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"Marginal land" for energy crops: Exploring definitions and embedded assumptions

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HIGHLIGHTS

- Qualitative methods were used to explore definitions of the term "marginal land".
- Three definitions were identified.
- Two definitions focus on overcoming biomass land use controversies.
- One definition predicts what land will be used for growing biomass.
- Definitions contain problematic assumptions.

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ABSTRACT

The idea of using less productive or "marginal land" for energy crops is promoted as a way to overcome the previous land use controversies faced by biofuels. It is argued that marginal land use would not compete with food production, is widely available and would incur fewer environmental impacts. This term is notoriously vague however, as are the details of how marginal land use for energy crops would work in practice.

This paper explores definitions of the term "marginal land" in academic, consultancy, NGO, government and industry documents in the UK. It identifies three separate definitions of the term: land unsuitable for food production; ambiguous lower quality land; and economically marginal land. It probes these definitions further by exploring the technical, normative and political assumptions embedded within them. It finds that the first two definitions are normatively motivated: this land *should* be used to overcome controversies and the latter definition is predictive: this land is *likely* to be used. It is important that the different advantages, disadvantages and implications of the definitions are spelled out so definitions are not conflated to create unrealistic expectations about the role of marginal land in overcoming biofuels land use controversies.

1. Introduction

Growing energy crops on "marginal land" is seen as a way of ensuring that biomass production involves an acceptable and sustainable use of land (Reijnders, 2009; International Energy Agency, 2010).[1]

The production of biomass on agricultural land has raised a number of interrelated controversies. Competition for land between biofuels and food crops is seen as one of the causes of food price spikes that occurred in 2007 and 2008, leading many to conclude that biofuels production was unethical: the so called "food versus fuel" controversy (McMichael, 2010; Mol, 2010; Ribeiro, 2013). There is the issue of the direct and indirect destruction of natural lands and land with high carbon stocks resulting in the release of carbon emissions (Nuffield Council on Bioethics, 2011; Gamborg et al., 2012). Indirect Land Use Change (iLUC) is the use of agricultural land that displaces food production and causes natural land elsewhere in the world to be cultivated for food instead – indirectly leading to the use of natural land. An influential paper by Searchinger et al. (2008) stated that greenhouse gas emissions from biofuels production could be significantly *higher* than those

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[1] This paper will use the term biomass to refer to any organic material that is used in energy production, whether for heat, power or transport fuel. The use of biomass in transport fuel will be referred to as biofuels. Most of the land use controversy surrounding biomass production has thus far been concerned with biofuels for transport so this paper will focus on biofuels in particular.

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of fossil fuel use once emissions from indirect land use change were factored in. Similar papers calculating the indirect effects of biofuels production followed (Melillo et al., 2009). The sheer scale of the land use required to meet targets has also raised doubts about biofuels, with some pointing out that they would have a large impact on the agricultural sector and a relatively small impact on the energy sector (FAO, 2008).

This paper will refer to these factors together as the land use issue or controversy. The use of marginal land is cited as a way of overcoming land use controversies because, as the UK government states in the 2009 Renewable Energy Strategy: "Use of this [marginal] land will reduce the risk of competition with existing food crop production, and help ensure that any associated land use change does not have a significant impact on the anticipated greenhouse gas savings or pose any other significant detrimental environmental impact" (HM Government, 2009 p. 114). The production of biofuels from wastes and residues is seen as another way of dealing with these issues, as well as the production of both animal feed and biofuels from food crops (Ozdemir et al., 2009; Drax Group plc, 2011).

The idea of putting "marginal land" in areas where farming is currently unprofitable to a more productive use while meeting energy goals is an appealing one. Energy could be locally grown, produced with few inputs, not compete with food production and give farmers an additional income (Schubert et al., 2008). Some controversy surrounds the idea of using marginal land however (The Gaia Foundation et al., 2008). Two prominent questions relate to what "marginal land" actually means and how claims about marginal land would be put into practice.

These questions are worth asking because of the rhetorical force of the concept of marginal land in debates about biomass, particularly biofuels for transport. Hype about future technologies can be used to raise expectations and tap into cultural expectations of scientific progress leading to societal progress (Brown, 2003). Talk of marginal land could be seen to raise expectations about the production of abundant, sustainable biomass. The concept marginal land has not made its way into UK or EU biomass policy as yet but we can ask whether it will in the future. Will the idea that using marginal land can circumvent iLUC lead to more favourable treatment of non-food energy crops in EU policy? How will the marginal land issue influence perceptions of non-food based energy crops and the land issues they raise?

This paper will focus on the question of what "marginal land" actually means. It will use qualitative social sciences methods to identify different definitions of marginal land in a selection of academic, industry, government and civil society (including NGO) documents in the UK. It seeks to highlight the ethically relevant values and assumptions embedded within these definitions and suggests challenges to these assumptions. Three different definitions of marginal land will be presented: (i) land not fit for food production, (ii) ambiguous lower quality land and (iii) "economically marginal land". It will highlight technical assumptions about where and under what conditions it will be possible to grow energy crops, political assumptions about the feasibility of implementing land use strategies and normative assumptions about how much food production should be displaced and the acceptability of displacing environmental "uses" of land. We will see that definitions (i) and (ii) have a normative motivation: energy crops *should* be grown on this land to avoid further land use issues and definition (iii) has a practical motivation: energy crops are *likely* to be grown on this land. It is important that the different advantages, disadvantages and implications of the definitions are spelled out so that definitions are not conflated to create unrealistic expectations about the role of marginal land in combating biofuels land use controversies.

2. Background

This paper focuses on the use of marginal land for biomass production, regardless of whether it is used in biofuels for transport, heat or power applications. The concept of marginal land in the UK is often tied up with the production of perennial energy crops such as willow and miscanthus because it is suggested that they do not need to be grown on prime land (Nuffield Council on Bioethics, 2011). A relatively small quantity of perennial energy crops are currently grown in the UK for heat and power production (DEFRA, 2012). The production of liquid biofuels from these feedstocks is not yet undertaken commercially because of technical and/or economic challenges (Nuffield Council on Bioethics, 2011).[2] The majority of biofuels currently come from wastes such as used cooking oil or food crops (Department for Transport, 2012).

Before the land use controversies and criticisms of biofuels outlined in the introduction became widespread, marginal land was not widely promoted in the UK as somewhere suitable for energy crop production. In fact, quite the opposite, in one instance unproductive land is framed as marginal for energy crops. An academic document in 2005 estimating the amount of land available for perennial energy crops production in Scotland states that ideally crops should not be planted on "marginally suitable land" because yields would not be significant and production would unlikely be profitable (Andersen et al., 2005). The term refers to "land with low yield potential and/or severe harvesting conditions" (p. 74). This definition is echoed in a report written by the Royal Commission on Environmental Pollution (RCEP 2004) in 2004. The report led to the establishment of the Biomass Task Force and the publication of the UK Biomass Strategy in 2007.[3] The report contains no references to the problems of direct and indirect land use change and only refers to "marginality" in the following context: "Farmers currently see willow as a marginal crop and will make use of subsidies by planting on set-aside land. The land chosen for set-aside is often the lowest quality land and this could also result in reduced yields" (p. 11). Here the term "marginal" is used to signify that farmers do not regard willow as an important crop and as such it risks being put on the least productive land resulting in the lowest yields. The potential association of biomass production with "marginal land" or as a "marginal crop" is seen as a hindrance to its development in the UK. We can see that this changes after the height of the controversies in 2007 and 2008 when marginal land is promoted as land where energy production should take place.

The term marginal land is part of a family of related labels used to characterise the type of land that is promoted for biofuels production such as idle, unused, suitable, free, spare, abandoned, under-used, set aside, degraded, fallow, additional, appropriate, under-utilised land. The definitions of these terms are also ambiguous and fluid and there are many interesting conceptual issues raised, particularly in relation to the linguistic negotiation of "free" and "unused" land. A preliminary study done by Slade et al. (2010), as part of a large UK Energy Research Council (UKERC) funded project into potential biomass resources, gives an exposition of the work previously undertaken in estimating biomass potential and the different classifications of what counts as "available" land. For the sake of simplicity and conceptual neatness this paper will restrict the analysis to marginal land.

[2] It is stated that certain conversion pathways for producing biofuels from non-food feedstocks do not face technical challenge, only economic challenges and indeed production of ethanol from lignocellulosic materials is currently in commercial production to a limited extent (Rødsrud et al., 2012). Other technologies are seen to face technical challenges also.

[3] This was superseded by the UK Bioenergy Strategy in 2012.