CHAPTER I

INTRODUCTION

1.1 Background

The Dry Zone of Myanmar 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 (Figure 1.1). The hills in the Dry Zone with the exception of Mount Popa are low (about 1,000 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 consists of deciduous trees and a ground flora composed of different species of grass.

The Dry Zone to this day is still one of the most important agricultural areas in Myanmar. There is still over 55.5 percent of fairly productive land for agriculture, 19.7 per cent of closed forest, 13 per cent of forests affected by shifting cultivation, 8.4 per cent of degraded forests, 1.4 per cent of water body and 2 per cent of others of total area (Forest Department, Myanmar, 1997). The majority depends on agriculture and allied activities for their livelihoods. People rely on an unstable income from agriculture with only limited opportunities for other employment (JICA, 2007). Most of the crops grown in this region are typical upland crops such as cotton, maize, pulses, millet, groundnut, sesame, etc. Although there is some rainfed rice cultivation, multi-crop cultivation is the traditional system in this area (UNCCD, 2000).

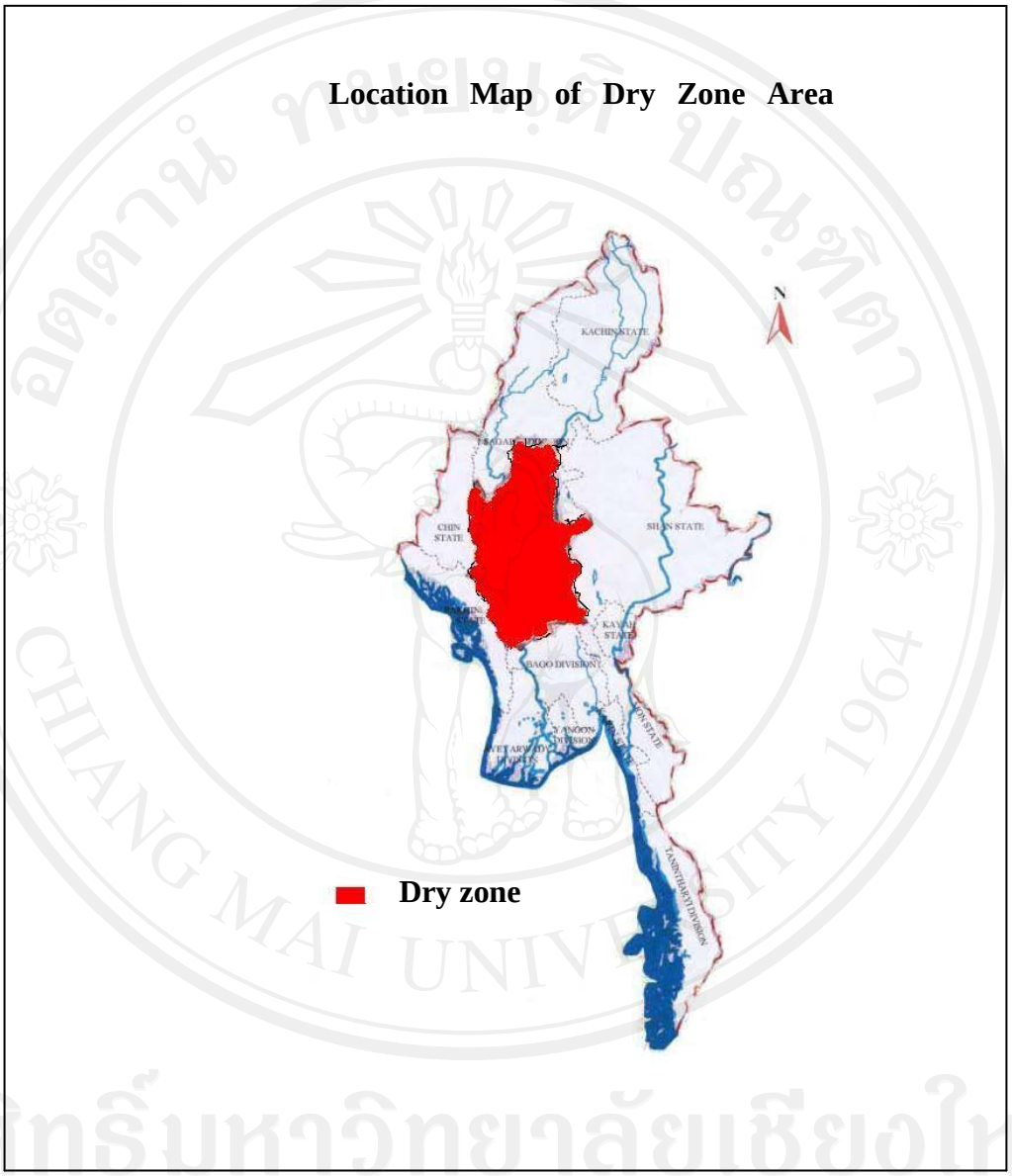

Figure1.1 Location map of Dry Zone area, Myanmar.

The zone is characterized by shallow soils, low uneven rainfall distribution, a high degree of soil erosion and annual rainfall which ranges between 500 mm to 1,000 mm. The 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. The rainy season extends from May to late October. The weather is generally dry in the rest of the year. According to the rainfall pattern, the dry zone has an area of about 33,710 square miles (87,308 sq km) about 13 per cent of the country. It comprises Lower Sagaing, Mandalay and Magway Divisions. There are altogether 13 districts and 57 townships in this zone (Htoo, 2009).

The zone is also a resource-poor area. Water is scarce; vegetation cover is thin and soil erosion severe. In central Myanmar, where wind and water erosion is very common due to its dry and windy weather condition. Loss of vegetation cover and unfavorable agricultural practices such as slash and burn cultivation and shifting cultivation are found. Shifting cultivation still continues because the state punishment over violation is not severe and the farmers can legally obtain their agricultural products in exchange with little fine. Mismanagement of soil and plant nutrients by farmers further reduces the soil's nutrient reserves. As nutrient reserves are reduced, crop growth and productivity are low. Over time, cumulative nutrient depletion reduces agricultural production, crop yields and soil fertility, leading to soil degradation. The population density is relatively high. About 23 per cent of the total population lives in this region. NCEA (1997) reported that compounded by increasing population pressure, high competition for naturally thin vegetation, mismanagement by farmers and tree cover (for fuel wood and livestock fodder), the region is suffering rapid environmental degradation. Carucci (2001) also reported that the entire area of Myanmar Dry Zone is considered affected by various levels of soil erosion. In several townships, i.e., Kyaukpadaung, Magway, Chaung U, Thaung Tha, Nga Htoe Gyi and

Ma Hlaing, land degradation and erosion rates are severe, leading to chronic food insecurity and various degrees of poverty.

In the central plains of Myanmar, gradual degradation of soil fertility is occurring through erosion. However, the worst affected regions are Mandalay, Sagaing and Magway Divisions. Among them, Magway division is a high level of erodibility because of sandy top soil there. In 2001, Maung Maung Than reported that the critical erosion susceptibility (the susceptibility of the soil to erosion) of Magway, Sagaing and Mandalay division were 2.74, 0.06 and 2.28 per cent of total area. Moreover, the critical erosion susceptibility of Magway division was 68.30 per cent of total Dry Zone area.

Therefore, soil degradation is now a major problem in this zone. According to this problem, IFPRI (2001) mentioned that efficient and effective management of soil resources and plant nutrients was important for obtaining sustainably higher crop yields. Similarly, NCEA (1997) also reported that soil erosion and degradation in Dry Zone area were noted as soil problem in Myanmar. The proper conservation and improvement of these soils problem needed an immediate action. Bot and Benites (2005) also stated that a key to soil restoration was to maximize the retention and recycling of organic matter and plant materials and to minimize the losses of these soil components caused by leaching, runoff and erosion. Improving soil fertility through application of various types of organic fertilizers such as crop residues and manure etc. were also practiced. According to Farouque and Tekeya (2008), soil fertility improvement and conservation practices will be a beneficial approach to improve crop yield and to preserve soil fertility in the long run.

Therefore, the farmers need to cope with soil fertility degradation by developing alternative strategies that include the use of organic residues, inorganic fertilizer, and crop rotation because soil degradation is one of the major problems facing farmers in the Dry Zone area.

However, the farmers in the Dry Zone area rarely adopted organic fertilizers, especially green manuring, compost and crop residues application for soil conservation. Kyu (2006) reported that green manuring was rarely found in Dry Zone. Only 4 per cent of farmers were practicing green manuring in Dry Zone and 14 per cent of farmers were using crop residues for soil fertility management practices.

Moreover, residues of agricultural crops such as stalks of sesame, pea, cotton, peanut husks and etc. have been used as fuel. The utilization of Dry Zone agriculture residues as fuel increases about 8,312.7 ton during 1998-99 to 2000-2001 as the utilization of agriculture residues as fuel was 12,054 tons in 1997-98 and was 20,366.7 tons in 2000-2001. The utilization percentage of crop residues as fuel for Magawy, Sagaing and Mandalay divisions were 68.91, 20.31 and 10.78 per cent of total crop residues of Dry Zone. Therefore, the amount of crop residues used as fuel in Magway division is also the highest amount (Source: http://www.myanmar-narcotic.net / Ministry / Forest / Environment.html). The utilization of crop residues as fuel becomes increasing year by year because of fuel scarcity. Therefore, there is necessary to encourage using organic materials for soil conservation and improvement.

Besides, soil erosion and soil degradation are a physical process but its underlying causes are firmly rooted in the socio-economic, political and cultural environment in which land users operate. The degree of soil erosion in a particular

climatic zone with particular soils, land-use and socioeconomic conditions, will always results from a combination of the above factors. Sanchez *et al*. (1996) confirmed that soil fertility depletion in smallholder farms was fundamental biophysical cause of declining per capital food production. Unless land was intensively and more productively used, it was unlikely to provide enough food for consumption and sale. Land productivity could improve if soil fertility were improved.

Illukpitiya and Gopalakrishnan (2004) indicated that decision-making in the conservation of soil was largely the result of behavior of individual farmers, which was governed by internal as well as external factors. The major factors in the decision-making process of individual farmers could be categorized into personal, economic, institutional, and physical groups. Individual or combination of these factors might influence the final decision-making process on whether or not to invest in soil conservation.

1.2 Rationale

With naturally soil degradation and declining inputs, both in terms of organic and inorganic materials, agricultural productivity is decreasing annually and soil fertility problems remain a high priority for agricultural development in the central Dry Zone of Myanmar. Therefore, the most pressing problem for Dry Zone agriculture is the current state of gradually decreasing of soil fertility, stagnating crop yields and declining productivity in a range of food crops. To overcome the soil fertility problem, farmers should use mainly chemical fertilizer and organic manure for crop production improvement.

However, farmers applied a very little amount of crop residues into their fields for soil conservation. Besides, few farmers practise green manuring. This may lead to soil erosion because the soils in this area are mainly sandy with low organic matter content. Soils are generally poor and shallow, and easily eroded by intense rains and strong winds. This undulating land, composed mainly of clay and sandy loams with natural low fertility is subjected to severe environmental degradation.

On the other hand, as a developing country; the prices of inorganic fertilizers are relatively high. Therefore, most of the farmers, especially small scale farmers cannot buy inorganic fertilizers and they have to depend on the use of any available organic fertilizers in maintaining crop yields and in sustaining good soil quality and soil fertility. However, few farmers in the Dry Zone area have rarely adopted organic fertilizers for soil conservation, especially crop residue application, compost application and green manuring.

Although the farmers in the Dry Zone need to cope with soil fertility degradation by developing alternative strategies that include the use of organic residues, inorganic fertilizer, and crop rotation, they have rarely adopted organic fertilizers for soil conservation. Therefore, it is necessary to find out the reasons for using as not using organic fertilizers for soil conservation.

However, there is a gap of knowledge to understand farmers' situation. In most cases, the complexity of farmers' communities creates a gap between the scientists and the farmers. This gap should be bridged in order to facilitate mutual understanding on the problems to be tackled. In order to full this gap, it is necessary to study the Dry Zone farmers' society. According to the above conditions; this study was carried out with the following objectives;

1.3 Objectives

(1) To determine farmers' knowledge on soil conservation measures using organic materials in the study area

(2) To identify problems and constraints faced by the farmers in using organic materials for soil conservation measures

(3) To determine factors affecting soil conservation measures using the organic materials in the study area