

Preliminary Study on the Sustainable Conservation of Dryland Area: A Case of Tant-kyi-taung Mountain Range Area, Pakokku District, Magway Division

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Abstract

Drought and desertification are one of the main environmental problems in Dry Zones of Central Myanmar affecting the natural resources base communities depend upon. Desertification is caused by complex interactions among physical, biological, political, social, cultural and economic factors. Conservation and sustainable use of natural resources of dryland ecosystem is hence a key factor towards sustainable livelihood. In this preliminarily research study, the geomorphological characteristics of Tant-kyi-taung area, part of the designated greening project area is examined as to how these factors affect on the vegetation cover of the study area. Local people's environmental awareness, utilization of the natural resources, activities on the greening project, economic activities and cultural factors are also conducted.

Key words: Desertification, Dry Zone, Geomorphological characteristics, Environmental awareness, Tant-kyi-taung, Magway.

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Introduction

The term desertification as 'land degradation in arid, semi-arid and sub-humid areas is resulting from various factors including climatic variations and human activities' (UNCCD Art.1.a). Desertification already affects one quarter of the total land surface of the globe today. Desertification is caused by complex interactions among physical, biological, political, social, cultural and economic factors.

Both natural and man-made events cause the land degradation in Myanmar, particularly the dry zone. In order to prevent desertification and drought in the future, Myanmar has established a supporting mechanism that enable to create green environment and to encounter desertification in the country. It is mainly undertaken by the Government with its own limited resources, which is, the purpose of "Greening the Dry Zone".

The most significant efforts by the government on preventing land degradation and combating desertification in recent years is the rural area development programme envisaged in the current Third Short-Term Five-Year Plan (2001-2002 to 2005-2006) which includes - Ensuring smooth transport; Supplying sufficient water; Promoting education; Enhancing health care; Ensuring economic development.

As a result of increased population, shifting cultivation, fuelwood extraction and other human activities, very little of original natural vegetation remains and a degraded form of trees were found in many places in Myanmar. The absence of forest cover on the watersheds pose risks of severe floods.

According to the rainfall pattern the Dry Zone has an area of about 21,000 square miles (54,390 square kilometers) or about 10 per cent of the country. It comprises Lower Sagaing, Mandalay and Magway Divisions, where about 34% of the total population live. Poorer farm families and agricultural labour supplement their incomes by cutting fuelwood or making jaggery which contributed to overexploitation of forest resources and deforestation.

As a part of the government's effort to prevent land degradation and to combat desertification, in 1994 the Ministry of Forestry (MOF) launched a 3-year "Greening Project for the Nine Critical Districts" of Sagaing, Magway and Mandalay Divisions in the Dry Zone. It was later extended to 13 districts with the creation of new department, the Dry Zone Greening Department (DZGD) in 1997.

Dry Zone In Nature

Myanmar is a tropical country located between latitudes $9^{\circ} 28'$ North and $28^{\circ} 29'$ North and longitudes $92^{\circ} 10'$ East and $101^{\circ} 10'$ East. The length from northern to southern tip of the country is about 2060 kilometers. The country has several variant climate zones ranging from the temperate region of the north to the Dry Zone in central Myanmar and the monsoonal belts in the northwest, west and south.

The Dry Zone is a vast semi-arid low land between two higher regions, the Shan plateau on the East and the Rakhine Yoma and Chin hills on the west. Two major rivers, the Ayeyarwady and the Chindwin flow through

the Dry Zone from North to South connecting it to the Deltaic region in the South. The hills in the Dry Zone with the exception of Mount Popa are low (about 1000 feet high). They serve as local watersheds. Most of the local streams have water only immediately after the rain. The original vegetation of central Dry Zone is described as Savannah woodland which consisted of deciduous trees and a ground flora composed of different species of grass.

The rainy season extends from May to late October. The weather is generally dry in the rest of the year. The coastal regions, the delta region and the northern part of the country get the annual rainfall of about 5000mm. However, the annual rainfall in the Dry Zone is between 500mm and 1000mm. According to the rainfall pattern the Dry Zone has an area of about 21,000 square miles (54,390 square kilometers) or about 10 per cent of the country. It comprises Lower Sagaing, Mandalay and Magway Divisions. There are altogether 13 districts and 57 townships in the Dry Zone. The Dry Zone suffers intense heat of monthly temperature ranging from minimum of 10° C in the cool months to maximum of above 40° C in dry months.

Natural Impacts

The Dry Zone is tending towards droughts. The worse drought that hit the area was during 1979 and 1980. The second worse drought that hit lower Sagaing and Mandalay was during 1982 and 1983 and the third worse drought hit the whole area of the Dry Zone during 1993 and 1994.

Most of the soil in the Dry Zone is sandy and is vulnerable to wind and water erosion and soil erosion is high during the intensive storm.

Man Made Impacts and Consequences

As a result of increased population, shifting cultivation, fuelwood extraction and other human activities, very little of original natural vegetation remains and a degraded form of trees were found in many places. In the absence of forest cover on the watersheds, severe floods sometimes occur. During 2001 several villages were swept away because of high rainfall and flash floods of the sandy streams.

About 34 percent of the total population live in Sagaing, Magway and Mandalay Divisions. The major crops grown in the Dry Zone are cotton, sesame, pulses and beans. Seasonal vegetables such as onion, garlic, chillies, tomatoes are also grown on some alluvial soils on the banks along the Ayeyarwady river. Poorer farm families and agricultural labourers supplement their incomes by cutting fuelwood or making jaggery which contributed to overexploitation of forest resources and deforestation.

Location

Study area, Tant-kyi-taung lies in the Magway Division. It is situated between north latitudes $21^{\circ} 09'$ and east longitudes $94^{\circ} 47'$. The study area is hilly tract on the west bank of Ayeyarwady River, occupied a favorable geographic position on the opposite site of Bagan. It locates about 350 feet above sea level (Fig. 1).

TANT KYI TAUNG AREA

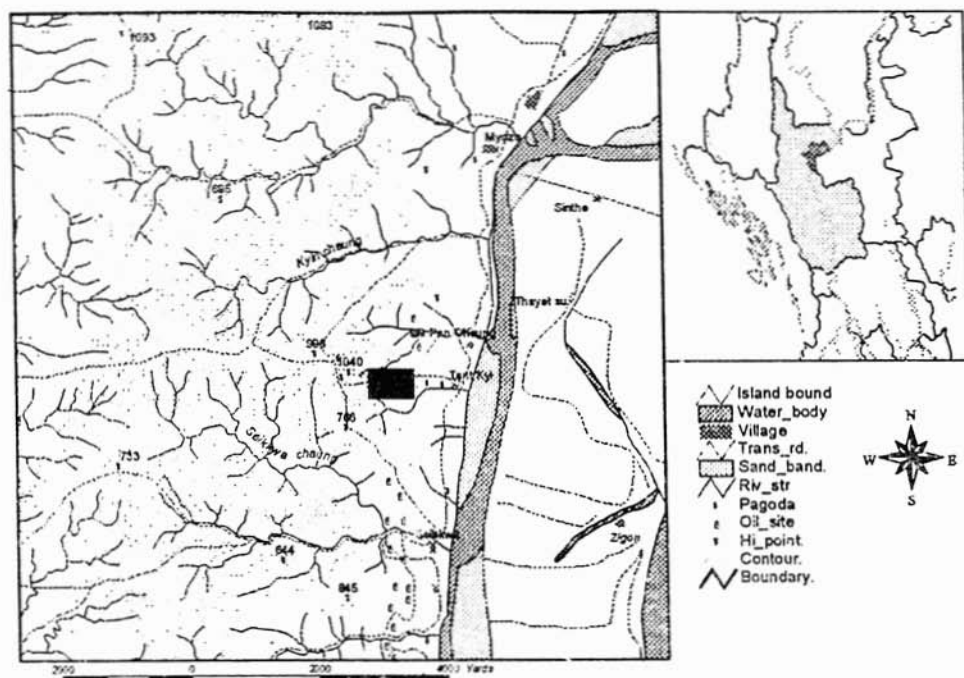


Fig. 1. Location of study area at eastern part of Tant-kyi-taung Range.

General Geomorphology of the Study Area

The study area is situated in the heart of the Central Cenozoic belt which constitutes one of the four geotectonic belts of Myanmar. This belt is relatively a low lying province between the eastern highland to the east and the western ranges to the south.

According to Maung Thein (1983), the Central Cenozoic Belt is a down-faulted block and consisting of several depositional basins and uplifts. Longitudinally it is bisected by the Central Pluto-volcanic arc, which has become a substantial barrier possible at the onset of Miocene.

The height of Tant-kyi-taung is 1040 feet. Tant-kyi range gradually decrease in height towards the south. The character profile of the Tant-kyi-taung is asymmetrical and having a wide and gentle slope in its western side. In the eastern region of the area, a *cuesta* landform is very conspicuous along the main parts of the Tant-kyi range. The long ridge of the *cuesta* have steep scarp faces on the eastern sides. It appears that the *cuesta* and form is well-developed in the regions of alternating weak and resistant units with general dips.

At the eastern fringe of the study area, hogback ridges are very conspicuous and these ridges are characterized by two symmetrical slopes. They typically develop on the east side of the Tant-kyi-taung where the beds dip very steeply eastward and form the eastern limb of the regional anticline. The eastern side of the Tant-kyi-taung generally shows a fairly rugged terrain of scarps and cliffs.

The study area is composed of many ridges and troughs. Generally the degree of the slope is 30. The slope degree of both sides of ridge are less than 10. On the eastern side of the hill, there are many outcrops in our study area. Paralleling the ridges, there are rill erosion between the outcrops. The pattern of rill erosion varies from place to place. Depending on rock strata, the gradient of the slopes varies.

Soil Forming Related to Weathering Processes

Weathering processes and soil forming are directly related to climate. Study area situated in the core area of the Dry Zone in Myanmar. Climatic

condition concern with the Dry Zone area experiences high temperature and low precipitation. Therefore, physical weathering processes are more pronounced than chemical weathering. In this part the majority of the rock outcrops are composed of sandstone of the Bago series. By weathering processes, fissures appear in the joints and bedding plane and rocks are gradually apart from one another. Surface soils are coarse grain sand. The rock talus are drop and fall of the slope surface by the weathered outcrops. Bare rocks are experienced through the rill erosion process. Climatic condition and soil types are highly influenced on natural vegetation in this region.

Chemical weathering processes have also been found in this area. In rainy season, small amount of water are found in the sandstone. Gypsum minerals within the sandstone are evaporated by temperature which the thin layer of gypsum on the sandstone rock surface. This gypsum minerals and weathered rocks are scattered along the slope surface by the process of rill erosion. Gypsum mineral is used in fertilizer. Sodium and potassium compound reach the surface of micaceous sandstone is another type of chemical weathering processes. Evaporation deposit of sodium-potassium compound produces white powder. These chemical weathering processes play less important role in soil formation. Biological process also play an important role in soil formation. But biological weathering process is not distinguished in our study area. Among the above mentioned three processes, physical weathering process is the main cause of soil formation.

Soil Erosion on Slope

The amount of erosion that occur on a slope as a result of process such as rainsplash, surface wash and rill erosion will depend on a range of factors which, primarily are : the erosivity of the eroding agent, the erodibility of the soil, the slope of the land and the nature of the plant cover.

Upper portion of the slope soil erosion are more effected than the lower, because the slope gradient are steeper in the upper portion than lower portion of slope. Soil erosion is less on the slope surface between first and usecond ridge. Due to the lower slope gradient and the composition of highly resistance rock, so also soil formation processes are very slow. The high amount of soil erosion may occur in the area of low plant cover and sudden heavy torrential rainfall in the rainy season. Soil erosion on the upper portion and accumulation of soil on the lower portion are influenced by the distribution patterns of natural vegetation.



Fig. 2. Surveying of geomorphic and vegetation condition on the Tant-kyi-taung.

Natural Vegetation Condition

Depending on slope, climate and soil condition there are 9 types of natural vegetation Tawthamon, Zaunggyan, Gyoke, Kanakho, Baukthee, Zaweazar, Manithanhlet, Kaukkwe, and Kanazane.

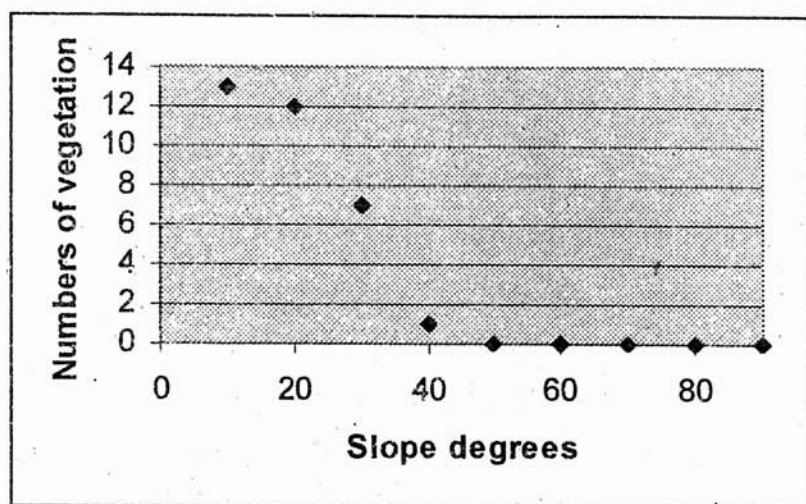


Figure 3. The relationship of hillslope and vegetation growth.

The natural vegetation is directly related to features of slope. Small trees occupy in higher elevation of steep slopes but large trees are present in gentle slope areas (Fig. 3).

Tant-Kyi Village's Some Socio-Economic Condition and Awareness

In study area, Tant-kyi Village, we took some interviews concerning on the dry zone greening project and their environment for their socio-economic condition.

According to the interview data, 32.3% of total population of village are dependent, 24.8% are student, 21.3% are daily wages worker, 15.8% are holding own business and 5.3% are government services (Fig.4)

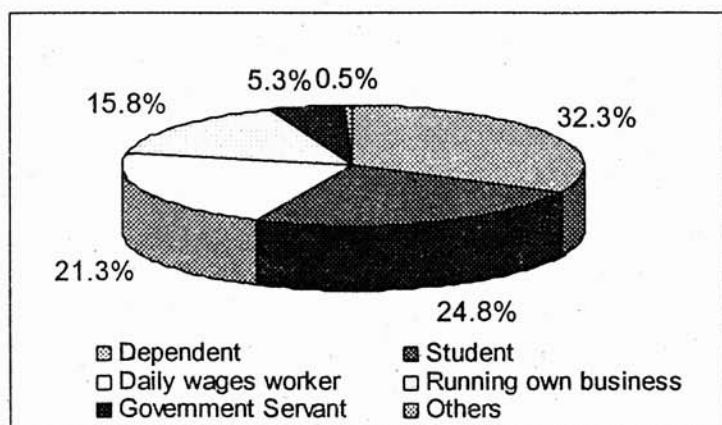


Fig.4. Occupation structure of Tant Kyi Village (n=112)

Source: based on personal interview

To know the source of fuel supply for house use, some questions are asked and the result is shown in Fig 5. Most are using fuelwood (69%) and charcoal (26%). Thus in total 95% of the village get their fuels from their environment of Tant-kyi-taung. Most of people get the fuel by means of searching and buying.

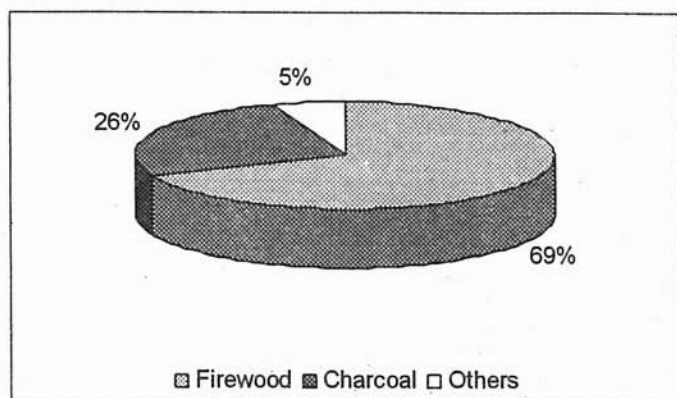


Fig.5. Principle sources of fuel supply in Tant-kyi Village

Source: based on personal interview

Those people believed that supernatural spirits abound some big trees which are shown in Fig. 6. More than 80% believe and they abstain from cutting such kind of trees. That condition will support to conserve the trees if they believed the trees have supernatural spirits.

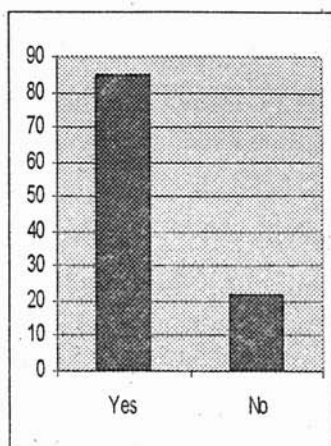


Fig. 6. Belief of supernatural spirit of trees

Conclusion

The villagers knew the punishment they will get when they cut the trees, but, they need to use fuelwood and charcoal. They need to substitute fuel instead of fuel wood. Most of the people have some awareness on their environment, but the physical condition of Tant-kyi-taung area is not fit to plant the trees even as for the fuelwood on the eastern side the mountain range. Time is needed for soil formation in that side. The cultural factor as belief of spirit in this area can be one of possible way to conserve the forest.

Physical and human impacts on the plant environment

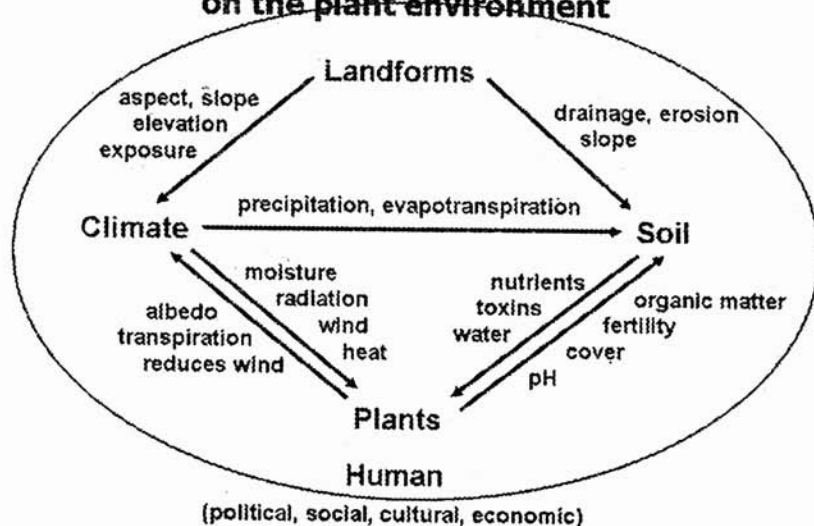


Fig. 7. The conceptual frame work for physical and human impacts on the plant environment.

Fig. 7 is the conceptual frame work for the physical and human impacts on the plant environment considering the sustainable greening project in dry zone area. Decision maker for sustainable plant environment, basically

should consider the physical condition of the area. These conditions are good for successive growth of plant environment reciprocally. In that frame work, the most important factor is human factor. Their socio-economic and cultural conditions governed the whole physical and plant environment. In this research only some part of the framework were considered, so the rest of factor also need to be considered in future to conserve the sustainable greening project in dry zone area.

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