

Genomics

Biofuels: Is genomics the key to the future?

Late in 2011 the human population reached seven billion, a milestone which fuelled debate about how we meet the food, water and energy needs of a population that may well exceed nine billion by mid-century. Central to this debate is the role biofuels could play as a renewable energy source.

Primarily derived from plants such as cereal crops and sugar cane, or animal waste, biofuels are already being used as substitutes for fossil fuels. Bioethanol and biodiesel, for example, are mixed with conventional petrol and diesel to power cars and other vehicles.

But their use is not without concern: the Mitchell report for the World Bank blames sharp rises in food prices on increased production of biofuels because these fuels are made from food crops and grown on land that could otherwise be used to grow food. Mitchell specifically blames US and European policies promoting the use of biofuels to reduce greenhouse gas emissions. There are also concerns that the race to plant biofuel crops is increasing deforestation.

In an environment where benefits of first generation biofuels are starting to be questioned, Professor Jo Chataway, Co-Director of the ESRC Innogen Centre at The Open University, highlights the vulnerability of farmers in developing countries. "Poor farmers are carrying a lot of the risk of current biofuels policy." If policies change because biofuels are seen not to deliver sufficient environmental benefits this could leave already vulnerable farmers without a market for their crops.

Most experts agree that for biofuels to play a significant role in the energy mix we need to harness the potential of modern technologies, such as genetic modification and synthetic biology to design crops and microbes specifically for fuel production.

Professor Joyce Tait, ESRC Innogen Centre at the University of Edinburgh, believes that the policy and governance environment has a huge role to play in the safe development of these technologies.



Far from advocating a restrictive regulatory environment, Professor Tait argues that the risk-averse approach taken in the European Union is hampering effective innovation.

"You could say that through restrictive regulation what we've done with GM crops in Europe is to stop all work," she says.

Professor Tait's work shows that European companies working on GM crops in the 1980s and 1990s, before restrictive regulations came into play, were more focused on environmental issues and concerns than their American counterparts. In effect, pressure from European environmental groups to restrict research on GM crops had the counterintuitive effect of driving the companies that were most environmentally oriented out of it, leaving the field open to the ones that were less focused on environmental concerns.

She argues that we need to learn "how regulatory systems can be devised in a smarter way than we have in the past so that we support innovation rather than inhibiting it."