CHAPTER I
INTRODUCTION

For decades, plastics have been used to substitute natural products in many areas and have become an indispensable part of our lives so it is not surprising that the consumption of plastics is increasing more and more. Most of conventional plastics being used nowadays is derived from petroleum and does not degrade naturally. As a result, this has led to increasing environmental problems in waste management as well as global warming the world is facing. Recently, bioplastic has been proposed as an alternative way to solve these environmental problems as it is made from renewable resources/biomasses such as corn starch, cellulose, cassava and sugarcane. Moreover, some bioplastics can also be degradable biologically by microorganisms in the natural environment which results in microbial metabolic end-products such as water, carbon dioxide and methane. These bioplastics are usually called "Biodegradable plastics".

To date, many types of bioplastic have been developed and studied for their potential as a substitute for conventional plastics in various applications. Polycaprolactone (PCL) and polyhydroxyalkanoate (PHA) are naturally produced by micro-organisms from various carbon substrates as a carbon or energy source. They are used in packaging films; mainly in bags, containers and paper coatings. Polylactic acid (PLA) is prepared from lactic acid and is one of the most promising products for packaging application. Polybutylene succinate (PBS) is an example of bioplastics which can be obtained from petroleum-based or bio-based resources and can also be biodegraded. It is commonly used in plastic film such as mulch film in agricultural industry. All of these examples are considered important bioplastics which are already used in commercial applications.

Since Thailand has abundant natural biomass resources, there are great potentials to convert these resources to eco-friendly products such as bioplastics. There have been several studies conducted in Thailand on these bioplastics in many aspects such as properties, processing ability, suitable applications, etc., but very few in environmental aspect and the proper management of bioplastics and their products. Therefore, in this research, we focus on the management of bioplastics and

their product based on a life cycle perspective as there are several questions to be answered such as how they should be produced?, how we should use them?, how we should manage their products?, how we should dispose them?, etc. Two bioplastics (PLA and PBS) and their product (garbage bag) were selected in this study in order to evaluate the environmental performance of bioplastics and to compare with the same product produced from conventional plastics. Samed Island was chosen as a model site to study the management of bioplastic product because it has been set as an experimental site by National Innovation Agency (NIA) to promote the use and proper disposal of bioplastic in Thailand where a model composting plant has been built. The scope of the research covered the inventory data collection throughout the entire life cycle of bioplastic product based on the cradle-to-grave approach. This includes raw materials, the monomer and bioplastic production, usage and disposal of the product (by composting). The input data including raw materials and chemicals used, energy consumption and utilities and the output data including emissions to air, water and soil were collected. The results were analyzed by using LCA software, SimaPro 7.0, with Eco-Indicator 95 and CML 2 baseline 2000 methods to identify the environmental burdens in various impact categories such as global warming, ozone layer depletion, acidification, and eutrophication. The results were compared with those of conventional plastics. Finally, suggestions for environmental improvements were offered.