

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.

EcoNexus

Nuffield Council on Bio-Ethics: Consultation: New approaches to biofuels

Question 1

What is your view on society moving towards greater use of biofuels?

- We believe this is the wrong direction to go, as biofuels¹ have many negative impacts on communities and land use, especially in the global south.
- So-called advanced biofuels would not be any better as they also need land and water.
- Biofuels are not carbon neutral as claimed and therefore not fully renewable, see: Fixing a Critical Climate Accounting Error: Searchinger et al. Science 23rd October 2009: Vol. 326. no. 5952, pp. 527 – 528: DOI: 10.1126/science.1178797
- Biofuels have many unresolved issues re energy balance and also emissions.
- Biofuels began with a lot of promises, but many of these remain unfulfilled : this seems to be a repeating pattern, eg: jatropha and maize ethanol in the US: the former is increasingly revealed as a false promise and the latter is displacing soya production to the Amazon.
- Without subsidies and targets they would likely not be viable.
- Recent info from E4tech suggests that rape/canola and oil palm biofuels are hardly better than fossil fuel. See <http://www.ilucstudy.com/meetings.htm>
- Finally, biofuels of all kinds distract us from what is really needed: reduced consumption, not just of fuel but of all the resources (from metals and plastics, through to land, often prime agricultural land ideal for food production but covered in roads) consumed by transport.
- For a useful summary of major concerns see the report: **Agrofuels Towards**

a

Reality Check in Nine Key Areas <http://www.econexus.info/pdf/Agrofuels.pdf>

especially Chapter 3: Second Generation Agrofuels: How do unproven promises of future technological fixes shape the present debate?

Question 2

What are the most important ethical challenges raised by the prospect of future generation biofuels?

- Industry is deliberately setting out to create the vision and the market for such biofuels: the rest of society needs to decide whether this is the right path, yet there has been no opportunity for society at large to consider the issues before the market is created by projections with subsidies and targets.
 - There is a serious danger that policy decisions driven by industry hype have run ahead of science on new approaches to biofuels as they did with the first biofuels: <http://news.bbc.co.uk/1/hi/sci/tech/7309099.stm> “Call for delay to biofuels policy”
 - Promoters of future generation biofuels make promises that may never be fulfilled, but which promote further development of liquid fuels at the expense of other potential development paths.
 - Technological optimism based on little evidence and exaggeration leads to destructive and usually irreversible impacts, especially on communities and land in the global south
 - Land use issues and land-grabbing for biofuels based on targets, subsidies and promises
 - Exploitation and expropriation of land, water, soil, local communities
 - Displacement of food crops: increasingly industrial agriculture seems to be turning towards fuel and other industrial products even though our need for food is set to increase, and
- ¹ We use the term biofuel in our response to Nuffield, but generally we prefer the term agrofuel, which we use in our own publications.
- future generation biofuels are firmly linked with the bioeconomy, that promises to replace a growing proportion of fossil energy and by-products with biomass energy, even though sober reflection shows that for this we would need the resources of more than one planet.
- Future generation biofuels may well increase, not reduce, climate change, through generating land clearance (direct and indirect land use change), monoculture plantations,

infrastructure, displacement of other crops, etc

- Water resources are under great pressure in many parts of the world and biofuel plantations would likely increase this pressure
- Public trust in scientists and government is damaged by such promises; the public often believes that industry and profit are the main drivers, but also feel that these developments are inevitable and they have no power to change them.
- Inflated promises lead us down the wrong path; and undermine our need to make real changes in our development paradigm.
- Inequity: if we don't act carefully, the lives of future generations will be impoverished by our actions.

Question 3

Do you regard yourself as well informed about biofuels? Where do you get your information from?

We have been working on these issues since 2006 and have excellent on the ground and network contacts for our information.

Question 4

Which factors are going to be the most important in driving the development of biofuels in the future? To what policy concerns should priority be given? What advantages not mentioned here could and should future biofuel production aim to deliver?

- The development of future generation biofuels is not (as stated by Nuffield in the material for the consultation) mainly driven by the need to mitigate climate change and reduce GHG emissions, but by the search for new markets and opportunities for agribusiness. Such developments are unlikely to drive economic and agricultural development that benefits the population at large because if it takes place, it is likely to be on a large scale and (in the case of the global south) driven by demand from industrialized countries. It is hard to see therefore how this helps energy security since at scale it would involve international trade and imports to the UK.
- We need far more imagination about developing alternatives to constant moving about and changing public perceptions of status, which is still very much tied to constant movement, and the status of the means of moving about, ie model of car, etc, all based on liquid fuels.
- Targets and subsidies are a major concern as they provide incentives for a path that we do not believe is in the long-term interests of people or planet.

Question 5

Which of the new approaches to biofuels will be most successful in generating GHG emission savings? How should these be encouraged? Are there any reasons why these new approaches should NOT be encouraged?

- Instead of talking about which approaches to biofuels will be the most successful, we should be asking whether biofuels are the right way forward.
- Statements like this in the Nuffield material: "biofuels produced from agriculture or forestry residues have been estimated to have GHG savings of 80 to 90 percent" are a perfect example of the way biofuels are being promoted, with iteration of promises, often based on no real evidence.
- Residues cannot, as sometimes claimed, make up the greater part of the feedstock; there is not enough of it to satisfy biofuel markets and it is needed for other purposes, eg: to return nutrients to the soil.
- Addressing climate change is not just about GHG emission savings. This is a linear approach to a complex problem involving systems: ecosystems, human societies, agriculture and food production, etc.
- We have no idea whether these new approaches will actually work, even at the level of markets, let alone for societies and ecosystems.
- However, we do know that solid-to-liquid biofuels, if they become viable, are likely to rely on industrial tree plantations and that their impact is disastrous for people, ecosystems and climate, soil and water.
- Much of the debate over approaches to new biofuels has been around energy input versus energy output. Now that biofuels have been shown not to be carbon neutral, balancing the

inputs and outputs will be even more difficult than previously.

- As a recent study predicts, the displacement of food crops and clearance of pasture due to increased biofuel production over the next century would produce massive increases in CO₂ and N₂O emissions. MBL October 22nd 2009: New Study Predicts Future Consequences of a Global Biofuels Program:

http://www.mbl.edu/news/press_releases/2009_pr_10_22b.html

Question 6

Which of the new approaches to biofuels will be most successful in improving energy security? How should these be encouraged? Are there any reasons why these new approaches should NOT be encouraged?

- The best way to improve energy security is to increase the efficiency of energy use, reduce demand and keep production and consumption within the same region as far as possible.
- The “new approaches” (ie: future generation biofuels) will not improve energy security because we will still depend massively on imports in the UK, especially when other emerging uses of biomass, eg: for heat and power, are taken into consideration.
- Projections already show a huge increase in imports to the UK of biomass for CHP plants, which would add to what would be needed for “advanced” agrofuels.
- There is no reliable information to suggest that future generation biofuels will be able to fulfill demand, if demand is allowed to grow without being constrained.
- “Waste” biomass and residues (see also question 5) are constantly proposed as the answer, as in the introductory section to this consultation, but is this really waste and how much of it is there? Certainly not enough to satisfy demand if these fuels became a percentage of the national mix.

Question 7

Which of the new approaches to biofuels will be most successful in supporting economic development? How should these be encouraged? Are there any reasons why these new approaches should NOT be encouraged?

- Economic development for whom? This is the first question to ask and the answer is likely to be industries or companies from industrialized countries.
- To be “cost effective”, next generation biofuel development would need to operate using economies of scale. This would require large plantations, big machines, large refineries. Normally such industry does not provide many jobs and actually marginalizes people.
- In fact it may remove many jobs and reduce possibilities for people – and countries - to develop their own paths.
- Small-scale production of energy by communities is unlikely to fit with the technical demands posed by next generation biofuels, which would more likely encourage international market networks based on large scale production and processing.
- Talk of a green economy and support for agricultural development is based on projections or assumptions that are not well thought through. What sort of jobs are we talking about? There is often a tension between the number and type of jobs, mechanization and economies of scale. For example, sugarcane workers in Brazil are forced to harvest ever-increasing amounts of cane per day and constantly threatened with mechanization and therefore unemployment if they try to demand better conditions.

Question 8

Of all the new approaches to biofuel feedstock development, pre-treatment and processing (including any additional to those mentioned here), which is looking most promising for eventual commercial and sustainable use? Over what timescales might such developments be commercialised? Are there any risks associated with these developments?

- Risks: GM modified plants and trees, also bacteria etc are proposed as a means of processing biofuels, but these may have unpredictable and serious impacts
- Biofuel crops and trees often have the characteristics of invasive species: need little water, poor soils, robust etc. Miscanthus is one example. See: Low, T. & Booth, C. (2007) The Weedy Truth about Biofuels, Melbourne, Invasive Species Council

http://www.invasives.org.au/downloads/isc_weedybiofuels_oct07.pdf

- Algae are often projected as the answer to problems with other possible feedstocks, but claims that they are up to ten times more productive than other kinds of plant have not been

proven. Furthermore, they have problems of their own, whether grown in closed containers (eg: limits to the amount of light reaching them and therefore of productivity), or in open ponds (eg: where contamination can be a problem).

Question 9

Is the use of the following technologies to develop new approaches to biofuel production appropriate? Why?

Advanced plant breeding strategies

- Marker assisted breeding may be useful for breeding new varieties in the future, but only if:
- account is taken of the interactivity and multiple actions of genes
- it is not accompanied by aggressive IPR strategies.

Genetic engineering

- The claims made in the introductory material to this question are speculative: for example: "Genetic modification can be used to introduce genes to produce favourable traits for biofuel production, such as higher yields or the ability to grow on land which cannot be used for food crops." No GM crop has ever been developed to improve yields, see: Feed the world? Dr Ricarda A Steinbrecher and Antje Lorch, 1st November, 2008, Ecologist November 2008:18-20

- Reduced losses due to the agricultural system used with GM crops may occur at first, but experience shows that current GM crops and methods tend to induce resistance among weeds (GM soya in the US and Argentina) and pests (Bt cotton, India). It may also encourage new pests that were never a problem before.

- The development and introduction of favourable traits has been promised for many years, but is proving far more complex than projected initially, at least partly because we still understand very little about how genes function and because characteristics such as drought or salt tolerance involve a number of genes in interaction and we do not yet understand these interactions.

- We are a very long way from designing and constructing organisms to act as biofactories. It is easy to say and sounds plausible, but is far from realization. Many claims have been made regarding microbes genetically engineered to promote easier processing, but we have seen no reliable proof of this concept. The statements in the Nuffield consultation paper itself are characteristic of the unsubstantiated claims made by many others.

- Much of the debate over approaches to new biofuels has been around energy input versus energy output. Various approaches to improving ratios have been suggested, including genetic engineering and synthetic biology applied to microorganisms. This is potentially a very dangerous path. For example if the microorganisms created by either genetic engineering or (hypothetically) by synthetic biology, were to escape, the impacts could be devastating, even though advocates say the organisms can't survive outside the specialised environment of the refinery.

Synthetic biology

- Synthetic biology is already promising many things, yet there is no agreed definition of the term. It involves disciplines (engineering, biology, information technology) that have conflicting core values.

- For example: an engineer often builds something from parts (as promised with synthetic biology), can modify what they build if it doesn't work at first, and can usually describe why it works, which is far from always being the case with biological systems.

Furthermore, what the engineer constructs does not normally have the capacity to modify itself in unforeseeable ways, for example, in order to survive, or evolve independently, nor does it replicate.

- As a student noted: "There's a lot of biology that gets in the way of the engineering" ie: we need to reflect on the potential clashes between these disciplines and the cultures underlying them – and with the information technology/computer models. (from: Five hard truths for synthetic biology by Roberta Kwok, Nature, 21st January 2010)

- Synthetic biology is currently entirely hypothetical and as with GM, results are much slower to emerge than promised.

- Even if these developments were to be successful, there is still the basic problem of the amount of raw material (biomass) that would be required.

- If GM or synbio micro-organisms were to escape and start acting on biomass, the results could be catastrophic. Although we are often assured that they would not survive outside the lab or the processing plants, microorganisms have a vested genetic interest in survival, and may adapt very quickly to hitherto inhospitable circumstances.

Question 10

What are the most important intellectual property and access issues raised in new approaches to biofuels? What is the best way of governing these?

- As in other fields of research, IPRs can be a major barrier to public interest research and small-scale interests that cannot pay fees or risk huge court cases. Barriers caused by defensive IPRs have already held back research on solar power in the past.
- IPRs can also distort research priorities by pulling them towards areas of work where IPRs are possible to obtain and there may therefore be large rewards if the relevant application can be developed.
- IPRs can help to “orphan” research where information is in the public domain or where IPRs cannot readily be obtained and where private profits are not so easy to realise or protect.
- IPRs have been shown to prevent the exchange of information between researchers while the application is being developed and examined.
- IPRs and legal issues can make it very difficult for poor and marginalised communities to have equal access. However, it has proved extremely difficult to address IPR issues in reality and legal cases to challenge the appropriation of knowledge are expensive (eg: Indian government challenge to a patent application regarding turmeric: US patent 5,401,504, finally rejected in the face of the evidence by the USPTO; one patent on neem (WR Grace and the USDA) overturned in 2000, but 80 patents remain).

Question 11

What are currently the main constraints to R&D in new approaches to biofuels?

Question 12

Where should R&D for new approaches to biofuel be targeted, and who should decide about future biofuel R&D strategies?

- There has been much exaggeration about the possibilities of this area of research that great care must be exercised about future decisions. We believe that research should be targeted at completely different areas because of the fundamental issues around the availability of biomass. If (as we suspect) there is never going to be enough available biomass, then it is pointless trying to develop ever more efficient ways of breaking it down and converting it into fuel.
- Ideally society at large should have the opportunity to decide about the priority to give to new approaches to biofuel, which taking into account a full raft of social and environmental issues, ranging from future patterns of transport to regulating novel microorganisms.

Question 13

Are new approaches to biofuels likely to raise problems related to land use? If yes, how? If not, how do new approaches avoid these issues?

- Although it is claimed that next generation biofuels will address the problems raised by the first, this is certainly not true as regards land use. Even though the crops and trees themselves may not apparently compete with food crops because they are not edible, all biomass production requires land, for which there is already serious competition without introducing a whole new industry.
- Indirect land use change is a serious issue for agriculture, especially for any new application. It is a complex issue, but potentially massive, so even though it may be very difficult to calculate the impacts, this does not mean they should be discounted.
- The issue of biodiversity is also more complex than often admitted. Biodiversity cannot be reduced to species counting and hotspots. It has to be considered as part of an ecosystem approach, taking into account interactions between elements within the ecosystem. Since, even where we can name species, we often know far less about the

interactions between them, this is obviously an area where careful research is needed.

- The answer from industry to the issue of land availability is often: we must therefore increase yields on current agricultural land. However, this is more difficult than usually admitted. It is well-known that green revolution crop yields have been flattening out for years and that major yield increases are more likely to come from small-scale mixed farming, with intercropping etc, than from industrial scale production. Although GM crops (see question 9) have been promised as a means of increasing yields and indeed are already claimed to do so, this is not the case. They may reduce losses to pests or competition with weeds for a time, so far the evidence is that resistance sets in quite quickly, reversing these initial gains.
- There are many other problems with potential biofuel crops, such as their capacity for invasiveness and the fact that compared with current food crops, we know very little about them, eg: pests and diseases that may affect them.
- A major underlying issue is that of energy density. We cannot replicate the process of development of fossil fuels, which are far more energy dense than anything we can produce from plants. Such issues are often not properly taken into account, which means that we are likely to need even more land for even more feedstock than promoters are indicating to us.

Question 14

What differences are there between the developed world and developing countries with regards to the potentially problematic effects of future generation biofuel production on land use?

- In the global south, especially Africa, land is often used on a collective basis with a long history of such use, but no legally recognised rights.
- Collective rights are not readily amenable to standard property rules. Examples that work best include extractive reserves and indigenous territories in Brazil.
- Currently many governments are offering land for sale or on lease to outsiders leading to big problems: "In Mozambique, over 18 months, some 13 million ha were bid for and investigations soon revealed that targeted land overlapped with land vital to local communities. Now the conflicting claims have to be resolved. Meanwhile, some 2.5 million ha are under cultivation for agrofuels." **Agriculture and climate change: real problems, false solutions:** Report by EcoNexus, Grupo de Reflexion Rural, Biofuelwatch and NOAH - Friends of the Earth Denmark: www.econexus.info

Question 15

Should iLUC be considered when evaluating the GHG emissions savings of new approaches to biofuels, and if so, how?

- ILUC should be considered whatever kind of biofuels we speak of. Indeed we do not see any evidence that the ILUC issues for **new approaches to biofuels** will be different from those of the old.
- It is likely that when properly accounted for, ILUC will deal a fatal blow to biofuels of all kinds, all of which need land. See INDIRECT LAND USE CHANGE: Possible Elements of a Policy Approach – Commission Paper July 2009, EcoNexus response, 31st July 2009

Question 16

What advantages and disadvantages for environmental security could new approaches to biofuels have? How could harms for environmental security be dealt with?

- Would there really be any difference between the impacts of first generation biofuels and "new approaches" to biofuels? We can see no reason why the latter should be any less damaging to land and ecosystems than the first.
- "New approaches" to biofuels would likely involve a massive extension of tree plantations for cellulosic ethanol. The expansion of CHP plants is already increasing demand for imports of wood pellets. Tree plantations have well-documented negative impacts, eg: see <http://www.wrm.org.uy/plantations/material/impacts.html>
- Dealing with the impacts is always fraught with difficulties, as corruption, violence to communities and environment and destruction often take place before any thought has been given to countering them.
- For example, the target for biofuels in the EU has certainly provoked land grabbing in the

global south, including for jatropha, which has not fulfilled the early and emphatic promises made for it. However, local communities in African countries and in India have lost land because of the early promotion of this crop.

- Large monocultures are not noted for heeding ecosystem integrity or biodiversity.

However, it is the case that investment is difficult to obtain for small-scale projects that largely benefit local people and that big projects that promise economies of scale are more attractive to investment.

- Issues of harm tend to be addressed after decisions have been made rather than before, and certification of biofuels is not the answer, especially where targets and subsidies are driving the industry.

Question 19

Are new approaches to biofuels likely to raise problems related to rights of farmers and workers? If yes, how? If not, how do new approaches avoid or benefit these issues?

- Yes, they are likely to raise problems because they will generally be carried out on a large scale for economic reasons, as noted previously, which will tend to disadvantage local communities and cause large-scale appropriation of land.

- There are already tensions in the sugar industry (see question 7) between scale, mechanization, and employment. New approaches to biofuels could face the same problems.

- New kinds of job will require different skills and thus it may be easier to bring in a new workforce rather than re-train the existing workforce.

- Often local communities can only gain employment in new industries by doing the most dangerous and lowly jobs (eg: spraying pesticides).

Question 20

What differences are there between the developed world and developing countries with regard to the effects of the production of future generation biofuels on the rights of farmers and workers?

- In Europe we have a tiny percentage of people remaining who actually work the land, whereas in the global south, there are millions of farmers.

- In the global south there is still a far closer relationship with the land than in industrialized countries. This means that:

- People depend on the land, including so-called marginal and collective land for food, medicine and materials of different kinds, especially during times of stress, such as are induced by climate events.

- People also have far better knowledge of seeds and crops, which is hardly surprising, since they are continuing the long history of the development of crops and livestock that has been going on for thousands of years.

- Unfortunately these are the people who are most likely to be adversely affected by the development of biofuels – land being taken over for large plantations etc. When these people are uprooted from their land, they become food consumers not producers and their knowledge and locally adapted varieties are lost.

Question 21

Where do you think investment in new approaches to biofuels should be directed and where should it come from (public sector, private sector or public-private partnerships)?

Question 22

Which policy issues in relation to new approaches to biofuels would you like to bring to our attention?

- We are very concerned about the use of subsidies and especially targets to drive biofuels. This has already proved problematic with first generation biofuels, generating forest destruction and land grabbing in the prospect of being able to profit from the EU target biofuels. If targets are set up front in this manner, then the damage is done before it is recognized that actually the whole policy needs radical amendment or complete change.

- Unfortunately this is also happening with new approaches to biofuels because they too are part of the EU biofuel target and interest and activity, including this consultation, are beginning to build around them internationally, eg: the Global Advanced Biofuels Scale Up

Summit 2010, taking place in Washington D.C. on June 22-23, and organized by American Business Conferences. The promotional material makes it clear that the market for what they call “advanced” biofuels has to be created.

Question 23

What would be the most effective policies a) to promote and incentivise; and b) to regulate the development of new approaches to biofuels?

We simply wish to note here that the most ineffectual way to regulate biofuels is to introduce targets and incentives and then to try and devise regulation, including certification, afterwards, which is how current biofuel policy has been devised in Europe.

Question 24

Are there any other issues not mentioned in this consultation that we should consider in the ethical evaluation of new approaches to biofuels?

Please expand below.

- The questions in this consultation have been limited to the single issue of **new approaches to biofuels**. There has been no effort to set these in the context of transport issues for society in the long term or in the context of limits to resources and increasing competition for those resources (including the actual capacity to convert solar radiation into biomass for food, materials, biodiversity, ecosystem functions – and now biofuels).
- What about alternatives to the path of biofuels altogether? Nuffield’s approach to the consultation appears to assume the inevitability of this latest promotion of biofuel development, merely seeking to mitigate its negative impacts.
- This approach is familiar: a linear progression through various levels of mistake: promises are made, policy decisions are taken, then evidence shows that these policy decisions were flawed, so they are slightly revised until problems emerge in relation to these revised approaches, which are then revised again, as we persist with the same development path.
- The situation is particularly serious for two reasons: we are coming up against the limits imposed by the planet itself, yet the power to influence policy of ill-founded promises for hypothetical solutions appears to be increasing.
- What we really need is a radical evaluation of the whole future of transport in the light of climate change, resource depletion, finite resources, etc. We need new approaches to transport, not just to biofuels.

15th March 2010