

Waste—better to bury it than burn it

Burning mankind's waste to create electricity is being touted as an important source of 'green' energy, but it still creates carbon dioxide. **Bill Butterworth** of Land Network International says we should do the natural thing and plough it back into the soil.

About 360 million years ago, Earth's atmosphere was hot, clammy and rich in carbon dioxide (CO₂)—ideal for copious plant growth. Trees grew rapidly and, over a comparatively short period of around 60 million years, produced a significant depth of fallen plant remains. These peaty carbon sinks eventually resulted in our current fossil-fuel reserves—but at current rates it looks likely we will have burnt the lot within the next 60 years or so.

Pumping all fossilised carbon back to the atmosphere as CO₂ is generally expected to result in dangerous temperature rises due to the greenhouse effect.

Society is thus seeking ways to reduce energy consumption as well as alternative and more apparently sustainable energy sources, such as nuclear power, biofuels and our ever-increasing output of waste.



Green solution—this oil-seed rape field, the biodiesel from which is being used at the 100% rate in the tractor, has for the past two years only been fertilised with composted waste, making a total annual CO₂ reduction of 43 t per ha.

Burning waste not sustainable

With the world's population now standing at over 6.6 billion—nearly double what some population scientists say is sustainable—there is both an insatiable demand for energy and an over-abundance of waste. Part of the definition of life is that organisms produce pollutants or waste, and it is also true that the waste produced by humans rises with economic growth. It is therefore entirely natural to think of creating energy from waste; there is tried-and-tested technology for it—the Scandinavians have many community energy-from-waste schemes—and there is no doubt it is safe and it works.

However, there is a fundamental carbon problem with energy from waste: it involves incineration. The reality is that incinerating waste produces enormous amounts of CO₂ and consumes enormous amounts of oxygen, which is simply not sustainable. There is, however, a more natural answer, and one that has always been there.

Integrated agricultural solution

Farmers harvest solar energy to 'fix' carbon. That is what they do when they grow a crop, such as oil-seed rape, as a result of the chlorophyll mechanism in green leaves. The basic equation, without adding in all the arguments about the energy costs of logistics and processes, is $6 \text{ CO}_2 + 6 \text{ H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2$. This mimics the processes of the carboniferous era; it worked then and it still does.

Mineral fertilisers to help crop growth are a relatively recent development. It was not until 1842 that John Lawes, generally thought of as the father of the modern fertiliser

industry, built his first superphosphate factory. It was later still, in 1910, that the Haber–Bosch process enabled large-scale manufacture of ammonia, the basis of modern nitrogen-based fertilisers. This process currently consumes nearly 1% of the world's electricity.

However, if waste is substituted for manufactured fertiliser, there are multiple benefits. While a small amount of carbon is lost as greenhouse gas from composting wastes, very nearly all of it ends up fixed in the soil, which serves as a carbon sink. Nutrients in the waste—such as nitrogen, phosphorus, potassium, calcium, sulphur or magnesium—help the crops to grow and convert atmospheric CO₂ into large carbon molecules, a second carbon sink. Third, the energy required for manufacturing fertiliser is reduced.

Significant carbon reductions

As a round-figure guide, 1 ha of oil-seed rape will each year produce 1 t of biodiesel and about 200 litres of bioglycerol, which can be used as heating oil. The 1 ha of crop, however, also has leaves, stems and roots, all of which are based on large carbon molecules. There will be around 18 t of dry matter per ha which, less 1 t of crop oil, can be ploughed into the soil. Work the equations through and net, after burning the biofuels produced, there will be at least 43 t of CO₂ per ha per year removed from the atmosphere.

Are these figures accurate? They do not account for leakage in the system or inconsistencies in the real biological world, but they are a reasonable guide to what happens. We know this because it has been done before, some 360 million years ago. It worked then and it can be worked now.

Creating energy from waste burns oxygen. There is no sustainable solution other than recycling waste to land.

FOR FURTHER INFORMATION CONTACT

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