Introduction

Motivation for this Contribution

The public consultation on biofuel issues in the new legislation on the promotion of renewable energy deals centrally with the raison d'être of the EPEA Internationale Umweltforschung GmbH. For 20 years, EPEA has been engaged in environmental research and consultancy in material flow and nutrient management and the development of concepts and solutions to optimise products and processes for companies world-wide. EPEA often collaborates with governmental and non-governmental organisations concerned with consequences of deficits. We recognised very early that environmental problems originate in deficient design and that sustainable development requires the ability to see "design" as the target for activity, improvements and extended quality. Traditionally, design involves three dimensions of quality: technical performance, aesthetics and price from "cradle to grave"--resources to waste. However, the exhaustion of resources and the accumulation of waste to soil, water and air are the actual problem. Ultimately, this can be solved only when the intention to overcome waste by maintaining a status of materials as resources over their use, is integrated into the design process at any level between singular products and global policy making. This approach introduces a fourth dimension of design that can be articulated in a positive way as simply, "waste equals food." This fourth dimension is the fundamental basis for the Cradle to Cradle Design approach, which is presented on our website (www.epea.com) and in the book, "Cradle to Cradle" by chemist Prof. Dr. Michael Braungart and renowned American architect and designer William McDonough. A few years ago, EPEA already pointed out the dramatic consequences of the forbiddance of animal meals as complementary fodder in cattle growth. A strict forbiddance was introduced, resulting in an acceleration of deforestation and the generation of enormous amounts of greenhouse gases (GHG), especially in South-America[1]. Instead, a re-organisation of material flows in order to avoid cannibalism, the processing of cadavers and the management of residual material flows as high quality fodder could have been installed for the same beneficial effect of solving the mad-cow disease issue without creating geographically distant but massive collateral damages. We see the same phenomenon arising with biofuels: The good intention of providing a European answer to the major issue of climate change may lead to measures that dramatically reinforce the problem because of overseen--or at least underestimated, consequences arising from a too narrow scope of the questions raised. The biofuel issue is showing us how urgent it is now to set comprehensive nutrient management processes and to fix conditions for the implementation of this ambitious goal. This is sustained by recent works that were done by us as well as from others to get an exact orientation on this topic. The results of this investigation are strongly suggesting the possibility that only few biofuels may be produced in a sustainable manner and as a whole may contribute only marginally to energy supply on a sustainable way. A profound revision of the legislation in place and of the current course of its further development is necessary in order not to create much more problems with biofuels than with doing nothing. Unless otherwise indicated, illustrations and statements made in this document have been developed in a report accessible at the website of EPEA [2]. A striking finding during the course of the former investigation was the divergence of views published until now, all resulting from a bottom-up approach to the performance of biofuels. They are either prejudiced by particular interests or simply and naively lack a scope sufficient enough to cover all issues.

What is sustainability?

Framing a sustainability system for biofuels requires a top-down approach starting with principles and values to be defined prior to their differentiation and application to biofuels. The answer of whether biofuels are a possible option in the frame of sustainability can then be generated by looking for impacts in borderline scenarios. The process should therefore be open to the possibility that a large spectrum of biofuels options may be unsustainable. The Brundtland commission defined sustainable development as a development that "meets the needs of the present without compromising the ability of future generations to meet their own needs". This definition sets a right for all to have access to a supply meeting their needs of today and in the future, and basically subordinates everything else, including the design of politics and economy to this requirement. It includes that mankind today has no more rights to meet its needs than mankind tomorrow; it also includes that there is no justification to increase actively a misbalance between more and less privileged parts of mankind in meeting their fundamental needs, today. A motivation for the production of biofuels is the assumption that the use of "renewable resources" for the production of energy will actually serve the ability of future generations to meet their own needs via an avoidance or reduction of fossil hydrocarbon usage and the resulting greenhouse gas effect. However, this assumption is utterly false, and the competition with traditional assignations of agricultural production has the potential to create significant social problems.

What does bioenergy represent in the context of energy supply?

Bioenergy represents a new purpose of agriculture, which was traditionally the means for the production of food and raw materials for textile applications and chemistry. The first question to address is whether agricultural production for bioenergy is commensurable with traditional agricultural production and demand patterns. First-generation biofuels are biodiesel resulting from the transesterification of vegetable oils, and bioethanol resulting from the conversion of cereals and sugar crops to ethanol via fermentation. The production of biofuels directly competes at the level of crop assignation for food supply. The EPEA study mentioned above shows that if the complete world-wide production of crops was only assigned to bioenergy production, a gross yield of 25 EJ could be produced at maximum. This represents not even one third of the global energy demand for transportation alone, and only 7.5% of the global usable energy in 2004 (see Table 1). Meanwhile, the world-wide energy demand is expected to rise by 49% between 2004 and 2030, equivalent to a difference in 5 billion tonnes of oil [3]!

	Yearly production (Mio t)	Biofuel gross energy potential (EJ)	Biofuel net energy potential (% of gross)
Vegetable oils	95.0	3.6	about 60%
Sugar	145.0	2.0	about 30%
Wheat	585.8	4.4	about 0%
Maize	923.0	7.6	about 20%
Rice	399.3	3.0	probably less than 20%
Other (guessed)		4.3	probably less than 20%
Total		**25.0**	**5.7 EJ**
Global transportation energy demand (2004)	78.1 EJ		
Global usable energy demand (2004)	330.0 EJ		
Prospected development of the global primary energy demand between 2004 and 2030	49%		

Table 1. Maximal 1.st generation biofuel potential in the context of the global energy demand

The production of a gross energy yield requires energy inputs for the agricultural production and the industrial conversion to final biofuels. The remaining difference is a net bioenergy amount with an order of magnitude of 5.7 EJ. This amount is the truly renewable energy share that has no reinforcing impact toward the greenhouse effect. The transformation of food crops to biofuels is clearly not a significant way to brake the greenhouse effect. Even in the borderline scenario where the world population would starve, only a small amount of the fuel energy demand could be supplied and the savings of greenhouse gas (GHG) emissions shrink further when all non-renewable energy inputs necessary for the production of biofuels are considered from well to wheel. If only 14% of this world-wide food crop production were considered surplus and assigned to bioenergy production, the net energy yield would have allowed to save 75 million tonnes of carbon dioxide emissions with mineral oil derived carbon. This represents 0.3% of global CO_2 emissions in 2004 [3].

What does bioenergy represent in the context of food supply?

According to the UN Food and Agriculture Organization (FAO), 854 million people (14% of the world-wide population) were chronically malnourished between 2001 and 2003, 96% being located in developing countries and 4% in industrialised countries [4]. Therefore, we do not face an agricultural production surplus of 14%, but rather fail to supply enough dietary energy for 14% of the current world population. Furthermore, the present world population is expected to grow from 6 billion in 2000 to approximately 8.2 billion by 2030 [5]. Combining this trend with the sustainability requirement to supply the needs of the current generation, leads to a necessary growth in the global dietary energy supply by 37% until 2030. By then, the World Health Organization requests that the global average dietary energy supply increases from 2800 kcal per person per day in 2000, to 3050 kcal per person per day.[6]. This could only be realised either with a corresponding increase in agricultural surface or agricultural productivity. However, an expansion of the agricultural surface is unanimously considered impossible without an immense damage to the environment. Significant gains in productivity are also rather questionable when looking at current trends of soil degradation [studies quoted in 2]. The assignation of first-generation biofuel production to current agricultural production is globally contradicting the principles of sustainable development because not only does it compromise the ability of future generations to meet their own needs for food, it fails to even meet the needs for food of the present.

European overproduction or global nutrient misbalance?

According to the European Environmental Agency (EEA), not more than 15 million ha will be available in the EU (EU-25) in 2010 for bioenergy production without compromising the environment, when surfaces traditionally allocated to food and raw material production for export, are included [7]. Additional surfaces may be also available later in 2020 or 2030. However, their lower productivity or poor accessibility for agricultural machines makes them attractive for minor additional biofuel productions only if energy prices are high. Interestingly, 93% of the EU's 16.3 million tonnes demand of soybeans was supplied from countries outside the EU, the most important exporters being Brazil, the United States and Argentina. A total of 5.3 million ha of land were needed in 2005 for this production assigned traditionally as human food and power fodder meals after separation from oil [8]. Rape and soy fruits have the same typical yield (about 2.5 tonnes/ha*yr) but have different meal/oil ratios (rapeseeds: 40% oil – 60% meal; soybeans: 20% oil – 80% meal). If the vegetable soybean meals – the traditional target of soybean production - were substituted for meals of rapeseed grown in Europe, a surface of 7 million ha would be needed in Europe. Considering that the European maize demand exceeds European domestic production, a further half a million ha would be needed to produce the imported difference [8]. Taken together, the surface required for a European substitute for soybean and for full production of the demand for maize represents half of the surface considered by EEA as available for biofuel production in Europe. It is apparent that European agricultural surfaces that are presumably not needed but could contribute to sustainability with food production for exports, are shrinking.

Enhancement of poverty and malnourishment with biofuels

The European domestic production of vegetable oils are now largely directed toward the Production of biofuels. This has already lead to doubling the price of agricultural commodities used for biofuel production within the last 3-4 years. Experts believe this trend will continue in the next years [see EPEA study, 2]. Food will therefore get decreasingly affordable for an increasing part of the world population, including first (but not only) those 1,5 billion people in developing countries who receive less than US$ 1 or less per day and allocate half of this for food.

Deforestation as a massive accelerator of the greenhouse effect with biofuels

Another effect introduced by the demand for biofuels and vegetable oils is deforestation. Its impact is horrendous; it is contradicting by far the original intention to contribute to a brake in the greenhouse effect. The switch from a domestic nutrient production for cattle to a production of soybeans, was already responsible for the conversion of rainforests to agricultural land, and the production of soybean oil as a side product. In this conversion process, an order of magnitude of 180 tonnes of carbon stored in the aboveground biomass of the forests was released to the air as CO2 per hectare [9; 10]. To counterbalance this, the carbon content of a yearly soybean oil production is about 400 kg/ha. The positive effect of using renewable resources for the climate is therefore bought with an initial carbon dioxide emission investment, which gets a net return in the form of avoided fossil carbon emissions from conventional diesel fuel only after 450 years (0.4 t*yr-1/180 t = 450 yr). Additional investments needed in the form of fuel for the agricultural machines, transportation and processing of biodiesel are not even included in the figure. Very productive palm plantations grown in Southeast-Asia yield 5 tonnes of oil per ha each year (retaining about 4 tonnes of carbon), which is greater than soybean oil production by a factor of 10. These plantations are grown on former rainforests that typically retained even more carbon (235 tonnes / ha) than Brazilian ones. In some Southeast Asian areas, even greater carbon amounts that are stored in the peat underground are also made accessible to biodegradation and conversion to greenhouse gases in the course changes in land use [11, 12, 13]. The "amortization" time for the initial carbon dioxide emissions resulting from deforestation amounts to 59 years with this queen of vegetable oil-producing plants, when energy for the production of oils and their conversion to biodiesel are not considered. When energy for the production of oils and their conversion to biodiesel are taken into consideration, amortization time is 74 years, and centuries when the peat is burnt prior to plantation or is biodegraded in the course of decades of palm cultivation on drained soils! After a hundred years after the initial deforestation in Asia, only 38% of CO2 emission investments are amortized when biodiesel originating 50:50 from rapeseed oil and palm oil is used as biofuel in cars. In 1996, the UN Environmental Programme (UNEP) already published figures showing that changes in land use are responsible for more than 20% of the global emissions of carbon in the form of greenhouse gases (GHGs) [14]. More recent estimates see the contribution of changes in land use being even higher [15]. Eighty percent of the GHG emissions in Brazil result from the conversion of forests and savannahs to agricultural land. World-wide, Indonesia is world-wide the third GHG emitter after the United States and the People's Republic of China for the same reason [16]. The recent laureate of the German Environmental Award, Prof. Dr. Ernst-Detlef Schulze, director of the Max-Planck-Institute for Biogeochemistry in Jena, points out to the major role of forests and soils as carbon stocks that need to be maintained as such [17]. In Figure 1, carbon movements are modelled over a period of 100 years for biodiesel use after palm oil production on former rainforest areas with 2 metre-deep peat land underground and the educated guess that peat will degrade at a rate of 12 tonnes of carbon per hectare per year (See EPEA report [2]).

Economic inefficiency of biofuels (at least of first generation)

Biofuels are not only putting a dangerous pressure on global food supply; They are also extremely expensive when measured against their ability to reduce greenhouse gases. The Rhine Westphalian Institute for Economic Research compared the price of saving one tonne of GHGs with different options and showed that increases in efficiency of power plants lead to the same results at less of a tenth of costs with the first-generation biofuel option [18]. In this study, the authors did not even consider the impact of deforestation, which would rocket the cost for CO2 saving with biodiesel to the infinite. Other options thought to be much more affordable than biofuels for the same effect consist of creating incentives to save energy with new motor and architecture designs.

Can some biofuel options be sustainable ?

For a part, yes, but their identification depends on criteria that will need to be much tighter than those presented in box 1, in order to match with principles for sustainability.

1 How should a biofuel sustainability system be designed?

1.1 Do you think the "possible way forward" described above is feasible?

In the definition of a "possible way forward", the commission proposes that the legislation lists the "sustainability criteria" to be fulfilled by the biofuels recorded as suitable for fulfilling the biofuel targets (a). The approach is correct if criteria considered go largely beyond those drafted in box 1 and encompass subjects handled above and other. Criteria are defined at two levels. The first level defines the positive end effect to avoid the negative end effect and is directly derived from the sustainability definition of the Brundtland report. The second level defines conditions for establishing that the criterion is fulfilled. Each criterion must be fulfilled as proposed in the consultation paper (b), and the technical control of application may occur by application of the subsidiary principle, as suggested in (c). However, the EU commission gets a mandate to compile national results for the assurance of EU fitting with global targets needed.

Some suggested criteria for a biofuel sustainability system:

Criterion 1: "Biofuel production does not compete with the food production necessary for eradicating malnourishment within and outside the EU"

Some conditions for fulfilment are

- Biofuels are not to be produced as the sole target of agricultural production so long as chronic malnourishment has not been globally overcome, and the feedstock for biofuel production is made of side products of traditional assignations of agricultural and forestry productions for food, textile and chemistry.
- The export of matter from fields do not exceed the capacity of soils for humus regeneration.
- The export of matter does not contradict the recycling of critical nutrients.
- The EU (seen globally) does not import more nutrients from outside the EU (seen globally) than could be produced on set-aside surfaces within the EU. Descriptors of nutrients to be at least recorded are dietary energy, protein content and phosphorous.

Remarks:

This criterion sets human rights and the fulfilment of the needs of the population as a priority before protection against climate change. It is further reinforced by the analysis made above that biomass-derived energy will not be able to produce more than a marginal share of the global energy demand without massively impeding a fundamental right to the access to sufficient food. A critical nutrient is phosphorous, whose deficit in recycling induces the use of either scarce non-renewable resources (low heavy metal containing phosphate rocks available for not more than 20 years at the current level of depletion), or of problematic phosphate reserves containing radioactivity and high levels of toxic heavy metals (e.g. cadmium, lead, uranium) [more in 2]. As long as malnourishment is not overcome globally, then feedstock that is susceptible to sustainable energy usage, is restricted to residual materials of agriculture and forestry (e.g. straw, dung, small dimensioned wood, etc.), the food processing industry and meal residues. The last bullet point is to avoid discrimination between domestic production and imports, but also to set a priority of sustainability goals on trade legacy.

Criterion 2: Biofuel production contributes to the prevention of climate change

Some conditions for fulfilment are

- Global changes in land use no longer contribute to greenhouse gas emissions.
- Biofuel production and use achieve greenhouse gas savings greater than from the reforestation of agricultural surfaces that are no longer required for food, textile and chemical raw material production.

Remarks:

The analysis made above is pointing out to the fact that biological cycles are apparently overburdened by changes in land use. The first priority is therefore to stop causes of deforestation and subsequent release of GHGs resulting from underground carbon stocks. Taking Criterion 1 as fulfilled, a production of biomass for biofuel production is acceptable if greenhouse gas savings are given. This is the case when:

- all greenhouse gas emissions are taken into account from 'well and field to wheel' (for biofuels) and from 'well to wheel' (for conventional fuels) and include those resulting from changes in land use.
- **AND** the resulting positive difference between biofuel and conventional fuel is greater than the biomass that would have been fixed on the same area in the same lapse of time with forestry. For example, the production of rapeseed oil biodiesel requires energy for the cultivation of rapeseeds, for pressing and the conversion of oil to oil methylester that amounts to about 40% of the gross energy output. The use of nitrogen fertilizers further induces an emission of laughing gas of about 3.6 kg/ha rape*yr [19]. Laughing gas, having a 300-fold higher greenhouse potential than carbon dioxide, reduces the net greenhouse gas emission savings to 820 kg CO_2/ha*yr.

Instead of rapeseed production, the reference 1 ha could have been used for reforestation. In Europe, the yearly wood growth amounts to a magnitude of 8 m3/ha*yr. This corresponds to a dry wood mass of 3,740 kg that contains 1,870 kg carbon, and therefore the potential to bind 6,857 kg of CO_2 per ha*yr [based on largely converging data found in the following publications, 20,21,22,23,24,25,26,27,28]. The efficiency of net GHG emission prevention by binding CO_2 as wood on land that is no longer required for food production is about 8-fold greater than when biofuel is made for transportation alone on the same surface. After 100 years, 686 tonnes of CO_2 will have been fixed as wood biomass on one ha. With the biodiesel option based on the cultivation of rape, the best oil yielding plant for temperate regions, only 82 tonnes of CO_2eq emissions will have been effectively avoided (8 times less). Considering the comparatively high contribution of reforestation to reducing climate change (when compared to many biofuel options, including all first-generation biofuel options),

efforts should be considered for the recultivation of at least a part of the strongly degraded land that, in 1996, amounted to 1.2 billion ha world-wide (14% of the overall used surface) and 158 million ha in Europe (20% of the overall used surface). The development of synthetic humus to retain rainfalls could help to provide trees with the necessary regular water supply that is not guarantied on strongly eroded surfaces in hot regions. A thorough analysis of this option is however required to assure commensurability of investments and results. In the case of processing biowaste flows to energy, the second condition does not apply because
biowaste flow is occurring in any case, and indeed qualifies as a resource via this processing method.

Other criteria
A series of other criteria would have to be defined. This includes the protection and recovery of biodiversity, recovery of water reserves and water pressure, soil quality, costs of CO2 saving options, etc.

1.2 What do you think the administrative burden of an approach like the "possible way forward" would be? (If possible, please quantify your answer)

Given the current sustainability situation, it is clear that at least first-generation biofuels are a premature option for a contribution to the protection of the climate. It appears preferable to orientate efforts in the development of solutions to eradicate extreme poverty inside and outside of the EU and to configure a monitoring system for establishing international nutrient balances, and integrate them in political decision-making. Reforestation is then likely to be the most powerful option to combat climate change, especially when considering the positive effects for recovery of biodiversity, the retention of rainfalls and the regeneration of water reserves. No administrative burden can be identified.

1.3 Please give your general comments on the "possible way forward", and on how it could be implemented. Does it give an adequate level of assurance that biofuels will be sustainably produced? If you think the problem should be tackled in a different way, please say how, giving details of the procedures that would be used.

Providing that criteria to effectively depict the sustainability of biofuels are further developed and some biofuel options are indeed able to meet all these criteria, “the possible way forward” described is likely to be effective.

1.4 Carbon stock differences between land uses would be taken into account under criterion 2. Should they also be taken into account under criterion 1? If so, what method should be used to determine how the land in question would have been used if it had not been used to produce raw material for biofuels?

The effects of changes in land use should definitively be included in Criterion 1. The method proposed is the calculation of the time for (physical) amortization of initial GHG investments resulting from changes in land use, with GHG emissions saved with biofuels. This has been presented and illustrated in the introductory section. Changes in land use include deforestation (including conversion of above-ground and underground biomass, and eventual peat to carbon dioxide) and conversion of pasture biomass to biofuel feedstock. Further investments to be included in calculations are the well-to-wheel fossil carbon inputs contained in energy for agricultural production, harvesting and transformation to ready-for-use biofuels. Due to the extremely high potential of laughing gas (N2O) as a GHG, nitrogen stock differences should also be considered in a thorough way, since laughing gas may have the potential to more than annihilate the climate protection potential of carbon dioxide savings. This following calculation illustrates the consequences of including N2O in the life cycle of second-generation biofuels after the gasification of biomass: Biomass, which contains 4.5% (1.2-7.5%) nitrogen [29], could lead to the production of a theoretic maximum of 70 kg (24-118 kg) N2O during the gasification of 1 tonne of dry biomass. Based on stoichiometry and without even taking into account energy for the conversion of biomass to liquid (BtL), BtL derived from 1 t biomass replaces a maximum of 450 kg of mineral oil for conventional diesel production (well-to-wheel) and correspondingly saves a maximum of 1,430 kg of CO_2. The greenhouse potential of N_2O is 300 times the greenhouse potential of CO_2. From this, it follows that the generation potential of greenhouse gases is 15 (5 to 25) times higher than when compared with substituted conventional diesel. The low oxygen conditions of gasification speak in favour of an important production of the non-maximally oxidized forms of nitrogen that N_2O and N_2 represent. This aspect is not described in literature to the current knowledge of the authors of this contribution.

1.5 As described in the "possible way forward", criterion 3 focuses on land uses associated with *exceptional biodiversity. Should the criterion be extended to apply to land that is adjacent* to land uses associated with exceptional biodiversity?
If so, why? How could this land be defined?

Yes, land adjacent to land with exceptional biodiversity should be considered with avoidance of monocultures. Monocultures show low biodiversity and can disturb the biodiversity at least in the periphery of the areas with high biodiversity. Disturbances can occur via water depletion, pesticides, genetically engineered biofuel crops, etc.

1.6 How could the term "exceptional biodiversity" (in criterion 3) be defined in a way that is scientifically based, transparent and non-discriminatory?

We invite to consider opinions of specialists on biodiversity.

2 How should overall effects on land use be monitored?
2.1 Please give your comments on the "possible way forward" described above. If you think the problem should be tackled in a different way, please say how.

The “possible way forward” defined under point 2 is meaningful if it includes a monitoring of social and environmental effects of a European biofuels demand on land use **within, as well as outside** the European Union. The monitoring of effects should be aligned with principles for sustainability of the Brundtland commission.

2.2 Do you think it is possible to link indirect land use effects to individual consignments of biofuels? If so, please say how.

First-generation biofuels are highly destructive as a competitor with food supply and as drivers for additional deforestation, at least in tropical regions. A forbiddance of these biofuels, rather than establishing the link of indirect land use effects to individual consignments, is preferable. A second-generation biofuel that may reach technical maturity is cellulosic bioethanol. It is likely not to be able to be differentiated from first-generation bioethanol that results from the fermentation of cereals or sugar beets based on markers of composition. In that case, cellulosic ethanol, only with an inner-European origin, could be allowed because tracing consignments back to the production is more likely possible than when consignments are imported. The same analysis applies to BtL.

3 How should the use of second-generation biofuels be encouraged?
3.1 How should second-generation biofuels be defined? Should the definition be based on:
a) the type of raw materials from which biofuels are made (for example, "biofuel from cellulosic material")?
b) the type of technology used to produce the biofuel (for example, "biofuels produced using a production technique that is capable of handling cellulosic material")?
c) other criteria (please give details)?

Neither the type of raw materials as such nor the type of processes as such should underlie the definition of second-generation biofuels that deserve support, but the combination of raw materials and process chains. Depending on the results of a detailed assessment of the processes and their alignment with proper criteria, as they are proposed here or remain to be developed, the combination of straw as a raw material with the cellulosic ethanol production process could be acceptable, but the combination of straw with BtL production may not. A thinkable reason for differentiation may be that in one combination (raw material / process), a climate change braking potential is given, whereas in the other, a laughing gas production annihilates the beneficial effect of making use of renewable carbon stocks. Due to the low level of effectiveness of biofuels to brake climate change, the definition of process chains should include an analysis of alternatives for feedstock assignment, which may be more profitable and make better use of the organisation of biomass e.g. in biorefineries with subsequent chemical applications.

3.2 Please give your comments on the "possible way forward" described above. If you think the problem should be tackled in a different way, please say how.

The legislation should forbid first-generation biofuels because they do not pass a sustainability test. Biofuels produced based on making use of biowaste flows should be given an advantage in the support system of member states. These biofuels may not only include cellulosic ethanol or syngas derivatives but also biogas.
Remark:
Syngas derivatives are the result of strong degradation of organic matter that, contrary to biogas and cellulosic ethanol, may prevent the recycling of critical nutrients, depending on their form (See first criterion proposed here).

3.3 Should second-generation biofuels only be able to benefit from these advantages if they also achieve a defined level of GHG savings?

If more energy is required to transport biowastes to the processing infrastructure and bring the nutrients back to where they can be properly recycled in agriculture than can be obtained as an output of the process, then it is of course meaningless to make the effort.

4 What further action is needed to make it possible to achieve a 10% biofuel share?

4.1 Should the legislation include measures to ensure that diesel containing 10% biodiesel (by volume) can be placed on the market, and is in fact placed on the market?

No. The 10% substitution target is surely not achievable in a sustainable way.

4.2 Should the legislation include measures to encourage the use of ethanol and biodiesel in high blends?
If so, what?

No. For the same reasons as in 4.1.

4.3 Should the legislation include measures to encourage the use of biomethane, methanol and DME in transport? If so, what?

No. For the same reasons as in 4.1.

4.4 4.5 Should the legislation ask the Commission to review, by a given date, whether it is possible to be confident that the 10% target can be achieved through:
a) rules that allow 10% blending by volume of ethanol in ordinary petrol, plus
b) rules that allow 10% blending by volume of biodiesel in ordinary diesel, plus
c) the four options listed under 'other options for solving the problem';
If so, what should the date be? If the review were to conclude that the target is unlikely to be met, what action should the Commission take?

No. For the same reasons as in 4.1.

4.5 More generally, what role should taxation play in the promotion of biofuels (considering different situations such as low blends, high blends and second-generation biofuels)?

Taxation of deficits in the sustainability of conventional fuels and no less of biofuels, could be an option to support social and environmental repair measures.

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