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# New agricultural technology is turning waste into fuel

## Case Study

Company Name:  
Echo Farm

Sector:  
Agriculture

Location:  
Essex, NY

## Background

Located in Essex, NY, Echo Farm is a 170-acre diversified, organic, sustainable farm. With rising fuel prices and recognizing the need for cost-effective, environmentally responsible fuel sources, the farm's owner and operator, Dillon Klepetar, designed a system to convert slaughter fat waste to biodiesel and refine, blend, and use the fuel in one of the farm's tractors. The farm produces approximately 600 pounds of fat waste annually, which Dillon estimated could be transformed into approximately 110 gallons of biodiesel fuel. The main goal is to produce fuel that is not only better for the environment but cheaper than buying petroleum-based diesel traditionally used to run farm equipment.

The system—built by a team of machinists, fabricators, mechanics, farmers, and researchers from Cornell's Smith School of Chemical and Biomolecular Engineering—has an estimated lifespan of 20 years and with little maintenance needed to keep the equipment in good working order.

## Environmental Benefits

When combusted, biodiesel produces less greenhouse gas emissions—such as carbon dioxide (CO<sub>2</sub>) and nitrogen oxide—than conventional diesel. The California Energy Commission, which has measured the emissions of a wide variety of alternative fuels, presented data showing that biodiesel has 58 to 80 percent lower greenhouse gas emissions than petroleum diesel; Echo Farm's biodiesel was found to have 95.6 percent lower CO<sub>2</sub> emissions.

Additionally, in comparison with conventional diesel, biodiesel emits significantly less toxic tailpipe emissions such as particulate matter and hydrocarbons—including carcinogenic compounds and carbon monoxide. Reducing these toxic emissions decreases the health risks of farm workers who operate or work closely with petroleum diesel-powered farm equipment.



**Use biofuel to reduce your energy footprint and cut operational costs and show consumers your farm is committed to reducing greenhouse gases.**

## How it Works

Biodiesel manufacturing converts animal-based oils and fats to fuel through a process called transesterification, which is carried out by mixing fatty acids, alcohol, and a catalyst such as a strong acid, sodium, or potassium methanolate. The byproducts of making biodiesel, including glycerin, can also produce their own revenue streams.

## A Collaborative Opportunity

The process to create diesel from animal fat—primarily beef tallow and pork lard—is considered an emerging technology.

Start-up costs for an animal fat biodiesel manufacturing system can be significant for any one farm; however, while the original purpose was to create a system for an individual farm, over time the project evolved and now 12 additional farms are working closely with Echo Farm to produce fuel. These partner-farms provide slaughter waste fat that Echo Farm converts to biodiesel; then the fuel is delivered back to those same farms. Establishing a micro-refinery as a farmer network may reduce initial costs and provide opportunities for farms to produce fuel collaboratively.

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