

Executive Summary

On December 12, 2000, the Cabinet approved the accession for Thailand to enter into force of the United Nations Convention to Combat Desertification (UNCCD). On March 2001, the Ministry of Foreign Affairs submitted the “Instrument of Accession” to the United Nations Organization, with Thailand fully entered into force in June of 2001 as the 174th of member of the UNCCD.

As a member country of the UNCCD, Thailand is obliged to follow section 9 and 10 of the Convention in preparing a National Action Programme (NAP).

The studies by Land Development Department (LDD) show that Thailand is an affected country due to land degradation or desertification and also faces with 33.57 million hectares of problem soils for agriculture. Thus, to prevent and fix such problems, Thailand needs implementation. Regarding the obligation, the National Action Programme to Combat Desertification of 2004-2008, consisting of two groups of strategic issues with 4 strategies was prepared by the LDD as follows.

1. Strategic Issue 1: Development of land and water resource infrastructure for crop production, consisting of two strategies.
 - 1.1 Strategy 1: Development of a Geo-information Technology System for agricultural land-use zoning.
 - 1.2 Strategy 2: Development of soil and water resources to increase productivity.
2. Strategic Issue 2: Farmers can have access to LDD’s services, consisting of two strategies.
 - 2.1 Strategy 1. Establish and strengthen Volunteer Soil Doctors, learning center, and sub-district center for land development services.
 - 2.2 Strategy 2. Renovation of the administrative system of the organization to focus on learning and principles of good governance.

All the strategies were developed to support land development projects by the following activities:

- (1) Land rehabilitation and soil improvement
- (2) Water resource development
- (3) Zonation of suitable soils for cropping
- (4) Strengthening and capacity building of sub-district and village Volunteer Soil Doctors
- (5) Implementing demonstration plots and establishing an agriculture learning center for each sub-district.
- (6) Provision of soil analysis services
- (7) Development of a soil information system to serve farmers' requirements
- (8) Conducting land development and bio-technology research to increase crop production
- (9) Personnel development
- (10) Development of agro-tourism

The period of this first National Action Programme to Combat Desertification is five years from 2004 to 2008. After that the programme should be improved to suit the changing economic, social, and environmental conditions. Budget allocation for the programme is approximately USD \$1,379 million with the following six successive indicators:

- (1) attaining suitable land-use zones for no less than 20 crops
- (2) cultivated land will be developed and rehabilitated
- (3) water resources outside of irrigation schemes
- (4) Volunteer Soil Doctors are knowledgeable and eligible to serve all farmers in sub-districts and villages
- (5) farmers can have access to sub-district learning and service centers for land development
- (6) no less than 80 per cent of users are satisfied with the services of LDD.

Foreword

According to the provision of the United Nations Convention to Combat Desertification, affected country parties, either from desertification or land degradation, are obliged to prepare their National Action Programmes to Combat Desertification. Land Development Department (LDD), in its capacity and jurisdiction to prevent and address land degradation in the country, has been designated by the Ministry of Agriculture and Cooperatives to serve as a national focal point for the Convention and take care of the preparation of this National Action Programme to Combat Desertification. Land resource conservation and rehabilitation are the main objectives of the programme to revitalize the fertility of the land and promote safe fundamentals for sustainable food production of the country.



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Director General

Land Development Department

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National Action Programme to Combat Desertification

1. Introduction

Thailand submitted the *"Instrument of Accession"* in March 2000 and fully entered into force of the United Nations Convention to Combat Desertification (UNCCD) in June 2001 becoming the 174th member of the Convention.

According to the definition of the United Nations Convention to Combat Desertification, Thailand is classified as an affected country although it is located in a monsoon climate.

The provision, according to section 9 of the Convention, obliges every affected country party to prepare a NAP in responding with the objectives provided in section 10 of which the causes of desertification must be defined together with measures for implementation to combat desertification and the affects of drought. Thailand's NAP preparation is the implementation regarding the obligation of the Convention.

2. Objective

Combating desertification will specifically focus on conservation and rehabilitation of land resources and fertility fundamental for safe sustainable food production for the country.

3. Definition of desertification

Section 1 of the United Nations Convention to Combat Desertification;

(1) *"Desertification"* means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities;

(2) *"Combating desertification"* includes activities, which are part of the integrated development of land in arid, semi-arid and dry sub-humid areas for sustainable development aimed at:

- (i) Prevention and/or reduction of land degradation;
- (ii) Rehabilitation of partly degraded land; and
- (iii) Reclamation of desertified land;

(3) "**Drought**" means the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems;

(4) "**Mitigating the effects of drought**" means activities related to the prediction of drought and intended to reduce the vulnerability of society and natural systems to drought as it relates to combating desertification;

(5) "**Land**" means the terrestrial bio-productive system that comprises soil, vegetation, other biota, and the ecological and hydrological processes that operate within the system;

(6) "**Land degradation**" means reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land use or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as:

- (i) Soil erosion caused by wind and/or water;
- (ii) Deterioration of the physical, chemical and biological or economic properties of soil; and
- (iii) Long-term loss of natural vegetation;

(7) "**Arid, semi-arid and dry sub-humid areas**" means areas, other than polar and sub-polar regions, in which the ratio of annual precipitation to potential evapotranspiration falls within the range from 0.05 to 0.65;

(8) "**Affected areas**" means arid, semi-arid and/or dry sub-humid areas affected or threatened by desertification;

- (i) "Affected countries" means countries whose lands include, in whole or in part, affected areas;

(9) "**Regional economic integration organization**" means an organization constituted by sovereign States of a given region, which has competence in respect of matters governed by this Convention and has been duly authorized, in accordance with its internal procedures, to sign, ratify, accept, approve or accede to this Convention;

(10) "**Developed country parties**" means developed country parties and regional economic integration organizations constituted by developed countries.

4. Causes of desertification

The major causes of desertification found in Thailand are: (a) climatic factors i.e. heavy rain during the monsoon period dissolves and translocates soil minerals and seasonal drought; (b) human activities i.e. land use without soil improvement, over-exploitation of land, land use on steep-slope lands causing soil erosion and expansion of saline soils.

5. Desertification in Thailand

In order to respond to section 1 (1), (6), and (7) as mentioned in part 3, the analysis of desertification in Thailand covers four important areas as follows:

- (1) Identification of aridity index using the ratio of average annual rainfall over potential evapotranspiration,
- (2) Soil erosion by water,
- (3) Loss of forest area, and
- (4) Problem soils

5.1 Aridity index

Results from the application of the ratio of average annual rainfall over potential evapotranspiration with regard to the classification by WMO-UNEP (1996)¹ is given below.

Classification of climate zones based on aridity index	
Climate Zone	P/PE ratio
Hyper-arid	< 0.05
Arid	0.05-0.20
Semi-arid	0.21-0.50
Dry sub-humid	0.51-0.65
Humid	>0.65
Cold	>0.65

According to the principle of the WMO-UNEP, results from calculations of the ratio (in the same period), average annual rainfall over evapotranspiration of 30 years (1971-2000), and

¹ WMO-UNEP. 1996. Interaction of Desertification and Climate. Williams, MAJ and Balling RC, Jr. Arnold, New York.

statistics from climatological stations, found the following nine stations within the ranges of 0.51-0.65 classified as Dry Sub-humid:

<u>Stations</u>	<u>P:PET ratio</u>
1. Chainat	0.59
2. Hua-Hin	0.61
3. Kanchana Buri	0.64
4. Lop Buri	0.64
5. Chaiyaphum	0.65
6. Bhumibol dam	0.62
7. Suphan Buri	0.61
8. Tak	0.63
9. U-Thong	0.61

5.2 Soil erosion by water

Regarding the application of the Universal Soil Loss Equation ($A=RKLSCP$), the following amount and severity levels of soil loss are found in Thailand.

Lowland (alluvial plain, footslope, hill less than 35 per cent slope)

Soil loss classes	Areas (hectare)
Class 1: slightly	27,235,036
Class 2: moderate	6,865,991
Class 3: severe	1,566,276
Class 4: very severe	110,352
Class 5: extremely severe	363,414
Total (1)	36,141,069

Highland (mountainous slope, valley slope, more than 35 per cent slope)

Soil loss classes	Areas (hectare)
Class 1h: slightly	6,656,164
Class 2h: moderate	4,114,024
Class 3h: severe	2,277,102
Class 4h: very severe	426,813
Class 5h: extremely severe	1,696,329
Total (2)	15,170,432
Grand total (1+2)	51,311,501

As can be seen from the above figures, lowland contains 8,906,033 hectares of area under soil loss, including moderate up to extremely severe, beyond the permissible level or more than 12.5 ton/hectare/year.

On mountainous lands, the total area including moderate to extreme soil loss is 8,514,268 hectares.

The total area of soil loss in the country, including moderate to extreme levels on both lowlands and highlands, is 17,420,302 hectares or 33.9 per cent of the country area.

Soil erosion causes land degradation due to loss of surface soil and plant nutrients. Agricultural land will no longer be suitable for continuous use without protection and/or improvement.

5.3 Declining of Forest areas

Forest area in Thailand was 27.36 million hectares or 53.3 per cent of the country in 1961 and 12.96 million hectares or 25.28 per cent by 1998.

Declining forest area directly contributes to land degradation on sloping land and headwater regions due to the occurrence of soil erosion. It is evident in 5.2 that a total of 8.51 million hectares under moderate to extremely severe levels of soil loss occurred on highlands. In addition, loss of forest area also contributes to the expansion of saline soils in the North-east.

5.4 Problem soils for Agriculture in Thailand

Seven types of problem soils for agriculture in Thailand can be classified ie. saline soil, acid sulfate soil, organic soil, very sandy soil, sandy soil, shallow soil, and soil on slope complex areas. These soils make up 33,575,601 hectares of land within the country as given below.

(1) Saline soil, sodic saline soil and affected areas:	3,475,004	hectares
(2) Acid sulfate soil:	667,358	hectares
(3) Organic soil:	43,884	hectares
(4) Very sandy soil:	1,115,747	hectares
(5) Sandy soil:	6,336,219	hectares
(6) Shallow soil:	6,555,547	hectares
(7) Soil on slope complex area:	15,381,842	hectares

5.5 Desertification in Thailand

As can be seen from the above data in 5.2-5.4, desertification in Thailand is caused by soil erosion, reduction of forest area and land degradation due to land-use problems. More over, the ratio of average annual rainfall over potential evapotranspiration shows that some areas of the country fall within the dry sub-humid climate classification. Therefore, with reference to the data in 5.1, Thailand is an affected country in response to section 1 (a), (f), and (g) of the Convention.

6. Government Policy on Desertification

6.1 Constitution of the Kingdom of Thailand B.E. 2540²

Section 79. The State shall promote and encourage public participation in the preservation, maintenance and balanced exploitation of natural resources and biological diversity and in the promotion, maintenance and protection of the quality of the environment in accordance with consistent development principles as well as the control and elimination of pollution affecting public health, sanitary conditions, welfare and quality of life.

Section 84. The State shall organize the appropriate system in holding and use of land, provide sufficient water resources for farmers and protect the interests of farmers in the production and marketing of agricultural products to achieve maximum benefits, promoting the assembling of farmers with a view to laying down agricultural plans and protecting their mutual interests.

6.2 The Ninth National Economic and Social Development Plan (2002-2006)

The Ninth Plan emphasized the management of natural resources as follows.

6.2.1 Objectives

(1) To focus on the management system based on shared responsibility, transparency and practicability. Knowledge and information shall be disseminated to people, community, and local administrative units, so that they can actively participate in protecting natural wealth.

² A.D. 1997

(2) To restore a proper balance using, preservation, and rehabilitation of natural resources. Effective controls over resource use shall be instituted. Environmental quality shall be improved in order to promote a grassroots economy and quality of life. Also, top priority shall be given to the management of livable environmentally healthy cities and the preservation of local culture and arts.

6.2.2 Targets

To preserve and rehabilitate natural resources consistent with sustainable use. Forest reservation shall cover an area not less than 25 per cent of the entire Kingdom, while mangrove forest shall cover an area no less than 0.2 million hectares. By 2006, soil erosion reduction measures shall be undertaken on no less than 0.8 million hectares, and rehabilitation measures to address problems of soil quality, such as soil acidity, soil salinity, and infertility, shall be undertaken on no less than 1.6 million hectares.

6.2.3 Development Guidelines

- (1) Upgrading the efficiency of natural resource and environmental management to induce conservation, rehabilitation, and development of grassroots economy.
- (2) Preservation and rehabilitation of natural resources of the country for better ecosystem balance, and supporting grassroots economy.

6.3 Government Policy

Prime Minister Taksin Shinawatra delivered the Government's policy on Monday 26, February 2001 on income creation policy part 1 as follows:

“Supporting farmers to have adequate land for earning their livelihood by implementing a coordinated and comprehensive land utilization policy and by optimizing the use of idle land. The management of water resources at every level must also be improved efficiently in a manner that is suited to the production system of each crop and the conditions of the terrain. Emphasis must be placed on the full participation of the people in the restoration, conservation and development of land that is upstream as well as in river basins, reservoirs, irrigation canals, water quality, and piped irrigation. The use of surface water and underground water must also be efficient and systematic, especially in projects involving the development of large water sources.”

6.4 Strategic Plan of the Ministry of Agriculture and Cooperatives

A strategic plan of the Ministry of Agriculture and Cooperatives, of which the National Action Programme for Combating Desertification is constituted, consists of the following details;

(1) Vision

A principal ministry producing agricultural products meeting consumer safety standards worldwide as well as protecting the well being of local farmers.

(2) Mission

- i. Conducts research and development, and transfers agricultural technology,
- ii. Develops infrastructure for agriculture,
- iii. Promotes universal standard production, and
- iv. Promotes and strengthen farmers' intuition and self-reliance for improved quality of life and sustainable livelihood.

(3) Goals

- i. Agriculture production in responding with marketing demands and safety for consumers, and
- ii. Improved quality of life and well being of farmers.

(4) Indicator

No poverty/long-term spiraling debt among farmers.

(5) Goals by A.D. 2008

- i. Value of Gross Domestic Product of agriculture sector will reach expected USD \$0.025 billion,
- ii. Will acquire three safety lines of production ie. cropping, animal husbandry, and fisheries,
- iii. Value of export food and agricultural products expected to reach USD \$0.03 billion,
- iv. Two million farmers will access sources of credit with sustainable use of production resources,
- v. No poverty among farmers with \$3,037.97 USD/household/year of income.

(6) Strategic issues and strategies

Two strategic issues and strategies prepared by the Ministry of Agriculture and Cooperatives in responding with the National Agenda and Government Policies to achieve the above goals offer the following details:

(6.1) Strategic issues

i. Strategic issue 1. Agriculture production will be focused on the improvement of performance for competitiveness by development of substantial infrastructure for agriculture eg. land, water, and etc. Up-to-date technology and know how will be brought in to improve productivity in order to achieve anticipated quality and safety, as well as higher price. Aiming to achieve value added agricultural and food products directly serving market demand, productivity development and transformation as well as packaging will be applied whereas a unique brand name will be publicized globally.

ii. Strategic issue 2. As a prime concern, the Ministry of Agriculture and Cooperatives will prioritize living conditions of farmers at all levels especially small-scale and landless farmers who have no land for cultivation. More options will be generated through opportunity to access formal sources of funding, promotion of local knowledge and know-how, and recuperation of farmers' livelihood to earn enough for a sustainable living.

(6.2) Strategies

In connection with the above strategic issues, the following four strategies were defined.

(i) Increasing productivity

(ii) Creation of value added

(iii) Exportation of food and agricultural products for the world's kitchens.

(iv) Sustainable livelihoods for farmers

The NAP to combat desertification will be a component of the strategy to increase productivity including the development of basic resource infrastructure for production as follows:

*“At present, most farmers have not enough water for agriculture. In some areas, they are facing drought and marginal soils. These resources are fundamental costs of production. To help farmers produce efficiently, there is a need to develop resource infrastructure for such areas to meet maximum capacity. The infrastructure must be equally distributed and allocated to farmers in all areas. Management must also be applied to protect these production resources from natural hazard. Irrigation systems and wells must be provided in drought prone areas. Soil fertility must be developed, maintained and improved for better productivity and sustainable use. **“Implementation of the National Action Programme to Combat Desertification is a part of this strategy”.**”*

7.National Action Programme

Considering the designation to combat desertification by the Ministry of Agriculture and Cooperatives, the LDD prepared this National Action Programme to serve as a response with the Policy of State as mentioned in section 6. The Programme includes the Constitution of Thailand of A.D. 1997, the 9th National Socio-economic Development Plan, the Government Policy presented to the National Assembly on February 24. A.D. 2000, and section 2 of the Strategic Plan (A.D. 2004-2008) to develop production infrastructure to increase productivity of the Ministry of Agriculture and Cooperatives. Detail of the NAP is given below.

7.1 Vision

Land Development Department is a key agency to conserve and rehabilitate land resource fertility in supporting safety, security and sustainability for food production of the country.

7.2 Missions

(1) Issues of suitable land-use zones for production as well as provide services of accurate and up to date spatial data;

(2) Develop and implement soil and water management in supporting safety and security for incremental crop production;

(3) Conducts research and development and transfers technologies concerning management of land, water, crops, organic fertilizer, as well as thoroughly distributes useful micro-organisms for agriculture to farmers.

7.3 Goals

- (1) Good quality soil and water resources for agriculture, and
- (2) Increased opportunity to access to land development services.

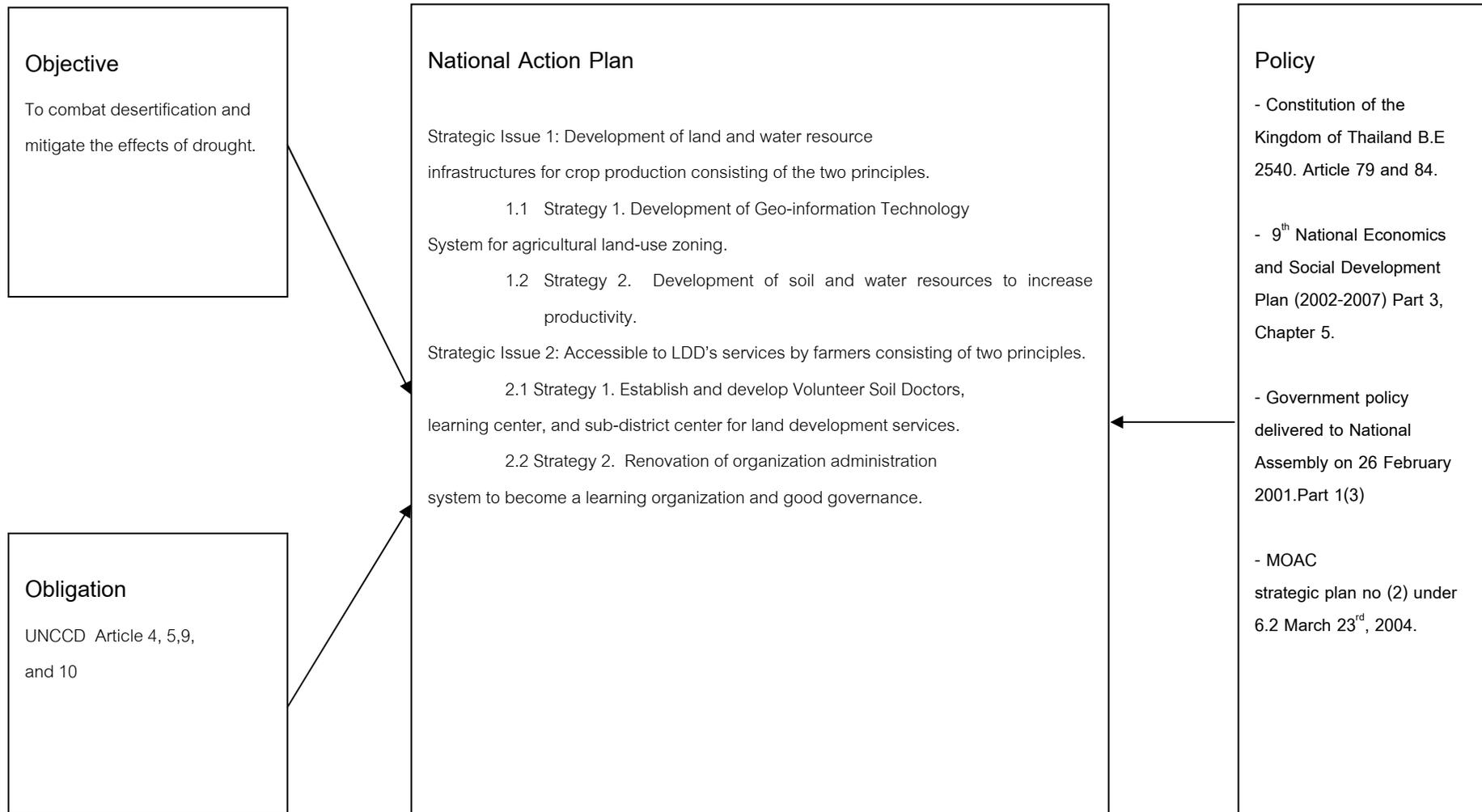
7.4 Indicators

- (1) No less than 20 zones of suitable land for cropping,
- (2) 16 million hectares of cultivated area will be developed,
- (3) 200,000 sites of water resources in rainfed areas will be increased,
- (4) All volunteer soil doctors will be strengthened and readily knowledgeable to service all sub-districts and villages,
- (5) Farmers can access 7,125 learning and service centers of all sub-districts, and
- (6) 80 per cent of users will be satisfied with services provided by LDD.

7.5 Targets

- (1) Achieve 16 million hectares of developed cropping areas by the end of 2008.
- (2) 200,000 water resources will be available for farmers to increase production by the end of 2008, and
- (3) All volunteer soil doctors will serve as an effective mechanism to encourage farmers in gaining complete accessibility to land development learning and service centers of all sub-districts and villages.

Figure 1. Theme of NAP preparation



7.6 Strategic issues and strategies

To achieve the vision, missions, and targets of each key agency to conserve and rehabilitate land resource fertility in supporting safety and security for food production of the country as well as the National Action Programme to Combat Desertification, the LDD defined two groups of offensive strategic issues, consisting of 4 strategies for implementation, as follows:

7.6.1 Strategic issue 1: Development of basic infrastructure of soil and water resources for crop production that aims to promote suitable land uses as well as improves soil fertility and water resources to achieve safety and security, increasing crop production while reducing production cost competitiveness and conserving the environment. Two strategies have been initiated below.

Strategy 1: Development of geo-information technology (GIS) as well as delineation of agricultural land-use zones for suitable and appropriate use of land while reducing production cost by the following guidance.

(1) **Development of soil information and maps** by acceleration of soil survey and classification activities for 1:25,000 mapping scale throughout the country. The improved detailed map will support and enhance more accurate and up to date soil analysis. Aerial photo and a ortho-color map of the Ministry of Agriculture and Cooperatives will be produced at 1:25,000 and 1:4,000 mapping scales to support urgent needs of specific programmes and agencies for example the Conversion of Asset to Capital Programme, the Sea Food Bank Programme, etc.

(2) **Planning and delineation of suitable soil boundaries for individual crop and crop varieties** in addition to the major economic crops which have been implemented. These will support a strategy to increase production of seven potentially exportable agricultural goods i.e. rice, para rubber, cassava, orchid, pineapple, tiger prawn, and chicken that the Ministry of Agriculture and Cooperatives will introduce to the world's kitchens. Newly thirty-five potential agricultural goods will be pushed forward for export. They include: six kinds of vegetable i.e. asparagus, roselle, baby corn, sweet corn, garden pea, bean, soil bean, vegetables; fourteen kinds of fruit

i.e. fresh fruit, dry and dehydrated fruit, mangosteen, durian, longan, pamelo, yellow banana, banana, mango, coconut, lychee, pineapple, Sri Thong rambutan, Round Sali guava; four kinds of Thai recipe i.e. chilli, galangal, tamarind, coconut milk; four kinds of herb i.e. plai (Curcuma Cassumunar), turmeric, black kaempfer, amomum (Siam Caramon); three kinds of ornamental flower i.e. chrysanthemum, curcuma, anthurium, and others; four kinds of livestock animal i.e. native chicken, organic chicken, swallow, dove; and fishery i.e. ornamental fish, aquatic plants, accessories of ornamental fish aquarium.

(3) Monitoring of land use and assessment of crop productivity

by conducting land-use survey annually as well as applying geo-information technology for assessment of productivity of important economic crops which will be used to support planning for marketing by concerning agencies.

Strategy 2: Development of soil and water resources to increase productivity qualitatively and quantitatively for safety and security reasons. In order that farmers can increase their production while decreasing production cost. The development will cover 16 million hectares of cultivated areas. The following are the guidelines for implementation:

(1) Improvement of the system for land development by adopting a holistic approach. Activity areas will be focused on increasing soil reaction or pH and soil organic matter as well as protection of soil erosion and organizing diversified cropping systems. The following will be principle activities:

(i) **Activity to increase soil pH** by applying lime material such as grinding rock and marl to increase availability of plant nutrients while applying less chemical fertilizer.

(ii) **Activity to increase soil organic matter** by applying compost, green manure, organic fertilizer (LDD 1-7) and vetiver grass to keep soil moisture as well as increasing more air to the soils.

(iii) **Activity to prevent and protect soil erosion** by planting vetiver grass with the structures of soil conservation systems such as feeder roads that can be used for transportation of agricultural goods as well as function like dikes to divert water into sedimentation ponds or farm ponds available for further use. The structures will also be useful for prevention of sedimentation and maintaining natural water resources when water storage capacities elsewhere are reduced.

(iv) **Activity to diversify cropping** by applying twice a year plantation, strip cropping, and multiple agriculture or New Theory Agriculture to incomplete the life-cycle of insects and diseases while reducing risk of production and price;

(2) Specifying land development for individual crops to increase the efficiency of crop production and use the land suitably and appropriately such as;

Rice:

- Stop burning of rice straw but burying and applying liquid organic fertilizer (LDD 2) with green manure for soil improvement,
- Raise soil pH in competitive agriculture areas to 6 or more and apply liquid organic fertilizer (LDD2) in combination with LDD5 and LDD7,
- Twice or three times a year cropping will be promoted in self-subsistence areas by rotation cropping or multiple agriculture or New Theory;

Cassava:

- Raise soil pH to 6 or more and apply green manure,
- Applying vetiver grass as inter-cropping with cassava on slopping land in competitive agriculture areas with provision of feeder roads and farm ponds while supporting utilization of liquid organic fertilizer (LDD2) and LDD5,
- Supporting alternate cropping and the New Theory Agriculture in self-subsistence areas

Sugar cane, corn and other field crops:

- Follow the line as applied to cassava considering suitability of specific areas

Horticulture, vegetables, orchards

- Focus on raising soil pH to 6 or more together with LDD composts (LDD1, 2, 3, 5, 7)

(3) Development of soil and water resources and promote utilization of organic fertilizer, bio-fertilizer and agricultural bio-organisms by:

(i) Rehabilitation and improvement of soil in areas where economic crops are grown to increase at least 10 per cent of crop production but decrease 10 per cent of production cost and 30 per cent of chemical use by:

- Using appropriate fertilizer and soil amendment material to support crop production,

- Supporting organic farming and production for food safety,

- Farmers will be promoted/encouraged to use organic fertilizer, bio-fertilizer, and products from agricultural micro-organisms for soil improvement, nutrient enrichment, prevention from harmful insects, and protection of the environment.

(ii) Implementation of soil and water conservation in necessary areas to protect against soil erosion, to conserve soil quality, to rehabilitate the environment, and to increase food security by: incorporation of vetiver grass plantation with establishment of soil and water conservation systems i.e. farm roads and farm ponds.

(iii) Provision of integrated water resource development to improve efficiency of soil and water conservation, water storage, that will provide enough water for a number of cultivation practices by farmers such as the New Theory Agriculture, mixed farming, including mitigation and addressing problems of drought and flooding to sustain farming and to achieve uninterrupted crop production. The New Theory Agriculture will be supported and further enhanced into public schools as a source of lunch for students.

(iv) Producing, developing and transferring of innovative researches and technologies concerning management of soils, water, crops, and bio-technology to support an increasing qualified products and safe food production by:

- Transferring and enhancement of developed innovative technologies such as LDD 1 accelerating agent for composting, LDD 2 accelerating agent for liquid organic fertilizer making, LDD 3 accelerating agent for producing plant-disease control micro-organisms, LDD 5 accelerating agent for weed-control substance producing, LDD 6 accelerating agent for producing waste-water treatment micro-organisms, and LDD 7 accelerating agent to prevent crops from harmful insects,

- Strengthening farmers to produce all LDD's soil-improvement accelerating agents for marketing and create new innovative technologies as required by customers.

(v) Organizing public relations and extension for access by target groups.

Dissemination of land development information insights:

- different media such as publications, CD, and Website;
- establishment of continuous learning networks among volunteer soil doctors, farmers, and agencies for up to date, fast, and correct dissemination of innovative technologies;
- utilizing interactive communication for comment and suggestion

(vi) Protection from landslides by: Mapping of landslide risk areas at 1:50,000 scale and establishment of warning system for farmers in such areas.

7.6.2 Strategic issue 2: Accessibility of farmers to land development services consisting of two strategies aimed at the enhancement of opportunity for farmers and communities to thoroughly access public services.

Strategy 1: Establish and develop Volunteer Soil Doctors, learning centers, and sub-district land development service centers to function as continuous learning and service networks by:

(i) Recruitment and development of sub-district and village volunteer soil doctors

- Recruit to complete a total number of 7,125 sub-district Volunteer Soil Doctors as well as 60,000 village Volunteer Soil Doctors to be the driving mechanism and network to quickly cooperate and help local farmers throughout the country on behalf of the LDD.

- Annually strengthen and develop know-how and experience to increase capacity of Volunteer Soil Doctors to be agricultural entrepreneurs, ready to provide services, and to make recommendations to farmers regarding suitable land for crops.

- Sub-district Volunteer Soil Doctors will be trained to be trainers on soil rehabilitation and improvements such as producing compost and liquid organic fertilizer, improvement of soil by green manure, and plantation of vetiver grass.

- The LDD will provide Sub-district Volunteer Soil Doctors with tools for technology transfer such as soil test kit to conduct basic analysis of soils for farmers.

(ii) Establish and develop one learning center for each Sub-district; Establishment of Sub-district learning centers for land development by:

- Implementation of land development demonstration plots suitable for each sub-district for effective technology transfer and exchange of knowledge and experience among farmers so that the land will be effectively used,

- Sub-district Volunteer Soil Doctors will represent the LDD to provide services to farmers at sub-district and village levels.

(iii) Establish one land development service center for each Sub-district

Establish land development service centers in each tambon where Sub-district Volunteer Soil Doctors are located. All Village Volunteer Soil Doctors will function as a network to support farmers in their own villages with soil improvement material and transfer of knowledge. The centers and network will help to extend the opportunity for farmers as a whole to have quick, efficient and extensive access to government services.

Strategy 2: Improvement of organization management to become a learning organization with good governance focusing on preference of customers.

(i) Development of information and information technology systems

Increase management effectiveness in various aspects of application of LDD information technology by: updating, correcting, and improving the existing information as well as MIS and GIS technology programmes for more convenience, quickness, and accessibility, and also developing new application programmes.

(ii) Improvement of organizational structure and capacity building for staff

- Improvement of organizational structure to be proactive for field operations

- Changing role from implementer to advisor and facilitator

- Strengthening and capacity building for staff to become a learning organization ready for operational mechanisms by: development of skill, raising knowledge on scientific and information technology.

- Establishment of mutual development and management networks in order to serve the mission qualitatively and quantitatively

(iii) Development of good governance principles

Continuously implement a transparent strategic plan with internal control of public service output (P.S.O.) and public service agreement (P.S.A.) to increase management efficiency, to clearly control and investigate the operation, and to effectively decrease risk and error of management.

7.7 Projects and activities

In responding with 7.6, the supporting land development projects and activities will be organized as follows:

7.7.1 Land rehabilitation and soil improvement

- (i) Soil and water conservation system,
- (ii) Development of watershed conservation of Songkla Lake Basin,
- (iii) Land development in specific areas
- (iv) Development of soil and water conservation systems on highlands
- (v) Tree plantation to protect soil salinization in Khong, Chee, and Moon river basins
- (vi) Rehabilitation of abandoned tiger prawn farming areas
- (vii) Soil improvement by compost and liquid organic fertilizer
- (viii) Soil improvement by green manure
- (ix) Saline soil improvement
- (x) Acid soil improvement
- (xi) Acid-saline soil improvement
- (xii) Acid-sulfate soil improvement
- (xiii) Vetiver grass plantation
- (xiv) His Majesty the King Initiative Projects
- (xv) Transferring of technology to farmers

7.7.2 Water resource development

- (i) Development of small-scale water resources
- (ii) Development of areas under water-use management systems
 - (iii) Improvement of natural water resources as sources of production base for communities
- (iv) Provision and development of farm ponds
 - (v) Provision and development of ponds to practice New Theory in school

7.7.3 Zonation of suitable soils for cropping

- (i) Preparation of land-use zones
- (ii) Conducting land-use survey and production estimation
- (iii) Conducting soil survey

7.7.4 Strengthening and capacity building of sub-district and village Volunteer Soil Doctors

7.7.5 Implementing demonstration plots and establishing one agriculture learning center for each sub-district.

7.7.6 Provision of soil analysis service

7.7.7 Development of soil Information systems to serve farmers' requirements by:

- developing information systems, and
- developing data base systems for transferring agricultural technology for sub-district centers.

7.7.8 Conducting land development and bio-technology research to increase crop production

7.7.9 personnel development

7.7.10 development of agro-tourism

Detail of targets and budget are in Table 2

Table 2 Land development programme (soil to address poverty) fiscal year 2004-2008

Main activities/activities	Units	2004		2005		2006		2007		2008		2004-2008	
		Targets	Budgets	Targets	Budgets	Targets	Budgets	Targets	Budgets	Targets	Budgets	Targets	Budgets
Output 1 Land and water resources development	Mill. Hectare	0.408	55.032	3.2	176.730	3.2	196.292	4.392	226.274	4.8	241,558	16	895.887
Main activity1: Extension of soil and water conservation and improvement of deteriorated soils			15.767		81.379		81.833		102.596		110.283		391,857
1.1 Soil improvement by aqua organic compost and products of micro-organism	Hectare	46,400	0.936	3,200,000	15	3,200,000	15	4,392,000	20.587	4,800,000	22.5	15,638,400	74.023
1.2 Soil improvement by green manure	Hectare	147,424	4.545	640,000	30	640,000	30	878,400	41.175	960,000	45	3,265,824	150.720
1.3 Transfer of technology to farmers	Households	-	0	2,000,000	10	2,000,000	10	2,745,000	13.725	3,000,000	15	9,745,000	48.725
1.4 Saline soils improvement	Hectare	6,400	0.245	8,000	1.875	9,600	2.25	11,200	2.625	12,800	3	48,000	9.995
1.5 Acid soils improvement	Hectare	9,600	0.907	48,000	6	48,000	6	48,000	6	48,000	6	201,600	24.907
1.6 Acid soils improvement in Southern Region	Hectare	2,400	0.189	3,200	0.6	4,000	0.75	4,800	0.9	6,400	1.2	20,800	3.639
1.7 Acid-sulfate soils improvement	Hectare	1,600	0.245	8,000	1.125	8,000	1.125	8,000	1.125	8,000	1.125	33,600	4.745
1.8 Rehabilitation of abandoned tiger prawn farms	Hectare	160	0.572	240	1.093	240	1.093	240	1.093	240	1.093	1,120	4.944
1.9 Provision of soil and water conservation system on low land and up land	Hectare	60,912	6.444	88,000	11.44	88,000	11.44	88,000	11.44	88,000	11.44	441,392	52.204
1.10 Provision of soil and water conservation systems on high land	Hectare	1,680	1.684	1,680	2.625	1,680	2.625	1,680	2.625	1,680	2.625	8,400	12.183
1.11 Organization of demonstration plots for learning centers	Sites	7,125	0.00	10,000	0.8	10,000	0.8	10,000	0.8	10,000	0.8	10,000	3.2
1.12 Development of agro-tourism	Sites	-	0.00	3	0.821	3	0.75	3	0.075	20.	0.075	102.83	

Table 2 Land development programme (soil to address poverty) fiscal year 2004-2008 (cont.)

Main activities/activities	Units	2004		2005		2006		2007		2008		2004-2008	
		Targets	Budgets	Targets	Budgets								
<u>Main activity 2:</u> Land development in specific areas	Hectare	8,720	5.4	25,840	19.136	25,840	719.136	25,840	19.136	25,840	19.136	112,080	81.945
2.1 Provision of soil and water conservation system in Song Khla Lake Basin	Hectare	160	0.062	240	0.094	240	0.094	240	0.094	240	0.094	1,120	0.437
2.2 Land development in specific areas	Hectare	8,400	5,250	24,000	18	24,000	18	24,000	18	24,000	18	104,400	77.25
2.3 Tree plantation to protect soil salinization in Khong, Chee, and Moon basins	Hectare	160	0.087	1,600	1.042	1,600	1.042	1,600	1.042	1,600	1.042	6,560	4.257
<u>Main activity 3:</u> Water resources development	Sites	11,335	33.141	30,000	74.965	40,000	94.073	50,000	103.293	69,025	110.888	200,360	416.360
3.1 Small scale water resources	Sites	268	21.306	400	31.8	500	39.75	500	39.75	500	39.75	2,168	172.356
3.2 Development of areas under water-utilization management systems	Sites	70	8.787	100	12.552	150	18.829	200	25.105	200	25.105	720	90.378
3.3 Improvement of natural water resources as sources of production base for communities	Sites	5	1.987	5	1.987	5	1.987	5	1.987	5	1.987	25	9.937
3.4 Provision and development of farm ponds	Sites	10,992	3.251	25,855	7.648	35,345	10.455	45,295	13.398	63,960	18.919	181,447	53.672
3.5 Provision and development of ponds for New Theory practicing in schools	Sites	-		3,640	20.977	4,000	23.052	4,000	23.052	4,360	25.127	16,000	92.208
<u>Main activity 4:</u> Conducting land development and bio-technology researches to increase crop production	Programmes/ projects	41/320	0.724	20/325	1.25	20/325	1.25	20/325	1.25	20/325	1.25	20/235	5.724

Table 2 Land development programme (soil to address poverty) fiscal year 2004-2008 (cont.)

Main activities/activities	Units	2004		2005		2006		2007		2008		2004-2008	
		Targets	Budgets	Targets	Budgets								
<u>Output 2</u> Land use zoning	Crop types	12	2.788	18	27.177	18	27.177	18	27.177	18	27.177	18	111.497
<u>Main activity 1:</u> Preparation of land use zones	Crop types	12	0.275	18	1.510	18	1.510	18	1.510	18	1.510	18	6.314
<u>Main activity 2:</u> Land use survey and crop production evaluation	Crop types	12	0.587	18	1.094	18	1.094	18	1.094	18	1.094	18	4.964
<u>Main activity 3:</u> Soil survey			0.948		4.75		4.75		4.75		4.75	-	19.948
3.1 Soil survey	Hectare	1.68	0.948	3.2	2.5	3.2	2.5	3.2	2.5	3.2	2.5	14.48	10.948
3.2 Mapping of demarcation of permanent forests	Kilometers	-	0.00	3,000	2.25	3,000	2.25	3,000	2.25	3,000	2.25	1,200	9
<u>Main activity 4:</u> Development of information system			0.978		19.823		19.823		19.823		19.823	-	80.271
4.1 Development of computer systems		-	0.978		1.889		1.889		1.889		1.889	-	8.534
4.2 Storing and services of 1:25,000 scale ortho-color map of MOAC ³		-	0.00		1.009		1.009		1.009		1.009	-	4.037
4.3 Preparation of 1:4,000 scale ortho-color maps		-	0.00		16.925		16.925		16.925		16.925	-	67.7
<u>Output 3</u> Strengthening and capacity building of farmers	Numbers of farmer	60,000	14.977	71,558	33.393	71,558	35.185	71,558	35.185	71,558	35.185	71,558	153.924
<u>Main activity 1:</u> Services of soil analysis/mobile agriculture clinics	Numbers of sample	142,700	1.094	400,000	2	400,000	2	400,000	2	400,000	2	1,742,700	9.094
<u>Main activity 2:</u> Strengthening and capacity building of Volunteer Soil Doctors (VSD)	Numbers of VSD	60,000	0.761	71,558	1.038	71,558	1.038	71,558	1.038	71,558	1.038	71,558	4.912

³ Ministry of Agriculture and Cooperatives

Table 2 Land development programme (soil to address poverty) fiscal year 2004-2008 (cont.)

Main activities/activities	Units	2004		2005		2006		2007		2008		2004-2008	
		Targets	Budgets	Targets	Budgets								
Main activity 3: Agriculture development under His Majesty the King Initiative Projects			484.38		28.956		29.147		29.147		29.147	-	128.507
3.1 Vetiver grass	Hectare	120,000	9.499	200,000	16.687	240,000	20.025	240,000	20.025	240,000	20.025	1,040,000	86.262
3.2 His Majesty the King Initiatives	Hectare	14,962	2.61	20,122	12.269	14,962	9.122	14,962	9.122	14,962	9.122	79,968	42.245
Main activity 4: Development of data base systems for sub-district centers for agriculture technology transfer	Numbers of sub-district		1.012	7,125	1.399	7,125	3	7,125	3	7,125	3	7,125	11.411
4.1 Preparation of maps	Numbers of sub-district	1,000	1.012	2,249	0.708							7,125	1.720
4.2 Preparation of resource development plans	Numbers of sub-district	3,000		3,249	0.691							7,125	0.69
Administration cost			3.947		1.029		1.526		1.526		1.526		9.554
Personnel cost			18.4		18.40		18.4		18.4		18.4		91.999
Total budget			95.144		256.729		278.58		308.562		323.845		1,262.861

8. Administration

The LDD will manage the National Action Programme to Combat Desertification accordingly using the chain of command and staff as follows:

8.1 Duty of Land Development Department

8.1.1 **Section 10.** of the Land Development Act B.E. 2526 enacts that:

The Land Development Department shall have the duty to survey the land and to analyze the soil or land in order to determine the fertility and its suitability for utilization, classification, and development, and to prepare land census or conduct economic surveys of the land for the purposes of this Act and other tasks assigned to it by the Board. The Land Development Department shall have the same powers relating to statistics as those provided in the law on statistics with regard to the taking of land census for the execution of this Act.

8.1.2 The provision according to the Ministerial Regulation for restructuring the Land Development Department, Ministry of Agriculture and Cooperatives of B.E. 2545 on 9th October 2002 declares the duty of the department as follows:

(i) Conducting study, survey, classification, analysis and research on soil and land as well as preparing land censuses and monitoring of land-use status in order to define policy and prepare land-use plans for development of lands;

(ii) Providing land development services concerning testing and analyzing soils, water, plants, fertilizers and others as well as recommendations;

(iii) Providing services and transferring results of land development studies and research to concerning agencies and farmers;

(iv) Executing any other tasks, which have been declared according to the competence of the department in the Act or assigned by the Ministry of Agriculture and/or the cabinet.

8.2 Organization Structure

(1) Office of the Secretary

(2) Personnel Division

(3) Finance Division

(4) Engineering Division

- (5) Planning Division
- (6) Surveying and Mapping Division
- (7) Information Center
- (8) Land Development Regional Office 1-12
- (9) Office of Land Management Research and Development
- (10) Office of Science for Land Development
- (11) Office of Soil Survey and Land Use Planning

8.3 Manpower

Regarding the statistics on 30th January 2004, there are 1,665 officers with 661 working in central office and 1,004 working in regional offices. Also, the LDD employs 1,567 employees.

8.4 Budget

Budget allocation for the LDD in different fiscal years are as follows:

Year (AD)	Budget (million USD)
1997	69.47
1998	64.57
1999	65.73
2000	77.79
2001	80.26
2002	67.19
2003	83.85
2004	96.35

8.5 Time frame

The first 5 year National Action Programme to Combat Desertification of 2004-2008 will be revised accordingly due to the change of economic, social and environmental situations within the country.

9. Conclusion

The Cabinet approved the accession for Thailand to enter into force of the United Nations Convention to Combat Desertification (UNCCD) on December 12th, 2000. In March 2001, the Ministry of Foreign Affairs submitted the *"Instrument of Accession"* to the United Nations Organization. Therefore, Thailand fully entered into force of the UNCCD in June 2001 and became the 174th member of the Convention. According to the obligation in section 9 and 10 of the United Nations Convention to Combat Desertification, the National Action Programme to Combat Desertification of the Kingdom of Thailand has been prepared by the LDD. Regarding the definition of *"desertification"* meaning *"land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities"*, combating desertification is directly a duty of the LDD which has been a declared mission by law and in capacity as the focal point for UNCCD assigned by the MOAC. It is found from the analysis of rainfall and evapotranspiration data of 9 climatological stations that the ratio of 30-year (1971-2000) average annual rainfall over average evapotranspiration of the same period falls within 0.51-0.65 whereby it can be classified as a Dry Sub-humid area. Thailand is facing impermissible levels of soil erosion as much as 12.5 ton/hectare/year spreading over 8.9 million hectares on lowlands and 8.5 million hectares on highlands or 17.4 million hectares in total. Considering also the rate of continuous loss of forest area since 1961, which directly influences the occurrence of soil erosion, according to the definition of the Convention, Thailand is affected by land degradation or desertification. In addition, there is currently as much as 33.57 million hectares of degraded land under use for agriculture that must be addressed. Therefore, the National Action Programme to Combat Desertification of the Kingdom of Thailand (2004-2008) by the LDD has been prepared on the basis of the 2 strategic issues and 4 strategies as follows:

9.1 Strategic Issue 1: Development of land and water resource infrastructures for crop production consisting of two strategies.

Strategy 1. Development of a geo-information technology system for agricultural land-use zoning.

Strategy 2. Development of soil and water resources to increase productivity.

9.2 Strategic Issue 2: Farmers can access to LDD's services consisting of two strategies.

Strategy 1. Establish and strengthen Volunteer Soil Doctors, learning centers, and sub-district centers for land development services.

Strategy 2. Renovation of the administration system of the organization to become a learning organization under the principles of good governance.

In responding with such strategies, the supporting land development projects and activities will be implemented as the following;

- (i) Land rehabilitation and soil improvement
- (ii) Water resource development
- (iii) Zonation of suitable soils for cropping
- (iv) Strengthening and capacity building of sub-district and village Volunteer Soil Doctors
- (v) Implementing demonstration plots and establishing an agriculture learning center for each sub-district.
- (vi) Provision of soil analysis services
- (vii) Development of soil information systems to serve farmers' requirements
- (viii) Conducting land development researches and bio-technology researches to increase crop production
- (ix) Personnel development
- (x) Development of agro-tourism

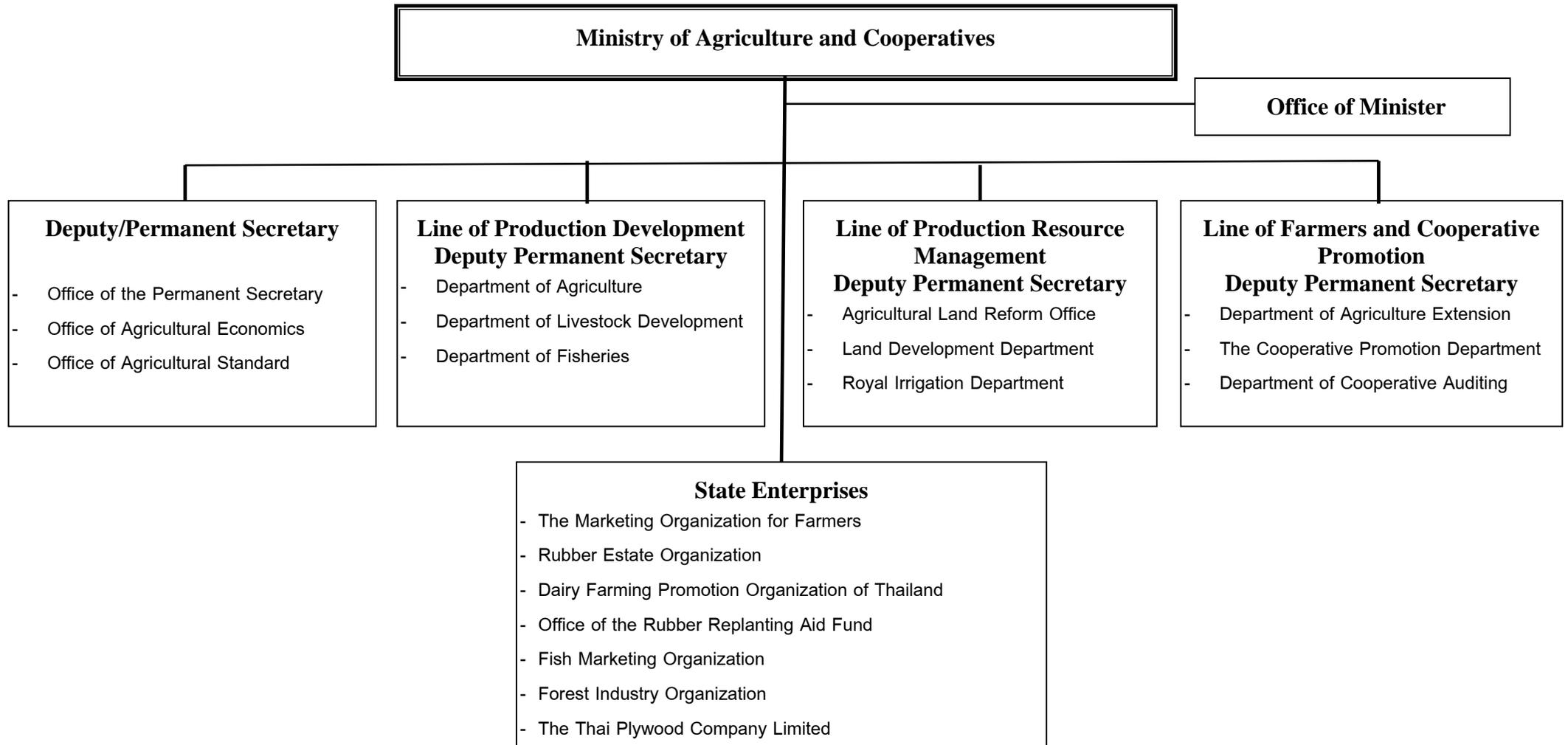
This first National Action Programme to Combat Desertification is set to be 5 years. The revision will be carried out to suit the changes of economic, social and environmental conditions of the future. A total of USD \$54,297.87 million budget will be allocated to achieve 6 indicators below:

- (i) Attaining suitable land zoning for no less than 20 crops
- (ii) Cultivated land will be developed and rehabilitated
- (iii) Water resources outside irrigation scheme
- (iv) Volunteer Soil Doctors are knowledgeable and eligible to serve all farmers in sub-districts and villages

(v) Farmers can access sub-district learning and service centers for land development

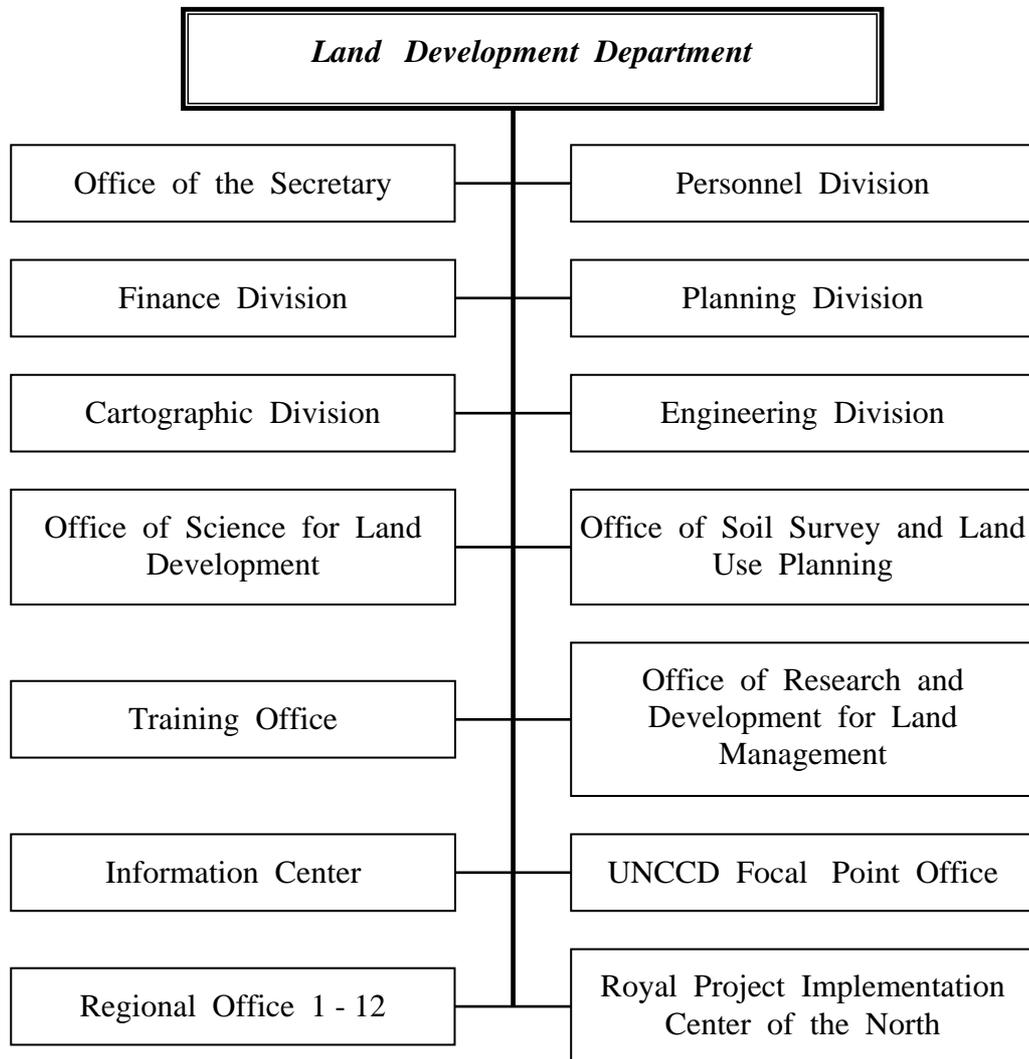
(vi) No less than 80 per cent of user satisfaction with services of LDD.

Annex 1

Structure of Ministry of Agriculture and Cooperatives

Annex 2

Structure of Land Development Department



Annex 3

Classification of severity of soil loss and ratios of area classified under different severity levels displayed by regions in 2002

Soil Loss Classification	Central		East		West		North		Northeast		South		Total	
	Hectare	%	Hectare	%	Hectare	%	Hectare	%	Hectare	%	Hectare	%	Hectare	%
Low land (Peneplains and foot slope less than 35%)														
1.Slight	1,550,225	76.34	1,974,722	52.65	1,856,649	40.22	5,710,226	33.66	12,917,357	76.50	3,228,859	45.66	27,235,036	53.08
2.Moderate	283,280	13.95	792,139	21.12	757,221	16.43	1,765,996	10.41	2,226,025	13.42	1,001,327	14.16	6,865,991	13.38
3.Severe	37,786	1.91	381,442	10.17	148,402	3.22	469,914	2.77	349,528	2.07	178,202	2.52	1,566,276	3.05
4.Very severe	406	0.02	9,001	0.24	4,608	0.10	59,375	0.35	18,573	0.11	18,385	0.26	110,351	0.22
5.Extremely Severe	4,873	0.24	22,879	0.61	10,600	0.23	240,894	1.42	52,334	0.31	31,821	0.45	363,414	0.71
Highland (Mountain and valley slope more than 35%)														
1.Slight	27,211	1.34	416,323	11.10	374,232	8.12	2,621,004	15.45	1,109,372	6.57	2,108,019	29.81	6,656,163	12.97
2.Moderate	20,712	1.02	37,131	0.99	942,955	20.46	3,073,954	18.12	37,148	0.22	2,121	0.03	4,114,024	8.02
3.Severe	64,372	3.17	62,636	1.67	465,947	10.11	1,550,548	9.14	121,575	0.72	12,021	0.17	2,277,101	4.43
4.Very severe	12,184	0.60	4,500	0.12	5,991	0.13	337,592	1.99	13,508	0.08	53,036	0.75	426,813	0.83
5.Extremely Severe	28,632	1.41	49,883	1.33	45,165	0.98	1,134,920	6.69	-	-	437,727	6.19	1,696,329	3.31
Region Area	2,030,685	100.0	3,750,659	100.0	4,608,775	100.0	16,946,428	100.0	16,885,434	100.0	7,071,518	100	51,311,501	100.0
Affected area	453,248	22.32	1,359,613	36.25	2,380,893	51.66	8,633,197	50.89	2,858,704	16.93	1,734,643	24.53	17,420,301	33.95

Note: Slight 0 - 12.5 ton / Hectare / Year
Moderate 12.5 - 31.25 ton / Hectare / Year
Severe 31.25 - 93.75 ton / Hectare / Year
Very severe 93.75 - 125 ton / Hectare / Year
Extremely Severe More than 125 ton / Hectare / Year

* Soil loss more than permissible in Class 2-5 of both lowland and highland.

Source: Land Development Department. 1992. Soil Loss Evaluation in Thailand.