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Future-proofing the farm: On-farm wind turbine development in farm business decision-making

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ABSTRACT

The European Union is committed to increasing the renewable energy produced and consumed within its territory, creating an opportunity and demand for renewable energy production on agricultural land. In this paper, Ajzen's theory of planned behaviour (TPB) is utilised to structure qualitative research on the role of renewable energy production in farm business decision-making, through a case study in North East Scotland. Qualitative interviews were undertaken with 23 farmers who had pursued wind energy production, and a further nine key informants. It is found that farmers undertake wind energy production primarily to 'future proof' their farms, increasing the long-term economic viability of their farms through business diversification and profitable capital investment. Although environmental considerations were not the primary consideration in turbine development, respondents recognised the energy dependence of farming and the depletion of world energy resources, including these issues in their rationales. The primary obstacles to turbine development focused around economic risks and transaction costs, which some respondents moderated by reducing turbine size or renting land to developers, thus increasing their 'perceived behavioural control'. Relationships between intention and behaviour are thus found to be multi-directional. The authors argue that on-farm renewable energy production could lead to increased environmental awareness among farmers (and thus more economically and environmentally sustainable agricultural practices), as well as providing a potential economic boost for local economies, but that these opportunities are at risk of being co-opted by large-scale energy companies, which are better able to negotiate the growing complexities and risks of turbine development.

Introduction

The European Union is committed to increasing the use of renewable energy sources, aiming to reduce greenhouse gas emissions and increase energy security. The European Commission's 1997 White Paper set the first target at producing 12% of energy consumed by 2010 (European Commission, 1997); most recently, the 2009 EU Directive (2009/28/EC) set binding national targets for member states, through which 20% of the EU's gross energy consumption should be produced by renewable energy sources by 2020 (Schwarz et al., 2012). Within the UK, Scotland has set a target of sourcing 30% of its total energy demand from renewable sources, including the equivalent of 100% of electricity consumed (Scottish Government, 2011).

Much of this renewable energy production will be undertaken on agricultural land. In 2010, biomass and waste were the most important sources of renewable energy in the EU, accounting for two thirds of production in the EU-29 (Eurostat, 2013). In the UK, grants for farm businesses to produce renewable energy were introduced in the 1980s (MAFF et al., 1987) but the introduction of Renewables Obligation Certificates (ROC) in 2002[1] enabled developers, including farmers, to undertake renewable energy production with prices guaranteed through contracts. Through the ROC mechanism, energy companies were required to ensure a set percentage of their energy was produced through renewable sources; if they were not producing sufficient energy through renewable resources themselves, they could purchase certificates from others. Support for on-farm renewable energy production received a further boost in the UK in 2010, with the introduction of feed-in tariffs (FiTs). These were specifically targeted at small scale producers, with higher tariffs than the ROC but limits on production to 5 megawatts (MW). This enabled farmers (and households) to undertake renewable energy production at a range of scales. The FiTs are available for renewable energy generation from wind, solar, hydro,

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[1] For England, Scotland and Wales. ROCs were introduced in Northern Ireland in 2005. (Ofgem, 2013).

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anaerobic digestion and domestic scale micro combined heat and power (DECC, 2011)[2].

Up-take of renewable energy production has been a subject of considerable academic interest in recent years. Attention has tended to focus on energy industry-level transitions (e.g. Raven, 2007; Raven and Geels, 2010; Verbong and Geels, 2007; Verbong et al., 2008), and on public perceptions (Walker, 1995; Land Use Policy special issue, 2010; West et al., 2010), governance (Cowell, 2010) and the potential for community involvement (Woods, 2003; Walker et al., 2010; Warren and McFadyen, 2010; Munday et al., 2011). There is a growing literature on on-farm renewable energy production, which predominantly utilises quantitative analysis to assess likelihood of farmer up-take. For example, it is consistently found that renewable energy production in Europe and North America is more likely to be taken up on large farms, with higher educated and younger owner–operators (Villamil et al., 2008; Tranter et al., 2011; Tate et al., 2012). There is some suggestion that solar energy production is most popular among UK farmers, followed by wind (Bailey et al., 2008; Tate et al., 2012; Mbzibain et al., 2013), although much of the up-take literature focuses on biomass and bioenergy crop production elsewhere in Europe and in North America (e.g. Mola-Yudego and Pelkonen, 2008; Villamil et al., 2008; Clancy et al., 2012; Huttunen, 2012). Attitudinal research suggests that improving farm profits is a primary motivator for on-farm renewable energy production (Tranter et al., 2011) and that start-up costs, tenure and planning restrictions are key barriers (Tate et al., 2012).

Recent literature on public perceptions of renewable energy has argued that that a deeper understanding of the positions of local actors is required, best achieved through qualitative research methods (Devine-Wright, 2005; Fast, 2013). There have been a large number of qualitative studies addressing farmer environmental behaviour, typically identifying the range and complexity of response to financial incentives (e.g. Morris and Potter, 1995), and contrasting the 'post-productivism' of agricultural policies with on-going productivist orientations at farm level (Wilson, 2001; Walford, 2003). However, there has been limited qualitative research into farmer perspectives on renewable energy production. One study in Finland demonstrated the different functions farmers associated with biomass heat production, contrasting these with academic constructions of multifunctional agriculture and suggesting that the environmental dimension was not an important motivator (Huttunen, 2012). This finding conflicts with quantitative research which suggests that reducing pollution risk and decreasing carbon footprints are very important for other forms of renewable energy production on-farm, such as biogas production (Tranter et al., 2011).

In this paper we utilise a qualitative case study to assess how renewable energy is considered in farm business decision-making, focusing specifically on how renewable energy production relates to agri-environmental considerations, social norms and perceptions of risk. The purpose of this article is two-fold: To assess the role of renewable energy production in farm business development, and to further develop the theory of planned behaviour (Ajzen, 1991, 2005) for use in qualitative research. This is achieved through a case study of on-farm wind energy production in North East Scotland, UK.

[2] The payment rate depends upon the technology used and the scale of the installation. In order to promote early uptake of the scheme, a degression was built into the FiTs. The generation tariff for new installations will be reduced each year. However, once the scheme has been taken up, the tariff remains constant at the rate of the year of installation.

Theory

This research utilised Ajzen's (1991, 2005) theory of planned behaviour as a conceptual framework. The basic tenet of the theory is that an individual's performance of a behaviour is best predicted – and understood – by assessing the individual's intention to perform this behaviour. Intention, in turn, is influenced by three conceptually independent determinants: Attitude towards the behaviour, subjective norms, and perceived behavioural control (Ajzen, 2005). These three determinants mutually influence each other, varying in importance with the behaviour in question. Although other factors can be important to the formation of intention (e.g. information access, personal and social characteristics, previous behaviour) these are conceptualised as influencing intention indirectly through the three determinants. In general, the stronger the intention to perform a behaviour, the more likely the behaviour is to occur.

Attitudes towards a behaviour reflect the individual's positive or negative assessment of performing the behaviour. This assessment is based on the attributes associated with that behaviour, such as the outcome, characteristics or associated costs (Ajzen, 1991). An individual is likely to hold multiple beliefs about a particular behaviour, reflecting these different attributes; these beliefs will therefore have different levels of salience and thus influence on the overall assessment (for example an individual may believe that air flights increase greenhouse gas emissions but may not consider this important to their decision to take flights to holiday destinations). The strength with which particular beliefs are held is therefore important.

Subjective norms are an expression of normative beliefs: Beliefs that individuals or groups who are important to the individual will approve or disapprove of the identified behaviour (Ajzen, 2005). In essence, subjective norms represent perceptions of 'peer pressure', which will be of greater or lesser importance for different individuals and behaviours. In some studies, personal or moral norms are included as a separate construct, to assess behaviours that have strong ethical or moral components (Ajzen, 1991). These were found to be important in an earlier study of farmer conversion to organic farming (Sutherland, 2011).

Perceived behavioural control is the sense of ability or self-efficacy to perform the behaviour of interest (Ajzen, 2005). The inclusion of this construct is the primary difference between the theory of planned behaviour and its predecessor, the theory of reasoned action. It was added in order to address behaviours over which individuals did not have complete volitional control (i.e. the resources and opportunities to perform the behaviour) (Ajzen, 1991). As with all three determinants of intention, it is what an individual believes that is important, not whether these beliefs reflect reality. If an individual believes it will be difficult to perform an activity (s)he is less likely to form an intention to undertake it, regardless of whether this is an accurate assessment. Unlike the other two determinants, perceived behavioural control is conceptualised as impacting directly on the behaviour, in addition to influencing the intention jointly with the other determinants. Ajzen (2005) proposes this additional connection for two reasons: Higher levels of perceived behavioural control (self-efficacy) are likely to lead to greater efforts to undertake the behaviour, and perceived behavioural control can act as a proxy for a measure of actual control.

The theory of planned behaviour has been used widely in social psychology, and in studies of farmer behaviour (e.g. Lynne et al.,1995; Beedel and Rehman, 1999, 2000; Cutforth et al., 2001; Bergevoet et al., 2004; Hu et al., 2006; Wauters et al., 2010). These studies are quantitative, as are the studies on which Ajzen (2005) based his theory. One of the criticisms of the theory of planned behaviour is that questionnaires require extensive development,