# CHAPTER I
# INTRODUCTION

## 1.1 The provenance and important

Sugarcane is an important industrial crop in Thailand where it is the fourth largest sugarcane producer in the word and the second largest exporter of sugar. Sugarcane is mostly grown in Kanchanaburi, Nakhon Sawan, Nakhon Ratchasima, Lop Buri, Udon Thani, Suphan Buri, Kamphaeng Phet and Khon Kaen province. There were 4.75 million rai of sugarcane cultivation areas in the northeast of Thailand during 2016/17 with an average yield of 9.31 tons per rai that was less than the other regions of the country (Office of Cane and Sugar Board, 2017).

Northeast of Thailand has the most suitable temperature for growing sugarcane which ranges between 26–35 degrees celsius. The production efficiency may be limited by chemical and physical properties of the soil, slope of areas, availability of water, and unpredictable rainfall. The soil in this area is mostly sandy soil that has low water holding capacity and nutrient absorption, and high drainage causing water shortage. In terms of water requirement, most of the sugarcane cannot receive enough water in every season because it needs water for 10 months but only receives rainfall for 5–6 months. If the sugarcane receives sufficient water throughout the growth period, the growth and yield will be significantly improved.

The suitable irrigation system would be the drip irrigation system, which is proved to be the most effective irrigation system by many researches. However, it is not yet adapted well by the farmers who cannot control water supply precisely causing loss or lack of water and low water use efficiency. In all irrigation systems, water supply can be controlled by 2 methods. The first method is based on the water balance model. In this method, the crop evapotranspiration (ETc) is estimated from weather conditions and crop coefficient (Kc), and the soil water holding capacity (SWHC) will be used to define the water supply pattern. Another method is to monitor the soil

moisture content during the irrigation period. If the soil moisture reaches the critical level, the filed must be irrigated. In this method, the soil moisture must be measured precisely using soil moisture sensor.

Few researches have been carried out to study the drip irrigation system for sugarcane in the northeast of Thailand, especially to compare the full irrigation with limited irrigation and to compare the efficiency of drip irrigation controlled by the two methods. Therefore, this research aimed to study the effects of the water apply amount and timing of drip irrigation and the effects of drip irrigation controlled by a wireless sensor system and water balance model on growth, physiological process, yield, and yield components of sugarcane.

## 1.2 Research objectives

1.2.1 To study the effect of drip irrigation controlled by the water balance model with full and half irrigation on growth, yield, and yield components in sugarcane

1.2.2 To study the physiological process of sugarcane in the water deficit condition and well-irrigated conditions

1.2.3 To compare the effect of drip irrigation controlled by a water balance model and a wireless sensor system on growth and yield of sugarcane