

# Utilization of Water for Rainfed Agricultural Areas in Northeast Thailand

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## Abstract

Approximately 70% of the population in Thailand derives its livelihood and/or income from the agricultural sector, and most of the cultivation areas are under the rainfed system, especially in the northeastern part of the country (the Isaarn Region). There are three sources of water available, namely rainfall, surface water and groundwater. The average annual rainfall in the Northeast is around 1,350 mm. The largest watershed, draining to the Mun River, covers about 70,000 km<sup>2</sup> while the Chi River watershed covers a further 50,000 km<sup>2</sup>, approximately. Paddy rice occupies most of the lowlands, while the main crops in the uplands are cassava, sugarcane, bean and maize. The main water resources problems are insufficiency, fluctuation of water regime and quality. These problems can occur at any time, even in the rainy season. This paper considers the past development of water resources in addition to discussing the National Government's present strategies and policies. Additionally, the methods adopted for the most economically beneficial utilization of water resources for rainfed agriculture in the Northeast are also highlighted.

## Introduction

The Land Development Department (LDD) was established on 23 May 1963 within the Ministry of National Development (later abolished). Several years after their establishment, the government agencies were restructured, and from 29 September 1972, the Land Development Department was transferred to the Ministry of Agriculture and Cooperatives. The Department consists of 10 central divisions and 12 regional offices. The main responsibilities are to conduct soil research, soil surveys, land use planning, soil and water conservation, and dissemination of land development techniques and soil analysis upon the request of farmers.

The Land Development Department has set up its operational policy according to the objectives of the National Economic and Social Development Plan. Its policy aims to maintain soil quality and ensure proper and appropriate land uses.

The use of water for agriculture is vital to about 70% of the population of the country. In the Northeast, about 80% of the population is engaged in agriculture under the rainfed system. The majority of the cultivation area (about 70%) is under paddy rice, which consumes more water than other crops. The annual rainfall is about 1,350mm. Soil texture for all the soil types occurring in this part of the country is moderately sandy to sandy, which seriously affects the water-holding capacity. Therefore, water management is a major problem for the rainfed agriculture system in Northeast of Thailand.

## Background

The Northeast Region is located at the latitude between  $14^{\circ} 8'$  and  $18^{\circ} 20'$  N and longitude  $101^{\circ} 52'$  and  $105^{\circ} 40'$  E (Fig. 1). The total area is approximately 168,854 km<sup>2</sup>, corresponding to one-third of the total area of the country.

The use of the term Northeast plateau for this region is due to the fact that the region is located at the altitude of 150-250m above sea level under undulating to rolling landforms. It comprises several small watersheds, which drain into the two principal rivers, the Chi and the Mun, flowing into the Mekhong River.

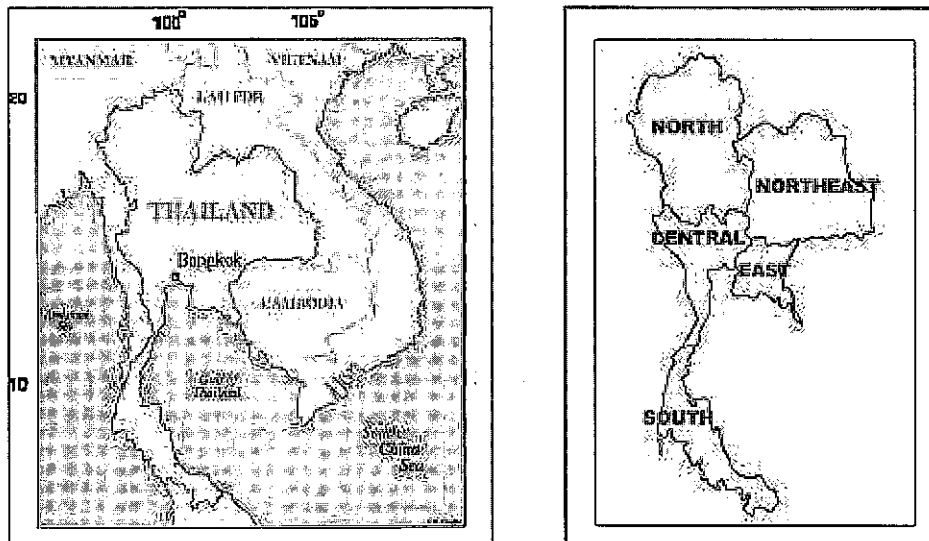


Fig. 1 Thailand and the Northeast Region.

## Water resources

Water is one of the most important resources in Northeast Thailand, and the three main sources of water can be described as follows:

### \* Rainfall

Rainfall is an important above-ground resource resulting from the influences of the southwest and northeast monsoons in addition to the tropical depressions and typhoons from the Gulf of Thailand and the South China Sea. In general, the rainy season starts around May and continues to October/November. The annual amount of rainfall in the Northeast is about 1,350 mm.

### \* Surface water

Surface water, or runoff, is normally captured and stored in the rivers, canals, ponds and lakes. The runoff processes occur after the saturation of the ground and the subsequent infiltration process, and they vary according to the amount of rainfall and the catchment areas. The volume of surface water potentially available from the watersheds of the Northeast is approximately 52,000 million m<sup>3</sup> annually.

### \* Groundwater

Groundwater is the result of rainfall percolation into the water table. The recharge rate of groundwater varies from area to area. The largest sources of groundwater can be found in the Mekhong riverbank in

Nongkai and Nakhonpanom provinces but smaller sources can be found in most other areas throughout the Northeast. This type of water which has traditionally been used for domestic consumption by the communities in the Northeast, could be developed for agricultural uses.

## **National water resources policies**

Given the harsh climatic conditions of the Northeast, water is one of its most important resources, and this has long been recognized by the Government.

Hence, the Social and Economic Development Plans 1 to 8 (inclusive) emphasized policies based upon two important principles as follows:

- \* Water as a scarce resource: promoting development projects concerned mainly with water development on various scales; strengthening the establishment of the national organization for water resource administration and management under the Act; seeking new water sources for the water supply system; supporting studies about groundwater potential, and developing water information systems for effective groundwater management; and
- \* Control of water pollution: promoting the development of systems and processes in order to preserve and control the water quality of the Lower Chao Phrya, Lower Ta Chin, canals, ponds and natural lakes.

The substantial achievements of the objectives of these (earlier) water resource development policies have been clearly demonstrated by:

- \* Greater efficiency in cultivation and agricultural land utilization and occupancy; and
- \* Increase of job opportunities in the rural areas.

Nevertheless, water crises still occur in many areas in the Northeast. These can be attributed to changes in the water quality and quantity resulting from the degradation of the watersheds, especially the rapid decline of the base-flow during the dry season, and flooding in the rainy season.

Considering the prevailing conditions and needs and the availability of substantial "untapped" and/or underutilized water resources (as noted earlier), the current policy concentrates on the effective harnessing and utilization of these resources through a more systematic water development program.

## **Water development program**

Various government offices/departments/agencies are involved in water development programs, including the Land Development Department. Each agency would be responsible for a particular type of water development project according to the agency's prime function or its role. These projects are aimed at solving the water resources problem, which can be identified as water shortage or insufficiency, fluctuation of water regime and water quality. The Water Development Program is therefore to be achieved through the application of a 3-tier project-based approach as follows:

### **\* Large scale**

This type of project can be considered on the big river systems with more than 100,000 rai (16,000 ha) of benefit area. This level of development involves a multi-purpose program (of the large river basin) for irrigation, electricity generation, flood prevention, etc. Responsible agencies for dam construction are either the Royal Irrigation Department (RID) or the Electricity Generating Authority of Thailand (EGAT). But after completion of dam construction, EGAT will take over the responsibility for the dam and subsequent electricity generation, while the RID will be responsible for its prime function, i.e. irrigation

only.

**\* Medium scale**

This type of project can be considered for smaller benefiting areas of more than 1,000 rai (160 ha). Programs mostly involve the irrigation and water consumption of the local community. So far, cooperation and coordination among government agencies responsible for the implementation of such projects have ensured their proper development. Nevertheless, these types of projects will require more coordination and cooperation in the future if the evident signs of pending water crisis and sedimentation are not to reach dangerous levels.

**\* Small scale**

This project level is for agriculture, domestic consumption and flood reduction or prevention. The benefiting area would be 300 rai (50 ha) to 1,000 rai (160 ha). During the last decade, soil erosion and sedimentation have been the main causes of decreasing water storage capacity. Many government agencies are now dealing with small-scale water resources development programs. Therefore, the key to sustainability will be the effective coordination of these agencies to maximize efficiency while, minimizing further environmental degradation that results in the rapid loss of capacity (and hence project benefits) of the storages and/or projects undertaken.

## **Expected benefits /beneficiaries**

The main purposes of the water resources development programs are to increase the use of natural surface water resources, supply water during the drought as well as in the dry season and also the prevention of flood in the rainy season. The benefits of these activities can be evaluated and the expectations are listed as follows:

1. Changes in land use patterns for mixed cultivation areas and also for second crops after harvesting.
2. Increasing farmers' income from crop(s) production.
3. Stimulating base line economies at the grass root levels.
4. Increasing opportunity to select suitable crops for suitable land as well as the market demand.

## **Responsibilities of the Land Development Department**

The Land Development Department has two main water development priorities namely:

- \* The construction of small water reservoirs and the improvement of old ponds, natural reservoirs, and checking of dams used mainly for community consumption in the dry season, in the rural areas; and
- \* The construction of water supply systems to accelerate the more appropriate use of the existing groundwater resources for agriculture instead of domestic consumption.

In total, 71 areas or locations in the 17 provinces of the Northeast are included in the operational plan for the development of small water storages, sediment removal from canals and old natural water reservoirs.

Twenty-two water supply system projects in 12 provinces in the Northeast are planned for implementation, with systems modifications, including the installation of water pumping systems and underground pipelines.

Cooperation with farmers in the implementation areas is very important to ensure the maintenance and improvement of the installed water resources systems. Monitoring and evaluation of these activities carried out to date have revealed the usefulness of the adaptation of the water development policy as well as the

operational plan.

## Conclusion

Most of the cultivated areas in Northeast Thailand are under the rainfed system. Shortage of water for consumption and for growing crops is always a serious problem. Many water resources development projects have been implemented by various government agencies including the Land Development Department. The scales of the development are based on the water development policies both at the national and implementing agency levels.

Small-scale water resources development is one of the Land Development Department's operational policies. Seventy-one locations in the 17 provinces of the Northeast have been selected to be the sites for water storage ponds, checking of dams and the removal of sediment from canals, streams and old water supply systems. A further important activity is the installation of water supply systems in 12 provinces.

The expected outcome of this plan is to increase the use of land area for cultivation, increase farmers' household incomes, reduce production costs, and improve the base line economies at the grassroot levels.

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