

This response was submitted to the consultation held by the Nuffield Council on Bioethics on *New approaches to biofuels* between December 2009 and March 2010. The views expressed are solely those of the respondent(s) and not those of the Council.

## **QUESTIONS ANSWERED:**

### **Question 1**

#### **ANSWER:**

There is a role for biofuels in a low carbon economy but there must be attention to defining their role within the constraints of finite land availability and the laws of thermodynamics. In general, biofuels should be used close to the point of harvesting in forms which require minimum processing; for example, biomass in UK latitudes should be used as a solid fuel and not converted to liquids.

### **Question 2**

#### **ANSWER:**

Conflict with other crops, including but not limited to food, for land and effects on rural economies and communities.

### **Question 3**

#### **ANSWER:**

Yes. Study of the issues, specifically in the framework of life cycle assessment, over at least 15 years.

### **Question 4**

#### **ANSWER:**

Economics and broader questions of sustainability. Policy concerns must cover all the three components of sustainability, including equity. Stabilisation of rural communities could represent a benefit but this requires careful policy measures, going beyond short-term economics.

### **Question 5**

#### **ANSWER:**

Approaches which maximise the energy yield and carbon offset per hectare. This means discouraging conversion of biomass to liquid biofuels. It matters not whether the technology is first, second or nth generation; thermodynamic limits are inescapable. Biomass must be used with the minimum of processing; this means as a solid fuel in heat or CHP applications.

### **Question 6**

#### **ANSWER:**

See question 5: the best approaches are those which maximise yield measured by net energy yield and carbon offset.

### **Question 7**

#### **ANSWER:**

Obtaining biomass from existing forests by bringing them back into productive management, and by growing high-yielding ligno-cellulosic crops. They may be encouraged by giving long-term contracts; planting grants are not a sufficient incentive.

### **Question 8**

#### **ANSWER:**

The real need is for small scale, efficient and reliable CHP plants, at the scale of a few MW (thermal plus electrical). This is much less "sexy" than processes to convert lignocellulosics to liquids but would be much more beneficial. Anyone who can crack this technical problem will find a huge export market, not least in Sub-Saharan Africa. There is an immediate commercial demand for this technology. The risks are low provided that the technology really is reliable.

### **Question 9**

#### **ANSWER:**

1. Breeding strategies should focus on developing strains to give maximum yield in terms of calorific value when grown on marginal land. 2. ditto for genetic engineering and synthetic biology. This is an area where the familiar objections to GMOs should be more muted and where there is clear argument for these technologies given the long growth cycles and hence the relative slowness of conventional plant breeding approaches.

### **Question 10**

#### **ANSWER:**

IPR over new strains and technologies should not present any new issues. The matter is different if new plants are brought into cultivation; the story of the San people and the hoodia plant is salutary - basically, TRIPS has ensured that the San will get minimal benefit from their traditional knowledge.

### **Question 11**

#### **ANSWER:**

The fact that the R&D needed is relatively small-scale. It is therefore not attractive to or appropriate for large corporations but is beyond the resources of most SMEs. Government programmes and development cooperatives are therefore needed.

### **Question 12**

#### **ANSWER:**

See q.8. Biofuel strategies must recognise that the familiar economic interests must be set aside to develop technologies of appropriate scale.

### **Question 13**

#### **ANSWER:**

Of course they must! This is why one of the objectives of plant breeding must be to produce energy crops on marginal land.

### **Question 14**

#### **ANSWER:**

In the developed world the matter is to produce energy crops in ways which do not reduce food production. In the developing world the matter is to increase overall productivity. In both cases the need is to produce crops on marginal or unused land.

### **Question 15**

**ANSWER:**

Of course it must be. This is a research question. At present there is no alternative to using some form of equilibrium modelling but general and partial equilibrium models have not really been developed so far for this purpose.

**Question 16****ANSWER:**

Displacing demand for imported fossil fuels is an obvious advantage. This underlines the need to approach the problem by maximising yield and offset.

**Question 17****ANSWER:**

Yes, they could do. Hence the need to find cultivars which can give good yield on marginal land and cultivation regimes which bring benefits in terms of biodiversity and soil organic carbon.

**Question 18****ANSWER:**

See q.14.

**Question 19****ANSWER:**

Many of the problems related to rights of farmers and workers result from imbalanced power relationships along the supply chain. This could be similar or even worse for biofuels: the energy majors do not have a better track record than the major food retailers! There is a need to set up a system, such as strong cooperatives, to ensure balanced supply chain governance.

**Question 20****ANSWER:**

Farmers and workers in the developing countries will be even more vulnerable to imbalanced supply chain governance.

**Question 21****ANSWER:**

See q.8. This probably can only be achieved by deployment of public funds.

**Question 22****ANSWER:**

Covered by previous questions.

**Question 23****ANSWER:**

See previous questions.

**Question 24**

**ANSWER:**