



## Introduction

Biodiesel is a non-toxic, biodegradable, and renewable fuel that can be used in diesel engines with little or no modification. Biodiesel can be produced from oils and sources of free fatty acids such as animal fat, vegetable oil, and waste greases. Biodiesel is produced by removing excess hydrocarbons from these oils to create a shorter chain molecule that is chemically more comparable to diesel fuel. Sodium methoxide is added to the oil causing the mixture to settle into two simpler constituents: glycerin and methyl ester. The methyl ester is collected, washed, and filter to yield biodiesel. The glycerin has several commercial uses, the most common one being the manufacture of soap. The facility where biodiesel is made is relatively simple and easily scaled to meet local needs.

The feedstock oil can be derived from a variety of sources including soybean, cotton, palm, and rapeseed. Waste oil, grease, and fats from restaurants and food processors (meat packers) can also be used. In the U.S., soybean and corn oil are the two most common feedstocks.

## Potential for Kauai and KIUC

Given Kauai's high fuel prices and agricultural infrastructure, biodiesel is an attractive alternative for transportation and power production. The amounts of available restaurant waste oil and grease are limited and too small to be considered for power production. Dedicated oil crops would need to be planted for large scale production. Palm oil is considered one of the best sources of vegetable oil and is well suited for tropical climates. The reported yield of biodiesel from oil palms is 635 – 1,000 gallons per acre per year. A recent study concluded that 17.8 millions gallons could be produced from just twenty percent of Kauai's agricultural lands. For comparison, 2.2 million and 24 million gallons of conventional diesel are used on Kauai each year for transportation and power production respectively.

## Cost

Capital costs for use of biodiesel are minimal as it can be used in diesel engines with minimal modifications. Most diesel engine manufacturers have warranted their engines for use with 5-20% blends (B5-B20) of biodiesel. The production cost of biodiesel can range from being competitive with conventional diesel to as much as 2.5 times higher depending upon the feedstock and transportation costs. Biodiesel is currently being sold on Maui for \$2.35/gallon. However, it is manufactured from restaurant waste oil (zero cost) and is exempt from Maui County road tax. The levelized cost for electricity produced from biodiesel would be between 18 to 23¢/kW. However, KIUC is currently investigating the price with several biodiesel suppliers.

## Advantages and Disadvantages

### Advantages

- can be used in existing equipment with little modifications
- lower sulfur and particulate emissions
- utilizes existing agricultural infrastructure and expertise
- creates/retains agricultural jobs

### Disadvantages

- more expensive than conventional generation
- higher Nox emissions