

## NGO roundtable meeting on agrofuels, 23<sup>rd</sup> July 2007

### Presentation on GM and agrofuels by Helena Paul, EcoNexus

- GM biotech industry hopes to find acceptance for GM crops as agrofuels rather than food or feed
- Climate change provides additional pressure – and new funding too
- Which crops? Maize, soya, oilseed rape, sugarcane, wheat and even rice in large-scale monocultures. Plus trees: oil palm, eucalyptus and jatropha
- Link with (GM) animal feed production in South America and US: turning residue from agrofuels into animal feed with the help of GM

### Main applications of GM specifically for agrofuels

- Crops engineered to break down more easily into agrofuels and other products
- Enzymes and micro-organisms used in processing

**Argentina** as an example of future trends and impacts: GM soya, mainly for **animal feed** for Europe and China, has completely changed agriculture from a rich, diverse production of food to massive monocultures of soya for export. This means fewer workers, aerial spraying of pesticide: seed and fertiliser applied with huge machines, people driven off the land into urban slums, rural communities destroyed or sprayed with pesticides, forests cleared (eg: Gran Chaco), water overexploited and polluted and higher food prices/food imports.

### Examples of animal feed/agrofuel link:

- Renessen – Cargill-Monsanto collaboration – developing installations to treat maize residue after agrofuel and turn it into animal feed
- In 2008 Monsanto plans to commercialise a genetically engineered maize variety, Maveria, with high starch for ethanol production, and high lysine for animal feed

Grain trading companies and fossil oil companies are working together to exploit agrofuels. For example, the agribusiness firm Bunge is working with the oil company Repsol and Acciona in Spain. This joint venture has plans to build factories to refine soya oil imported from Argentina to mix with fossil fuel. Monsanto thus stands to benefit as well.

Result: more monocultures: animal feed and agrofuel production combined in giant industrial complexes: processing and refining agrofuels and industrial byproducts plus factory production of animals close to ports...

Syngenta has applied in Europe and South Africa (which has turned it down) to import Event 3272, a maize which expresses an enzyme (AMY797E) which breaks starch into simpler molecules of carbohydrate to assist rapid breakdown. It also contains a marker gene derived from E coli.

**Increasing yield for agrofuel crops:** Targeted Growth holds patent number WO2007016319: to postpone the cessation of cell division and increase seed size.

- Has licencing agreement with Monsanto for use of “yield enhancement gene”

- Also working with the Centro de Tecnologia Canavieira in Brazil to produce GM sugarcane with more sucrose and better disease resistance.

## **Second generation agrofuels**

What is second generation?

- Term reminds GM campaigners of the promises made for second generation GM crops.
- Promises for biotech futures keep the focus on biotech answers rather than alternative solutions.
- Often promoted as means to prevent competition with food production and biodiversity conservation.

Here, “second generation” applies to the production of fuels from whole plants, residues and also trees, which involves breaking down lignin and cellulose in cell walls. This process is currently energy intensive. Aim is to use genetic engineering to break down the “biological barriers” in plants that prevent easy conversion into fuel. (risks: remember there are good reasons for plants to have strong cell walls, eg: insect and disease attack)

### **Main areas of work**

- Altering plants to produce less lignin, different kinds of lignin and cellulose that break down more easily and may produce useful industrial by-products as with fossil fuel refining
- Altering enzymes and micro-organisms to attack and digest the plant’s fibres more effectively:
  - termite enzymes and other enzyme research
  - extremophiles – organisms that inhabit extreme zones such as hot springs or deep sea vents, which could perhaps be engineered to work in highly inhospitable industrial contexts to make agrofuels
- Genencor and Novozymes: cheaper production of enzymes
- Diversa: enzymes to break down hemicellulose, recalcitrant form of cellulose

### **Trees – major focus for 2<sup>nd</sup> generation**

- Purdue University: low lignin poplar (bendy!)
- Eucalyptus: cold tolerance and more fibre: ArborGen, US and Brazil
- Oil palm: higher yield, less growth, earlier maturity

### **Synthetic biology**

A new area of work that aims to re-design existing organisms and build completely new organisms, for example, to break down plant matter, or thrive in conditions of mass industrial processing.

Craig Venter’s new company, Synthetic Genomics, aims to study the genetic information from microbes collected from extreme environments to construct a completely new micro-organism designed to convert agricultural waste to ethanol.

On 31st May 2007 the US Patent & Trademark Office (US PTO) published US Patent application number 20070122826, entitled 'Minimal bacterial genome,' the first application for an entirely synthetic life form.

Synthetic Genomics working with Asiatic Centre for Genome Technology on Oil Palm improvement for fuels:

- SG will conduct analysis of the oil palm genome. Later, the groups will also analyze the oil palm's root and leaf microbial communities, to identify biomarkers and metabolic pathways that affect the plant's growth and viability.
- Useful traits research: that enable the plant to be grown in more arid locations, high oil yield and "low height increment".
- Synthetic Genomics and ACGT will also develop diagnostic tests for plant diseases that enhance natural resistance mechanisms for the breeding and maintenance of disease resistant energy crops.

### **Other examples**

US Government puts massive resources into a programme called Genomes to Life (GTL) that supports synthetic biology research as part of the US aim to develop alternatives to its dependence on fossil fuels.

BP has offered 500 million US dollars to the University of California at Berkeley for research into agrofuels. A major component of this work will be genetic engineering research into lignocellulosic fuels that will include the use of synthetic biology. BP has also joined the Bio-Industry Association.

### **Most dangerous outcome: more corporate concentration**

Car industry is emphasizing agrofuels to evade calls for engine efficiency. Oil industry, agribusiness and biotechnology making alliances; danger that corporate power will be further concentrated across the agriculture and energy sectors.