

# How Hemp-derived Biofuels Are Powering a Renewable Energy Revolution

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[/EINPresswire.com/](https://www.einpresswire.com/) -- Low-cost, carbon-neutral, and packed with all the compounds needed to make highly efficient fuels: Hemp is challenging corn and sugarcane to be the fuel crop of the future.

Growing awareness of the dangers of climate change and energy insecurity have prompted public and private organizations to search for smarter, safer, more renewable, and more environmentally-friendly alternatives to

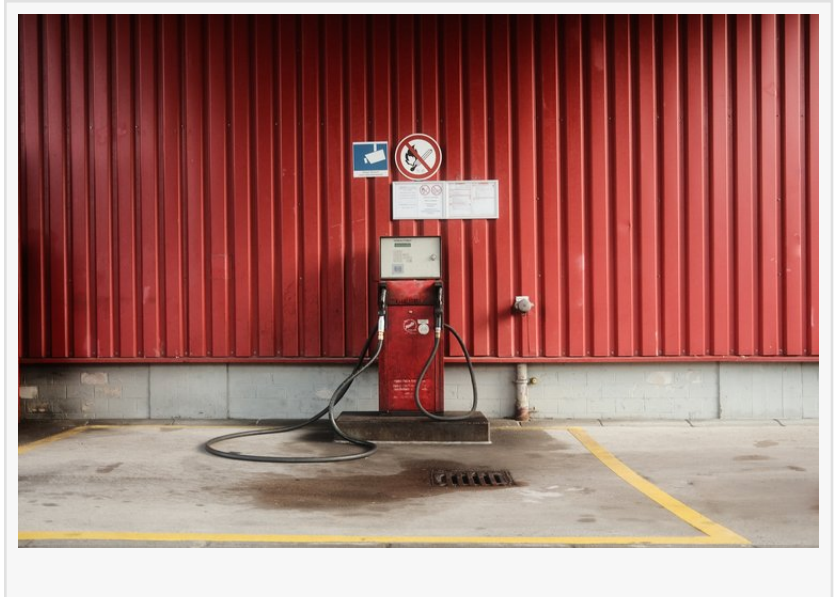
traditional fossil fuels. One of the more promising technologies investigated has been biofuels like plant-based ethanol and biodiesel. These types of energy are derived not from our diminishing stores of petroleum but from endlessly renewable plant sources.

What began as an experiment has proved to be a viable pathway to reducing our reliance on fossil fuels. By 2011, domestic production of biodiesel surpassed a billion gallons. Just four years later, it passed two billion gallons. Both federal and state regulatory bodies have incentivized this development — notably through the federal Renewable Fuel Standard which requires all transportation fuel sold in the U.S. to contain a minimum amount of renewable fuels

Every major energy forecaster expects the production of biodiesel and other renewable energy sources to see regular growth in both the short and long term.

## Tapping Into a Real Power Plant

Renewable energy sources, particularly those developed through sustainable approaches with minimal negative impacts on the planet or its delicate atmosphere, are in high demand, but they aren't all of equal practical or economic value. One humble crop holds more promise than almost any other: the versatile and valuable hemp plant.



Virtually any plant can be converted into a biofuel but some are far better suited to that purpose than others. Corn, sugarcane, soybeans, sunflower, peanut, and rapeseed crops have all been successfully trialed for biofuel applications, but even those top candidates can't match hemp's usefulness. A single hectare of hemp cropland can outproduce almost every other type of crop, with up to 800 liters of biodiesel per year.

The only other crop that can generate more biodiesel in the same acreage is algae, but because it requires an aquatic environment to thrive, the challenges and costs of cultivation are substantially higher than for soil-based farming. Plus, unlike with algae, corn, and sugar, hemp does not require lengthy and expensive drying before it can be processed into fuel.

Biodiesel is just one type of renewable energy source that can be produced from hemp. There is actually a whole range of different hemp-derived fuels, each with its own advantages:

### Hemp Ethanol and Methanol

Ethanol is the chemical name for grain alcohol, the type of alcohol that's safe for human consumption. It's also a type of fuel. Ethanol can be made from anything containing sugar or starch. In the U.S., the majority of renewable ethanol fuels are derived from corn or sugarcane, but the advantages of hemp-based ethanol are becoming more widely known.

The process for converting hemp into ethanol is called cellulolysis and involves the use of enzymes that accelerate the breakdown of cellulose. Cellulose is an organic compound that gives plant cell walls their strength. It's a polysaccharide, a compound made up of several sugar molecules bound together. Cellulolysis cuts those bonds, releasing the constituent sugar molecules. Hemp is a good candidate for conversion into ethanol because it's almost 80% cellulose.

Once the sugar is free, it can be converted into alcohol much the same way producers of alcoholic beverages do: via fermentation and distillation. In short, the hemp sugars are combined with yeast or bacteria that eat the sugars and excrete ethanol (and carbon dioxide), and the resulting substance is heated to force the pure ethanol to evaporate so that it can be collected.

Also known as wood alcohol, methanol is a type of alcohol that is not safe to drink. It does have other uses, though, including as an energy source. Hemp-derived methanol is produced through dry distillation, which refers to heating dry, solid material to force it to release certain compounds as a gas.

Hemp methanol can also be produced in a process called pyrolysis, which refers to the application of heat to organic matter in an oxygen-free environment. Without oxygen, the substance cannot burn, and hence pyrolysis is among the most effective means of producing a renewable energy source from hemp (95.5% feed-to-fuel efficiency). While producing hemp methanol from dry distillation is less efficient than pyrolysis, it's cheaper, easier, and creates

hemp-based charcoal as a byproduct, which is also a useful source of renewable energy.

### Hemp Biodiesel

Roughly a third of the mass of hemp seeds is hemp oil, a substance containing different fatty acids. Hemp oil has many uses in foods and health and beauty products, but it can also be converted into biodiesel. The process for doing so is called transesterification where the hemp-derived fatty acids are mixed with alcohols and a catalyst.

The end result is a raw form of biodiesel that outperforms biodiesel derived from most other types of crops. In fact, it performs as good or better than petroleum-based diesel in every regard except for resistance to oxidation (and that issue is easily addressed by adding antioxidants). It's even less flammable, with a flashpoint of 300°F compared to just 125°F for traditional diesel, which makes transporting it safer.

### Hemp Solid Fuel

Wood pellets are a popular fuel source for everything from home BBQ grills to massive industrial power plants. But, trees, the primary source for wood pellets, take a very long time to grow. They may be technically renewable, but at impractical time scales. Hemp, by contrast, grows fast, takes remarkably few agricultural inputs, and can be cheaply processed into hemp pellets.

Hemp hurd (the woody internal fibers) was once considered a waste product, something to discard during processing. It has since been discovered that they are a suitable alternative to tree-derived wood for producing fuel pellets and other types of solid, renewable energy sources.

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