Institution: Queen Margaret University
Unit of Assessment: UoA 4 Psychology
Title of case study: Farming practices and the environment
1. Summary of the impact

The model of farmers' decision-making developed by Dr Joyce Willock in Psychology at Queen Margaret University (QMU) and co-researchers identified the influences of socio-economic, psychological, and farming variables on farmers' decisions. Understanding the influences on farmers' business-oriented and environmentally-oriented decisions is important for farmers themselves and environmental policy-makers. Findings from the research by Willock and colleagues have had an impact on (1) Scottish Government regulations designed to prevent nitrate pollution of the environment, (2) farmers via the guidance they receive from the Scottish Government, and (3) current Scottish Government policy towards agriculture and climate change.

2. Underpinning research

Prior to 1999, research into farmers' decision-making emphasised the roles of economic variables while paying little regard to other factors. The explanations of behaviour that resulted from such research (a) focused on farmers' profit-related motivations at the expense of other drivers of behaviour, (b) assumed (incorrectly) a direct link between farmers' expressed attitudes and their behaviours, and/or (c) failed to distinguish between direct and indirect influences on behaviours. All such explanations produced, at best, limited understandings of farmers' decisions through a failure to take account of the wider context within which farmers made their decisions.

In 1999, Dr Joyce Willock and colleagues reported findings (Key output 1) from an extensive study that had collected data from 245 farmers based in eastern Scotland. For this study, the researchers developed three novel questionnaires, each designed to elicit more detail of influences on farmers' decision-making than could be obtained from previously-existing measures: The Edinburgh Farming Attitudes Scale collected data on seven domains of attitudes (achievement, legislation, pessimism about farming, openness, financial risk, chemical use, policy communication); The Edinburgh Farming Objectives Scale data on five factors relating to objectives (success in farming, conservation of environment, quality of life, status, off-farm goals), and The Edinburgh Farming Implementation Scale on four types of farming behaviour (business-oriented behaviour, environmentally-oriented behaviour, emergent behaviour, stressed behaviour).

From analysis of the data, Willock and colleagues showed how farmers' attitudes influenced their behaviours both directly, and indirectly as mediated by objectives. In particular, Willock et al. demonstrated how the model could explain farmers' business-oriented and environmentally-oriented behaviours. For example, they showed how farmers' environmentally-oriented behaviour is influenced directly by an attitude of openness in farming and indirectly by an attitude related to achievement as mediated by an objective of conservation. Similarly, attitudes to chemical use were seen to exert a direct and an indirect influence, the latter also mediated by an objective of conservation of the environment. From these analyses, Willock et al. produced a novel model of farmers' decision-making that took account of both a broad range of psychological factors (farmers' attitudes, objectives and behaviours) and farming context in the form of farm size. The outcomes of this study provided an integrated and comprehensive framework within which to understand direct and indirect impact of the wider context upon farmers' environmentally-oriented behaviour.

In a continuation of this research, Austin, Deary and Willock (2001; Key output 2) showed how personality traits (neuroticism, extraversion, openness, agreeableness, and conscientiousness) and psychometric intelligence can influence farmers' business-oriented and environmentally-oriented behaviours. The influence of these antecedent variables arises both directly and indirectly, mediated by psychological variables of attitudes and objectives identified by Willock et al (1999). In particular, Austin et al. found that environmentally-related behaviour was more likely for farmers who scored high on extraversion, openness, and conscientiousness, and high on cognitive ability, and for farmers with larger farms. Thus, the inclusion of personality traits and intelligence extended

the previous model of the effects of psychological variables and farming context produced by Willock et al. (1999).

In contrast to previous explanations of farmers' behaviours, these studies provided a developed and comprehensive understanding of farmers' decision-making. Willock, as first author of the 1999 study, conducted analysis of the data collected for the study and developed the resulting model of farmers' decision-making. She also conducted the analysis reported by Austin et al (2001). On these dates, Willock was employed as a lecturer at QMU (then Queen Margaret College).

3. References to the research

Key outputs

1. Willock, J., Deary, I. J., Edwards-Jones, G., Gibson, G. J., McGregor, M. J., Sutherland, A., Dent, J. B., Morgan, O., & Grieve, R. (1999). The role of attitudes and objectives in farmer decision making: business and environmentally-oriented behaviour in Scotland. *Journal of Agricultural Economics, 50*, 286–303.
   DOI: 10.1111/j.1477-9552.1999.tb00814.x
2. Austin, E.J., Deary, I.J., & Willock, J. (2001). Personality and intelligence as predictors of economic behaviour in Scottish farmers. *European Journal of Personality, 15*, S123–S137.
   DOI: 10.1002/per.421

4. Details of the impact

The model of farmers' decision-making developed by Willock and colleagues has had a significant impact on (1) the development of Scottish Government policy towards farming practices and the environment, (2) farmers themselves through the guidance provided to them in pursuit of Scottish Government policy, and (3) current Scottish Government policy towards agriculture and climate change, as follows:

(1) Scottish Government policy towards farming practices and the environment
European Union Nitrates Directive 91/676/EEC, which came into effect on 19 December 1991, required all Member States to identify areas at risk of nitrate contamination and to devise Action Programmes to reduce or prevent future contamination. Following The Scotland Act (1998), responsibilities for agriculture and for the environment were devolved from the Westminster Parliament to the Scottish Parliament. In 2003, the Scottish Executive (now Scottish Government) designated four areas in Scotland as nitrate vulnerable zones (NVZs). Thereafter, the Scottish Executive Environment and Rural Affairs Department funded Willock and co-investigators from the Scottish Agricultural College (SAC, now part of Scotland's Rural College) [source 1] to conduct two research projects (Ref. 115-3138; Ref. 541-6157) to examine farmers' activities in response to and attitudes towards the 2003 regulations and NVZs as designated. Findings from the first study, conducted in 2004/5, showed that farmers were often sceptical towards the introduction of NVZs and often made few efforts to comply with the requirements of the legislation. The second study, conducted in 2006/7, collected data from interviews with 376 Scottish farmers and from farmers who attended four workshops, one in each of the NVZs in Scotland. The subsequent (2007) report of this study [source 2] produced findings and recommendations designed to inform the Scottish Government in introducing revised legislation under the EU Nitrates Directive. In particular, this report made five policy recommendations to promote environmentally-oriented behaviour that would comply with NVZ Regulations. These recommendations, based upon the model developed by Willock and colleagues, had an impact on public policy and services in the Scottish Government's implementation of The Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008.

(2) Guidance provided to farmers in NVZs
The 2007 report of farmers' practices and awareness in relation to NVZs identified differences between NVZ farmers and non-NVZ farmers in their attitudes towards production and water management and environment. As noted above, farmers were often sceptical about the

designation of NVZs and thereby less likely to comply with the requirements of the legislation. The report also noted the potentially damaging effects that mandatory environmental schemes might have on farmers' attitudes towards the environment. Of the recommendations included in the report, therefore, two were designed specifically to have an impact on the guidance to be provided to farmers to promote environmentally-oriented behaviour, as follows:

- Information must be clearer and it must reach all farmers in NVZs;
- The scientific messages must be made more clearly and more convincingly.

These recommendations were taken up in the preparation, framing, and dissemination of the Guidelines for farmers in Nitrate Vulnerable Zones [source 3], issued in 2008 by the Scottish Government. Willock et al.'s research has, thereby, had an impact on society, culture and creativity through guidance issued to farmers under the Action Programme for NVZs.

(3) Current Scottish Government policy towards agriculture and climate change

The model of farmers' decision-making developed by Willock and colleagues continues to influence the policies of the Scottish Government. In 2011, the Scottish Government introduced its *Agriculture and Climate Change: Evidence on Influencing Behaviours Programme*, to be carried out by analysts in the Rural and Environment Science and Analytical Services Division. This programme has three main aims:

- to gain a better understanding of the range of factors influencing farmers' behaviours (in general, and in relation to environmental issues);
- to consider the effectiveness of the climate change mitigation measures in use/available to policy makers;
- to consider how policy makers in Scotland, and opinion formers working with farmers, could most usefully draw on these behavioural insights to refine the suite of initiatives which aim to influence farming practice in relation to mitigating climate change.

In its most recent (2012) report [source 4], this branch of the Scottish Government takes the model developed by Willock et al. to provide the relevant evidence for understanding how farmers' behaviour is influenced by 'socio-economic, psychological and farming variables within a comprehensive framework' (2012, p. 41). The 1999 research conducted by Willock and colleagues, and the model that it produced, thus continues to impact upon public policy and services in Scotland.

5. Sources to corroborate the impact

1. *Scotland's Rural College, as successor to the Scottish Agricultural College, members of which collaborated with Willock on the research* – SRUC, Rural Research, Education, and Consulting, King's Buildings, West Mains Road, Edinburgh EH9 3JG.

2. *The report produced in 2007 for the Scottish Government* –
   Barnes, A., Toma, L., Hall, C. & Willock, J. (2007). Implementing the Action Programme for Nitrate Vulnerable Zones in Scotland: Farming Practices and Awareness. Edinburgh: Scottish Government Social Research.
   ISBN 978 0 7559 6908 1
   Available from: http://www.scotland.gov.uk/Resource/Doc/208205/0055221.pdf

3. *The guidance issued to farmers following the 2007 report* -
   Scottish Government (2008). *Guidelines for farmers in nitrate vulnerable zones*. Edinburgh: Scottish Government.
   ISBN 978 0 7559 5742 2
   Available from: http://www.scotland.gov.uk/Resource/Doc/254684/0075393.pdf

4. *Most recent report by Rural and Environment Science and Analytical Services, Scottish Government, on the Agriculture and Climate Change Programme* -
   Hallam, A., Bowden, A. & Kasprzyk, K. (2012). *Agriculture and climate change: Evidence on influencing farmer behaviours*. Edinburgh: Scottish Government.
   ISBN 978 1 78256 151 4
   Available from: http://www.scotland.gov.uk/Resource/0040/00406623.pdf