

Biofuel: a solution, or a socio-economic and environmental disaster in the making?

By Graham von Maltitz

Interest in plant-based fuels is skyrocketing all around the world, but the conversion of large areas of land to energy crops raises many social and environmental issues, not all of which are bad. There is, for example, the potential for competition between biofuels and food production from limited arable land; loss of biodiversity if new land is planted; loss of access to alternate natural products; gains of some jobs, but potential losses in others.

Biofuel production from annual crops is being promoted by South Africa's draft Biofuels Industry Strategy as a way to revitalise rural areas, especially in the former homelands. Some bio-energy projects probably have this potential, but others have disadvantages that outweigh their benefits. Some may even make climate change worse rather than better. How are policymakers, developers and energy entrepreneurs to sort the good from the bad in an efficient, but reliable way?

The CSIR is a partner in a large international project (RE-Impact) to develop and test a framework for weighing up the societal costs and benefits of individual bio-energy initiatives. The CSIR's contribution is to adapt the well-regarded South African environmental impact procedures (including the strategic environmental assessment framework developed by the CSIR) to this specific task. The streamlined process will then be field-tested in five environmentally and socially diverse regions around the world, including southern Africa, and modified if necessary. The intended outcome is an agreed methodology that will meet international standards while protecting local livelihoods and environments. The project is funded by the European Union.



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Keeping an eye on issues. Graham von Maltitz and the rest of the RE-Impact project will determine the long-term effects of the production of large-scale plant-based fuels

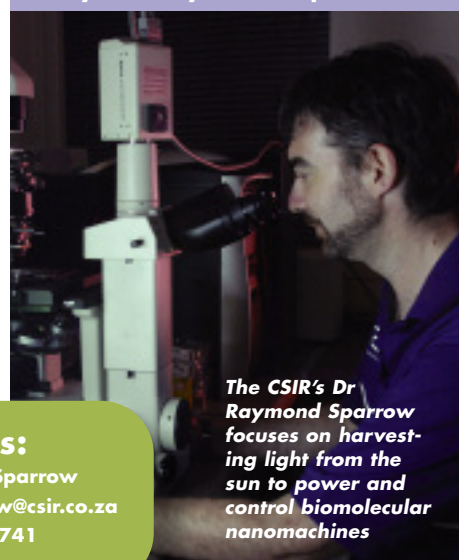
Mechanisms of photosynthesis may provide solutions to energy crisis

The most abundant and environmentally friendly energy source is solar energy. A considerable amount of research exists into the use of solar energy for a variety of applications, mostly in the area of photovoltaic devices, using inorganic materials. With these kinds of systems and materials, the efficiencies are often very low (less than 10%). However, as in many other instances, nature has developed her own solar energy trapping and conversion system, called photosynthesis. Research into this area is therefore of crucial importance, not only from basic scientific interest but also for all our lives, in providing for our future energy needs in an environmentally friendly manner.

Photosynthesis is the fundamental biological process through which ecosystems capture energy from the sun, on which almost all life is dependent. The very initial photochemical reactions of photosynthesis are 95-98% efficient at trapping radiant energy and transporting it to initiate photosynthetic electron transfer. However, once the energy has passed through the enzyme reactions and has been converted to plant biomass, and the biomass to useable energy for humans, the efficiency drops to 1-2%.

A CSIR research project looks at using these very efficient light harvesting and energy transfer processes and materials that are found in higher plants and photosynthetic bacteria, as light (energy) harvesting and energy transfer systems to power and control bio-molecular nanomachines. This marriage of nature and technology, if successful, could help us create a more sustainable future.

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The CSIR's Dr Raymond Sparrow focuses on harvesting light from the sun to power and control biomolecular nanomachines