Ensuring biodiesel is green

By Colin Everson

Scientists have shown that over the past century, sea levels have risen by between 10 and 20 cm, ocean heat content has increased, snow cover and ice extent have decreased and the global average surface temperature has increased by about 0,6 °C. It is generally agreed that the 1990s was the warmest decade, and 2006 the warmest year in a millennium. Thus the arguments around the existence of global warming have been settled by science, and the debate is now about how far the effects of global warming will go. Increased levels of CO_2, coupled with ever increasing oil prices, have led to international concern about the global impacts of greenhouse gases and the worldwide consumption of fossil fuels (oil, gas and coal). Some 85% of the world's energy comes from fossil fuels that emit CO_2. Consequently, many countries are considering the possibility of the large-scale production and use of biofuels – such as bio-ethanol and biodiesel – as alternatives to conventional fossil fuels. The Kyoto Protocol commits most industrialised countries to reduce their greenhouse gas emissions by 5% below their 1990 levels, by 2012. The South African White Paper for Renewable Energy Policy gives a 10-year target for replacement of 14% of fossil fuel-based energy sources by renewable energy, such as from biomass. This is equivalent to replacing 1,1 billion litres of diesel (14%) with biodiesel.

Considering the wide range of scientific disciplines effecting energy and climate change, it is not surprising that CSIR scientists are increasingly involved in research on resolving the energy crisis and global climate change.

Optimistic prospects – Colin Everson and Mark Gush of the CSIR inspecting a Jatropha curcas plant. Research is underway to establish whether to use the plant in the large-scale production of biofuels

Biodiesel: the impact on South Africa's scarce water resources

By Colin Everson and Mark Gush

The proposed introduction of bio-energy species for large-scale planting and biofuel production can help reduce net greenhouse gas emissions. *Jatropha curcas* has attracted international and local interest as a drought tolerant, fast growing, bio-energy crop. Other advantages attributed to this species are that it tolerates marginal soils and is unpalatable to livestock, reputedly making it suitable for restoration of degraded land. The South African government has received numerous requests for permission to plant *Jatropha*, but the impacts on hydrology, food security, poverty relief and biodiversity conservation are currently unknown. These uncertainties require clarification through a combination of process-based field measurements and modelling exercises.

The ecophysiology group of the CSIR in Pietermaritzburg forms part of a team tasked by the Water Research Commission to conduct a study into the potential hydrological impacts associated with the large-scale planting of *Jatropha*. The CSIR's task is to conduct studies of *Jatropha's* water use at several sites in KwaZulu-Natal, using site water balance modelling and evapotranspiration measurements. The combination of a *Jatropha* tree and an animal grazing system is suggested to provide flexibility in the cash flow of this agroforestry system, making it more economically viable and sustainable. The possibility for poverty relief through the production of biodiesel is a key driving force in attracting investment by the various provinces in South Africa. These projects aim to contribute to a broader assessment of the species, investigating the feasibility, viability and advisability of the wide-scale introduction of *Jatropha curcas* to South Africa.

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