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# Physiography of Rice Land in Peninsular Thailand

by

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## Abstract

Rice land in Peninsular Thailand is categorized into three groups with respect to physiographic environment during the wet season and patterns of cultivation. The areas under consideration are the lands on the coast, in the young fan region, and in the old fan-terrace region.

On the coast region rice is grown in silted lagoons and in swales between beach ridges. These low-lying areas are moderately inundated for a considerable part of the year and therefore, are good for rain-fed rice growing. However, there still remain seizable amounts of potential rice land unreclaimed. In most cases, they are too remotely located for easy commuting from existing dwellings.

Rice lands in the young fan region are found on gently sloping fan surfaces which are well watered by numerous bifurcated streams. Due to this ideal physiographic condition for both rice growing and human habitaiton, the region is highly developed as wet season rice land with simple water control devices. At present it is on the way to acquiring a more sophisticated irrigation system with the aid of the schemes of the Royal Irrigation Department.

The old fan-terrace region, comprised of undulating and rolling ground surface, is primarily a terrain for tree crops rather than rice. But rain-fed rice fields were introduced to the region and have been expanding for a dozen years or so despite the danger of drought.


## Introduction

Approximately 600,000 hectare of rice land, comprising about 10 % of Thailand's rice land, are located in Peninsular Thailand. This paper categorizes rice land according to the physiographic environment during rainy season, and uses Phatthalung-Songkhla province as a model. The results can be extended to the entire peninsula.

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## I Rice land map & geomorphologic map of the Phatthalung-Songkhla province

Fig. 1 is a map showing rice land distribution as of 1954 in an area around Phatthalung and Songkhla. Fig. 2 is a simplified geomorphologic map of the same area. Consideration of the two maps clearly shows that nearly all the rice lands are located in the coast region and in the young fan region.

## II Description of the regions

### 1 Coast region

*Physiography*

The topographical composition of the coast region falls into three categories; beach ridges, swales between beach ridges, and silted lagoons as shown in Fig. 3.

Beach ridges are generally 1 to 3 m higher than adjoining swales and silted lagoons and are composed primarily of sand. Thus, they are unsuitable for rice cultivation.

On the other hand, swales and silted lagoons are flat and low-lying, with an average elevation of 1 to 2 m. Generally, the ground surface consists of dark gray-colored heavy clay. The soil is fertile because of its recent origin and is a rich reserve of base and organic materials.

Hydrographically, the swales and silted lagoons constitute a somewhat poorly drained area due to their flat and low-lying position. Generally, however, inundation does not reach a great enough depth to kill rice plants because both swales and lagoons have open access to the sea. This prolonged inundation of medium, depth is advantageous for primitive rice growing which does not require a sophisticated control of water depth.

On the other hand, the sea produces an undesirable effect on the soil of the region. Brackish sediments, ubiquitous in the area, produce a toxic soil such as acid sulphate soil after dehydration. In extreme cases salt water directly affects those areas in which fresh water influx is scanty. However, problems of this kind do not seem to be serious at the present stage of development.

*Landuse*

Being low-lying, poorly-drained, fertile areas, swales and silted lagoons are primarily suitable for rain-fed rice growing. Both transplanted and directly-sown rice can be grown with easy care. The comparatively high yield of the region, i.e. 30 to 40 tang/rai,* can be attributed to these favorable water and soil conditions.

Although the area's location is physiographically suitable for agriculture, seizable portions remain uncultivated due to their inaccessibility. Many places accessible only

*1 thang=20 litres
1 rai=1,600 sq. meters

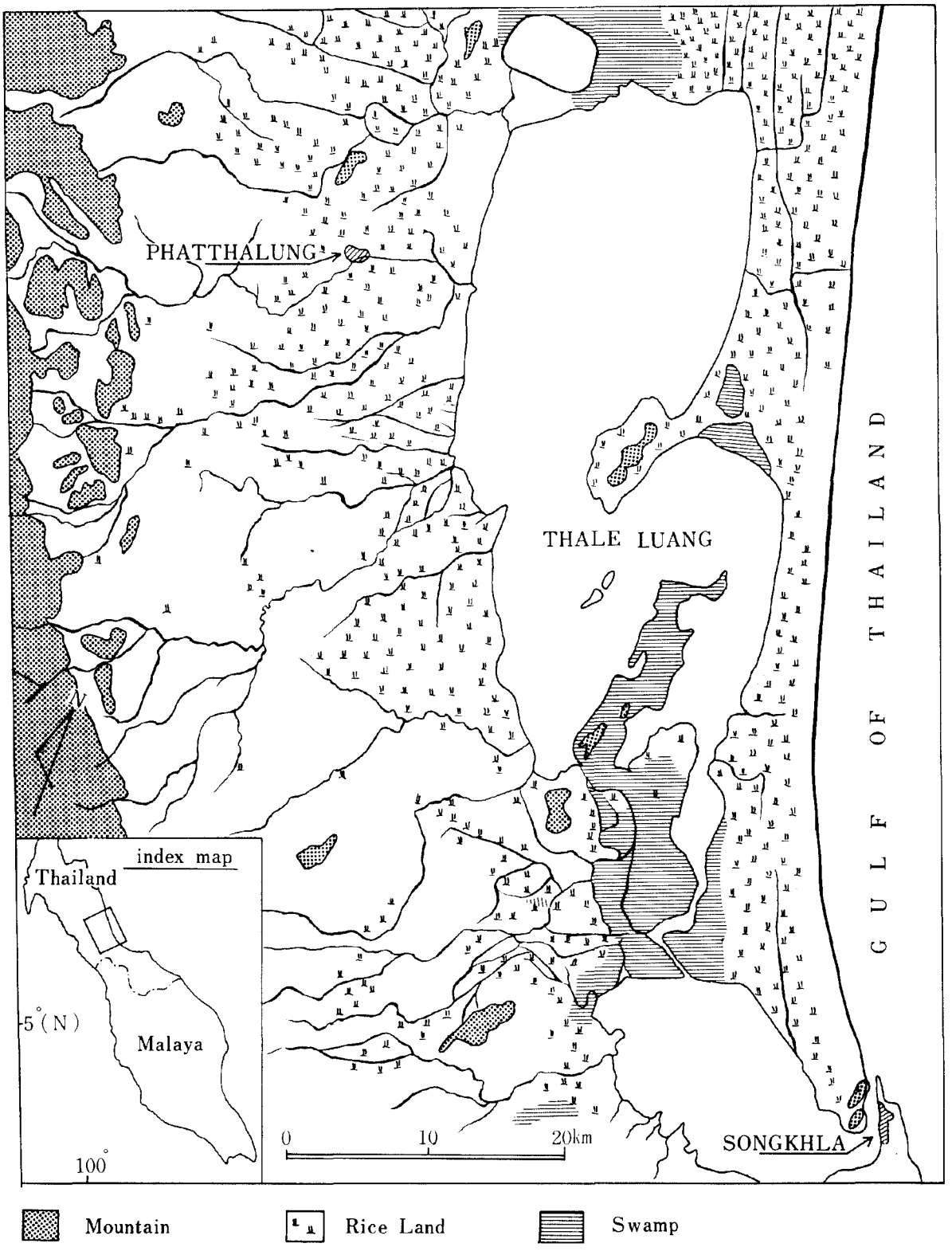


**Fig. 1** Distribution of rice lands in Phatthalung–Songkhla province as of 1954; Prepared based on the AMS's 1/250,000 topographical map

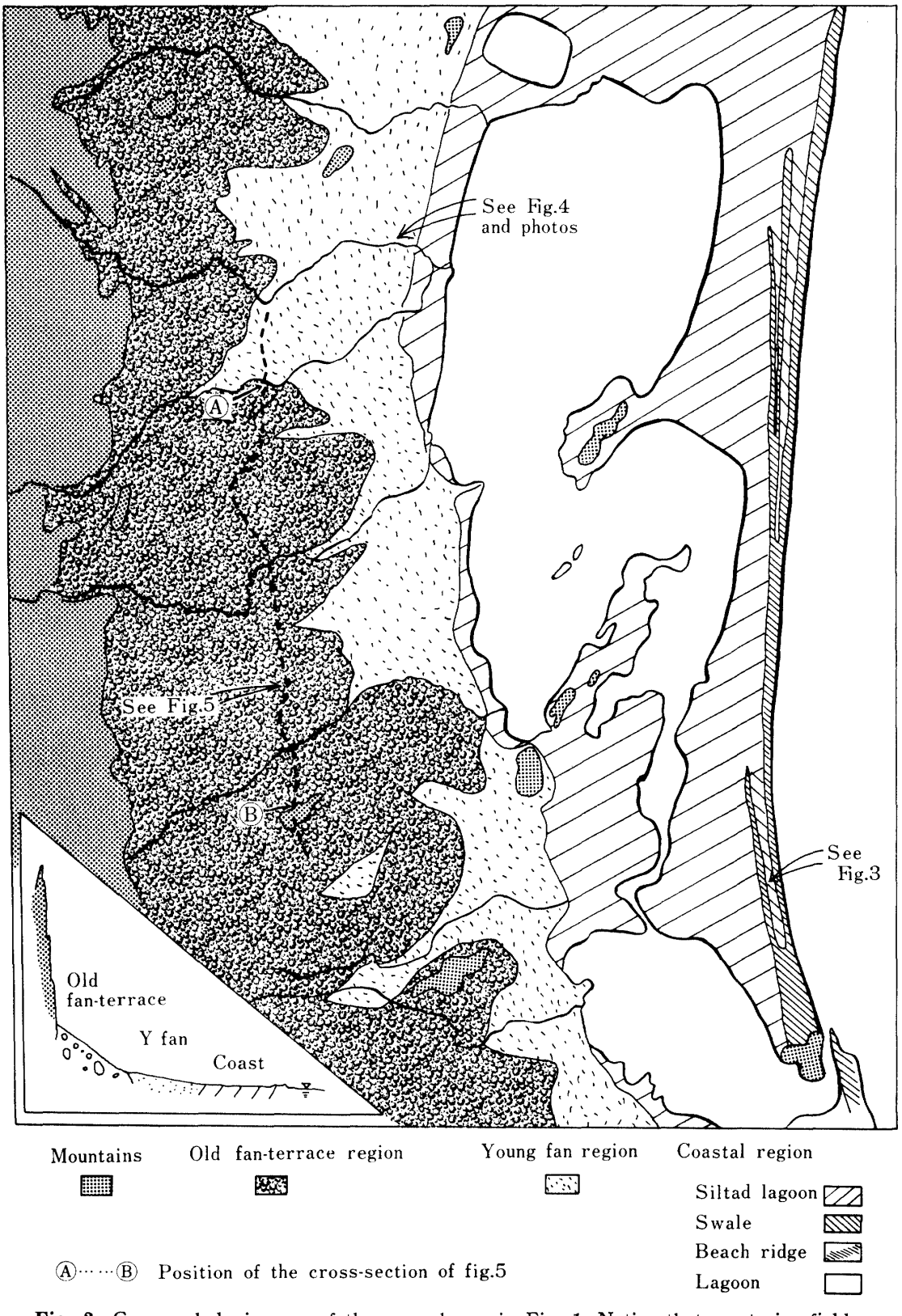


**Fig. 2** Geomorphologic map of the area shown in Fig. 1. Notice that most rice fields are either on the young fan or the coast regions.

from the sea, are unconvenient for commuting farmers. Judging from the present trend, more and more areas are being converted into rice land in order to keep pace with the increasing population. In this respect, the region can be characterized as having an unsaturated potential as rain-fed rice land.

A representative cross-section of the coast region is shown in Fig. 3

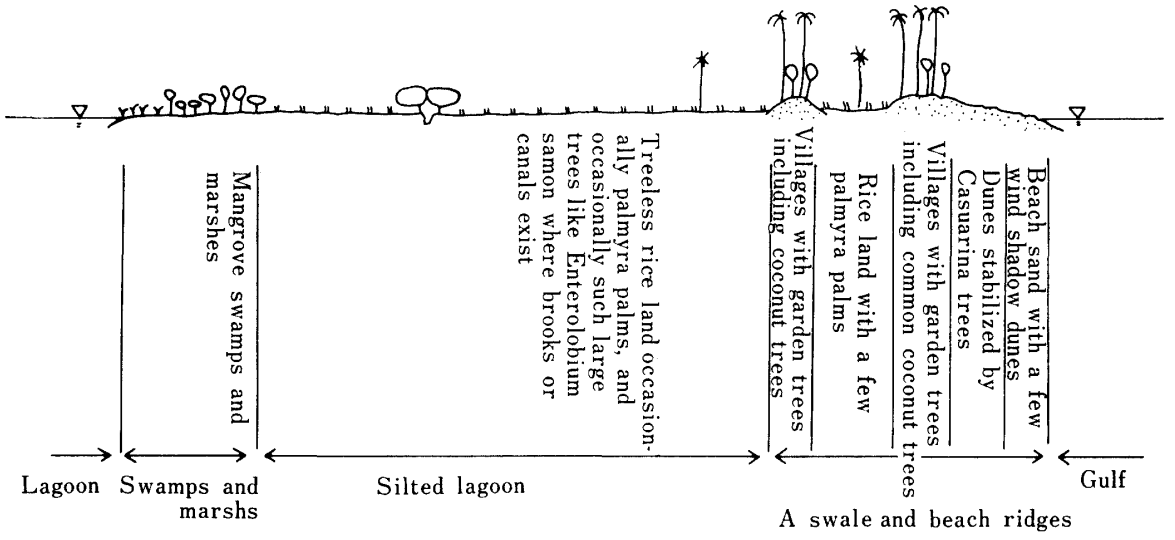


**Fig. 3** A representative cross-section of the gulf side half of the coast region

## 2 Young fan region

### *Physiography*

The ground surface of the young fan region is slightly undulating with a general slope of 2 to 3 per 1000. The micro-relief is characterized by stream incisions and by numerous mounds made by a kind of mud flow from swollen streams. The stream incisions vary in depth from 5 to 8 m near apices and 1 to 2 m in the middle of fans. The mounds are usually 10 to 20 hectare in area and 1 to 2 m higher than the fan ground surfaces. Villages and gardens producing vegetables and fruits are concentrated on the elevated areas of the stream strips and mounds, whereas rice fields cover the flat parts of the fan surfaces.

The bulk of the deposits of the region, capable of attaining a thickness of more than several meters, consists of sand or clayey sand with gravel. The actual rice fields are, however, in most cases, floored with a clayey layer more than several decimeters thick and can hold water fairly efficiently. This is because the reworking of surface materials and the superimposition of over-bank stream deposits have occurred repeatedly in the past and have resulted in the accumulation of fine materials in relatively lower positions. The texture and weathering degree of the surface materials

suggest the soils of the regions to be less-fertile than those of the coast region but more fertile than those of the old fan-terrace region.

Bifurcation characterizes the stream pattern in this region. Major streams attain a width of more than 20 m and a bank height of more than 5 m. Most, however, are 3 to 5 m in width and 1 to 3 m in bank height. A few have a width of less than 1 m. All of these streams can carry water during rainy season with minor maintenance.

The catchment-fan region area ratio* is computed as being as small as 4.1 in the case of the Phatthalung-Songkhla province. This is the second smallest among all rice regions of Thailand, and is comparable to 5.1 which is the ratio for the fan-terrace complex region of the Chao Phraya basin.

*Landuse*

In theory, a gently sloping ground surface with a bifurcating stream network is ideal for gravity irrigation. An example of traditional water management in the region is illustrated in Fig. 4 with photographs. Water moving swiftly (on Jan. 11,

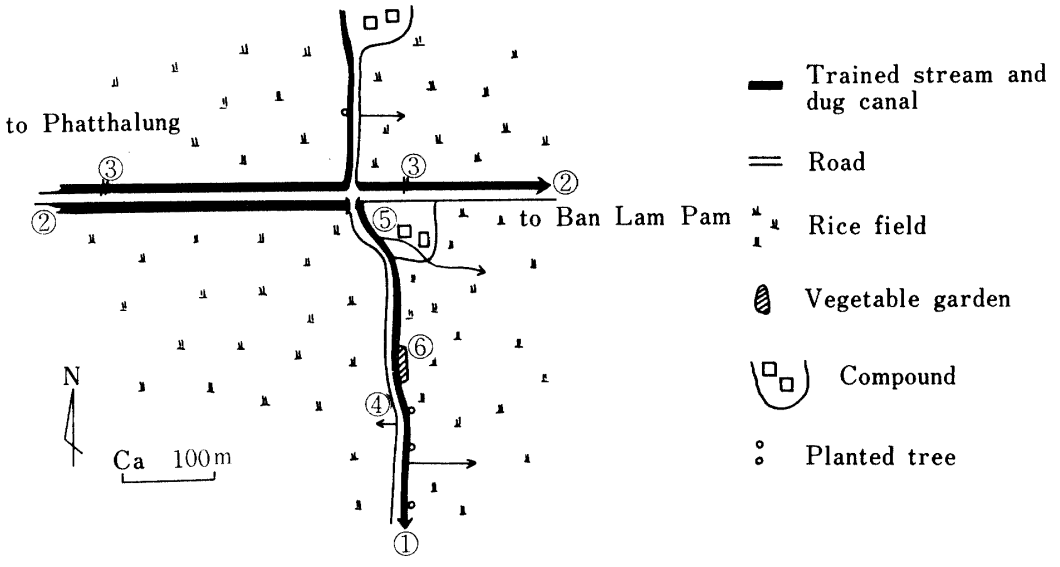


**Fig. 4** An example of traditional water management, ca 10km east of Changwat Phatthalung

1972) through a canal 1 m in width [① in the figure] comes from a trained stream 2 m in width ②, which is equipped with a series of fai** ③. It is fed into many places by various methods, e.g. by a mined pipe made of a hollow palm trunk ④ to rice fields, or by a small ditch to a compound ⑤ for family use. According to

* Catchment is the entire area from which a region receives drainage. Measurement of the catchment areas of the young fan region is based on a 1: 250,000 topographical map of AMS.

** Small dam made of bamboo, brush and soil

**Photo. 1** A dug canal 1 m wide ①, on which bank a small vegetable garden ⑥ is seen.

**Photo. 2** A pipe made of a palm trunk ④

an informant, this particular canal ① was opened many years ago and has been maintained carefully by a group of farmers who dredge the silted sand every year in order to get water. (personal communication with Mr. Tomosugi). In the accumulations of dredged sand piled along the canals are grown vegetables such as chilis, beans, onions, etc. ⑥. This landscape remind the author of Japan's rice land on a fan.

It should be noted that the example described above is somewhat misleading. In reality, the existing state of conventional water management is far more crude despite the region's ideal topographical setting for irrigation. Fais are not rare along natural streams. However, dug canals like those described above are very rare. Therefore most rice fields rely upon overflow from natural streams. Thus the region's topographical advantages regarding irrigation are as yet barely utilized. At present, however, the situation is changing quite rapidly. Concrete-lined canals of the RID will in time cover more and more acreage, proving that gravity irrigation is an extremely efficient technique in the region.

3 Old fan-terrace region

*Physiography*

The ground surface of the old fan-terrace region is undulating to rolling with a general slope of 3 to 6 per 1000. The micro-relief is caused primarily by stream incisions, which is capable of attaining more than 12 m in bank height.

Although the main component of the subsoil of the region is such coarse materials as clayey sand and gravelly sand, the soil layers are composed of clay, as in the case of the young fan region, especially in depressional places. But the weathering degrees of the materials, both of the subsoil and soil layers, are far more advanced than those of the young fan region. Iron oxide concretions and lateritic fragments are often found on the ground surface. These indicate the soils to be very poor in nutritious sabstances.

Hydrographically, gorge-like streams of the region is unfavorable for irrigation. They provide torrential flashes rather than steady flow of water. Moreover in most cases, bank height are too high to allow overflow even during the midst of the rainy season.

*Landuse*

The old fan-terrace region, described as undulating to rolling and poorly-watered, possesses a terrain more suited for fruit crops and rubber trees rather than rice. In fact, until the middle of the 1950's, most of the region was woodland supporting a few rubber estates.

This pattern, however, has been changing for the past dozen years or so. The expansion of rain-fed rice fields has been remarkable in many places. Fig. 5 illustrates this phenomenon. The figure, indicating rice land distribution at present (1972) and 18 years ago, may be read as follows;

1) in 1954, along a highway 90 km interval, rice fields could be seen for a total distance of 17 km,

2) in 1972, along the same portion of the same highway, rice fields can be seen for 41 km.

A comparison of rice land distribution at these two stages of development makes clear that the acreage of rice fields has more than doubled in the last 20 years or so.

The abundance of newly burnt tree tunks and dwarf rice plants suggests that the fields were recently opened and are in danger of drought. From this standpoint the region can be viewed as a newly emerging, poorly watered, rain-fed rice region which is primarily unsuitable for rice growing.

## III Distribution and correlation

The relation between the distribution of the three types of rice regions discussed above and the whole of Peninsular Thailand is shown in Fig. 6.

The old fan-terrace region has the greatest area, but its rice field density is low. The coast region also, has seizable amounts of non-rice lands. Thus, it seems that the young fan region holds the largest share of rice growing acreage in the peninsula. The author's estimation of the respective acreage of each region is 0.1, 0.2 and 0.3 million hectares judging from the 1 to 50,000 topographical map.

The correlation is made between the peninsular lands and the rice lands of the Chao Phraya basin which is the most important rice growing division in Thailand.

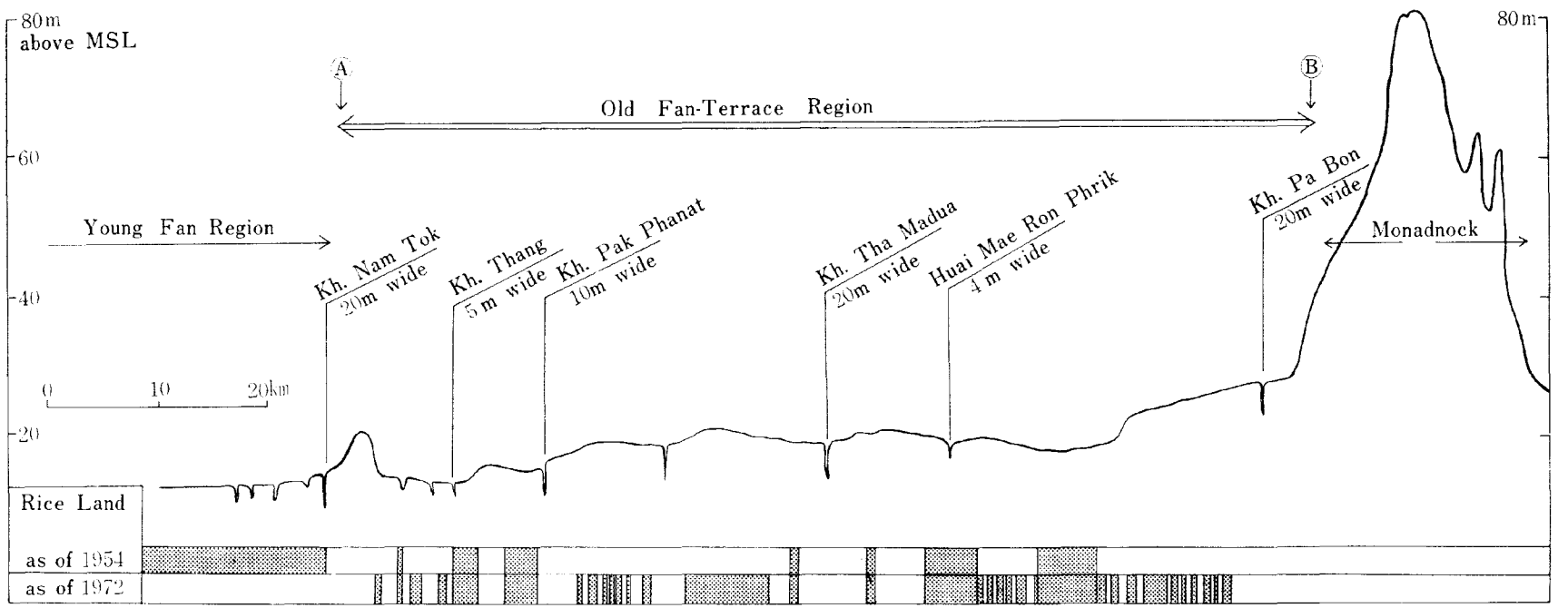


**Fig. 5** A Profile showing rice land distributions as of 1954 and 1972, along a highway passing through the old fan-terrace region : for the location, see Fig. 2.

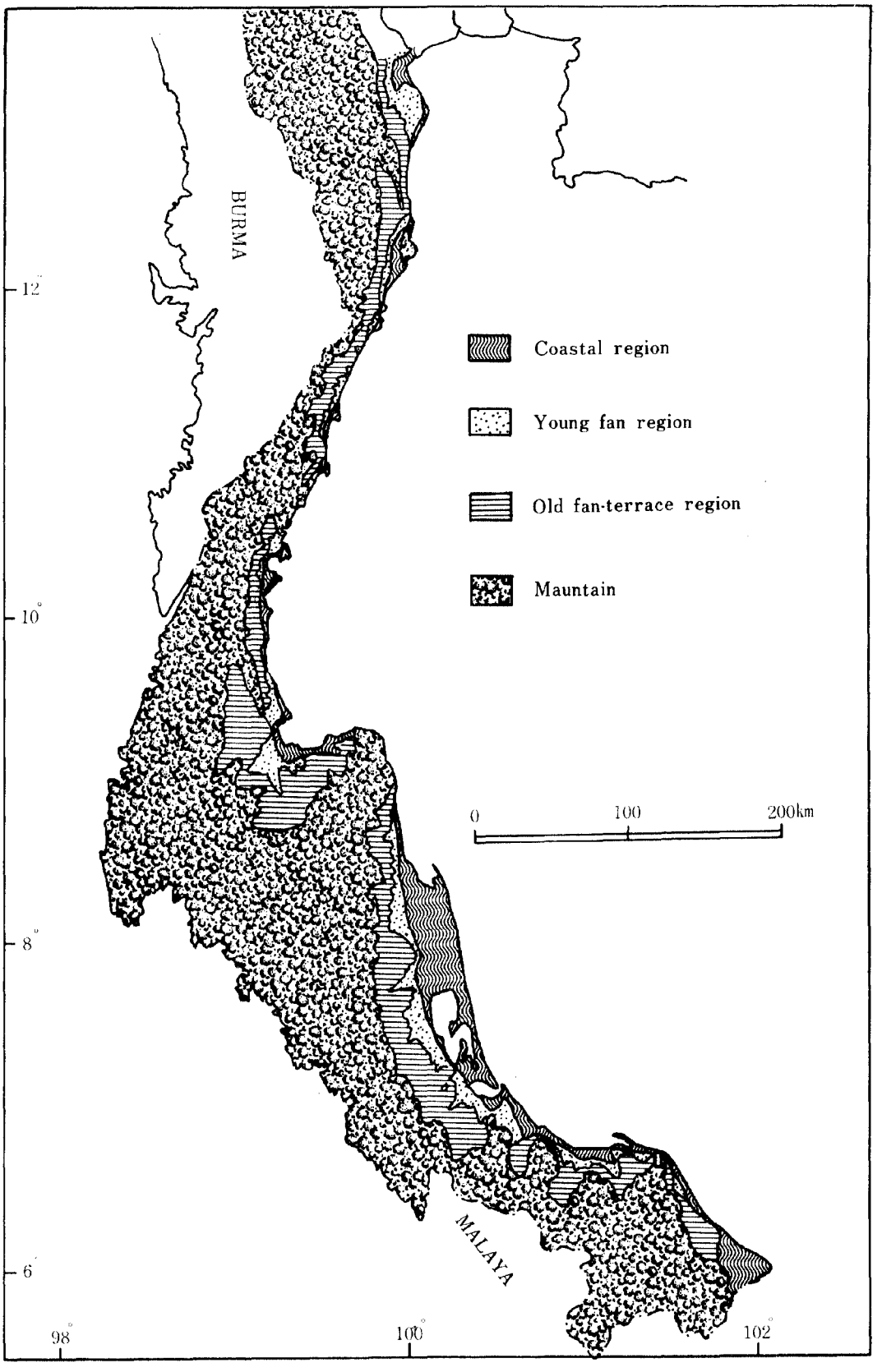


**Fig. 6** The distribution of the three types of rice region in Peninsular Thailand

| Peninsula | | Chao Phraya basin * | |
|---|---|---|---|
| type of rice land | acreage | type of rice land | acreage |
| | (mil. ha) | intermountain basin | 0.2 |
| | | plugged river channel | 0.2 |
| | | old delta | 0.4 |
| | | young delta | 1.0 |
| young fan<br>old-fan terrace | 0.4 | fan terrace complex | 1.3 |
| coast | 0.2 | | |
| total | 0.6 | total | 3.4 |

A combination of the peninsula's young fan and old fan-terrace regions could be called the fan-terrace complex region, and would be exactly identical to the fan-terrace complex region of the Chao Phraya basin. Thus constructed, the rice land of peninsular Thailand could be viewed as a kind of southern arm of the fan-terrace complex region of the Chao Phraya basin. Along the periphery of the fan-terrace complex region are small but distinctive areas identified collectively as the coast region.

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* Takaya, 1971; Fukui, 1971