THE FUTURE CONTRIBUTION OF BIOENERGY ENTERPRISES TO RURAL BUSINESS VIABILITY IN THE U.K.

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Abstract

Bioenergy has been granted an official role in the UK to contribute significantly to sustainability targets in the coming years and yet the position with farmers and rural entrepreneurs is generally confused. Financial support, electricity tariffs, the availability of advice and the profit foregone from other enterprises have all fluctuated. The level of adoption of the new technology is not as advanced as in other EU countries. This study seeks to discover why this could be by exploring the entrepreneurial, financial and motivational environments that bioenergy adopters are working in.

The following hypotheses have been developed:

1. *The entrepreneurial environment for bioenergy development in the UK is sympathetic to the needs of this emerging industry;*
2. *Adopters of bioenergy are positively motivated towards the venture; and*
3. *Farm based bioenergy enterprises make a positive contribution to overall farm business viability.*

The UK government is looking to rural entrepreneurs to play a role in this through the adoption of bioenergy technologies which can contribute towards achieving the country's energy and climate change targets and at the same time offer potential farm enterprises that could be viable long-term contributors to farm enterprise sustainability (NFU, 2008). The rate of adoption of bioenergy on-farms has been lower than expected suggesting that government objectives might not be achieved. This study extends and applies the concepts of entrepreneurship environment and country institutional profiles (Busenitz et al., 2000; Gnyawali and Fogel, 1994; Kostova, 1997) to a specific domain of entrepreneurship in the land based bioenergy sector in the UK.

The UK bioenergy industry is comprised of a number of enterprises that reflect a relatively densely populated country that has historically comprised an even split between livestock/grass based enterprises and arable based enterprises. The former attracts interest in anaerobic digestion and biogas, whilst the latter attracts interest in biofuels and the combustion of wholecrops and crop residues for heat and power.

The methodology and results of this study are expected to provide a framework geared towards stimulating the uptake of bioenergy on land based enterprises as a means for their regeneration and growth. A capital decision making model for the bioenergy sector is expected comprising of both qualitative and quantitative business drivers which explain the viability of farm based enterprises. This model should provide a basis for policy formulation as well as serve as an investment decision tool for all stakeholders involved with capital investment decisions in bioenergy enterprises.

Keywords: Bioenergy, entrepreneurship, entrepreneurial environment, viability, sustainability, UK

Introduction and literature review

The following section reviews literature on the institutional profile for entrepreneurship in the renewable energy sector in the UK. The objective is to identify variables that explain the behaviour of UK farmers and to construct a theoretical or conceptual framework to support the study. It is organised into three sections in line with the three constructs of the institutional profile adopted in this study.

The UK Government has formally recognised the need for reducing the impact of traditional country's energy consumption on climate change. As a result, a number of environmental targets have been defined: to reduce the emissions of CO_2 by 80% by 2050 and 26% by 2020; 10% of transport fuel; 12% of heat; and 30% of electricity from renewable energy (CCA, 2008, DECC, 2010). The UK Government is looking to the rural sector to play a substantial role in these developments (DEFRA, 2007; NFU, 2008) especially because renewable energy offers important opportunities and potential enterprises that could be viable long-term contributors to farm business sustainability. However it should also be noted that some RE technologies such as biomass and miscanthus potentially involve an increased risk to the farmer. Typically there is the fixed capital expenditure on plant to handle the crop, combust it and on the rhizomes themselves, plus the prospect of committing land to a 15-20 year single enterprise use. There is also the fickle nature of the value of bioenergy outputs and government support payments. Thus it can be seen that although there is potential to increase farm business sustainability this might not be realised for all adopters.

Additionally, in the face of a decline in traditional agricultural support, production and income alternatives for farmers seem necessary. Plieninger (2006) has argued that bioenergy represents the most outstanding alternative for traditional agricultural production. Through bioenergy production, farm businesses can be stabilised; production diversified and farm enterprises allowed to stay in agricultural business, acknowledging that along the same timeline of bioenergy adoption it is likely that farmers will also have to adjust to climate change (Tate et al, 2010). There are increasing concerns about the low level of adoption of bioenergy in the farm sector in the UK suggesting that government objectives might not be met (Sherrington et al., 2008). The UK Biomass Strategy suggests that to reach the technical potential of perennial energy crops such as short rotation coppice (SRC) willow and miscanthus by 2020 requires 350,000 hectares of land. This represents a more than 20-fold increase on the current 15,546 hectares (Sherrington and Moran, 2010 In Press). There is little agreement amongst scholars on the reasons for this poor deployment in the farm sector (Perry and Rosillo-Calle, 2008, Pollitt, 2010, Thornley and Cooper, 2008) and the need to understand and model the processes and consequences of farmers' decisions remains (Willock et al., 1999). Researchers have argued that adoption is not merely a question of relative profitability of different systems, but also reflects the lifestyle decisions of producers and so any analysis which confines itself to farm level financial measurements will be missing important factors (Burton et al., 1999; Willock, 1999; Wallace and Moss, 2002; Greenbank, 2001).

One objective of farm diversification from the farmers' perspective is to enhance farm incomes and ensure the sustainability of the business (Plieninger, 2006; IIbery et al., 2009). Policy makers are advocating a more entrepreneurial approach to farm business management because of its likely positive effects on business profitability and sustainability. What is known is that farmers, for whatever reason often find it difficult to be entrepreneurial (Tate, 2010) Unfortunately, there is little knowledge about the farm sector, the individuals who own bioenergy enterprises, what triggers them to engage in bioenergy and what contribution to business viability and sustainability bioenergy makes/can make to their farms given that farmers have rarely been an empirical setting for entrepreneurship research (Carter, 1998, Carter, 2001, Sara and Rosa, 1998).

With this theoretical background, the next section of this paper provides an outline of the conceptual framework proposed for this study followed by the literature review. The review focuses on the country institutional profile for bioenergy deployment in the UK to identify knowledge gaps and to highlight the contribution of this study to knowledge. The methodology proposed for the study is presented thereafter leading to some preliminary results of a pilot survey. The paper ends with a conclusion and future work.

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Proposed conceptual framework for the study

Vesala et al. (2007) studied the entrepreneurial identity of non farming and farming entrepreneurs. They concluded that portfolio farmers showed strong entrepreneurial traits including personal control, risk taking, innovative and growth oriented which were quite similar to non farming entrepreneurs who considered themselves more strongly as entrepreneurs than portfolio and conventional farmers while (Carter, 2001) differentiated between monoactive, diversified and portfolio farmers. Alsos et al. (2003) categorised farmers as being pluriactive when they or their family members carried out non farming income earning activities.

Based on this, it can be argued that farmers' interaction with the institutional environment will differ, in terms of their motivations and objectives, their appraisal of the environment and the type of bioenergy investments and strategies that they will engage in. It is important for policy makers to be aware of the different characteristics of farmers so that policies can be targeted more successfully (Rosenqvist et al., 2000; Sara and Rosa, 1998; Alsos et al., 2003).

Researchers have often considered that farmers respond to internal and external factors in the operation of their businesses (Bowler et al., 1996; Barlas et al., 2001; Maye et al., 2009).

Table 1: Internal and external factors affecting farm business operation

Internal factors	External factors
1. Changing farm profitability	1. regulation by the state
2. Employment status	2. market trends and opportunities
3. Family size and family life course	3. availability of new technologies
4. pressures on farm incomes	4. physical environment
5. characteristics of those who run the farms	5. social trends
6. farm management experience	6. behaviour of agricultural support organisations
	7. location

Source: adapted from (Bowler et al., 1996; Barlas et al., 2001; Maye et al., 2009).

According to these authors, these factors permit farmers to adopt capital accumulation (expansion or profit maximisation) or economic survival strategies. Farmer's decisions to exploit their lands for bioenergy were dependent on economic factors (input and output prices), expected yields, timeliness of operations, availability of investment capital, subsidies and other socio cultural characteristics of farmers (Bokusheva et al. 2007, Rounsevell and Reay, 2009).

Gnyawali and Fogel (1994), Fogel (2001) and Zapalska et al. (2003) conceptualised five issues which affected entrepreneurial behaviour including: (i) government policies and procedures; (ii) socioeconomic conditions; (iii) entrepreneurial and business skills; (iv)financial assistance and (v) non-financial assistance.

Institutions and the policies that shape them are therefore what allocate entrepreneurial efforts. If entrepreneurial efforts are to be allocated to productive investments, policy strategies need to be tailored to the institutional context of each economic region (Minniti, 2008). An assumption that is made in this study is that institutional dimensions affect the attitudes and intensions of entrepreneurs in the venture creation process (Fogel, 2001; Wallace and Moss, 2002; Willock et al, 1999; Burton et al., 1999).

The **regulatory** pillar of the institutional theory of entrepreneurship is primarily driven by the provisions of government legislation, industrial agreements and standards; (Bruton et al., 2010). Busenitz et al. (2000) define this as consisting of laws, regulations and government policies which

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provide opportunities, support for businesses, reduces risks and eases entrepreneurs' efforts to acquire production resources.

Table 2: A timeline of key policy instruments in the UK

Year	Policy initiative
1989	Deregulation and Non Fossil Fuel Obligation (NFFO) set
1997	Government encouragement for biofuels
1998	Investment subsidies
2001	Carbon tax
2002	Renewables Obligation
2002	Capital grants
2010	Feed in tariffs

Source: adapted from Thornley and Cooper (2008 p. 908) and DECC (2010)

The UK Biomass Strategy published in May 2007 (DEFRA, 2007) was presented as meeting the need for a coherent strategy for bioenergy deployment in the UK (Slade et al., 2009).The Renewables Obligations (RO) has been the main UK government policy instrument to support the development of RE since 2002. This is a system of tradable permits or renewable obligations certificates (ROCs). After years of its operation, it has been acknowledged (DECC, 2010) that the RO was not designed with small projects in mind. The RO favours mainly electricity based technologies while non-electricity technologies are disfavoured (Mitchell and Connor, 2004). Pollitt (2010) concluded that the real failure of the UK policy has been to gain practical support from investors while other instruments like the renewable transport fuel obligation, the climate change levy and the EU trading schemes have achieved very little impact.

Non financial assistance refers to any form of sponsorship provided to create an environment that is munificent for the creation and survival of businesses (Flynn, 1993). At creation, non financial assistance may help facilitate access to other types of resources needed by the nascent entrepreneur. Many organisations have emerged with the objective of providing non financial assistance to farmers interested in renewable energy in the UK. These include public and private sector organisations. The most prominent are government departments: Department for Environment, Food and Rural Affairs, Department of Energy and Climate Change; non department public bodies: Environment Agency, Research Councils and quasi autonomous government agencies: Carbon Trust, Energy Saving Trust and Ofgem (Slade et al., 2009). It would be expected that the more assistance farmers have, the more they will engage in renewable projects. Non financial assistance enhances the human, social and financial capital of entrepreneurs (Jenssen and Havnes, 2002). This has stopped short of widely available free business specific consultancy which has not been available to farmers and other rural entrepreneurs for some time.

The ability of the entrepreneur to put together financial resources is very important for the take off, growth and subsequent survival of any business (Alsos et al., 2006). Financial incentives are particularly relevant for renewable energy deployment because they offer the possibility for farmers to carry out farm investments which might not be justified by purely potential economic returns. Incentives are also valid considering that the initial investment for Renewable Energy Technologies (RETs) is usually costly and of a capital nature. In effect, most countries involved in the promotion of this type of energy employ some form of financial support. This includes capital grant schemes and subsidies (DECC, 2009a), feed in tariffs (Campoccia et al., 2009), tax credits (Dautzenberg and Hanf, 2008), low rate loans (German Federal Ministry for the Environment Nature Conservation and Nuclear Safety, 2009); net pricing and net metering (Talavera et al., 2010). Most of the financial support is derived via government agencies (Pollitt, 2010).

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Access to resources enhances the ability and willingness of entrepreneurs to invest (Fogel, 2001). It is estimated that between 2005 and 2008, the UK government support for RETs was estimated at about £8.5bn. This covered subsidies and grant schemes, research and development and other support services (Pollitt, 2010). These investments are thought to have had limited impact (Thornley and Cooper, 2008) but this has not discouraged the provision of other grant schemes aimed at promoting RETs uptake (DECC, 2009a; DECC, 2009b, DECC, 2010). Additionally, energy generators receive support when they meet their renewable energy quotas in the form of ROC recycled funds (Ofgem, 2009) as well as guaranteed feed in tariffs for units of heat and electricity generated and used or sold to the national grid (DECC, 2010). Increasing oil prices and low prices for conventional agricultural commodities have made the production of biomass for electricity, heat and fuel production very interesting for farmers compared to the production of conventional agricultural products (Tharakan et al., 2005). However, recent increases in world commodity prices and most notably wheat and other grains have altered the perception of attractive financial returns to energy crop farmers. In mitigation it has been found that the security and stability of income from bioenergy contracts has been a positive feature of renewable energy production (Sherrington and Moran, 2010 In Press). Development of bioenergy projects is almost always accomplished at the level of the individual farm business, often run by a sole trader or partnership. Although this has the merit of organisational simplicity, seldom is the business risk or borrowing spread over more than one or two individuals. As a result, the type of cooperative fuel processing and burning plants and district heating systems seen in some European countries are not commonly available in the UK. This clearly is an issue that increases business risk for bioenergy participants and tends to add to the capital required for UK bioenergy ventures.

There are increasing concerns amongst land owners that red tape and regulation could make microgeneration unaffordable (Country Land and Business Association, 2010). It has been argued that entrepreneurs can be discouraged from investing if they have to comply with too many rules and procedural requirements, are expected to report to a wide range of institutions and have to spend substantial amount of money and time fulfilling documentation requirements (Soto, 2000 cited by Bruton et al. 2010). Also, lack of familiarity with the different support mechanisms and increased perception of risk and is likely to make it more difficult for investors (Connor, 2003). Knowledge of the views of entrepreneurs with regards to their experiences of public support and their need for such support has been very limited (Normann and Klofsten, 2009).

The **cognitive** pillar of the institutional theory has been defined more narrowly as the knowledge and skills possessed by people in a country pertaining to the creation and operation of a new business (Manolova et al., 2008). This dimension can therefore operate at the individual level and influences the ability of the entrepreneur to invest.

Recent trends in the agricultural landscape in Europe (globalisation, increasing energy prices, the CAP reform, recession, etc) have increased demands on the skills required by farmers to succeed in their activities. Farmers no longer need skills only to produce food and fibre, but they need marketing, management, networking and other types of skills to realise new business opportunities (Rudman, 2008). Skills are defined as the "competencies required to accomplish tasks and activities related to the farm business which can be acquired by learning and experience" (De Wolf and Schoorlemmer, 2008). These skills are categorised into professional, management, opportunity, strategic, and cooperation/networking skills. These are the intangible resources embedded in the enterprise (Mc Elwee, 2008).

De Wolf and Schoorlemmer (2008) suggested that skills are required to follow cost reduction, value adding and diversification strategies as a response to the environmental context in which farms operate. In this sense, entrepreneurial skills are needed to enhance farm survival and at the same time, take advantage of opportunities that are created by the changing farm context (Vesala and Pysysiainen, 2008). The personal experience, knowledge, education, and training are the human

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resources which business founders bring to the enterprise (Rotefoss and Kolvereid, 2005). Firms are also able to improve on their human resource or social capital through capacity building and advice (Mole and Keogh, 2009).

Renewable energy technologies are new and demand new skills from farmers who are interested in investing in them or those that adopt them (Sherrington and Moran, 2010 In Press). Investments can be increased by improving the capacities of managers to handle these new activities (Bokusheva et al., 2007). Ernst (1999) showed that new energy technologies required managerial skills and farmers needed to stay updated to keep their projects in operation.

Domac et al. (2004) and Domac et al. (2005) revealed that a common constraint for bioenergy development in the EU was inadequate information and awareness among stakeholders in the economy, society and politics. The lack of awareness on the numerous advantages of biomass and bioenergy and their consequent poor acceptance has often been highlighted as an important disincentive for their use and adoption (NFU, 2005). One major challenge for the agricultural sector is to enable farmers to have access to information and develop entrepreneurial skills (Vesala et al., 2007). Skills and knowledge is also needed on: (i) how to legally protect a new business; (ii) how to deal and manage risk as well as (iii) where to find information about markets for their products (Busenitz et al., 2000). Farmers need trusted, clearly independent, practical and specific information at an individual farm level to help them make investment decisions and take on new ventures. Research must provide understanding of the information and skill needs of entrepreneurs. This information has to be tailored and made available through sources that are most appropriate and accessible to those in need (Sherrington et al., 2008).

The **normative** pillar of the administrative theory of entrepreneurship refers to the degree to which residents of a country admire entrepreneurial activity and appreciate creative and innovative thinking (Kostova, 1997). The normative institutions also exert influence because of the social obligation to comply, rooted in social necessity in what an organisation should be doing. They are typically made up of values (what is preferred) and norms (how things are to be done in line with the values (Bruton et al., 2010). The normative pillar represents actions that organizations and individuals ought to take – behaviors that may not be rational in the economic sense but which individuals think of as good nonetheless (Bruton et al., 2009).

With literature on institutional environments largely focused on the regulatory dimension, there is little written on the normative dimension (Manolova et al., 2008). It is argued that a munificent normative environment is one in which: (a) entrepreneurship is admired; (b) society appreciates innovative and creative thinking as a route to success and (c) turning ideas into business is admired as a career path by society (Busenitz et al., 2000). Estay (2004) asserted that rapid entrepreneurial development in countries like the United States was partly explained by the fact that people who started and ran their enterprises were highly admired and entrepreneurship was considered as a career path and a route to success.

Micro-businesses generally pursue a number of economic and non-economic objectives relating to factors such as income levels, job satisfaction, working hours, control and flexibility. These objectives are derived from the individual's social and economic contexts (Greenbank, 2001). Sutherland (2010) noted that farm viability as a personal goal directly reflected farm community norms: that there is a social stigma attached to failure to maintain a successful farm. Estay (2004) noted that networks and family as well as the existence of strong links with those in the same sector gave confidence to the entrepreneur with his progress towards business creation. Zhang and Wong (2008) proposed that networks are particularly important in areas of weak institutions. These social and market networks may be formal or informal in nature improving access of the entrepreneur to valuable resources needed for the venture – connections, finance, counselling and advice, and legitimacy. Otherwise stated, networks help to reduce market failures facilitating the activities of actors.

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According to Roos et al (1999), there is a social dimension of bioenergy choice and social structures such as status, solidarity and conflicts influence the development of a bioenergy market. Social criteria have been consistently identified as being decisive in making bioenergy projects viable (Buchholz et al., 2009). Also, many farmers think that the production of bioenergy is fundamentally a "good" thing and it was widely thought that it could be a strong incentive for energy production in the future (Sherrington et al., 2008).

Table 3: Reasons for public opposition to a renewable energy project in Devon-UK

Major concern	Response
Haulage lorry traffic congestion	93%
Haulage lorry air pollution	86%
Credibility of the developer	85%
Air pollution	85%
Visual appearance of the community	84%
Odour	82%
Wastes	82%
Technological reliability	79%

Source: Upham and Shackley (2007)

Upreti and van der Horst (2004) studied the causes and consequences of public opposition to the development of the North Wiltshire Biomass Energy plant. The authors suggested that when an external development process posed threats on the values and expectations of people, they developed mistrust - mistrust increased if the benefits of the proposed project were not clear to the local people. Upham and Shackley (2007) assessed local opinion to a proposed biomass gasifier in Devon. Locals revealed eight major concerns:

In another study of conflicts over biomass energy development in England and Wales, the Arable Biomass Renewable Energy project (ARBRE), the North Wiltshire Biomass Power Plant (NWBPP) and the Newbridge Integrated Wood Processing Plant were studied (Upreti, 2004). Two contrasting attitudes from the community and developers were observed: the 'Not In My Back Yard (NIMBY)' attitude by the locals and the 'There is No Alternative (TINA)' attitude of developers. Negative public opinion is a strong disincentive for renewable energy deployment especially when enterprises create negative externalities. This is very likely to affect the willingness of any investor interested in such a venture.

As a result of this literature review and following the identification of the knowledge gap the following hypotheses have been developed:

1. The entrepreneurial environment for bioenergy development in the UK is sympathetic to the needs of this emerging industry;
2. Adopters of bioenergy are positively motivated towards the venture; and
3. Farm based bioenergy enterprises make a positive contribution to overall farm business viability.

These hypotheses will be tested using the following methodology with the results reported at a later date.

Proposed methodology for the study

Firstly, rural entrepreneurship researchers have advised on the need to clearly determine the unit of analysis in studies of the agricultural sector (McElwee, 2005; 2006 and Carter, 2001). This is because farmers are considered to be entrepreneurially active individuals and directing the strategy of the businesses that they are responsible for (McElwee, 2008). McElwee and Smith (2010) suggested that

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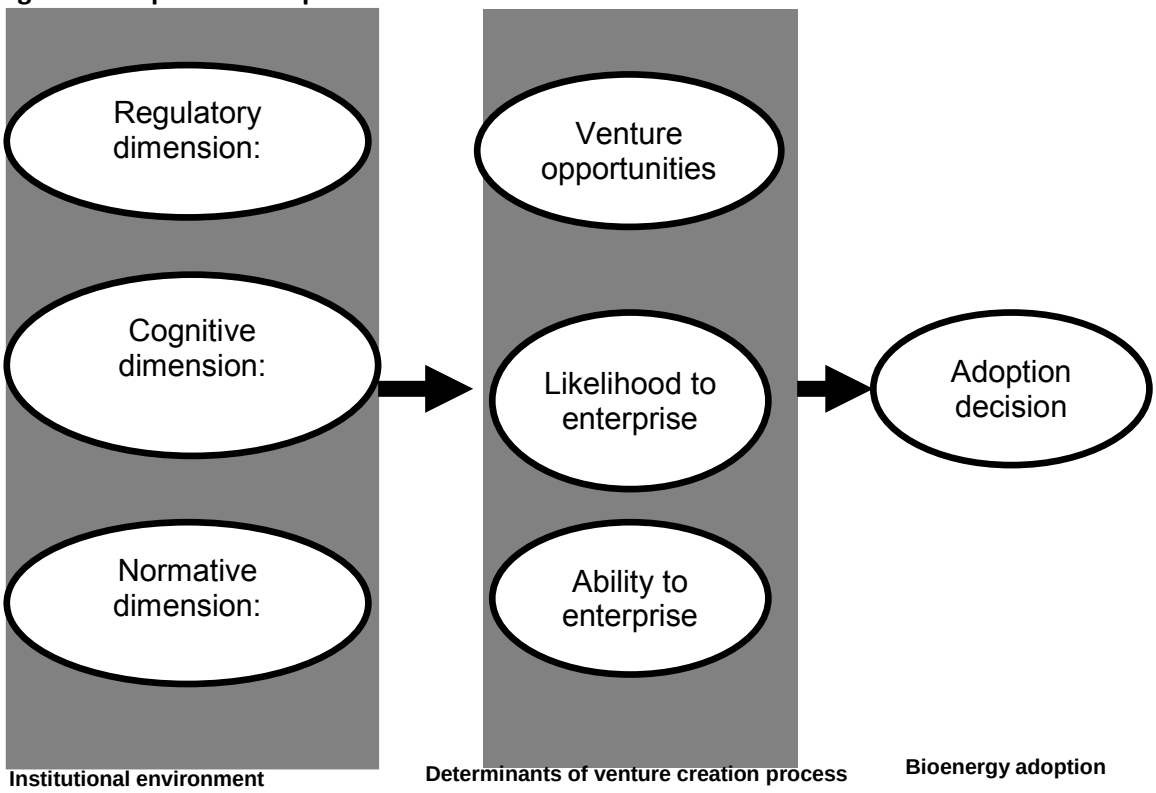
there is a need to determine whether the unit of analysis is the farmer or the farm. In this study, we are interested in the farmer and the farm.

Kostova, Busenitz et al. and Manolova et al. measured constructs of the institutional environment as they affected the domain of entrepreneurship as a whole at the macro level. In this study, we seek to apply the dimensions to the farm sector. This micro institutional view differs from the macro-institutional perspective. Additionally, Kostova, Busenitz et al. and Manolova et al. validated their measures with university students. The proposed framework to be employed in applying this methodology is shown in Figure 1 below:

There are well established financial assessment methods for evaluating the viability of energy technologies (Ericsson et al., 2009). These methods consider profit maximisation as the main objective behind farmers decisions to adopt (Sherrington and Moran, 2010 In Press) even though there is strong evidence that farmers often pursued a multitude of objectives and not only profit maximisation (Greenbank, 2001, Wallace and Moss, 2002 and Willock et al., 1999).

The study will be undertaken in three stages, these being the pilot phase followed by the quantitative phase and finally being completed by the qualitative case study phase. This study area will be the West Midlands Region of the UK. This is because the region is quite accessible to the researcher and will therefore achieve the objectives of the study with the resources available. Also, this region is a possible lead region for bioenergy (DEFRA, 2010). By considering areas of potential bioenergy production the study could be more relevant than a nationwide study (Sherrington and Moran, 2008).

Figure 1: Proposed conceptual framework



Source: adapted from Kostova, 1997; Busenitz et al., 2000; Lim et al., 2010; Gnyawali and Fogel,1994.

The pilot will consist of nine farmers will be interviewed; three adopters, three farmers who have weighed up the options to adopt or not and three others who are opposed to adoption. This will

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make it possible to integrate relevant concerns of respondents and then improve the final questionnaire for the quantitative study.

The quantitative research-survey of a statistically significant stratified sample of farmers in the West Midlands of the UK will take place after the pilot survey to assess both the present number and nature of land based bioenergy enterprises in the UK. This will be undertaken alongside an assessment of the institutional factors, administrative, cognitive and normative, which facilitate or hinder greater adoption of bioenergy in the farm sector.

The UK National Farmers' Union membership database has been made available to provide one sampling dimension will be used for the study together with sampling from the Yell database (Emerson and MacFarlane, 1995).

The qualitative research phase will deal with case studies sampled from the research phase 1 and will provide a detailed financial examination of the financial viability of a small sample of Renewable Energy Technology (RET) enterprises such as wind, solar, anaerobic digestion and biomass. This phase of the research will employ DCF/IRR techniques to assess potential investment viability. The unit of analysis here is the RET enterprise. Based on these results and the key explanatory variable of the quantitative research, a capital decision making model for the bioenergy sector is foreseen comprising of both qualitative and quantitative business drivers which will explain the financial viability of farm based enterprises. This model should provide a basis for policy formulation as well as serve as an investment decision tool for rural entrepreneurs as potential adopters.
Results of this study are expected to provide a framework geared towards stimulating the uptake of bioenergy on land based enterprises as a means for their regeneration and growth. A capital decision making model for the bioenergy sector is expected to comprise both qualitative and quantitative business drivers which explain the financial viability of farm based enterprises

Conclusion

This paper has developed a framework to progress the study of the actual and potential contributions of bioenergy to farm business sustainability in the West Midlands of the UK and proposed a methodology to realise the study. The research is likely to show that the low level of adoption of renewable energy enterprises and especially bioenergy on land based enterprises in the UK will be explained by variables in the regulatory, cognitive and normative dimensions of the country institutional profiles of entrepreneurship (Busenitz et al 2000). These variables affect the venture creation process and the farmers' decision to adopt bioenergy technology rests on his assessment of the opportunities offered by the institutional fabric, the willingness to enterprise and the ability for enterprise.

The proposed research will investigate the financial viability (Turner and Taylor 1998) of a wide range of potential farm enterprises in the renewable energy sector and to construct web-based computer software that farmers can use to forecast enterprise viability. In this paper both a framework and a methodology are proposed to investigate the interaction between farmers and the institutional environment. Mitchell et al. (2000) suggested that such a combination of concepts from entrepreneurship cognition research and institutional theory provided finer grained explanations for entrepreneur's venture creation decisions. This paper has argued that this novel, selected approach is more comprehensive than other established approaches used to study adoption of bioenergy on farms in the UK (Sherrington et al., 2008, Sherrington and Moran, 2008).

Bioenergy technologies and their adoption is claimed to be of increasing importance (DEFRA 2007, NFU, 2008) by the UK government and as a result has become worthy of detailed study. Nevertheless the UK's farmers and rural entrepreneurs are not in the strongest competitive position for bioenergy enterprises, faced with irregular policy changes that impact upon bioenergy

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enterprises, the lack of a developed cooperative infrastructure which might spread risk and an underdeveloped bioenergy engineering industry. On top of these constraints we have the reigning in of capital investment generally due to the ongoing effects of the 2008 banking crisis and widespread and complex planning controls that sit uneasily with the Not In My Back Yard (NIMBY) movement, which might be expected on a relatively densely populated collection of islands that make up the UK. There is also the UK government's new found enthusiasm for nuclear energy that will come on stream from 2017 onwards, possibly undermining other forms of energy production.

If bioenergy is to succeed anywhere then this appears to be least likely in the West Midlands of the UK which tends to add validity to the study and its location. The above hypotheses will be tested and the results reported in due course.

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