



Status and Priorities of Soil Management in Thailand

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Outline

- Overview
- Land uses
- Status of soil resources
- Priorities of soil management

Kingdom of Thailand



Location: Southeast Asian mainland

5°-20°N 97°-105°E

Total area: 51.2 million ha

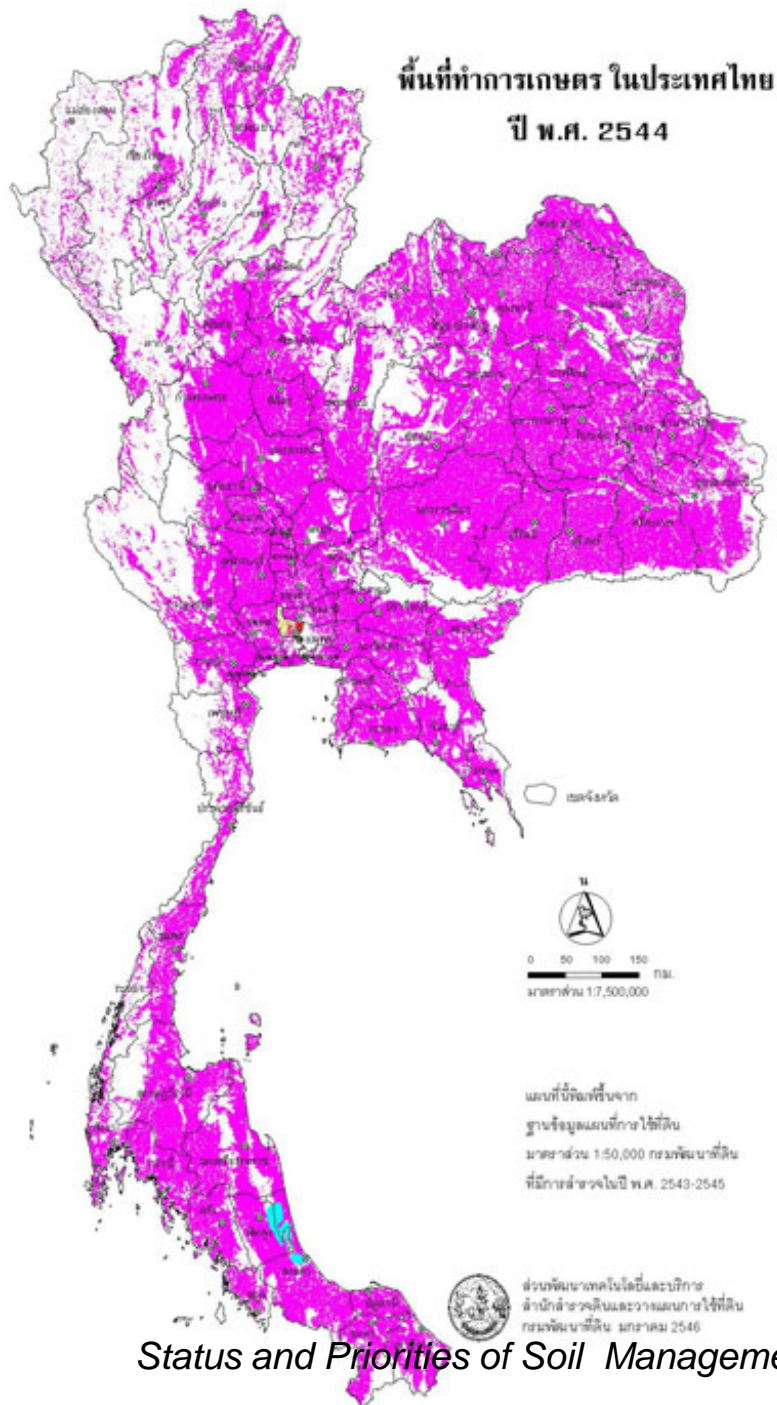
Capital: Bangkok

Population: 67.5 million people (2011)

Climate regimes Mainly Savanna climate
and Tropical monsoon in the Peninsular
south and southeast coast

Annual temperature: 24-30 °C





Introduction

Agriculture in Thailand is varied in terms of activities in each region or locality, particularly in the way farm cultures and traditions have been handed down through generations. Each region has clear social and economic differences.

Agricultural area 27.02 million ha



Soil topography map



Sandy loam soil

High and slope land
Deforestation
Shifting cultivation

Sandy soil

Low fertility
Low organic matter
High erosion

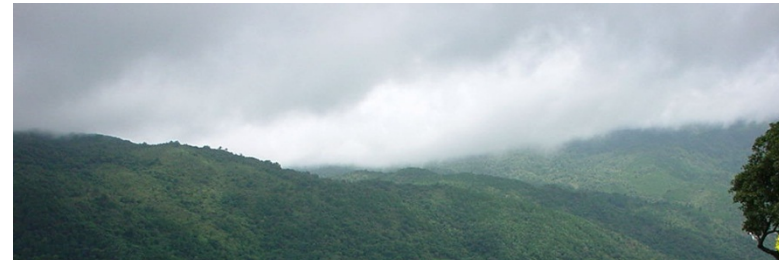
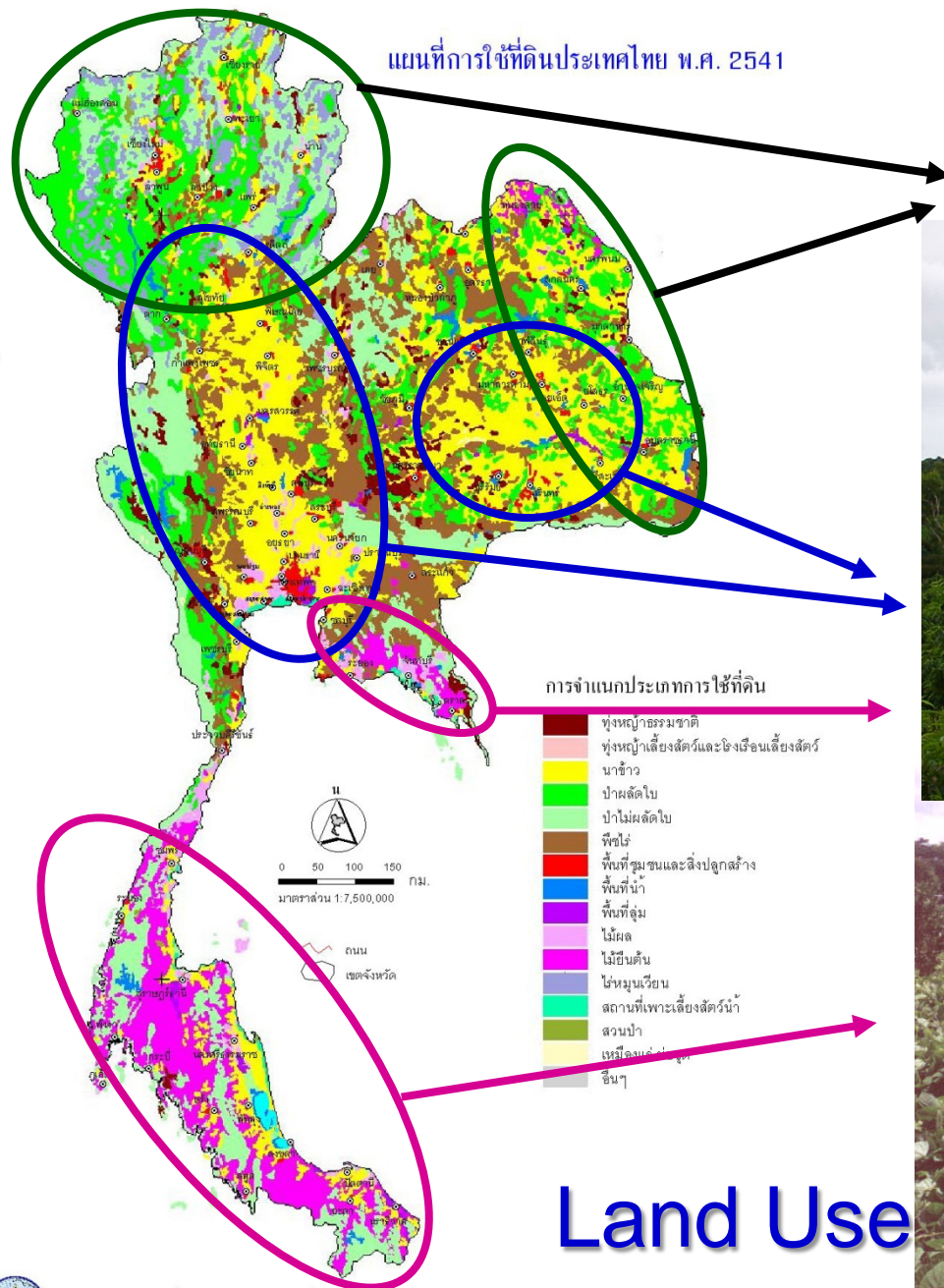
Clayey soil

High fertility
Rice cultivation

Shallow soil

Undulating
High erosion

Land use map



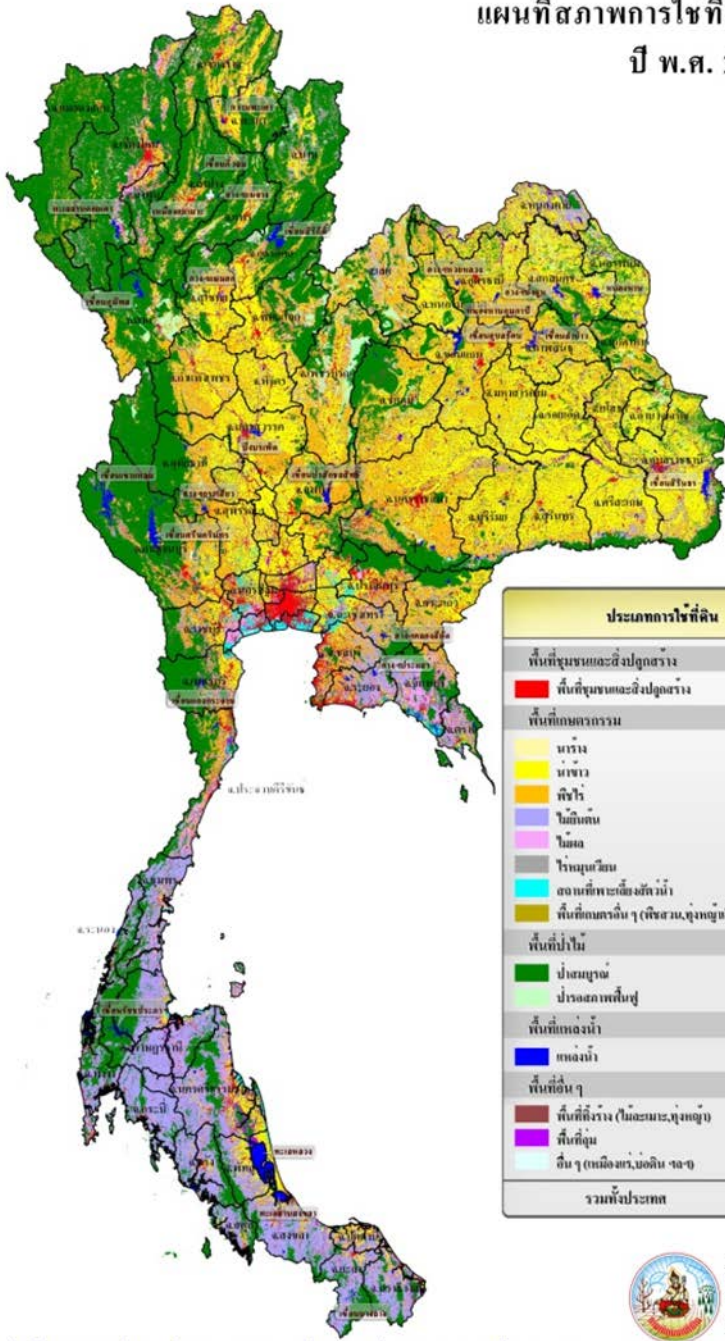
Land Use

Orchard and Tree



กลุ่มวิเคราะห์การใช้ที่ดิน กองวางแผนการใช้ที่ดิน
กรมพัฒนาที่ดิน กระทรวงเกษตรและสหกรณ์

แผนที่สภาพการใช้ที่ดิน ของประเทศไทย
ปี พ.ศ. 2551/52



ประเภทการใช้ที่ดิน	เนื้อที่	
	ไร่	ร้อยละ
พื้นที่ชุมชนและสิ่งปลูกสร้าง	15,111,800	4.71
พื้นที่ชุมชนและสิ่งปลูกสร้าง	15,111,800	4.71
พื้นที่เกษตรกรรม	171,585,556	53.51
นาไร่	1,340,914	0.42
นาข้าว	78,619,362	24.52
พืชไร่	38,679,371	12.06
ไม้ยืนต้น	32,464,276	10.12
ไม้ผล	12,526,963	3.91
ไร่หมุนเวียน	3,607,916	1.12
สวนพืชเศรษฐกิจ	2,694,372	0.84
พื้นที่เกษตรอื่น ๆ (พืชสวน, ทุ่งหญ้าเลี้ยงสัตว์)	1,652,382	0.52
พื้นที่ป่าไม้	113,170,136	35.29
ป่าสมบูรณ์	102,983,513	32.11
ป่าเสื่อมโทรม	10,186,623	3.18
พื้นที่แหล่งน้ำ	8,812,352	2.75
หนองน้ำ	8,812,352	2.75
พื้นที่อื่น ๆ	12,017,043	3.74
พื้นที่สีม่วง (ไม่เหมาะสมปลูกพืช)	9,179,624	2.86
พื้นที่ดิน	1,833,783	0.57
อื่น ๆ (เหมืองแร่, บ่อดิน ฯลฯ)	1,003,636	0.31
รวมทั้งประเทศ	320,696,887	100.00



ส่วนวิเคราะห์สภาพการใช้ที่ดิน
สำนักสำรวจดินและวางแผนการใช้ที่ดิน
กรมพัฒนาที่ดิน

Land Use of Thailand

Agricultural area 27.02 million ha

■ Paddy Field 11.27 million ha

■ Field Crop (5.02 m ha)

Cassava 1.70 million ha

Sugarcane 1.67 million ha

Maize 1.65 million ha

■ Perennial Crop (4.42 m ha)

Para Rubber 3.31 million ha

Oil Palm 0.60 million ha

Eucalyptus 0.51 million ha

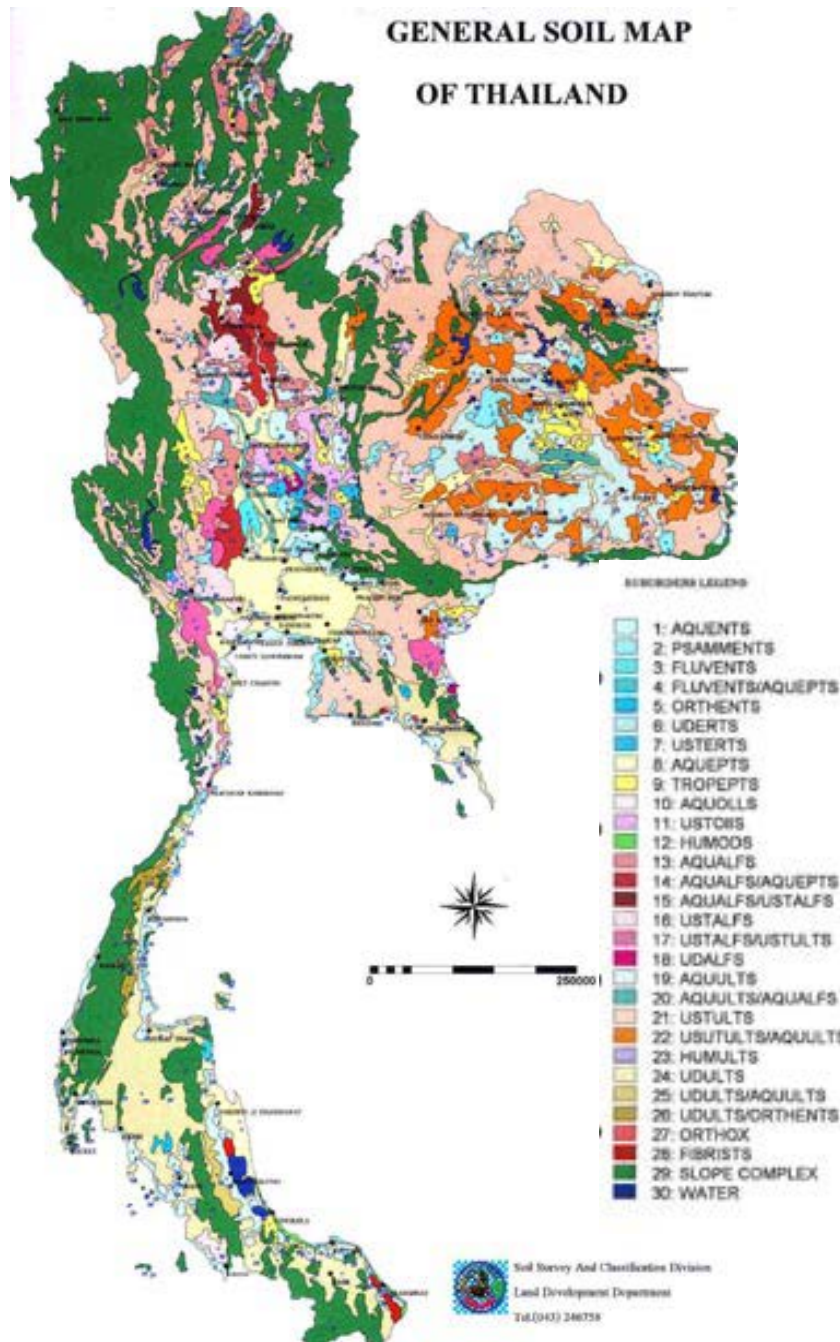
■ Orchard (1.54 m ha)

Mixed Fruit 1.16 million ha

Coconut 0.19 million ha

Longan 0.19 million ha

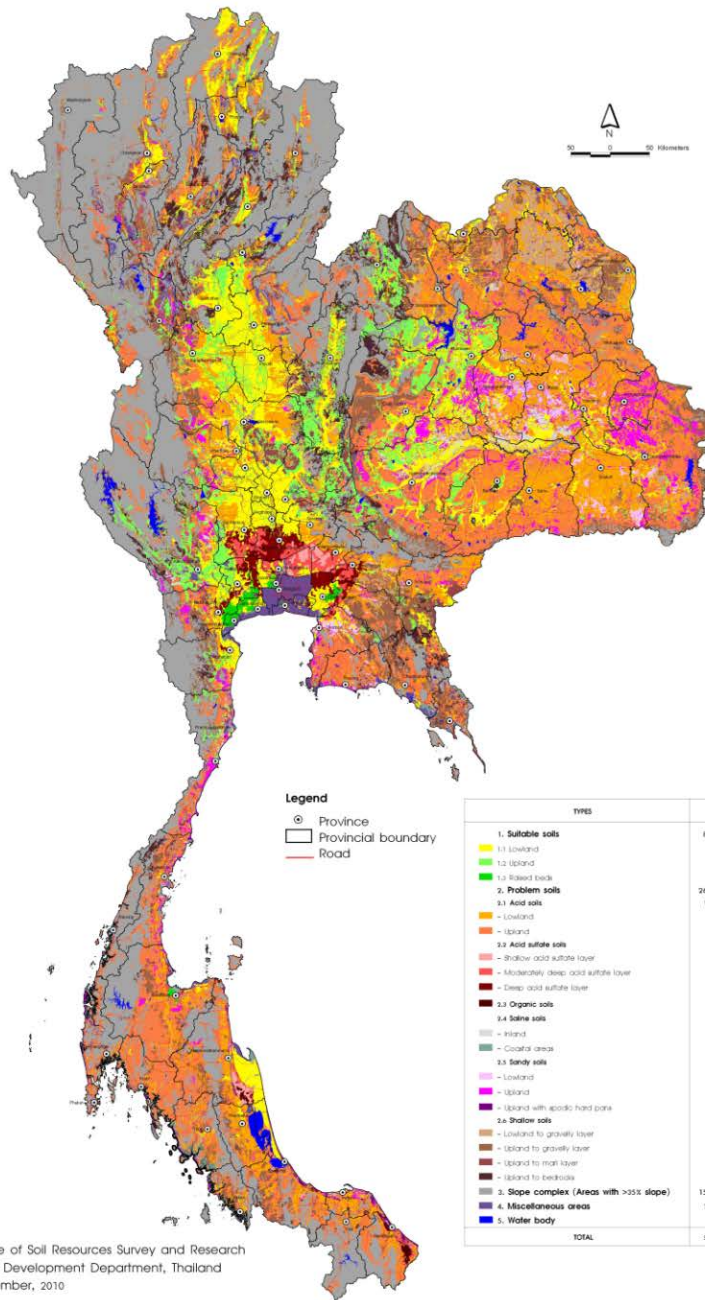
GENERAL SOIL MAP OF THAILAND



Soil Resources of Thailand

Thai soils are classified into 9 orders on the basis of USDA Soil Taxonomy:

Ultisols	42.13 %
Entisols,	33.75 %
(slope complexes, water bodies and others)	
Inceptisols	9.40 %
Alfisols	9.16 %
Mollisols	1.17 %
Vertisols	0.81 %
Histosols	0.14 %
Spodosols	0.12 %
Oxisols	0.03 %



Soil Resources of Thailand

- Suitable soils 16.03%
- Problem soils 51.23%
- Slope complex 29.61%
- Miscellaneous areas 1.98%
- Water 1.15%



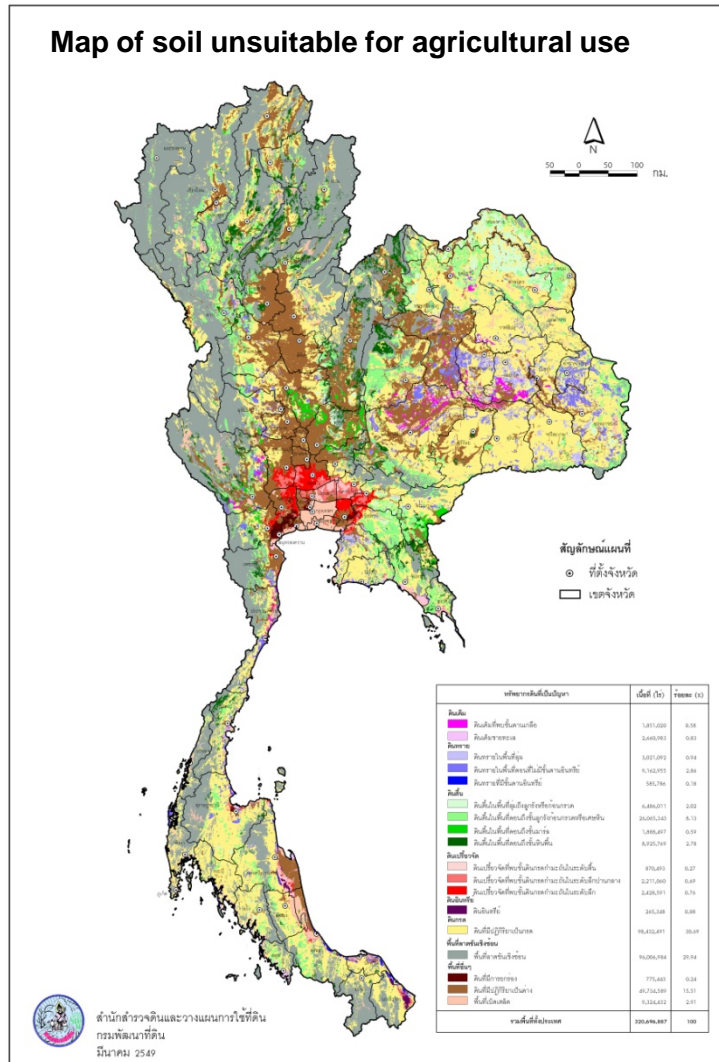
Priorities of Soil Management

Some soils have physical and chemical properties that lead them unsuitable for crop cultivation.

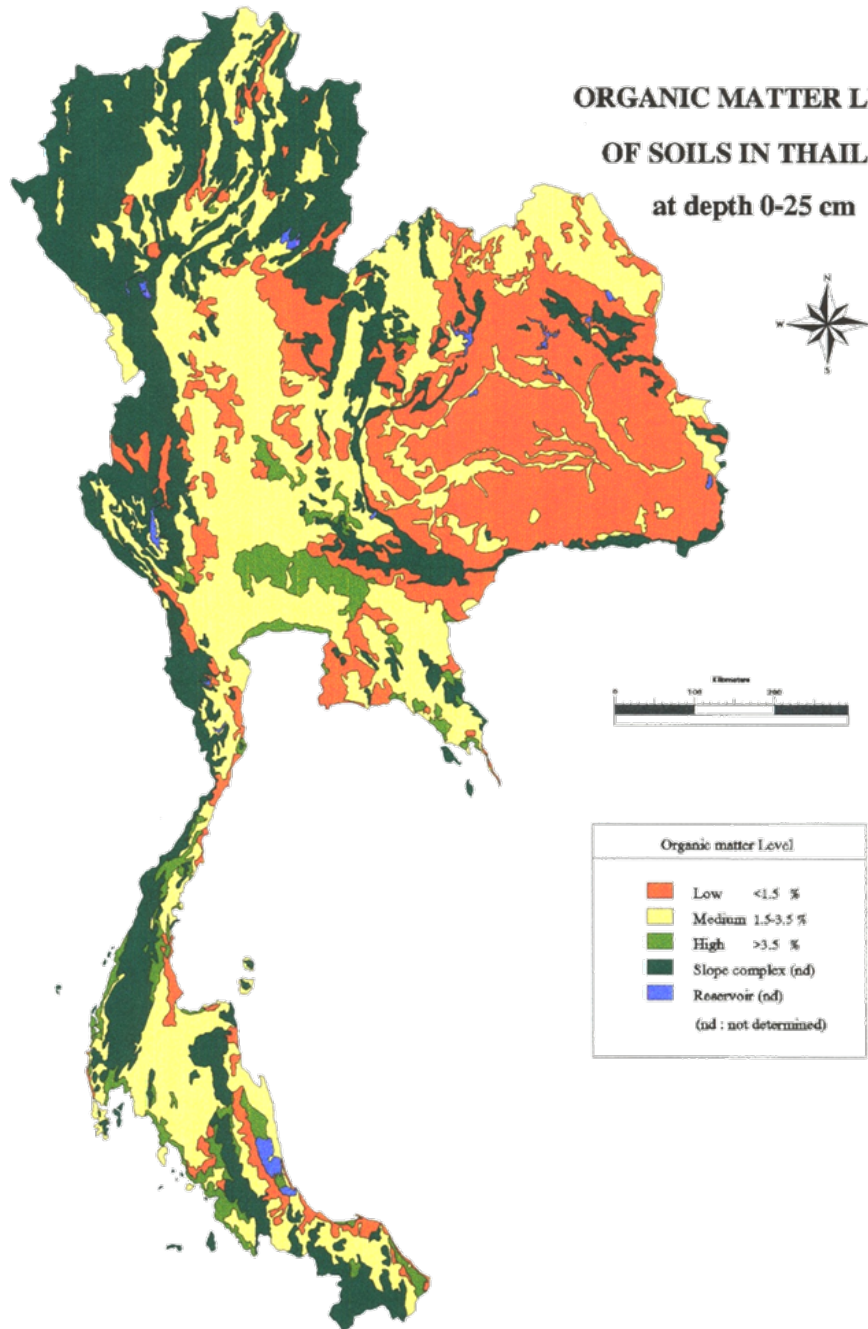
Most of them occur naturally and priorities of soil resources are as follow:

- soil organic matter
- sloping areas
- salt-affected soils
- acid sulfate soils
- sandy soils
- organic soils
- shallow soils

Farmers need to improve soil and land conditions before planting.



**ORGANIC MATTER LEVEL
OF SOILS IN THAILAND
at depth 0-25 cm**



Soil Organic Matter

“Low soil organic matter (SOM) content is widely spread in Thailand.”

The SOM is chosen as the most important factor of soil quality and agronomic sustainability, due to its impact on physical, chemical and biological properties indicators of soil quality

Declining of SOM levels generally lead to deterioration of soil physical and chemical properties.



Soil improvement and waste products

About 31 m.ha (60%) of lands are classified as areas facing a serious problem of low level of soil organic matter.

Soil organic matter plays a major role in soil functions and quality such as a source of nutrients, promotion of soil physical condition, soil biotic population and plant nutrients absorption.

The application of organic fertilizer combined with chemical fertilizer would appropriately raise the crop yield.





Infrastructure in land development zone



Green manure in paddy field

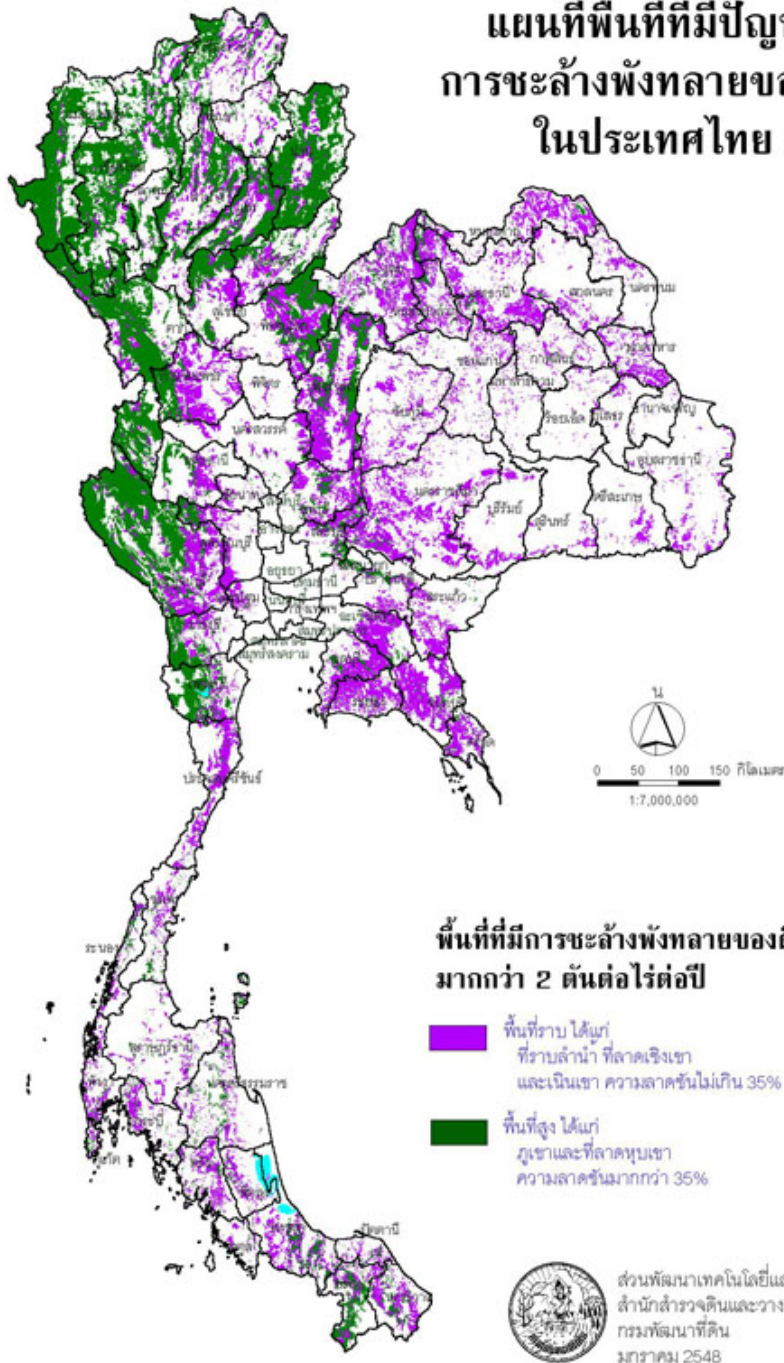


Inter-cropping with corn and bean



Residue mulching in mung bean plot

แผนที่พื้นที่ที่มีปัญหา
การชะล้างพังทลายของดิน
ในประเทศไทย



Sloping area

The mountainous soils, where slope are steeper than 35%, are also considered as problem soils due to erosion and other environmental problems.



Soil erosion

Soil erosion is a serious problem for land use in sloping area of Thailand. After rainfall, the water runs off on the sloping areas carrying topsoil and plant nutrients with it. Downslope plowing worsens the situation, and often serious gullying develops.





Soil and water conservation measures

The soil conservation practices have been implemented both mechanical and vegetation measures. The most common of the former of soil conservation measure in the field terrace has been widely used in slope area. Hillside ditches seem to be more potential.





Bench terrace



Hillside ditches



Soil and water conservation measures

At present, various types of mechanical with vegetative measures are implemented, such as mulch, strip cropping, cover cropping, multiple cropping, minimum tillage, perennial cropping and also agroforestry.





Vetiver grass contour line in fruit tree plot



Vetiver grass with terrace in fruit tree plot



Contour plantation of vetiver across the slope to prevent soil erosion





Soil and water conservation measures

Moreover, farm pond is one of soil and water conservation measure to preserve and collect water resource in rainy season. LDD has established farm pond project in agricultural area more than 10 years, and the important matter is cost sharing with farmer who requested farm pond in their land.





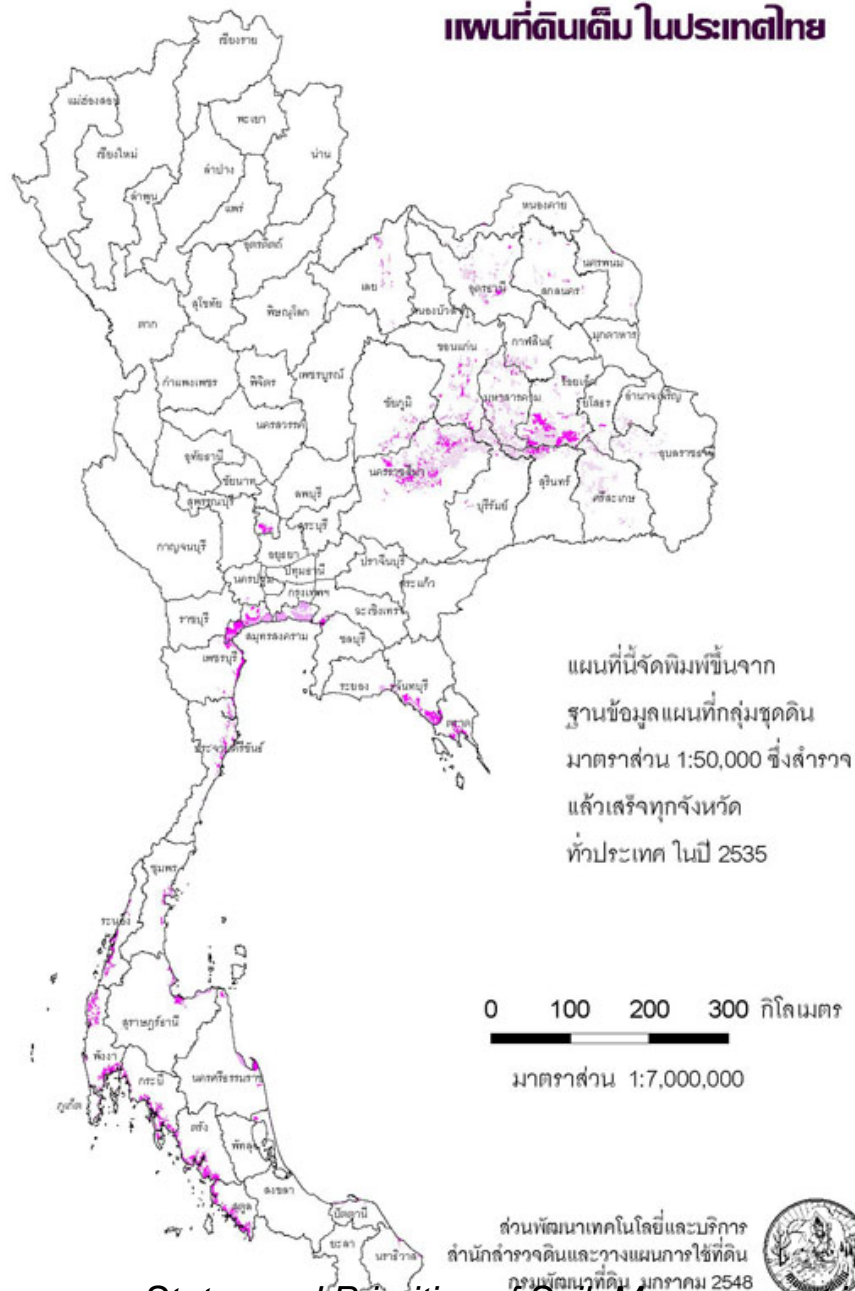
Farm pond with soil conservation measures



Farm pond as water stock in dry season

Salt-affected soils

Salt-affected soils are soils that contain sufficient salt to limit the growth of crops. Salt-affected soils refer to the soils that content salt in root zone, where an electrical conductivity (ECe) more than 4 dS m^{-1}





Status and Priorities of Soil Management in Thailand, Rome, FAO HD, 5-7 December 2012

Salt-affected soils



The management of these soils is very problem and management depend upon the degree of salinization and salt forming processes.

General management of these soils involves leaching, drainage control, land leveling, surface mulching, organic amendments, deep plowing and the use of salt-tolerant varieties of plants.



The most simple practice being used in Thailand is the use of salt-tolerant crops and trees. In highly salt-affected areas, Eucalyptus, Sesbania, Acacia and Dixie grass have been introduced with great success.

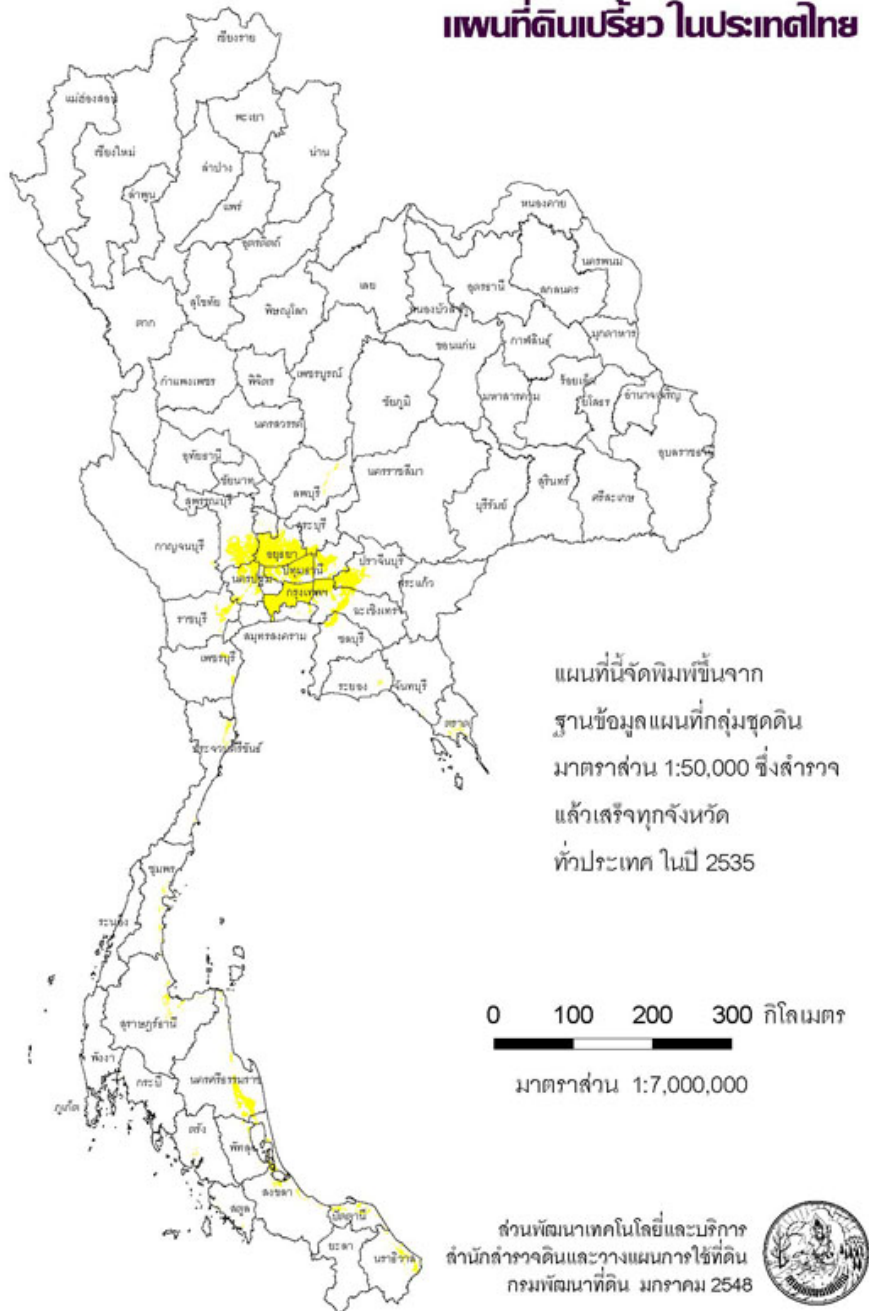


Acid sulfate soils

Acid sulfate soils occur in parts of the coastal lowlands.

In the Chao Phraya Delta of Thailand, acid sulfate soils occupy an area of 600,000 ha.

Most of the acid sulfate soils have very dark clayey surface, with thickness of 15-30 cm.



Acid sulfate soils

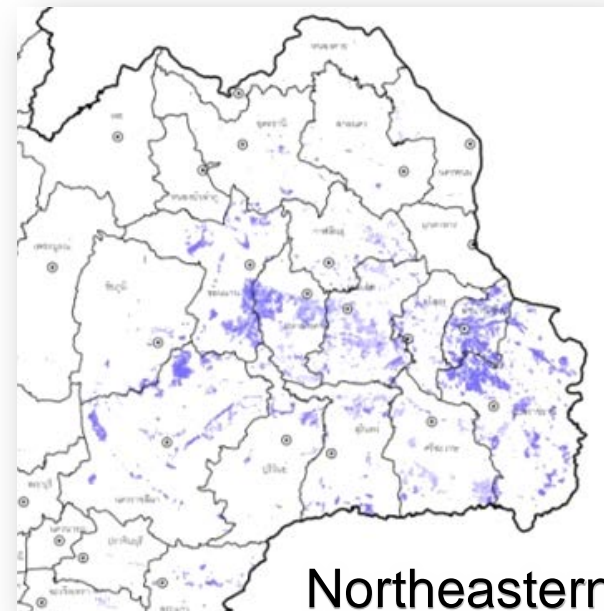
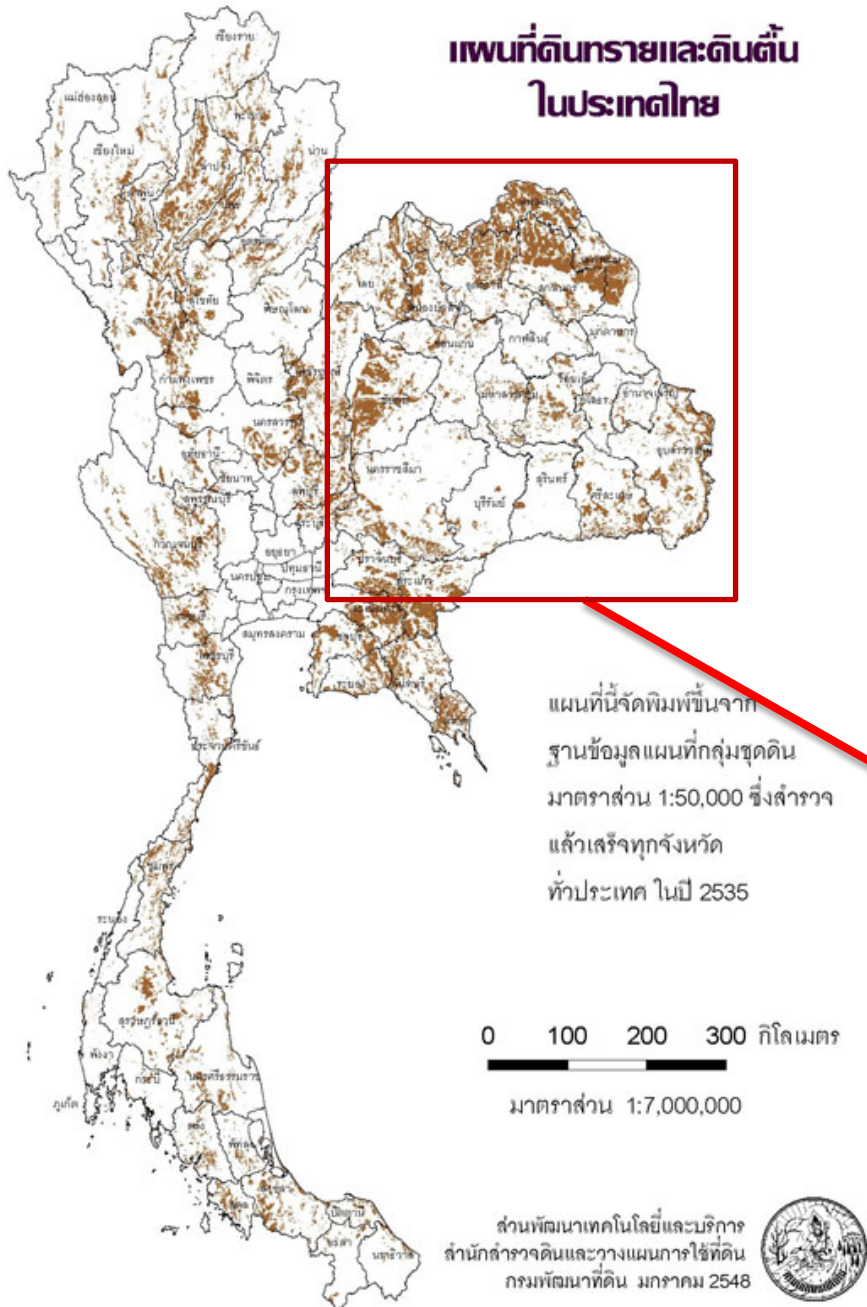
- Soil management
 - Improved by Dolomite, Lime
 - Organic material application (rice straw incorporation, green manure)
 - Fertilizer application
- Water management
- Using of Fe and Al-tolerant crop varieties.
- Integrated Farming, Organic farming



แผนที่ดินทรายและดินตื้น
ในประเทศไทย

Sandy soils

Sandy soils occur in many parts of the country where are normally sandy throughout the soil profile, especially in northeastern part of Thailand



Northeastern part

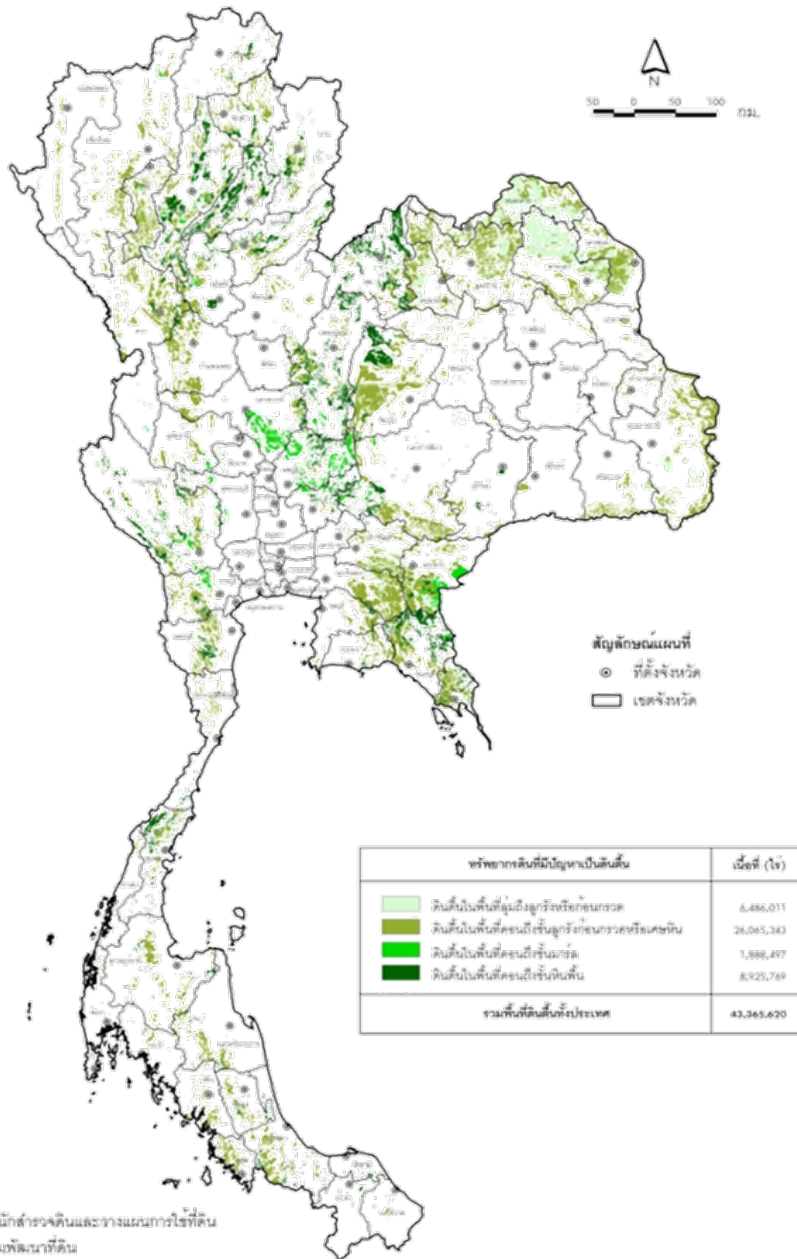
Sandy soils

- Soil organic matter management
 - Organic material application
 - Rice straw incorporation
 - Compost application
- Water management (water retention)
 - Mulching and Cover crops
- Fertilizer management
 - Chemical, Organic and Bio-fertilizer

Chemical fertilizer should be added according to soil quality analysis



แผนที่ปัญหาดินตื้น ในประเทศไทย



Shallow soil

Shallow soils refer to soils that contain 35% or more of rock fragments, cobble, gravel and laterite concretions or ironstones having diameters greater than 2 mm, within shallow depth (less than 50 cm).



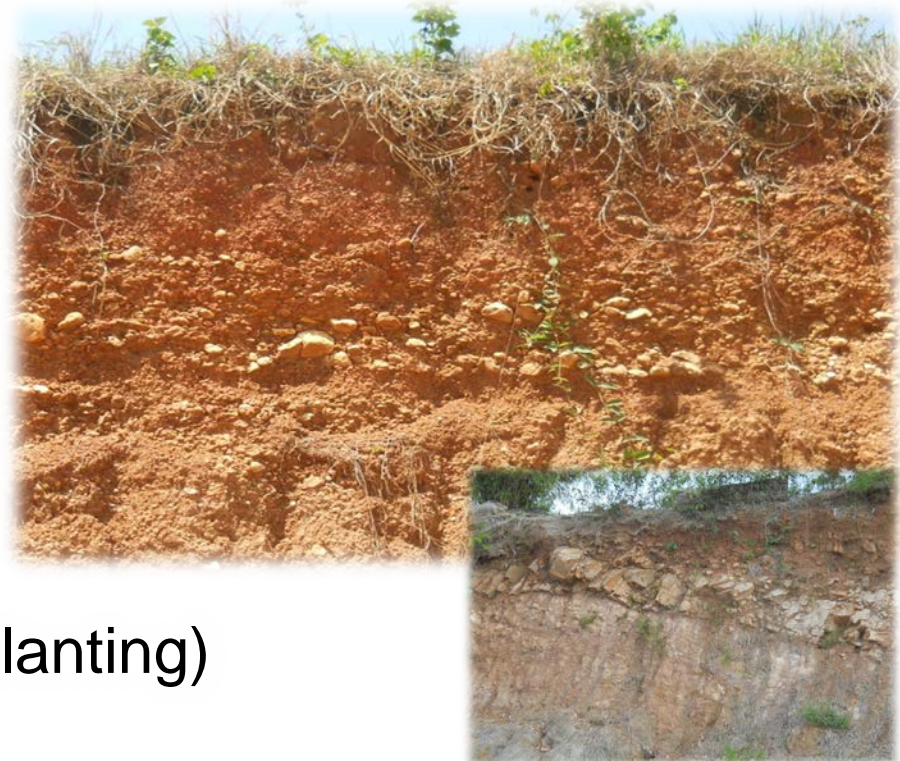
Shallow soil

Shallow soils are relatively variable in physical and chemical properties. These soils are usually prone to erosion, and of low fertility status.



Shallow soils

- Soil organic matter management
 - Organic material application
 - Rice straw incorporation
 - Compost application
- Water management
 - Mulching
 - Cover crops
- Fertilizer management
 - Chemical, Organic and Bio-fertilizer
- Tillage management (digging a hole for specific planting)



Organic soils

Generally these soils contain at least 20% organic matter in the surface layer and thicker than 40 cm.

Most of the organic layer is composed of rotten roots, twigs, branches, and even tree trunks mixed with some completely decomposed residues that are collectively called Peat.





Organic soils

Under a natural environment, the water table is constantly high, with surface flooding all year round. Most of the peat soils in the region are extremely acidic. Both macro- and micronutrients are often inadequate to support the growth of economic crops.





Some technologies transfer

1. Land use planning, soil analysis, soil improvement and conservation, land use management and socio-economic survey
2. Analysis of soils, water and plant at laboratories and mobile scale, including soil improvement materials
3. Construction of farm ponds for soil and water conservation (in term of cost sharing)
4. Supporting LDD products for soil improvement and soil and water conservation as vetiver grass, microbial activators, green manure seeds and so on
5. Establishment of soil doctors volunteer in all villages throughout of the country to assist LDD staffs





Thank you very much

Finally, soil management is imperative to maintain and enhance soil fertility and also to foster the use of soil resources in sustainable manner, which is a main interest among soil scientists.

But the sustainable management of soil resources and the contribute to global food security are also of great interest to the world population.

