CHAPTER 1

INTRODUCTION

Myanmar is a developing country, lies on South East Asia peninsula, endows rich natural resources. Myanmar has had in several economic changes since 1988. The most significant has been a major shift from centrally planned economy to a market-oriental economy and the establishment of a conducive economic-environment for fuller domestic and external participation in all sectors of the economy. However, agriculture has been still remaining as major sector for national development which contributing to 62.7% of employment, 35.6% of GDP and 31.0% of export earning for her in 1998 (MOAI, 1999). The government has laid down the policy for agricultural sector to serve as the basis for other sectors' development. It is the first priority in the national development policies.

Sugarcane (*Saccharum officinarum L.*) is one of the major industrial crops as cotton, jute, oil-palm and rubber, in Myanmar. Total annual cultivation area of sugarcane in the whole country is 141,235 ha (MSE, 2001a) contributing to 1.52% of net cultivated area; 9,277,837 ha (CSO, 1999) in the country. Sugar mills being located in rural areas, support huge economic activities in the rural areas. In adding to economic condition of the farmers and agricultural labors, engaged in sugarcane farming, they also support several others like transport operators, in put dealers, petty business men. Most of the factory workers are drawn from the surrounding area. Thus, sugarcane cultivation and sugar mills generate the rural employment. By products of sugar industry are also plays the important role in the nation's economy. Molasses is the main raw material for alcohol-based industries, sugarcane bagasse is the chief source of power for sugar mills and excess bagasse is now being used as raw material in the paper industry. Press-mud contains considerable amount of nutrients for plants so that it could be used as an important source of organic matter, containing major and minor nutrients. Nowadays, the State encourages the growers to make bio-fertilizers, based on sugarcane press-mud applying with EM (effective microbe) technology.

The State has recognized the sugarcane and sugar industry as one of the major four pillars for the national development. Therefore, encouragement and effort have been focused on the improvement within the sector. Recently, the nine new sugar mills were added into the sector last three years ago, with the objectives—to increase consumption of sugar per capita, to fulfill the requirement of raw sugar for domestic sugar based industries, and to promote the export of surplus sugar. Sugarcane has grown all over the country differing ecological zone. Sugarcane cultivated area increases year after year, and the total production of fresh cane as well. The annual sugarcane production of the whole country is 5.05 million-ton. The national average fresh cane yield is about 45 tonnes ha^{-1} (CSO, 1999). In production areas around the sugarcane mills, annual production of cane is 3.08 million ton and average fresh cane yield is about 50 tonnes ha^{-1} (MSE, 2000a). According to the milling schedule and their crushing capacity, the annual production of sugarcane in the mills' area is not sufficient to meet with the full capacity of the sugar mills while their total sugarcane requirement is 3.65 million ton. If the subtraction of cane setts for new plantation is taken into account, this volume of production is undoubtfully very low. Sugarcane yields in Myanmar are still low comparing with cane yields in some leading countries in sugar industry. Average cane yield in Thailand, Indonesia, Philippines, and India is at 68, 76.5, 62 and 66 tonnes ha^{-1}, respectively (Sundara, 1998).

The Nawaday Sugar Mill, Mill No (12) is a joint-venture enterprise between MSE and Sutech Co Ltd (Thailand), was started in 1996 for construction and completed in 1998 (MSE, 2001). The successful test had run in 1998. Up to five years ago, sugarcane (*Saccharum officinarum* L) was grown as secondary crop in the studied area, but now, has been extending sugarcane cultivation area under the encouragement of government enterprise, MSE and MOAI. Localized branch extension office of MSE has established in new developed sugar cane cultivation area since 1996, to take care and pay more attentions on their specialized field. However, the regional cane yield 40 tonnes ha^{-1} (survey, 2001) is lower than the national cane yield 45 tonnes ha^{-1} (CSO, 1999), and current cane production could not meet with the mill demand. Therefore, effort in research and development is very essential in order to improve sugarcane production, especially around the mill- areas of cane plantation.

Sugarcane is a giant grass crop, producing huge quantity of biomass and therefore its nutrient and water requirement is high, so the crop removal of nutrient is also considerably high (IFAS, 1996). This means that sugarcane consumes high amount of soil nutrients, which will lead to the gradual exhaustion of mineral nutrient supply from the soil. Therefore, in order to sustain the higher cane and sugar yields, additional application of synthetic fertilizers is inevitable. Mostly, synthesized chemical fertilizers are added in many intensive agriculture systems. In Myanmar, most of the cane growers practice sugarcane-based rotational systems but do not supply enough plant nutrients to the soil. However, since government encourages the boost of sugarcane production, cane growers can expand their investments through credit and institutional supports (MSE, 2000b). This eventually may lead to increasing use of inputs in their crop production especially inorganic fertilizers. In order to understand on the sugarcane production system and current farmers' practice in sugarcane cultivation and nutrient management in farming system, a field survey was carried out in the study area as a part of this study.

Efficient use of fertilizer in different weather and soil systems is the prime concern in agricultural production given two important aspects. First, it should practice in a way that reduced the cost but economic cane yield is insured greater returns. Second, it should leave less adverse effect on environment (Keating *et.al.*, 1997). To meet this objective, one of the requirements is understanding of sugarcane root system and their relations with nutrient concentration and soil moisture contents in the soil system. Although there are numerous studies for the above growth and development (Humbert, 1968; Yadava, 1991), the study on sugarcane root system has been neglected. The depth and spread of roots in soil are matters of much important to grower not only for irrigation and fertilizer placement but also for an understanding of plant's reactions to climatic circumstances and its environment. In addition, to obtain the high sugarcane yield, it is essential to induce extensive root system a key to high sugarcane yield. In this study, a field experiment was also conducted in order to observe on the initial growth and development of sugarcane responses to different basal nitrogen application under different moisture regimes including it effects on root growth and development. This study was also intended to fills up a part of the gap of

knowledge about sugarcane root system in the early growing period. Moreover, it may help to allow adjusting appropriate nitrogen fertilizing for both rate and timing for desirable crop growth and development under given moisture status.

In modern agriculture, modeling and simulation have developed through the system approach and system analysis. This development simulation is very useful in modern agriculture with several perspectives for agricultural research and development (Jongkaewwattana, 1995), from farm level to policy level (Jintrawet, 1995). Moreover, agro-technology transfer through DSSATv 3.5 developed by IBSNAT project has been widely used. This approach can reduce time and finance while simple technology transfer methods: trial and error, analogy, take such a long time with high spatial and temporal variability (Nix, 1986 *cited in* Jintrawet, 1995). Nowadays, crop models in DSSAT package, are being widely used in modern agriculture in crop management with several approaches. As for sugarcane drop, CANEGRO-DSSAT model has currently used. Although, the model could simulate on different management such as planting date, plant density, irrigation management, etc., well, but it could not well simulation on nitrogen management (Tsuji *et.al.,* 1994). However, it has been undertaking effort to develop, incorporation with such nitrogen sub-model (O'leary *et.al.,* 2000). In this study, the model incorporated with a nitrogen sub-model was tested for its accuracy of prediction against with observed data from the field experiment.

To do so, the results of field survey, results of field experiment, and results of simulation may be helpful to decision-making on farm management and development of the model.