CHAPTER I
INTRODUCTION

In the present, energy is highly demanded by the industries, power plant, offices, households, as well as individual life. The demand of the energy is expanding and leading to depletion of non-renewable energy. Since this problem has overwhelmed all over the world, renewable energy source are interested for solve these problem. One of important alternative sources is biomass.Biomass is known as biological material from agricultural crops or industrial processes. The biohydrogen production form biomass has gain wide attentions since it is one of the most reliable and sustainable energy for the future.In Thailand is allocated for cultivation of wide variety of crops such as cassava, rice straw, and corncob (Wang *et al.*, 2012). Moreover, cassava isthe agricultural residues composing of carbohydrate-rich substrates are used wildly organic material for biogas production on dark fermentation process (Fred *et al.*, 1997).

For anaerobic dark fermentation consists of threemain steps. For the firststep, a large molecule of substrate are enzymatically converted to soluble (small molecule) compound by hydrolytic bacteria called Hydrolysis. Following by the second step, the product from the previous one are further degraded by hydrogen-producing bacteria. For the last step, methanogenesis can be occurred simultaneously by methanogenic bacteria , which consumed the end products from acidogenesis to from CH_4. Therefore, the methanogenesis must be completely inhibited in order to achieve maximum hydrogen production efficiency.

The term microaeration was defined by Botheju and Bakkeas the introduction of small amounts of oxygen into an anaerobic biochemical process to enable both anaerobic and aerobic biological activities to occur within a single bioreactor (Botheju *et al.*, 2014). Microaeration has been used conventionally for the desulphurization of biogas (Ramos *et al.*, 2013), and recently it was shown to be an alternative pretreatment to enhance hydrolysis of complex organic matter.

The aim of this study was to investigate the effect of COD loading rates, range 12, 24, 36, 48 and 60 $kg \cdot m^{-3} \cdot d^{-1}$ based on hydrogen UASB unit(2, 4, 6, 8, 10 $kg \cdot m^{-3} \cdot d^{-1}$ based on methane UASB unit, respectively) to produce hydrogen under a

controlled pH of 5.5. Afterwards, the effluent from the first bioreactor was further fermented in the second bioreactor to produce methane without pH control, Moreover, the effect of microaeration on the hydrolysis, acetogenesis and methanogenesis steps would be studied by comparing the hydrolysis efficiency between pretreated with and without microaeration on hydrogen reactor and methane reactor.