NATIONAL REPORT ON THE IMPLEMENTATION OF UNCCD : COMBATING LAND DEGRADATION AND PROMOTING SUSTAINABLE LAND RESOURCE MANAGEMENT IN MALAYSIA [1]

1. INTRODUCTION

Desertification is land degradation occurring in arid, semi-arid, dry sub-humid areas where the ratio of the annual precipitation to the evapotranspiration falls within the range of 0.005 to 0.65. Most of Malaysia does not fall into this definition except for limited region in northwest and northeast of the peninsula where dry period of 2 months to 3 months occurred annually. The dry period occurs in the months of January to March when evapotranspiration exceeds precipitation. Desertification is not a problem in those areas even during the short dry period as there is sufficient soil moisture to sustain the growth of most vegetation except in soil originated from sandy beach swales in the northeast of the peninsula. The short dry spell is adapted to advantage in these areas like mango and rice producing areas in the country, as drought induces flowering of those fruit trees and creates favourable conditions for the ripening and harvesting of rice. Two to three months of drought would have made these areas underproductive, but water harvesting is practiced such that redistribution of water during drought period is possible, by building dams, cascading ponds and water tanks at regional, plantation and farm level respectively.

However Malaysia is not free of land degradation problems. There are real and constant threats from land degradation, although they differ from those of the arid or semiarid countries. Unlike dry regimes where land degradation is attributed to lack of rainfall, the threats of land degradation in Malaysia are caused by excessive amounts of seasonal rain which can badly damage unprotected sites, especially sloping hill land, resulting in severe soil erosion and other associated problems such as silting, water pollution, and frequent flash floods that bring about misery and huge financial losses in places situated far from the source of degradation. In some situations, large sums of money have been spent on mitigation measures to alleviate problems caused by poor land utilization and management. Land degradation in Malaysia is most eminent in fragile ecosystems such as steepland, mountainous areas which are termed as environmental sensitive areas. Here occurs land with shallow soils which can easily be degraded and eroded.

Degraded land comprise problem soils, such as mined land, peat land, land with acid sulfate soils and the impoverished sandy beach BRIS (Beach Ridges Interspersed with Swales) soils and areas under shifting agriculture. Degradation in these ecosystems occur either as direct damage to the land due to land clearing activities and soil erosion, or as deterioration to the physical and chemical properties of the soils which may require amelioration measures to restore the soil conditions. Land degradation is not yet a major problem in these ecosystems, but the scenario will change with increasing competitive demand from a growing population for more land for urban use and food production. Land development will invariably encroach into the fragile ecosystems such as the steepland and mountains which are presently spared from massive development because of difficult terrain conditions and strict regulations governing their use.

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[1] Third National Report for the Fifth Session of the Committee for the Review of the Implementation of the Convention to Combat Desertification (CRIC5)

Malaysia enjoys considerable success in the rehabilitation of the severely degraded ex-tin mining land for productive and economic use. The ex-tin mining land, created after the minerals were exhausted has now largely been reclaimed for crop production, aquaculture, duck rearing and also for housing, recreation parks and golf courses.

The ability of Malaysia to keep land degradation to a minimum can be attributed to the fact that Malaysia is a strong advocate of sustainable development. The country is mindful of the dangers indiscriminate use of the land especially land with the fragile ecosystems. Policy guidelines are in place to guide the land use planning, utilization and management of land on sustainable basis. Technical guidelines for various types of development have also been drawn to ensure the use of environment-friendly on-site operations. Legislation has been enacted as a deterrent against land mismanagement and abuses.

Soon after the independence, Malaysia launched an aggressive programme to develop its agricultural sector as part of the overall efforts to develop the nation. The main thrust of the development was directed at the conversion of large tracts of forest land into agricultural land for the cultivation of important economic crops. In the 1960's and 1970's, the development of land was concentrated mainly on land with favourable topography and suitable agroclimatic zoning, However, in recent years, as much of such land has been utilized, the encroachment into the steep areas has become inevitable.

2. PHYSICAL ENVIRONMENT

Location

Land degradation in Malaysia is very much associated with forest harvesting, hill land agricultural development and mineral exploitation. To represent the extent of land degradation and efforts to combat it, the case in Peninsula Malaysia, which has relatively more land opened for development, is referred for this report.

Peninsular Malaysia is situated between the equator and 8°. North latitude and longitudes 99°and 120° East. It is bordered in the east by the South China Sea and to the west by the Straits of Malacca. The peninsula has an area of 13.2 million ha of land, whereas in the eastern part of the country, Sarawak and Sabah have 12.5 million ha and 7.2 million ha respectively

Physiography

The physical relief is dominated by the Main Range that runs almost centrally along the middle of the peninsula. The Main Range rises to a height of beyond 2,200 meters above sea level (masl). Secondary ranges that fan out from it, mainly in the northern half of the country are the Kedah-Singgora Range, the Gunong Bintang Range on the western side while the Gunong Benom Range, the Gunong Tahan Range and the East Coast Range are to the east of it. From these mountain ranges, rivers flow through hilly and rolling lowlands towards the flood plains, coastal flats and beach ridges.

Climate
Malaysia has a hot humid climate, which can be classified as subtype Afi (tropical rainforest) of Koppen's classification. In the extreme northwest of the peninsula, where a distinct dry spell is present from the months of December to February, the climate tends to be Am (tropical monsoon). The annual air temperature is generally over 24° Celsius while the main annual rainfall is over 2000 mm. In general, the mean annual rainfall in most of the highlands (above 300 masl.) ranges from 2,000 – 2,200 mm and is quite similar to that of the national average. The highlands does not receive significantly higher rainfall than the lowlands. Moisture availability is, however, higher due to lower evaporation. The soil moisture regime is udic below 300 masl. and perudic above this elevation. The soil temperature regime is isohyperthermic (>22°C) up to 1200 masl isothermic (15-22°C) between 1200 to 1600 masl. and isomesic (<15°C) at elevations exceeding 1600 masl.

Vegetation
The primary vegetation from the lowland to the highland can be grouped into four floristic zone. The family Dipterocarpceae dominates the lowland forests below 300 m. The group Shorea is evident at this altitude. Between 300 meters and 800 meters, the Hill Dipterocarp appears. The upper Dipterocarp occurs between 800 meters and 1,200 meters and Oak-Laurel forests are found between 1,200 meters and 1,600 meters. Above 1,600 meters, the Montane-Ericaceous forests occur. Generally, the tree fern Thelypterus chlamydophora is commonly found above 300 meters.

Soils
A wide range of soils are found in the steep areas from an elevation of 76 masl to beyond 2,000 masl representing major differences in parent material, climate, vegetation and terrain conditions. A distinct characteristic of soils on sloping land is shallower solum depth for those derived from sedimentary parent materials, but can be deep for those derived from igneous rocks.

3. PROBLEM AREAS AND DEGRADED LANDS

Class 5 land and some of Class 4 land consist of predominantly fragile ecosystems such as steepland, peat, acid sulfate and BRIS soils. The steepland and the mountains together are the largest fragile ecosystem and occupy 15.7 million ha of land (78% of the total fragile land or 48% of the nation). Peat takes up 2.6 million ha of land (13% of the fragile land or 8% of the nation). This is followed by potential acid sulfate and acid sulfate soils which cover 1.31 million ha (7% of the fragile land or 4% of the nation). BRIS and tin tailings together take up approximately 0.5 million ha.

Steepland and Mountains
Steepland refers to land with slopes greater than 25°. Such land occurs in both the lowland (<300 masl) and highlands (>300 masl) while mountains are found in the highlands. In general, slope increases with elevation although there are plateaus and inter-montane valleys with gentle slopes which are potentially suitable for agricultural development. These are few and far apart, extremely expensive to develop and highly susceptible to soil erosion.

Peat

Peat is a low potential, non-renewable resource, which diminishes with use. It suffers from water logging and hyperacid conditions; poor trafficability; acute major and minor nutrient deficiencies; subsides irreversibly and gradually disappears when drained; and is prone to fire hazards. Nevertheless, more than 432,350 ha (46%) of peat land in Peninsular Malaysia have been drained, mostly for agricultural activities which occupy 376,005 ha (41%). Oil palm is the dominant crop and covers 247,034 ha or 57% of the cleared land on peat. Upon drainage and cultivation, peat decomposes and shrinks, resulting in subsidence and lowering of the ground surface. In the first 2 years of draining the peat, the rate of subsidence is drastic and reaches as much as 50 cm. In subsequent years, because of the consolidation, the rate of subsidence is only 2 to 3 cm per annum. Peat fires contribute to serious air pollution besides destroying crops. Now, no-burning rules during dry periods are strictly imposed in areas nearing airports.

Acid Sulfate Soils

Acid sulfate soils are only found along the coastal areas of the country. Under natural conditions, they are present as potential acid sulfate soils which are subjected to tidal influence and are frequently inundated by seawater. Land with acid sulfate soils must first be reclaimed before it can be put into effective use for agricultural production. Reclamation is time-consuming, tedious, costly, delicate and complex, and requires multidisciplinary expertise. Major engineering works involving the construction of coastal bunds and tidal gates to prevent sea water ingression, and a complex network of drains to remove the excess water and salts from within the polder, are needed to make the land suitable for crop production. However, reclamation results in the formation of acid sulfate soils which can render the reclaimed land less productive if amelioration measures are not implemented to improve the soil conditions. With proper agronomic and water management and liming, such soils can be converted into highly productive soils for the cultivation of many crops.

BRIS Soils

The term BRIS is the abbreviation for Beach Ridges Interspersed with Swales and refers to the alternating parallel sandy beach ridges and low depression areas which are commonly found in the coastal regions in Peninsular Malaysia, Sabah and Sarawak. In Peninsular Malaysia, it forms the dominant landscape in the coastal areas of the East Coast stretching from Kelantan in the north to Johor in the south. The alternating sandy beach ridges and swales are found as far inland as 10 km from the present-day coastline. The BRIS areas contain infertile soils which are composed predominantly of inert sand particles. The sandy nature of these soils results in very low inherent soil fertility, poor nutrient content and low water holding capacities, excessive drainage, high surface temperatures which can result very high moisture stress in crops. The low lying swales are prone to flooding during the monsoon. Although some of the BRIS areas have been cultivated successfully for tobacco, vegetables, corn, herbs, roselle and other annual crops, they constitute the most challenging for agriculture development. Now increasing areas are developed for intensive horticulture crops under irrigation and rain shelter. Organic fertilizers, manure additions and irrigation are vital inputs for the success of crop production in these areas.

Mined Land

By far, the most damaging activity to land degradation is mining. Approximately 200,000 ha of land have been mined in the peninsula for tin ore in 1960s and 1970s. The main

methods of mining tin are open-cast, gravel pump and dredging. The tin tailings left behind by these activities are highly impoverished by the washing process to extract the tin ore. In all cases, the sand and clay fraction of the soil were separated and dumped separately as sand and slime (mixture of silt and clay). The depth of the disturbed sediment varies from 10 meters for dredging to 0.5 km for open-cast mining. Ex-tin mined land has been rehabilitated successfully for many uses such as agriculture, aquaculture, duck farming and urban uses including housing estates, golf courses and recreation theme parks.

Shifting Cultivation

Shifting cultivation especially in Sarawak is a potential source of land degradation. Approximately 2.7 million hectares or 22% of its land area has been subjected to shifting cultivation activities. In the early years, shifting cultivation, mainly involving hill rice, was not considered a threat to land degradation due to the long fallow period of more than 10 years. Now, due to rural to urban migration especially among the rural people, there is clear decline in the land under shifting cultivation.

4. LAND DEGRADATION MITIGATION MEASURES

A national program to combat land degradation is built in forestry, water and agriculture resources conservation measures and legislation. Thus land degradation is not widespread in the country. One reason for this is that Malaysia is a strong advocate of sustainable development by application of agroclimatic crop zoning and installing appropriate conservation measures. The individual sectors which are involved in land development are implementing stringent mitigation measures to minimize land degradation. The mitigation measures are present in the form of policies, legislation, guidelines, awareness campaigns covering sustainable forest management, water resource management, environment impact assessment and soil conservation practices. Currently, to increase farming productivity, the Ministry of Agriculture and Agro-based Industry, through its departments, are vigorously promoting good agriculture practice certification schemes in crop production, veterinary and aquaculture. The Department of Agriculture is now using good agriculture practice as the foundation in its extension programme.

Three major policies that ensure the sustainable use of land resources for development are the National Forestry Policy, National Agriculture Policy and the National Urbanization Policy. These three policies together with the other mitigation measures have contributed significantly to the mitigation of land degradation. In the National Agriculture Policy (NAP), emphasis is given to increasing productivity through the efficient use of land resources. The opening of new land is discouraged and concerted efforts are made to increase the efficient use of under-utilized land, idle land and even marginal land such as acid sulfate and BRIS soils and ex-mining land. For optimal land use, mixed farming involving the planting of crops, aquaculture and livestock production is encouraged. Integration of livestock in rubber and oil palm plantations is also actively promoted. By discouraging the opening of new land, the NAP contributes to the preservation of forest land and protection of the environment. Guidelines are available for developing sloping land. In these guidelines, land with slopes more than 25° is classified as steepland and is not recommended for agricultural development. For land less than 25°, conservation measures are recommended including the construction of terraces, silt traps, contour ditches and proper drainage system, and planting of cover crops. The implementation of

these measures have effectively controlled soil erosion, thereby minimizing land degradation which is most susceptible and prevalent on such terrain.

Land with peat and acid sulfate soils have been reclaimed effectively on a sustainable basis by controlled drainage involving a gradual lowering of the ground water table; appropriate agronomic measures such as liming to overcome the hyperacid conditions; and suitable fertilizer applications to correct macro and micro nutrient imbalances land. With these measures, land with such soils has been transformed into productive agricultural land. Nevertheless, large scale forest clearing for agriculture of such land especially peat swamps is difficult and expensive. In the natural state, they serve a special function in flood control, being able to absorb large quantities of water. Furthermore, peat is non-renewable resource which disappears with use. In BRIS soils, the restoration is accomplished by cultural and agronomic practices. The use of large quantities of organic matter, discriminatory fertilizer use, irrigation and intensive farming systems are among some the measures used to rehabilitate such land.

In forestry, the National Forest Policy introduced in 1978 and revised in 1992, and the National Forestry Act enacted in 1984 provide guidelines for the management, conservation, utilization, development and protection of forest. The cornerstone of the National Forest Policy is the establishment of Permanent Reserved Forest (PRF) to ensure sustainable forest management. About 4.84 million hectares of forested land are designated as Permanent Reserved Forest to be managed sustainably for the benefit of both the present and future generations. This comprises 36.8 percent of the total land area in Peninsular Malaysia. These forest land are secured in their tenure as they are gazetted in accordance with the National Forestry Act. The PRF could be classified into functional classes to promote sustainable forest management and taking into account the multiple role of the forest, vis a vis timber production forest under sustained yield; soil protection forest; flood control forest; water catchments; forestry sanctuary for wildlife; virgin jungle reserves; amenity forest; education forest and research forest. Out of the 4.84 million hectares of Permanent Reserved Forest, 1.90 million hectares or 39.2% of the total PRF are classified as protection forest and the remaining 2.94 million hectares being classified as production forest. Presently Department of Forestry prohibits new opening of land above 1000 meters above sea level for any form of development. This decision will protect land above 1000 masl from man made degradation process and thus help to preserve the unique fragile ecosystem at this elevation.

Legislation is also in place to combat land degradation. The laws enacted for this purpose include the Land Conservation Act, 1960, the Environment Quality Act, 1974 and the National Forestry Act, 1984. In Environment Quality Act 1974, nineteen land-based development activities including agriculture, forestry, housing and infrastructures are required to provide an environment impact assessment (EIA) report on the development impact on the environment. Currently, the Land Conservation Act 1960 is being reviewed to provide more effective control in soil erosion and river silting which are common in agricultural land. The Department of Lands and Mines has recently initiated to write a national policy on sustainable land use. With implementation of the policies, technical guidelines and laws, Malaysia has enjoyed clear success in controlling land degradation and ensuring sustainable land development.

5. PROGRESS IN SOIL AND WATER CONSERVATION ACTIVITIES

5.1 Collection and Preparation of Agriculture Land Information

a. Soil Mapping

The Department of Agriculture is the custodian of digital spatial soil data for Peninsular Malaysia. Soil information is the basic data for land use planning. Presently 80 percent of the area have been mapped at semi-detailed scale.

b. Land Use Mapping

The Department of Agriculture updates the agriculture land use mapping every two years. This work is assisted using satellite image analysis and GIS tools. The data are important in evaluating the impact of land use and for future planning of land resources.

c. Erosion Risk Map

The Erosion Risk Map is a map showing an estimation of the total soil loss due to erosion on area without agronomic and conservation practices (worst case scenario) at various terrain classes using Universal Soil Loss Equation Method (modified) and GIS tools. This map is useful to planners in predicting the average rate of the potential soil erosion and to recommend soil conservation measures to reduce soil loss within permissible limits.

d. Agroclimatic Map

The Agroclimatic Map is the map showing the various zones with the same duration of moist/wet months and zones with similar duration of moist/wet in different months. The data provide guidance for planning various agricultural activities.

5.2 Preplanning Studies

a. Study of Soil Erosion for different soil types, crop groups and terrain classes

With the use of the Soil Erosion Gauge (designed locally) the amount of soil loss over an area with different soil type, crop type and terrain class can be estimated. Hence comparison of the soil loss in tons per hectare per year can be studied at different parameters

b. Preparation of Development Plan for Agriculture on Sloping Land

Soil erosion and land slide have been a menace to most agricultural areas on sloping land in Malaysia. Soil erosion becomes serious problem on slopes more than 25°. Removal of ground covers on steep slopes will invariably result in rapid and excessive soil erosion leading to soil degradation. This in turn will lead to silting of rivers and flood at the lower catchment areas. Development Plan for Agriculture on Sloping Land is being prepared for districts with high percentage of sloping land to assist the planners and developers in identifying the areas that can be developed for agriculture.

c. Study on Conservation Management of Environmentally Sensitive Areas

There is approximately 5000 hectares of land in Cameron Highlands in Peninsular Malaysia that has been developed since the colonial era for tea, flowers, fruits,

vegetables and holiday resorts. With increasing activities of both agriculture and tourism load, this area is classified as environmentally sensitive area due to accelerated depletion of carbon and soil erosion. Initiated by Department of Environment in collaboration with various other departments and agencies a study on pollution prevention and water quality improvement programme of rivers in Cameron Highlands is being conducted.

d. National Physical Plan

At national level, Department of Town and Country Planning with collaboration with various other departments and agencies has prepared a multi-sector sustainable land use master plan for the whole country.

5.3 Soil Conservation Extension Activities

i) Demonstration plot showing conservation structures and agronomic practices.

These plots have been constructed in the farmer's land where there is existence of sloping area. The purpose of these demonstration plots is to show to the farmers the type of conservation structures that have to be made for different slope classes and different crop groups. At the same time, the necessary agronomic practices that have to be carried out are shown. This plot will be the focal point for farmers having sloping land for agricultural purposes.

ii) Training and Extension Programmes.

The Department of Agriculture continues to play the role in the transfer of knowledge and skill to the extension agents and farmers through hands-on training in hill land agriculture, as follows:

- Guidelines for land clearing for various crop groups and slopes
- Guideline for construction of soil conservation structures for various crop groups and slopes.
- Guidelines for agronomic practices to combat erosion for various crop groups and slopes.
- Farmers visit to demonstration plots showing the various soil conservation structures and agronomic practices for various crop groups and slopes.
- Good agriculture practice as the theme of extension work.
- Issuance of SALM certificates to farms that fulfilled the standard requirements of good agriculture practice scheme.

6. RELATED AGENCIES AND INSTITUTIONS

Several government departments and agencies are involved in promoting soil conservation and implementing activities to control land degradation. They are as follows:

i. Department of Agriculture
ii. Department of Irrigation and Drainage
iii. Department of Environment
iv. Department of Forestry

v. Department of Director General of Land and Mines
vi. Federal Land Development Authority
vii. Rubber Industry Small Holders Development Authority
viii. Forest Research Institute of Malaysia
ix. Rubber Research Institute of Malaysia
x. Palm Oil Research Institute of Malaysia
xi. Malaysian Agriculture Research and Development Institute

7. LEGISLATION

Related laws and regulations related to combating land degradation are as follows:

i. The National Land Code, 1965
ii. The Land Conservation Act, 1960
iii. The Environmental Quality Act, 1974
iv. The National Forestry Act, 1984
v. Town and Country Planning Act, 1976

8. UNCCD NATIONAL FOCAL POINT

The National Focal Point of the UNCCD for Malaysia is:

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