

America is abuzz with talk of replacing imported oil with 'biofuels' produced from homegrown materials. The US Environmental Protection Agency recently honoured famous country and western singer Willie Nelson for his efforts to promote the use of biodiesel through his own 'BioWillie' brand, a vegetable oil-based fuel which is now being distributed at filling stations nationally. Clearly, many hurdles stand in the way of making such biofuels commercially viable with traditional sources. Indeed, it remains very difficult to forecast whether powering our vehicles with crop derivatives will ever be a truly economic proposition. Nevertheless, it is not too early to ponder what impact the widespread adoption of biofuels would have on our environment.

Michael S. Briggs, a biodiesel advocate at the University of New Hampshire, has estimated that the United States would need about 140 billion gallons of biodiesel each year to replace all the petroleum-based transportation fuels currently being used. This calculation is premised on the idea that Americans could, over time, switch to using diesel vehicles, as European drivers are clearly doing – half of the new cars sold there now run on standard diesel. Although one could make a similar appraisal for the amount of sugar-derived ethanol needed to meet our needs, it is unlikely that drivers would ever want to fill up their tanks entirely with ethanol, which contains only two-thirds of the energy of gasoline, whereas biodiesel is only 2 per cent less fuel-efficient than petroleum-based diesel. Hence a switch to biofuels would demand no new technology and would not significantly reduce the driving range of a car or truck.

The main source of biodiesel is plant oil derived from crops such as rapeseed. An acre of rapeseed could provide about 100 gallons of biodiesel per year. To fuel America in this way would thus require 1.4 billion acres of rapeseed fields. This number is a sizeable fraction of the total US land area (2.4 billion acres) and considerably more than the 400 million acres currently under cultivation. Consequently, the burden on freshwater supplies and the general disruption that would accompany such a switch in fuel sources would be immense.

Such calculations are sobering. They suggest that weaning ourselves off petroleum fuels and growing rapeseed instead would be an environmental catastrophe. Are more productive oil crops the answer? Oil palms currently top the list because they can provide enough oil to produce about 500 gallons of biodiesel per acre per year, which reduces the land requirement fivefold. Yet its cultivation demands a tropical climate, and its large-scale production, which currently comes from such countries as Malaysia and Indonesia, is a significant factor in the ongoing destruction of what rainforest remains there. Conservationists have been warning that palm oil production poses a dire threat to the dwindling population of orang-utans, for example, which exist only in the wild in Borneo and Sumatra. So here again, the prospect of dedicating sufficient land to growing feedstock for the world's transportation needs promises to be an environmental nightmare.

There is, however, a 'crop' that is widely recognised as having the potential to meet the demands of a biodiesel-based transportation fleet without devastating the natural landscape: algae. Algae is a single-celled plant, some varieties of which can contain 50 per cent or more oil. They also grow much more rapidly than ordinary plants and can double in quantity within several hours.

The US Department of Energy funded considerable research on biofuel production using algae after the oil problems of the 1970s, an effort known as the Aquatic Species Program. Although this programme was terminated in the 1990s, a lot of experience was gained through research and various demonstration projects. The results suggested that algae can be grown in sufficient density to produce several thousand gallons of biodiesel per acre per year – a full order of magnitude better than can be expected using palm oil and two orders of magnitude better than soybeans.

**Questions 1–5**

Classify the following characteristics as belonging to

- A** biodiesel
- B** ethanol
- C** ordinary diesel

Write the correct answers A–C next to questions 1–5.

- 1 Produced by a popular American entertainer. ....
- 2 50% of new cars in Europe use this fuel. ....
- 3 Provides two thirds of the power of standard petrol. ....
- 4 Your car's performance will be almost unchanged if you change to this fuel. ....
- 5 Production can have a negative impact on water resources. ....

Do the following statements agree with the claims of the writer in the reading passage?

Next to questions 6–12 write

- Yes** if the statement agrees with the claims of the writer
- No** if the statement contradicts the claims of the writer
- Not given** if it is impossible to say what the writer thinks about this

- 6 2% of Americans already use biodiesel. ....
- 7 At present in America, 400 million acres of land are used for agriculture. ....
- 8 The use of palm oil as a fuel source will require more land than using rapeseed oil. ....
- 9 Growing biodiesel crops has had a positive effect on local wildlife in some areas. ....
- 10 One advantage of algae is the speed with which it grows. ....
- 11 David Bayless believes that algae can produce more energy than solar power. ....
- 12 It is easy to grow algae using agricultural waste water. ....

**Question 13**

Choose the correct answer **A**, **B**, **C** or **D**.

- 13 What is the main purpose of this article?
  - A** To prove that biofuels could totally replace petrol in America.
  - B** To examine the environmental impact of standard fuel sources.
  - C** To assess the advantages and disadvantages of different types of fuel.
  - D** To show that an international effort is required to solve the fuel crisis.