

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.

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Question 1

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

Society's move towards greater use of biofuels is a positive endeavour.

The use of technological advances towards harnessing untapped sources of energy is of potential benefit in a world where demand for energy outstrips supply.

That being the case, further study of the different types of biofuels and their socio-environmental impacts must be conducted in order to optimise the use of biofuels so that the greatest socio-environmental benefits can be attained at the smallest socio-environmental cost.

Question 2

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

The most important ethical challenges raised by the prospect of future generation biofuels are:

- The water footprint¹ of the cultivation of crops for biofuel in light of the world water crisis (a finite amount of global freshwater and an exponentially growing global population),
- The impact of the cultivation of crops for biofuel and (iLUC) on food security in developing countries,
- Potential negative impacts on land and marine biodiversity and detriment to ecosystem services resulting from:
 - (iLUC) associated with the cultivation of crops for biofuel (land),
 - The genetic modification of plants for use as biofuel (land),
 - The use of algal blooms as a source of biofuel (marine).

Question 3

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

I regard myself as being well informed about biofuels.

I get my information on biofuels from:

- Academic publications,
- Conferences where biofuels are discussed and,
- Policy in developing countries where biofuels produced.

I find that the mainstream media contains much misinformation on biofuels which it addressed both generically and superficially.

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 factors that are going to be most important in driving the development of biofuels in the future are:

¹ Water footprint refers to the amount of water (both direct and indirect) that is utilised by an industry or consumer.

- Policy in the EU and US on mitigating the impact of climate change through a reduction of GHG emissions and the development of energy sources that are non-hydrocarbon based,
- Public perceptions on the role of hydrocarbon energy sources in exacerbating climate change and the role of International NGOs in mobilising shareholder support in favour of or against multinational energy companies which support or impede the development of biofuels,

The policy concerns to which priority should be given are:

- The water footprint of the cultivation of crops for biofuel and its effects on global food security,
- The socio-environmental effects of cultivating crops for biofuels in developing countries,

The advantages that future biofuel production could and should deliver are:

- Contribution towards human development and economic growth in developing countries where biofuel crops are grown through:
 - The use of biofuels for the generation of electricity in the areas of the developing world where biofuel crops are grown,
 - The creation of jobs and new expertise in a green economy in developing countries,
 - Greater interest in the area of 'new energy sources' and more research and development into the generation of cheaper, cleaner energy.

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?

Extensive research must be made and published on the lifecycle assessment of the different types of biofuels and their respective GHG emissions before an informed answer can be made to this question.

A lifecycle assessment of bio-oil that is sourced from municipal waste and existing animal waste may find GHG emission savings in:

- Potentially shorter transportation routes of bio-oil from the processing plants to thermal plants nationally, as compared to the transport of hydrocarbons which contributes to GHG emissions through the international shipping of oil and liquefied natural gas in tankers,
- Incineration of less waste.

If it is found that the production of energy from bio-oil that is sourced from municipal waste and existing animal waste sources produces less GHG emissions than hydrocarbons, this approach to biofuels should be encouraged through:

- The incorporation of the production of bio-oil from waste into the international policy agenda through international fora and international organisations such as relevant UN bodies,
- The encouragement of research and development into the production of bio-oil from waste through financing of research grants and research centres by Public and Private institutions either independently or jointly,
- Engagement with international multilateral financial institutions such as the Global Environmental Facility for the financing of waste to bio-oil plants.

Question 6

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

The principal challenges of energy security are:

- The fact that the world's most utilised energy source 'hydrocarbons' are only present in commercial quantities in a number of the world's states,
- Access to and import of the world's most utilised energy source 'hydrocarbons' entails complex legal, financial and at times political investment by large-scale importing states.

- The economic interests of (hydrocarbon) energy producing and (hydrocarbon) energy importing states may become opposed, resulting in an increasing and fluctuating price of oil.

The UN estimates that half of the world's population already live in big cities.

City dwellers generate a large amount of human waste which could be converted into bio-oil which can be a fuel for thermal power stations.

The generation of bio-oil from human waste and existing animal waste sources will be the most successful new approach in improving energy security due to:

- The fact that the energy source will be available locally and will therefore not have to be imported.
- The fact that the energy source can be considered to be renewable and infinite.

The generation of bio-oil should be sourced from human waste and existing animal waste. The livestock industry should not be incentivised, beyond its current capacity, towards the generation of waste for the production of bio-oil due to the already large water-footprint of the global livestock industry and its effect on utilising large amounts of finite freshwater resources.

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?

Any of the new approaches to biofuels which contribute to addressing 'energy poverty'² in states where biofuels are sourced will be successful in supporting economic development. Addressing 'energy poverty' constitutes a positive-sum engagement between developed states that aim to increase their use of biofuels and the developing countries from which the biofuels are often sourced and imported.

Climate change is a 'global' challenge and if it is found that new approaches to biofuels make GHG emissions savings, it follows that developing states from which biofuels are sourced should be offered assistance in addressing their 'energy poverty' through 'cleaner energy' sources such as biofuels.

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?

I am unable to provide an informed answer to the first two questions in Question 8.

However potential risks may be associated with new approaches to biofuel feedstock such as the use of lignocellulosic biomass, and these are:

- Competition over finite freshwater resources between biofuel feedstock and edible crops in light of global food insecurity.
- The economic incentivisation of the cultivation of biofuel feedstock instead of edibles in light of global food insecurity and an exponentially growing global population.

² Energy poverty refers to an insufficient supply of energy, including fuel and electricity, to meet demand in a state or region.

It should be noted that the right to food has been recognised as a fundamental human right which is stipulated in a number of international legal instruments including and not limited to:

- The Universal Declaration of Human Rights (Article 25: 'everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food')
- The International Covenant on Economic, Social and Cultural Rights (Article 11.1: 'the right of everyone to an adequate standard of living for himself and his family, including adequate food' and Article 11.2: 'the fundamental right of everyone to be free from hunger')
- The Convention on the Rights of the Child.

Question 9

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

Advanced plant breeding strategies

Genetic engineering

Synthetic biology

The use of synthetic biology to develop new approaches to biofuels is appropriate due to the fact that the proposed source material from which the biofuel would be produced (waste water, sunlight, oxygen) do not require the consumption of finite freshwater for their production in a similar manner to plants.

The merits of advanced plant breeding strategies and the genetic engineering of plants may be questioned assuming that:

- Technological advances will continue to result in greater yields of edible crops that are grown in areas which were hitherto considered unsuitable for the growth of edible crops. Therefore plant breeding strategies and the genetic engineering of plants should be utilised to ensure global food security instead of producing crops for the production of biofuels which may potentially compete, economically and over limited water resources, with the production of edible crops.

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?

The best way of governing the intellectual property and access issues raised in new approaches to biofuels is through the World Intellectual Property Organisation (WIPO), which is 'a specialized agency of the United Nations, dedicated to developing a balanced and accessible international intellectual property system which rewards creativity, stimulates innovation and contributes to economic development while safeguarding the public interest'. 184 of the world's states are members of WIPO.

Question 11

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

One of the main constraints to R&D in new approaches to biofuels is the topical manner in which biofuels are addressed by the mainstream media. Perceptions regarding biofuels appear to be polarised due to use of edibles to produce first generation biofuels. Credible, substantiated information on new approaches to biofuels should be made available to the public at large. This will encourage the private sector in the energy industry to invest more heavily in R&D in new approaches to biofuels.

Question 13

Are new approaches to biofuels likely to raise problems related to land use? If yes, how? If no, how do new approaches avoid these problems?

New approaches to biofuels involving the conversion of human and animal waste to bio-oil and synthetic biology are not likely to raise problems related to land use.

New approaches to biofuels involving crops are likely to raise problems related to land-use.

The recent large-scale leasing of arable land for the cultivation of edibles in developing states by wealthier states has been criticised in the mainstream media and referred to as a 'land grab by rich countries' and 'exploitative'. It is conceivable that the same allegations will be made to the lease of land in developing states for the cultivation of biofuel feedstock.

Problems related to land use should be discussed in international fora in order to identify potential problems and in order to mitigate them. New approaches to biofuels involving the cultivation of crops can mitigate problems through 'public participation' and the exercise of 'corporate social responsibility' in the formative and productive stages of a biofuel project. Biofuel projects that necessitate land use in developing countries will avoid problems through providing a benefit to the communities that are indigenous to the land as opposed to a macroeconomic benefit that is received by the state.

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 when evaluating GHG emissions saving to new approaches to biofuels due to the following:

- The deforestation that would occur to offset losses in edible crops constitutes a loss of GHG sinks which impedes the reduction of GHG emissions.

New approaches to biofuels should therefore focus on the types of biofuels which cause minimal iLUC such as bio-oil from waste and from synthetic biology.

Question 16

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

The new approaches to biofuels which involve the plating of crops pose a possible challenge to environmental security through their potentially large water footprint due to their consumptive use of finite water resources in light of the world water crisis and global demographic growth.

New approaches to biofuels which do not necessitate the planting of crops such as the conversion of human and 'existing' animal waste into bio-oil and the use of synthetic biology constitute less of a challenge to environmental security.

Question 17

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

The new approaches to biofuels which involve the plating of crops pose a possible problem to food security due to following factors:

- The cultivation of non-edible crops for the generation of biofuel necessitates consumptive use of water resources which could otherwise be diverted to producing edibles.
- The land on which non-edible crops are grown for the generation of biofuel may provide ecosystem services that will be lost when the land is converted to the production of crops for biofuel. The land on which non-edible crops are grown could be also be potentially utilised for the cultivation of edibles with further R&D.

- The creation of a market for non-edible crops for the generation of biofuel will incentivise many agriculturalists to produce crops for biofuels instead of edibles in light of global food insecurity.
- If non-edible crops are grown in hostile conditions and land which is not currently suitable for the growth of edibles, this could potentially disincentivise further R&D into developing 'edibles' which grow in hostile conditions.

The new approaches to biofuels which do not involve the cultivation of plants are not likely to raise problems related to food security as they do not necessitate large tracts of land and the consumptive use of water resources.

Question 18

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

The developed world has the economic capacity to subsidise its agricultural sector in order to meet local demand for food. In cases where developed countries have an agricultural sector which is unable to satisfy the demand for grain, they have the economic capacity to buy grain from the global market even during price hikes.

Developing countries in many cases lack the technology, infrastructure and investment that is needed to produce their own food. Developing countries also lack the economic capacity that allows them to buy grain from the international market particularly during price hikes.

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?

New approaches to biofuels involving the conversion of human and animal waste to bio-oil and synthetic biology are not likely to raise problems related to the rights of farmers and workers.

New approaches to biofuels involving the cultivation of crops are likely to raise problems related to farmers and workers.

The main problem with the large-scale leasing of land for the cultivation of crops for biofuel is that there exists a perception that the projects do not accrue benefits to the local environment, economy and workforce.

In the event that contracts are signed between governments and foreign companies for the large-scale leasing of land for the cultivation of crops for biofuel it is probable that local farmers and workers will not be engaged in a consultative process in order to identify their needs and perspective.

The possibility of labour being imported into developing countries for the production of biofuel is potentially problematic due to the fact that local farmers and workers may perceive this to be an unfair encroachment in their labour market.

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)?

Investment in new approaches to biofuels should be directed towards R& D in the production of biofuels through processes with the smallest water footprints, or consumptive uses of water. The private sector should be engaged and encouraged to enter into public-private partnerships in new approaches to biofuels. The advantage of public-private partnerships is that by virtue of their composition they take into account public concerns in a more institutionalised manner than private sector projects. Investment

should also come from international multilateral financial institutions such as the Global Environmental Facility.

Question 22

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

The issue of the sustainable use of finite water resources is an integral part of sustainable development which is a global policy. The effect of new approaches to biofuels on water security should be adequately addressed. Research should be conducted into the consumptive uses of water by different new approaches of biofuels.

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?

The most effective policies to promote and incentivise the development of new approaches to biofuels are:

- The financing of R&D in new approaches to biofuels
- The financing of scientific and informative publications on new approaches to biofuels
- Engagement with educational institutions for the teaching of new approaches to biofuels
- Engagement with the media for the dissemination of information on new approaches to biofuels and contribution to an informed discussion on new approaches to biofuels.

The most effective policies to regulate the development of new approaches to biofuels are:

- The discussion of new approaches to biofuels in a multi-sectoral consultative process under the auspices of an international forum such as the United Nations Organisation.

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?

The issue of the sustainable use of finite water resources is an integral part of sustainable development which is a global policy. The effect of new approaches to biofuels on water security should be adequately addressed.