CHAPTER I
INTRODUCTION

Thailand is known to be one of the developing countries due to being agricultural country. We can produce approximately 3.85 million tons of corn in 2007/08. It seems that the current price of corn will slightly increase because corn production has decreased owing to reduction in plants areas (as shown in Figure 1.1). The farmers vacillated to cassava and sugarcane which give more profit in the 2–3 year. Moreover, the production cost of corn was higher such as fertilizer and seed but the grain price did not increase to compensate for higher costs. Therefore, production of biofuel from corn is an alternative way to add value of corn.

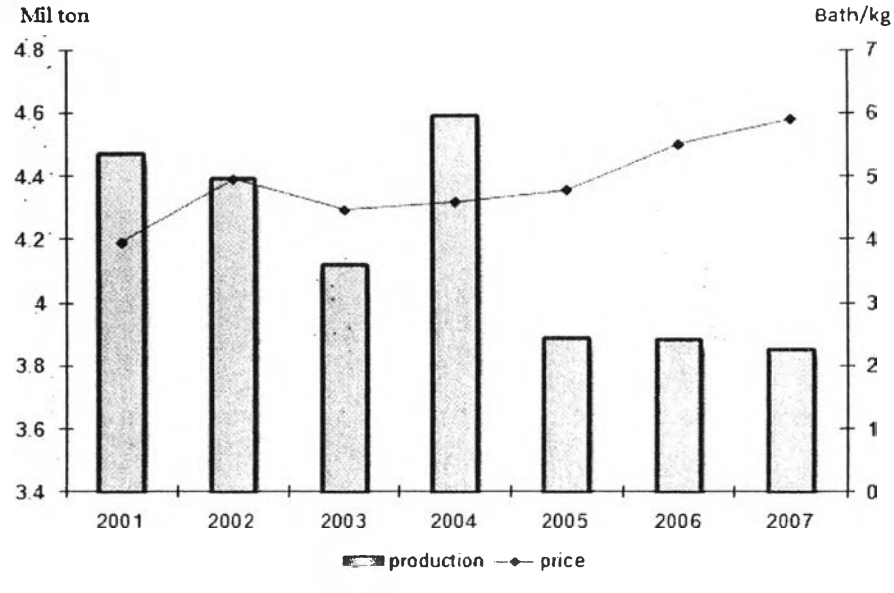

Figure 1.1 Corn production and price in Thailand during 2001–2007.

Corn is composed of three major components; cellulose 45%, hemicellulose 35%, and lignin 15% (Sun *et al.*, 2002). It is an abundant source of lignocelluloses that can be hydrolyzed to yield fermentable sugars for the production of value–added biofuel such as butanol, ethanol. According to fermentation process, corn is pretreated and hydrolyzed until releasing of reducing sugar (e.g. glucose, xylose, cellubiose, mannose, and arabinose). After that reducing sugar is fermented by

anaerobic bacteria such as *Clostridium beijerinckii*. These microorganisms convert sugars to solventogenic products, consisting of acetone, butanol, and ethanol.

In order to enhance effective of fermentation process, thermochemical pretreatment, or so called pre–hydrolysis, is required. The goal of pretreatment (Sierra *et al.*, 2009) is alter the physical features and chemical composition of the lignocelluloses to make it more digestible. Specifically, the pretreatment improves enzyme access and effectiveness by removing hemicellulose, lignin, and acetyl group from hemicellulose, reducing the degree polymerization in cellulose and expanding the structure to increase pore volume and internal surface area.

Pretreatment process converts some carbohydrate polymers into fermentable sugars. Generally, dilute acid, alkali and enzyme hydrolysis can be used as catalysts for corn pretreatments. These techniques allow cost–effective conversion of biomass into sugar with low–cost thermochemical pretreatment, highly effective enzyme hydrolysis, and efficient fermentative microorganisms. Pretreatment methods are either physical or chemical. Some methods require both effects. However, among the chemical pretreatment methods, dilute acid hydrolysis is widely used; there is more effective than other pretreatment methods since there is the fermentable sugar known xylose after acid pretreatment in the aqueous phase. Moreover, this method is effective and inexpensive (Gabhane *et al.*, 2010).

The products of the hydrolysis are usually sugars including glucose. Utility cost of enzymatic hydrolysis is low compared to acid or alkaline hydrolysis because enzyme hydrolysis is usually conducted at mild conditions and does not have a corrosion problem (Sun *et al.*, 2002).

The objective of this work is to investigate the optimum condition of sugar production from corn cobs by dilute acid pretreatment and followed by enzymatic hydrolysis of the remaining solids.