CHAPTER I
INTRODUCTION

Nowadays, several million tons of plastics are produced every year. Plastics can be found in everything from clothing to machinery. Plastics are used for packaging materials and almost every type of consumer products, and thus the consumption of plastics is increasing more and more. Virtually all plastics are made from petroleum resources, such as oil, coal or natural gas, which will eventually become exhausted and may take thousands of years to be biodegraded. Consequently, the quantity of petroleum-based plastic waste is increasing, adding to the already burdensome problems of waste management in many countries around the world.

In recent years, there have been increasing numbers of research works for new materials with better quality at affordable costs. With growing environmental awareness, many researchers have particularly focused on eco-friendly materials, with terms such as "renewable", "recyclable", "sustainable", and "bio-" or "biodegradable" becoming buzzwords. There has been great attempt to change from non-renewable based material, that are difficult to degrade or non-degradable, to renewable and easily degradable materials. Renewable materials are material from natural resources or natural biomass resources such as corn starch, cellulose, cassava and sugarcane. Bio-based materials are considered as an environmental friendly alternative to petroleum-based materials. They can be produced without toxic byproducts and are biodegradable in nature.

There are several renewable-based polymers or biopolymers being produced with an aim to minimize the environmental impact. Starch-based polymers are the first important group that becomes commercial products. They are used as a raw material in film production and blended with petroleum-based polymers to reduce cost and enhance biodegradability. Second, polylactic acid (PLA) is prepared from lactic acid and is one of the most promising products for packaging application. Third, polyhydroxyalkanoate (PHA) is 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. Fourth, polybutylene succinate (PBS) is obtained from petroleum-based or bio-based resources and commonly used in plas-

tic film such as mulch film. Since Thailand has abundant natural biomass resources, there are great potentials to convert these resources to eco-friendly products such as bioplastics.

In this research, we focus on the LCA study of two types of bioplastics (PLA and PBS) and their products in order to assess the environmental performance of bioplastics and the selected bioplastic products and to compare with the same products produced from conventional plastics. The scope of the research covers the inventory data collection throughout the entire life cycle of bioplastic products based on the cradle-to-grave approach. This includes raw materials, the monomer and bioplastic production, use and disposal of the products in various ways such as composting, landfill, incineration and recycling. The input data including raw materials and chemicals used, energy consumption and utilities and the output data including emissions to air, water and soil will be collected. The results will be 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 will be compared with those of conventional plastics. Finally, suggestions for environmental improvements will also be offered.