

Thailand

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PRESENT SITUATION

Introduction

THAILAND COVERS SOME 513,000 km² of land being situated in the central part of the Indo-China Peninsula. The climate is tropical and monsoonal. Annual rainfall varies between 1,000 mm and 1,500 mm depending on season, altitude and location of the area in relation to mountain ranges. The temperature regime and radiation levels are generally favorable for year-round production of crops. The population is around 56.34 million (1990) with a growth rate declining from 2.8 percent in 1980 to about 1.6 percent in 1990.

The Thai economy had an average annual GDP growth rate of about 8.9 percent from 1980 to 1990, whereas the average GDP growth rates of agriculture and nonagriculture sectors were 3.4 percent and 9.6 percent, respectively. The change of the government policy to become a newly industrial country from an agricultural country, had much effect on the employment of the agriculture sector. In fact, agricultural employment has been decreasing for a long time and is now remaining about 60 percent of the total employment of the country. The value of agricultural exports was about 38.0 percent of the total domestic exports in 1990 which had decreased from 57.9 percent in 1986.

Living on agriculture is not attractive due to its low income. During the past ten years, per capita income of Thailand has almost doubled from US\$559 in 1981 to US\$1,103 in 1990. Regarding agricultural income, net farm and nonfarm cash income for the crop year 1987/88 were US\$604.29 and US\$594.90, respectively, whereas the household cash expense per farm was US\$523.50. It indicates that the net farm income is slightly more than farm household cash expense. The farmers have to earn nonfarm income for their own living.

Irrigation and agriculture of the country have been developed simultaneously for sustainability reasons. Agricultural development policies are concerned with the productivity, marketability and suitability of resources utilization, whereas irrigation policies are related to project planning, construction, operation, maintenance and management, and personnel issues.

Land Utilization and Landholding

The total land of about 51.31 million ha is classified into farm holding (46%), forest (28%) and unclassified land (26%).

Rice fields constitute 50 percent of the average farm landholding. Upland crops and fruit trees and tree crops are the next two main areas with about 24 percent and 13 percent landholding,

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respectively. The remaining land is utilized for vegetables, flowers and livestock and as idle and other lands. The total number of farms is 5,244,643, the average farm size being 4.5 ha.

Farm landholding increased from 18.21 to 23.65 million ha during 1977-1988, whereas forest land decreased from 18.65 to 14.38 million ha within the same period. However, the rice field component decreased from 62 percent to 50 percent of the total, whereas the upland crops and fruit trees and tree crops increased from about 20.54 percent and 8.84 percent to 24.10 percent and 13.23 percent, respectively. These would show the gradual change of concept from monoculture of rice cultivation to multiple crops.

The Royal Irrigation Department (RID) is the main agency responsible for irrigation. These facilities have been primarily designed for supplemental irrigation of rice in the wet season.

Table 1. Present situation of land utilization in Thailand.

Description	Quantity (10 ⁶ ha)	% of total
<i>1. Land Utilization</i>		
Total land	51.31	100.00
Forest land	14.38	28.03
Farm holding land	23.65	46.09
Unclassified land	13.28	25.88
<i>2. Utilization of farm holding land</i>		
Total land	23.65	100.00
Housing area	0.53	2.24
Rice land	11.88	50.23
Upland crops	5.72	24.19
Fruit trees and tree crops	3.12	13.19
Vegetables and flowers	0.16	0.21
Livestock farm area	0.76	3.21
Idle and other land	1.48	6.26

Source: Ministry of Agriculture and Cooperatives. 1991. Agricultural Statistics of Thailand, Crop Year 1990/91.

At present, the total irrigable area is about 4.53 million ha, accounting for about 19 percent of the total farm holding land. It can be distinguished on the project types as follows:

Type of Project	No. of Projects	Area Served (10 ⁶ ha)
Large scale	66	3.30
Medium scale	598	
Small-scale	6,226	1.07
Pumping	656	0.16
Total	7,546	4.53

The pumping projects as indicated, are under the responsibility of the Department of Energy Affairs. During the past ten years, the irrigable area has increased by about 10 percent.

Water Availability and Utilization

There is no comprehensive inventory of either surface water or groundwater resources in Thailand. Surface water is usually of good quality and is suitable for irrigation. The exception is the high salinity levels that occur in the lower reaches of uncontrolled river or drainage systems in the dry season due to sea water intrusion at high tide.

Uncontrolled river flows follow the distribution of rainfall, with very high flows in the wet season and low or zero flow in the dry season. With the exception of rivers in the North and South which have small dry-season flows, no dry-season irrigation is possible without storage in dams, depressions or drainage systems. For this reason and to generate hydropower, a large number of storage dams have been built in Thailand.

On a national basis, less than 25 percent of the irrigable area is currently irrigated in the dry season. The general situation in some selected projects can be summarized as follows. After completion of the Phitsanulok Project, only about 35 percent of the irrigable land in the Chao Phya Plain can be supplied with sufficient water to grow dry-season rice. The Mae Klong Basin has sufficient storage to irrigate nearly 100 percent of the irrigable area in the dry season. However, future potential will be determined by releases for power generation and diversions to the Chao Phya Basin now being planned. Projects in the Northeast have potential to irrigate from 30 percent to 75 percent of the irrigable area in the dry season and in the Northern Region they have a potential to irrigate from 25 percent to 100 percent of the irrigable area in the dry season.

In summary, most of the projects do not have sufficient water to supply 100 percent of the irrigable area in the dry season. This does not pose any problems in the Northeast as only a fraction of dry-season water is currently used. However, in the Chao Phya Basin limited water supplies are being fully utilized, mainly for dry-season irrigated rice. Among the main questions arising in this situation are:

- To what extent can surface water supplies be supplemented by groundwater to increase cropping intensity and make better use of investment in irrigation and drainage infrastructure?
- To what extent can upland crops (crop diversification) be promoted instead of irrigated rice to spread the benefits of limited water supply over a large area? and
- Does allocating limited water to a particular section of a basin offer any special advantages (e.g., the Northern Region of the Chao Phya Basin which is more intensively farmed and geared to crop diversification, versus the South where the potential is almost exclusively for irrigated rice)?

The Secretariat Office of the National Water Resource Committee gathered data of projected water resource availability and use in Thailand for 1990-2000. The details of water demand are as follows:

Domestic Water

The Metropolitan Waterworks Authority will need an annual supply of 1,369 million cubic meters of water for the Bangkok Metropolitan Region by 2,000. The water supply for the Provincial Waterworks Authority will reach about 934 million cubic meters by 2000.

Irrigation Water

The irrigation water demand was 3,000 million cubic meters for the irrigation area of 4.24 million ha. The annual demand will increase up to 38,500 million cubic meters in 2000 if the irrigation area increases by 80,000-96,000 ha annually.

Industrial Water

The water demand in the industrial sector is about 35 percent of the whole demand and will increase up to 40 percent or about 2,339 million cubic meters in the Bangkok Metropolitan Region in 2000. Another major area of demand for this sector is the Eastern Seaboard Industrial Zone which will need a water supply of about 90.5 million cubic meters annually by 2000.

Others

The water demand for the other activities are also necessary, i.e., inland navigation and protection of sea water intrusion at high tide during the dry season, especially in the Chao Phya River. The water release for power generation is considered to be of lower priority.

In summary, there is an increasing demand of water in each region of Thailand. As it is too difficult to look for or build up new water sources, problems of water shortage will become serious in the near future.

Present Status of Irrigation and Drainage Systems

The Royal Irrigation Department classifies irrigation systems into four types, according to the level of development of irrigation and drainage infrastructure and on-farm development (OFD) work. These types largely define the quality of irrigation service and are as follows:

Type 1

The area developed with land consolidation, with a mix of intensive, semi-intensive and extensive OFD works as appropriate to topography, plot size, fragmentation of holding and flood risk.

Type 2

Refers to areas covered by the standard ditches and dikes program. Simple earthen ditches and dikes are constructed about every 400 meters along the lateral with a simple control gate to regulate the flow of water from the lateral to assist in distributing water.

Type 3

These areas are not clearly defined. They have a reasonable main and secondary distribution and drainage system but no OFD or ditches and dikes to assist water distribution and drainage.

Type 4

Systems in these areas are generally incomplete and do not have adequate water distribution, OFD or drainage facilities.

In theory, the four types of irrigation/drainage areas reflect the level of water control possible with the infrastructure provided. In practice, Types 3 and 4 are more common in flood-prone areas, so the influence of flooding may be more important in determining productivity than the level of water control that can be exercised with the irrigation system.

Rice yield differences are significant between Types 1, 2 and 3 but not between Types 3 and 4. Data on the irrigation area under the four types of irrigation and drainage systems along with comparative rice yields for the 1989/90 wet season are summarized below:

Type of System	Area (10 ⁶ ha)	%	Average Yield (ton/ha)
Type 1	0.27	8	4.0
Type 2	1.32	42	3.3
Type 3	1.61	50	2.8
Type 4			2.7
Total	3.20	100	

Only 8 percent of the RID irrigable area is Type 1 (land consolidation areas) with good water distribution and drainage facilities. About 42 percent is Type 2 (the old ditches and dikes program) with minimal tertiary and OFD facilities in the form of simple ditches and dikes. Types 3 and 4 constitute some 50 percent with poor or essentially no irrigation and drainage facilities. This shows that only about half of the total irrigable area has a comparatively good water control, resulting in higher yields.

Irrigated Crop Production and Diversification

Irrigation systems in Thailand are primarily designed for rice production. Since rice is the main crop grown in both the wet season and the dry season, crop diversification is still new to farmers. Irrigated rice yields in Thailand average about 3.0 tons/ha, whereas the average nonirrigated rice yield is about 1.5 tons/ha. However, the yield is also affected by the degree of water control at different levels as earlier mentioned, e.g., rice yield in irrigated area Type 1 is almost 4 tons/ha and yield in irrigated area Type 2 is only 3.3 tons/ha.

During the past five years (1986-1990), the farm value of total rice production increased from US\$697.9 million in 1986 to US\$2,539.6 million in 1990, whereas the total rice export value increased from US\$697.4 million to US\$1,095.9 million in the respective years. Productivity may be improved both intensively and extensively. The expansion of irrigated areas will, of course, decrease nonirrigated areas. This would result in more production that can be expected from the expanded irrigated areas. The ratio of nonirrigable to irrigable areas in Thailand decreased from 3.43 in 1977 to 2.73 in 1988. An increase of irrigated areas made it possible for Thailand to increase rice production for self-sufficiency and to maintain the export capacity in the previous years.

Thailand is already practicing diversified cropping patterns during the dry season. The major crops include mungbean, soybean, groundnut, water melon, corn, sorghum, etc.; and vegetables; sugarcane; fruit trees; and perennial crops. In addition to the cultivation of these diversified crops, fish farming is carried out during the dry season. Only about 13 percent (426,000 ha) of the total irrigated area (3,294,000 ha) is used for diversified cropping and fish farming (Table 2). There is an increase, however, of the diversified cropping area and the area used for fish farming by 1.25 percent annually.

Table 2. Irrigated areas and areas used in diversified cropping and fish farming, 1987-1991 (in '000 ha).

Area	Year				
	1987	1988	1989	1990	1991
Rice	509	700	735	491	593
Upland crops	117	113	114	109	107
Vegetables	30	11	30	29	31
Sugarcane	67	109	107	108	125
Fruit trees	97	99	129	115	104
Perennials	59	43	31	21	24
Fish ponds	37	45	48	32	35
Total diversified cropping	407	420	459	414	426
Irrigated area*	3,114	3,180	3,201	3,226	3,294
Percentage of diversified cropping area	13.0	13.2	14.3	12.8	12.9

Note: *Irrigated area under large- and medium-scale projects.

Many factors influence the development of crop diversification. Suitable areas for diversified cropping are those with good soils which are suitable for upland crops, free from flooding and with a dependable water supply. Table 3 lists the constraints and the measures to overcome them. Among other factors not related to irrigation are marketing constraints and lack of farmers' participation.

Irrigation Policy and Relevant Strategies

The Ministry of Agriculture and Cooperatives (MOAC) laid down the overall policies for agriculture and irrigation development as follows:

Agricultural Production Policy

Farmers should have more participation in decision making on their production issues with information support from the government. The production program should be made from the village and channeled to the Central Government for budget support. This is similar to the construction program of small-scale irrigation projects.

Marketing Policy

The information system is of great importance for the marketing policy, which has to be implemented together with the Ministry of Commerce. An ad hoc committee should be set up to deal with any specific commodity. The private sector should come into the system, whenever the farmers are able to make decisions of their own.

Table 3. Constraints and promising irrigation management practices for relaxing constraints to diversified cropping.

Constraints	Promising Remedial Measures
Unreliability of water distribution	Better main system management; suitable control structures; intensive training.
Soil suitability problem	Research on soil suitability; advice to farmers.
Inadequate water storage	Study capacities for water storage; increase water use efficiency; advice on crops that require limited amounts of water.
Inadequate existing infrastructure	Improvement of infrastructure to meet changed objectives; improve flexibility.
Drainage problems	Improvement of drainage systems; advise on crops that are sensitive to waterlogging.
Lack of good quality seeds	Research for better varieties.
Cultural practices favoring rice cultivation	Increase farmers' confidence in irrigated crop diversification.
Salinity problems	Good drainage and water control.
Interference between activities	Water operation planning; study on the various activities.
On-farm development	Farmers' participation in cost sharing and maintenance program.

Natural Resources Development and Agricultural Environment Policy

Resources for agriculture include land, water, forest and fishery. Benefits derived from natural resources utilization should be maximized with no degradation or pollution.

The irrigation policy classified irrigation into 3 categories, i.e., project planning and construction, system operation and maintenance and management, and personnel issues.

Project Planning and Construction Policy

Water is not only getting scarce, but utilization of natural water resources may also sometimes affect the environment. The development of new irrigation projects, especially for large project construction, was often attacked and prevented by conservationist actions. Clarification of this problem to the public is therefore essential.

System Operation, Maintenance and Management Policy

Farm efficiency should be increased for water saving to partially compensate the need for new water resources. Water allocation should be adjusted in accordance with the rapid change of land use. Clarification of dry-season water availability is necessary for crop planning.

Training of zonemen and operational staff is necessary to ensure better understanding of water management issues. Importance of system maintenance should be foreseen by the Budget Bureau for the provision of a sufficient budget.

Personnel Issue Policy

Due to the large number of personnel, the administration should be done properly and carefully. Incentives and remunerations should be provided to technical staff to prevent brain drain to the private sector.

Concluding Remarks

To sustain reasonable growth rates in the agriculture sector, Thailand must intensify its agriculture by improving crop yields, as there is little scope for expansion of planted area. To maintain a competitive position in world markets, Thailand must also improve efficiency of production by reducing unit costs, and raising the quality of produce. This applies particularly to rice where there are indications of oversupply now and in the coming years. Thailand already supplies nearly 40 percent of the international rice trade and hence feels vulnerable to potential oversupply conditions. The government is, therefore, interested in crop diversification. In theory, irrigated areas offer good possibilities for achieving these objectives as they should offer a low risk environment conducive to the high use of inputs, high yields, efficient production, and flexibility in cropping patterns. In practice, this is not the case due to agro-ecological conditions, markets and marketing, and farmer attitudes. In addition, irrigation systems as presently designed and operated are well suited to rice and poorly to other crops. However, improvements in design and operation of both new and existing irrigation projects can be introduced to take better advantage of the potential created from past irrigation investments through higher efficiency and yields in rice production and through production of irrigated upland crops where conditions are favorable.

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VISION STATEMENT

Constraints and Opportunities

- competition for limited water resources;
- declining share of agriculture in GDP;
- pressure on land and labor;
- competition and protectionism;
- low income group and distribution disparity;
- heritage of agricultural oriented society;
- conflict between irrigation development and environmental conservation; and
- centralization and disunity in irrigation system management.

Vision

Irrigated agriculture will remain an important component of the national economy and food security in Thailand by the year 2016. Its role can be maintained by a high degree of participation of farmers and private sector involvement in irrigation system management with emphasis on agrobusiness orientation combined with highly efficient management of irrigation systems in order to enhance the balance of development and resource utilization to ensure sustainability.

Strategies

- reorganize and strengthen farmers'/local organizations to increase management and decision-making capabilities;
- define a clear role for the private sector to participate in the management and marketing of irrigated agriculture including R&D;
- promote, coordinate and strengthen human resources development programs;
- improve/reorganize irrigation system management to attain better performance;
- increase water storage based on social and economic viability;
- provide clear guidelines on priority of water resources allocation;
- organize land-use zoning and agricultural zoning in response to physical, ecological and market demand;
- promote agro-processing industries;
- introduce intensive application of higher agricultural technologies;
- enact a comprehensive water code;
- enforce environmental acts; and

- promote public awareness of environmental issues and encourage people participation.

MEANS TO ACHIEVE THE VISION

The overall policy (super policy) should be to change from rice-based to higher-value commodities, to promote commercialization and agro-industry, and to assist farm production enterprises of various forms.

The following components have to be considered:

- policy;
- development measures;
- research and study; and
- education and training.

The following *policies* have to be implemented to achieve the vision:

- recognition and encouragement of high degree of farmers' organization in all aspects concerning irrigated agricultural development (IAD);
- recognition and encouragement of high degree of private business actions in all aspects concerning IAD;
- reorganization of concerned agencies for better management of IAD;
- increasing water supply and better utilization of available water resources;
- introduction of land-use planning and higher emphasis of agricultural zoning;
- keeping a balance of sustainable environment; and
- giving emphasis on research and development.

Policy 1: Recognition and Encouragement of High Degree of Farmers' Organization in All Aspects Concerning IAD

Development Measures

- recognize/strengthen the abilities of farmers' organizations to handle decision-making matters and management of production, food processing, marketing, irrigation activities and own organizational affairs; and
- revise the existing laws and regulations which obstruct the independency and growth of farmers' organizations as well as passing new favorable bills/regulations.

Research and Study

- proper roles and structures of farmers' organizations.

Education and Training

- training program for farmers' organizations in management, food processing and marketing.

Policy 2: Recognition and Encouragement of High Degree Private Business Actions in All Aspects Concerning IAD

Development Measures

- define a clear role for private business in IAD; and
- encourage private business to be involved in irrigation system investment, O&M, administration of IAD (production, processing, marketing).

Policy 3: Reorganization of Concerned Agencies for Better Management of IAD

Development Measures

- promote coordination among various agencies concerned in terms of plan, budget, execution and personnel management; and
- appoint one agency to be in charge of water use for industrial and other purposes.

Research and Study

- organization and management model suited to IAD in the Thai context.

Education and Training

- human resources development programs for staff of concerned agencies (content/target groups).

Policy 4: Increasing Water Supply and Better Utilization of Available Water Resources

Development Measures

- increase of water storage;
- importation of water supply;
- reforestation program;
- monitoring of water availability and utilization;
- setting priorities for water allocation;
- revising water codes; and

- introducing intensive agricultural extension intervention.

Research and Study

- potential demand and supply of water resources both surface water and groundwater, irrigated agricultural commodities and engineering issues.

Policy 5: Introduction of Land-Use Planning and Higher Emphasis on Agricultural Zoning

Development Measures

- enforce the application of land-use/agricultural zoning through:
 - taxation systems;
 - incentives such as crop insurance, market place, infrastructure, availability, contract farming and price guarantee; and
 - introducing specific laws to ensure there is no misuse of irrigation area through land reform and consolidation.

Research and Study

- suitability of various farming systems in response to physical, ecological, socioeconomic and market demands.

Education and Training

- transfer appropriate technology to farmers in the area of agricultural production, water management and processing.

Policy 6: Keeping a Balance of Sustainable Environment

Development Measures

- control and enforce the environmental act; and
- promote public awareness on environmental issues.

Policy 7: Giving Emphasis on Research and Development

Development Measures

- linkage among beneficiaries, implementing agencies and researchers.

Additional Issues

Research

- how to prevent the land-fragmentation problem caused by inheritance.

Education and Training

- irrigation engineering curriculum should also include issues of irrigation system management;
- support skill training for farmers who will leave the agriculture sector; and
- concepts of scarce resources and environmental issues should be included at all educational levels.

Regional Cooperation and Collaboration with International Organizations

- exchange of information and technology within the region and internationally;
- establishment of an information network system;
- encouragement of joint research programs within the region; and
- holding workshops to settle some issues of regional concern, e.g., use of international water, prevention and control measures for environmental pollution.

Role of Thailand: Receiver and Giver