple, banana, papaya, and mango. About 50 per cent of land used under paddy fields will remain for paddy production as before, with the remaining 50 per cent be gradually shifted into cultivation of vegetable and upland crops such as baby corn and asparagus, which are likely to have good demand in niche markets in Bangkok. Consequently, the irrigation is planned in the following manner:

(i) 3,000 rai (480 ha) for paddy by flood irrigation (at the initial stage);
(ii) 3,000 rai (480 ha) for vegetable and field crop by overhead irrigation; and
(iii) 4,000 rai (640 ha) for fruit tree (e.g., guava, rose apple) by fallow irrigation

In the land initially under paddy cultivation, it is further planned to gradually shift the cultivation into paddy in the wet season and upland crops in the dry season, by introducing appropriate land consolidation. Thus, it is assumed that only 3,000 rai of the total project area would need land consolidation. The cost of irrigation and land consolidation is preliminary estimated at 34 million Baht or US$1.3 million.

3.2 Schedule/Phasing

The schedule/phasing of the proposed project is summarized in the figure below:

Project's Schedule / Phasing

Component	Year 1	Year 2	Year 3	Year 4	Year 5
1. Crops Restructuring					
- 3,000 rai, paddy/vegetable					
- 3,000 rai, vegetable/ field crop					
- 4,000 rai, fruit tree					
- Technical assistance					
- Farmers' training					
2. Support for Marketing					
- Group formation					
- Training in marketing					
3. Land Consolidation					
- 3,000 rai					

3.3 Institutional Arrangements

As described above, the Government is implementing the Agricultural Restructuring Program aimed at increasing value added in the agricultural sector. The institutional arrangement proposed under this project should be, in principle, similar to that of the Agricultural Restructuring Program. However, as the Government is still in process of implementing and reviewing its program, it is considered beneficial to review and include the latest Government findings and lessons in the institutional arrangement proposed for this project.

The proposed project contains multiple components, and thus various Governmental institutions as well as private entities are expected to be involved in this project. In principle, the following Governmental institutions will take part in the project.

- MOAC : for agricultural extension, training, and formation of groups;
- RID : for irrigation;
- CLCO : for land consolidation;
- MOC : for agricultural marketing; and
- BAAC : for agricultural credit.

In addition to these institutions, private companies, farmers' associations, and farmers themselves will be involved in this project.

It is proposed that each institution implement its relevant task. For example, the MOAC will be responsible for agriculture extension, group formation and training to farmers; it will coordinate with BAAC for the disbursement of agricultural credit in order to implement the proposed project. The Ministry of Commerce (MOC) will collaborate with the MOAC, private companies, and farmers' association to promote marketing in niche markets, to train farmers in marketing, and to improve the pricing information system. RID and CLCO will be respectively responsible for irrigation and land consolidation aspects.

However, to harmonize activities and to exchange information in order to smoothly implement the proposed project, it is recommended that a Steering Committee be established to supervise the progress and to coordinate all activities. Members of the committee would include all participating institutions: MOAC (extension, training, cooperative), RID, CLCO, MOC, BAAC, representatives of private companies, and representative of farmers' association. Taking into consideration the nature of the proposed project, and the capacity of each institution concerned, it is proposed that the MOAC act as chairman of the Steering Committee.

4. PROJECT ASSESSMENT

4.1 Estimated Costs

The total estimated cost of the program is estimated at 376 million Baht or $15.0 million. Detailed cost by component is summarized in the table below.

Estimated Cost of Kanchanaburi Agricultural Intensification Initiative

	Quantity rai	U.Cost Baht/rai	Total mil. Baht	mil. US$
1. Crops Restructuring (credits)				
Paddy/vegetables	3,000	15,000	45.0	1.8
Vegetables/field crops	3,000	15,000	45.0	1.8
Fruit trees	4,000	40,000	160.0	6.4
Sub-total			250.0	10.0
2. Support for Marketing			30.0	1.2
3. T. Assistance and Training			62.5	2.5
4. Land Consolidation	3,000	11,200	33.6	1.3
Program Total			376.1	15.0

Source : JICA Study Team.

4.2 Economic/Financial Justification

It is premature to estimate with precision the economic and financial justification of the proposed project at this early stage of preparation as cost estimates are still preliminary. However, a broad assessment indicates that planting vegetable and fruit trees would be financially viable for farmers provided that they are supported with reasonable credit for their investment, particularly fruit trees, which normally take a long time to harvest their first benefit. Farm surveys also indicate that vegetable and fruit farmers are generally better off than paddy and traditional field crop farmers.

In economic terms, production of vegetable and fruit trees generates multiple benefits to the national economy: (i) vegetable and fruit trees generate higher value added than do paddy and traditional field crops; (ii) fruit trees consume less water, an input which will become increasingly scarce in the region in the future; and (iii) vegetable and fruit production is likely to find good demand in the future, particularly from health-conscious consumers in urban areas. In addition, fruit tree plantation would have a positive impact on the environment through promoting soil fixation, and thus preserving greenery in area, an important aspect also for tourist development.

4.3 Initial Environmental Examination

The project area is located on relatively flat and hilly terrain about 30 km northeast of Kanchanaburi municipality. The area has long been cleared for agricultural fields and no important forest resources exist. Major agricultural activities include cultivation of rice, sugarcane, and some upland crops. There are no important aesthetic, archaeological, or historical resources except some tourism attractions near the project area.

Implementation of the project might cause mixed effects on the environment. Possible beneficial effects include the betterment of reducing soil erosion/flooding due to the construction of new irrigation and drainage systems and the shift to soil-fixing crops, while adverse impacts include the potential health hazard to farmers caused by excessive use of chemical fertilizers.

It can be concluded that the project will not result in any significant environmental impact. However, some adverse impacts are anticipated as mentioned above, requiring preventive measures such as the construction of an appropriate new irrigation and drainage systems, and provision of clear instruction to farmers on new cropping methods including the proper use of chemical fertilizers. Consequently, provided all the measures are taken, a full-scale EIA is not considered necessary for the proposed project. A summary IEE table and IEE checklist are attached.

5. RECOMMENDED ACTIONS

The proposed project area is located near Bangkok as well as in the existing irrigation scheme of the Greater Mae Klong irrigation project. It will be a test case as well as a model for the agriculture development of the WSB in the future. The following recommendations are proposed for implementation:

(1) With regard to the provision of technical assistance and training to farmers, implementation with the cooperation of both multilateral and bilateral donors is recommended, as they could draw more expertise and experience in group formation, contract farming, agro-tourism, and production of chemical-free products for the benefit of the proposed project.

(2) Concerning lines of credit, it is recommended that the loans extended by OECF to BAAC be utilized to the maximum extent. In view of the nature of the project, which

tries to create a model for the agricultural restructuring to reflect the scarcity of natural resources, and of the favorable environmental effects particularly produced by tree crop plantation and the time required from planting to harvest, it is suggested that the current loan conditions be reviewed and modified so that incentives can be granted to farmers participating in this project.

(3) Establishing a good relationship with the private companies in urban areas, who will be the main buyers of the project's output in the future, is considered crucial for the success of the project. They are in a better position to estimate demand, to identify potential crops, and to provide information on the prices of high-value crops. Involvement of such potential buyers in the project design from the start is deemed very important. The project unit should also facilitate contact between these private companies and farmers' groups.

(4) A pilot project for rural development is also proposed in this project area. The pilot project aims at improving living standards in rural area by providing rural roads, water supply, and a rural market. Coordination and exchange between the proposed project and the pilot project should be enhanced to assure smooth implementation.

Initial Environmental Examination (IEE) for Kanchanaburi Agricultural Development Initiative

A. Description of Environment	
1. Physical Resources	1.The Project area is located on relatively flat and hilly terrain about 30 Km northeast of Kanchanaburi municipality.
2. Ecological Resources	2.The area has long been cleared for agricultural fields and no important forest resources exist.
3. Human Use Values	3.There are some agricultural activities, mainly cultivating rice, sugarcane and some upland crops.
4. Quality of Life Values	4.There are no important aesthetic, archeological or historical resources except some tourism attractions near the planned Project area.
B. Screening of Potential Environmental Impacts	
1. Environmental Impacts Caused by Project Location	1.Existing farming systems may be disturbed by a new irrigation system and land consolidation works.
2.Environmental Impacts Associated with Project Implementation	2. Potential impacts of irrigation and drainage works on flooding.
3. Environmental Impacts Resulting from Project Operations	3.Potential beneficial effects of cropping pattern change (i.e., from paddy and sugarcane to fruit and vegetable crops) on soil erosion and flooding, and potential adverse impacts of excessive use of chemical fertilizers on farmers' health.
C. Environmental Mitigation Measures	Provision of appropriate flood protection measures on the new irrigation and drainage systems, of instructions to farmers on new cropping methods including the proper use of chemical fertilizers would be an efficient means of preventing potential environmental quality degradation.
D. Conclusion	Provided all the mitigation measures are taken, the Project will not result in any significant environmental impacts.

Checklist of Initial Environmental Examination (Kanchanaburi Agriculture Development Initiative)

Environmental Parameters Affected by the Project Implementation	Impacts on the Environment	Recommended Feasible Mitigation Measures	Magnitude of Impacts			
			No Significant Effect	Significant Effect		
				Small	Moderate	Major
1. Air and Noise Pollution	1. Nuisances and health hazards to neighbors and wildlife.	1. Usage of low emissions and noise construction equipment, selection of proper times for a new irrigation system, and establishment land consolidation works.		x		
2. Terrestrial Ecology	2. Alteration of wildlife habitats and/or loss of biodiversity from tree cutting.	2. Minimize the amount of tree cutting, replanting precious vegetation.	x			
3. Water Quality and Sanitary Condition	3. Water pollution caused by new irrigation system establishment and land consolidation works, potential water contamination and adverse impacts on farmers' health caused by excessive use of chemical fertilizers.	3. Setting up of soil storage places so that the soils do not intrude into the water bodies, and providing proper instruction to farmers on chemical fertilizer use.		x		
4. Flooding	4. Potential adverse impacts of irrigation and drainage works on flooding.	4. Provision of appropriate flood preventive measures on the new irrigation and drainage system.		x		
5. Historical/Cultural Properties	5. Loss of historical/cultural properties.	5. Investigation of these properties and provision of appropriate preservation measures.	x			
6. Human Resettlement	6. Relocation of residents.	6. Consideration on alternative site selection and adequate compensation for affected residents.		x		