



The University of Reading

School of Agriculture, Policy and Development

**Department for Environment, Food and
Rural Affairs**

Research project EPES 0405 / 17

**Research to Understand and Model the
Behaviour and Motivations of Farmers in
Responding to Policy Changes (England)**

**Annex A to the final report:
Research methodology**

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This Annex sets out the methodology that was proposed for the study. Any variations between this and the methodology reported in the main text of the final report were agreed between the research team and the Defra project steering group.

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Annex A: Research methodology (extract from the research proposal)

A Objectives of the research

The objectives of the research are as set out in the invitation to tender:

- i review existing literature on farmers' motivations and behavioural influences;
- ii review existing predictive models intended to simulate or forecast farmers' responses to policy changes or market price changes, drawing out their strengths and weaknesses and identifying implicit assumptions;
- iii gather and analyse appropriate data on farmers' motivations and behavioural influences relevant to their farm management decisions;
- iv identify and describe the main factors found to influence farmers behaviour;
- v characterise different groups of farmers found to have distinct behavioural patterns;
- vi where possible relate any such groups to existing conventional systems for classifying farm types including the Farm Business Survey, and to farm income/return on capital;
- vii construct and, where possible, parameterise an "influence model" of farmer behaviour capable of describing the behaviour of the full range of groups identified at (v) above.
- viii make recommendations for using the outputs of this research in conjunction with existing and possible new quantitative economic models used by Defra, and as far as possible specify in detail the techniques and construct the model design.

As we show in section B below, to meet these objectives to the point where a fully functioning model capable of predicting behavioural responses to a wide range of policy options has been parameterised is not feasible within the nine months timescale of the project. However we can within that time produce a working example of such a model, test it with respect to a specific policy change and document the methodology needed to build a robust predictive model capable of integrating a range of economic and non-economic influences on farmers' behaviour and decisions.

B Methodology and approaches

(i) Review existing literature on farmers' motivations and behavioural influences

Over the past nearly forty years, the literature on farm decision-making has increasingly recognized the diversity and complexity of farmers' values, goals and objectives. These objectives, when considered either individually or together, define and frame decisions taken by farmers and hence determine how they respond to any stimuli. Farmers' objectives can be explored by direct questioning and by constructing decision-making models that assume the existence of certain objectives a priori and then compare the model results with the actual behaviour. Each approach has its strengths and weaknesses. In direct questioning reliance is placed on responses to pre-designed questions and therefore there is the risk of respondents wishing to portray a particular image of themselves or their businesses depending on their perception of why certain questions are being asked. The modelling route on the other hand may

suffer from the disadvantage that the a priori assumptions (such as profit maximisation) are not universally valid and therefore the model results might not replicate the observed behaviour correctly and thus undermine the reliability of the information generated.

The critique of economic rationality based on profit maximisation is now well received wisdom as initiated by the exposition of the logic of “satisficing” behaviour by Simon (1956), where the basic postulate is that human beings seek “good enough” solutions to choice problems within a ‘bounded rationality environment’ rather than pursue the optimal one within a, possibly unrealistic, ‘perfect rationality environment’. This idea has been instrumental in bringing about common understanding of human behaviour among psychologists and economists as witnessed in recent writings by leading economists such as Gigerenzer and Selten (2001) and Sen (1977;2003).

In the Agricultural Economics literature concern with the complexity and the multiple nature of farmers’ objectives dates back to 1926 when Ashby asserted that “ ... if we want to know how or why a farmer acts in a certain way or how to induce him to act in a certain way, we have to enquire why men act, and especially why men act as they do when they live in the sort of social environment and general circumstances in which farmers live.” Similarly in the United States, this interest goes as far back as 1949 (Taylor 1949) and research on the topic picked up later after a long period of inactivity (Wilkenning 1955; Harman 1972a; Harman 1972b; Nielson 1962). In the United Kingdom, however, this research remained dormant until the Bristol study (Mitchell 1968) followed by the path-breaking study of farmers’ goals and values (Gasson 1973). Gasson’s contribution has inspired comparable studies both in the United Kingdom (Ilbery 1983; Gilmor 1986; Whatmore 1983; Perkin 1990; Perkin and Rehman 1994; Willock et al. 1999), in the United States, Australia, New Zealand and Canada (Coughenour 1988; Fairweather & Keating 1990; Harper 1980; Kerridge 1978; Patrick 1980; Pemberton 1979; Smith 1976; Wise and Brannen 1983; Frost, 2000; Robinson et al. 2003) and elsewhere, particularly in Brazil (Costa and Rehman 2005), Chile (Korich 1997). Nigeria (Akatugba 1994) and Pakistan (Khan 1998).

The most common feature of this literature is the use of self-report questionnaires for the elicitation of farmers’ objectives, which are later used to derive classifications and hierarchical structures of goals. In more recent studies, some attempt has been made to derive orientations and categories of farmers as defined by their stated objectives. Such categories cover an extensive spectrum: ‘entrepreneur to cautious strategist’, ‘accumulator to sufficer’, ‘extensifier to intensifier’, ‘dedicated producer – flexible strategist – lifestyle’ and ‘custodian/steward to environmentalist’. This literature represents a considerable body of knowledge and understanding of why farmers act as they do. The intriguing question is: why has the knowledge on farmers’ goals and objectives not percolated to policy models, which continue to depend on profit-maximisation assumptions? Our review of the existing literature on farmers’ motivations and behavioural influences will identify the reasons for the lack of the use of such knowledge in modelling and then comment on how the situation could be improved. It will also identify what gaps in the knowledge on farmers’ goals and motivations need to be filled for policy modelling.

An important contribution to this review will be an analysis of the past four years of data relating to farmers’ objectives, goals and motivations from ADAS *Farmers Voice* surveys.

(ii) Review existing predictive models

There are many policy models in existence; some are in use whilst others are at different stages of their development, which can be reviewed. The ‘behavioural and influence’ focus of the proposed research, however, provides a criterion for selecting models for review but it eliminates a vast majority of the existing ones as there is hardly a model that incorporates farmers’ behaviour directly into policy analysis; the possible exception perhaps being the models developed at Reading for a LINK project (LK0647: Garforth et al. 2004) in which the behavioural Theory of Reasoned Action (TORA) was used to identify drivers and barriers to adoption for specific adoption behaviour domains. Measurements for attitudes and subjective norms so identified were carried forward to a novel Mathematical Programming approach for optimising a Behavioural Response Function, which predicted possible rates of adoption differentiated over various farm types. Both the approach adopted for LK0647 and the resulting models are the first candidates for review. The traditional econometric, mathematical programming and even simulation models will have to be selected carefully. Selection criteria will be specified in consultation with the contractor from the possibilities mentioned in the tender invitation, primarily LUAM and FAPRI. By its nature and purpose this review has to be on a ‘piece-by-piece’ basis to cover the following broad aspects of each model:

- Original purpose and sponsor of the model’s development
- Unit of analysis and its spatial (farm, region and national) and temporal dimension (static/dynamic)
- Behavioural assumptions (profit maximisation versus dimensions as revealed by the review of the behavioural and influence models)
- Type of farmers and farming systems covered
- Data requirements and sources of data
- Approach to validation and calibration of models
- Projection and aggregation of results
- Users (researchers, policy analysts and policy makers)
- Issues of access and usability.

The precise details of each of above are subject to negotiation with the contractor.

Besides the policy analysis there are some recent studies where the issues of farmer behaviour and behavioural influences have been addressed and they will be assessed from the point of view of which of their elements could be incorporated into policy analysis models and how. Relevant studies include Austin et al. (1998a; 1998b), Beedell and Rehman (1999; 2000), Burton (2004), Egoz, et al. (2001), Falconer (2000), Gasson and Potter (1998), Halliday (1989), Holloway and Ilbery (1996), Sullivan et al. (1996), Vogel (1996), Wilson (1992;1996;1997), Wilson and Hart (2000), Winter (2000), Wood (2000).

The review will be presented at a one day workshop for a small group of people with experience of building and using models for policy analysis for peer validation of the findings and to inform the identification of data needs for (iii) below.

(iii) Gather and analyse appropriate data

We envisage two main survey activities to generate new empirical data. The first will collect self-report data on farmers' goals, values and objectives, their attitudes towards current policy discussions and anticipated changes, and their perception of the main influences on their farm management decisions. This will be done by inserting additional questions into the 2005 ADAS *Farmers Voice* survey. The second will culminate in a postal survey of a sample of farmers, using a questionnaire based on the Theory of Planned Behaviour (TpB: Ajzen 1991). This posits that an individual's behaviour is influenced by three main factors: attitudes, which are in turn constructed from one's expectations of the outcome of the behaviour and the perceived importance of those outcomes; subjective norms, which is the extent to which the individual is influenced by other people (salient referents); and perceived behavioural control, which is the extent to which an individual feels he or she is constrained from a particular behaviour by factors outside his or her control. The questionnaire content will be informed by focus groups and telephone interviews which will identify salient outcome beliefs, referents and control beliefs in relation to specific behaviours. Because TpB recognises that behavioural influences are specific to the behaviour in question, we propose to select one significant area of policy change (the single Payment scheme) as the focus for the survey (see below).

(iv) Identify and describe the main factors found to influence farmers' behaviour

Analysis of the TpB survey data involves interpreting the correlations between different elements of the TpB model, in order to identify the influence of specific outcome beliefs, salient referents and control beliefs, as well as the relative importance of attitudes, subjective norms and perceived behavioural control in behavioural intentions. Information from this analysis and from the Farmers Voice analysis will be written up as a Working Paper.

(v) Characterise different groups of farmers found to have distinct behavioural patterns; (vi) Relate any such groups to existing conventional systems for classifying farm types; (vii) Construct and, where possible, parameterise an "influence model" of farmer behaviour capable of describing the behaviour of the full range of groups identified at (v) above.

The primary purpose of the proposed research is to improve the 'accuracy' of the predictions of farmers' responses to change in policies by integrating farmer behaviour, and its determinants, in an appropriate policy model. In our view this policy model should have the farm as its basic unit of analysis. For instance take the three categories of farmers derived by Fairweather and Keating (1994) from their elicitation of farmers' objectives: the *dedicated producer's* primary goal is to produce the best quality product from the highest standards of farming and who strongly disagrees with the idea that there is no enjoyment in farm work; the *flexible strategist* perceives marketing as a key element in the success of the farm and believes in reducing workloads and diversifying assets both on and off farm; and the *environmentalist* strives to reduce the use of agricultural chemicals on the farm and believes that working alongside nature is rewarding. Other researchers have clustered together farms with similar enterprise mixes, management styles and geo-physical features (Buckwell & Hazell 1972; Kobrich, Rehman and Khan 2003). Multivariate techniques can be used to create discernibly different and mutually exclusive categories that optimise some criterion, or criteria, for *intra group* 'homogeneity' to merge the normal *farm types* (such as the Defra schema) with the differentiation of farmers' goals. The conventional *farm types* show a clear association with the

variation in goals and objectives. The resulting classification should provide an improved resolution of farmer categories to impart accuracy to the aggregation of model results to regional and national levels of production.

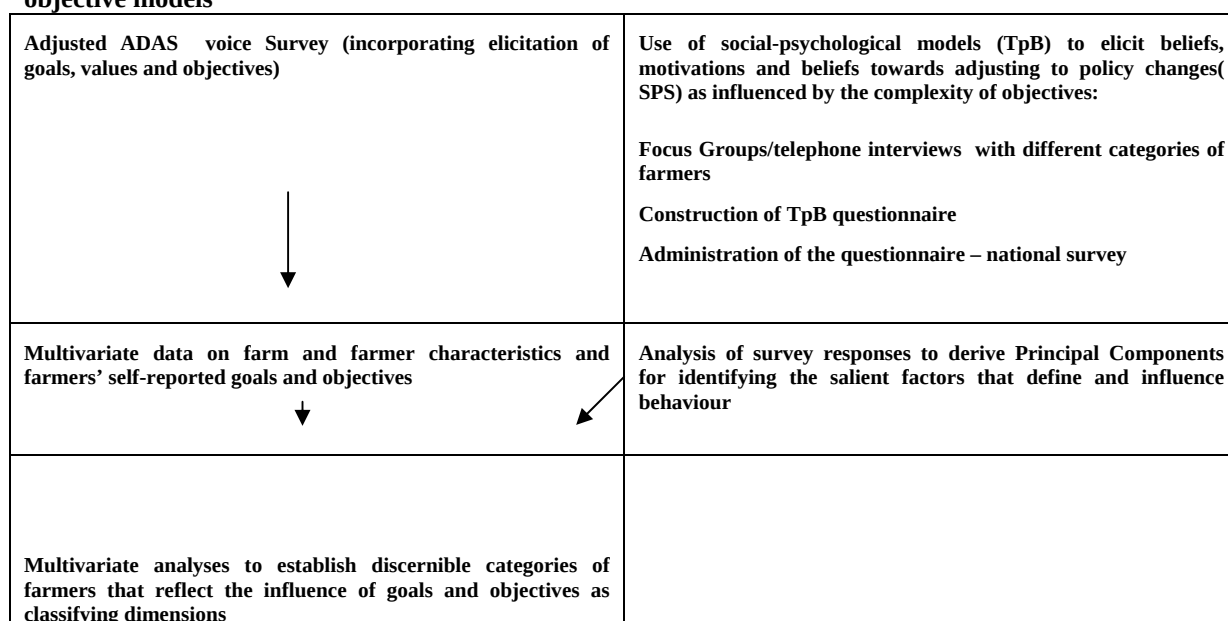
The overall logic of the suggested approach flows as shown in Figure 1 below.

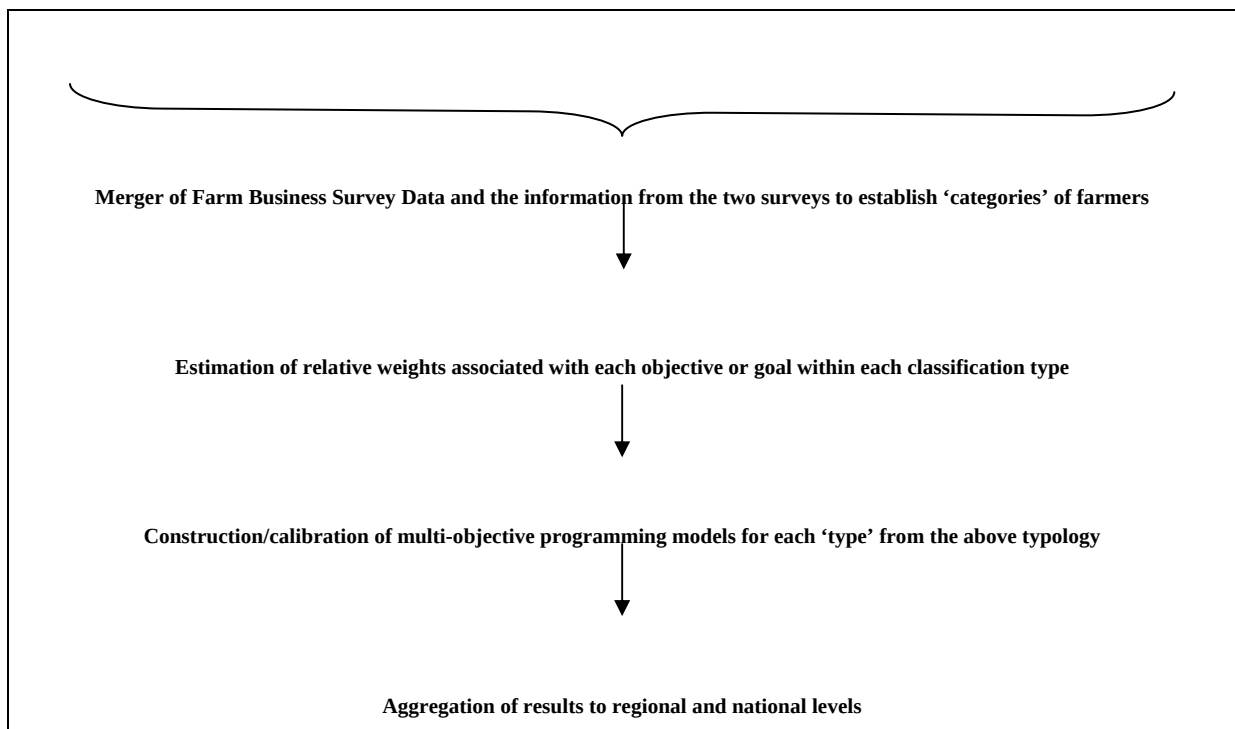
The use of the social-psychology TpB theory will play an important role in this project. First, as the project requires deriving quantitative weights associated with each the different objectives for each farm type, these are readily obtained from the TpB analysis by using its ability to take into account peer group and other referents' influences. For example, a dedicated producer may not rank environmental objectives particularly high but nonetheless may feel obliged to achieve certain standards for cross compliance or to respect peer group evaluation. In addition, the postal administration of the questionnaire allows much broader coverage of the 'universe' of farmer respondents and thus there is scope for deriving a more comprehensive typology of farmers.

The literature review and focus group consultation the various behaviours relating to management styles and farmer objectives will be used to design the questionnaire. These behaviours may include, business (with questions relating to marketing, independence, financial security, risk, development and debt etc), lifestyle, family and environment, but may also include other categories based on the consultations, particularly if the focus is to be placed on a specific behaviour such as 'strategies for dealing with CAP reform'.

From the results of the TpB and the farm attributes clusters of farmers and farm types will be derived. A Principal Component Analysis will be performed on the TpB data to identify factors relating to each of the behaviours. It is these salient factors that will be used in determining the different groups using cluster analysis (Kobrich, Rehman and Khan, 2003) of the data obtained from ADAS Voice Survey and the Farm Business Survey. Using this methodology, farmers will be classified according to the physical farm attributes, the attitudes and beliefs towards different goals and objectives and influence of peer pressure and social referents.

Figure 1 Proposed approach to integrating economic and non-economic influences into multi-objective models





For each farm and farmer classification identified above, we will build multi-objective models using FBS data. These will be calibrated using the method proposed by Yates (2005), where it is possible to determine the relative weights of each objective by using the observed ‘past’ behaviours through ‘objective’ statistical estimation. This is unlike the two previous historical approaches which use subjective assumptions for determining these weights. The first of these two approaches attempts to eliminate demonstrably inferior alternatives (Kirkwood and Sarin, 1985; Saati, 1977), whilst the second approach is to arbitrarily select a set of “reasonable” weights (Fishburn, 1965). There have been several attempts to determine approximate weights in the absence of the decision-maker’s exact weights. Dawes and Corrington (1974) use equal weights under the assumption that no information is available. Stillwall, Seaver and Edwards (1981) suggest two alternative weighting regimes, which make use of rank information. The alternative approach is to use weights based on the reciprocal of the ranks and rank exponents, this approach requires specific knowledge of the most important attribute. However, all of these historical approaches require some subjective quantification of ‘objective’ weights that is, whilst one objective may be more important than another by how much so is a subjective judgement.

The above methodology will provide models based on the multiple objectives of farmers and not on profit maximisation alone. However, the classification method alone does not allow for the estimation of the proportions of the derived *farm and farmer* classification within the existing Defra farm types. To achieve this aim of the project, the above modelling methodology will be used to estimate these proportions. For each Defra farm type a rational selection of the farmer classifications will be selected (i.e. if one of the defining physical attributes of a *farm and farmer* classification is predominantly livestock then this farm will not be included in the arable farm type classification of Defra). By assuming the weights for each objective so derived for *farm and farmer* classification, it is possible to determine the relative

proportions of each within a given Defra farm type by calibration with the observed results from the Farm Business Survey.

(viii) make recommendations for using the outputs of this research in conjunction with existing and possible new quantitative economic models used by Defra, and as far as possible specify in detail the techniques and construct the model design.

The outputs from the above stages will be discussed at a final workshop for team members and selected stakeholders. The workshop discussions will inform the recommendations which the team will incorporate in their final report to Defra.

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