Introducing CAVES: Complexity, Agents, Volatility, Evidence and Scale

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Abstract

CAVES is an EU funded research project, designed to bring together agricultural land users' experiences with advances in computer modelling and complexity theory, in order to better inform policy makers about land use change. The project is part of a larger programme to encourage new methods of studying complex issues, through interdisciplinary research. CAVES focuses on land use change, or lack thereof, in response to external shocks (such as climate or policy change) and internal pressures (such as social constraints). The CAVES project has three case study sites: one in Grampian, Scotland; one in Odra region, Poland; and one in Limpopo province, South Africa. The purpose of the CAVES Grampian study is to provide policymakers with scenario analyses for land use change in the region over the medium term, based on computer-generated models of land use change processes. These models will be based on findings from interviews with agricultural land users, such as farmers and estate managers, as well as other agricultural industry members. The poster is an overview of the CAVES project proposal, and progress to date.

The research is being conducted by a partnership of seven research institutions: the Macaulay Land Use Research Institute, Aberdeen; the Centre for Policy Modelling, Manchester Metropolitan University; Stockholm Environmental Institute, Oxford Office; Wissenschaftliches Zentrum für Umweltsystemforschung, Universität Kassel, Germany; Politchnika Wroclawska, Poland; the University of Wroclaw, Poland; and the International Institute for Applied Systems Analysis, Austria. CAVES is funded by the European Commission as part of the NEST Pathfinder Initiative `Tackling Complexity in Science.'

Extended Abstract

Introduction

This poster presents the structure of the CAVES project, and a summary of findings from the pilot field research study in the CAVES Grampian study site.

The purpose of the CAVES project is to provide policymakers with scenario analyses for land use change in the study sites over the medium term, based on computer-generated models of land use change processes. These models will be based on findings from interviews with agricultural land users. The type of modelling involved is 'agent based' – simulations are based on a number of individual agents, each following a set of decision-making rules. These decisions rules, and the characteristics of the agents themselves, are derived from field research. The complexity of interactions among agents results in unpredictable outcomes. This type of modelling is utilised to generate 'scenarios' (rather than predictions) in response to specific changes to the system. The models associated with these case studies and their use by the relevant stakeholders will test how well agent-based models of real, complex social networks enhance our understanding of both social processes, and, more generally, processes in complex networks.

CAVES Field Research

The purpose of the pilot study is to test and develop the research method, as well as to identify at an initial stage the potential outcomes of the research project.

The general research questions identified for the field research are:

1) How has agricultural land use in (a study site in) North East Scotland changed over the past 20 years?
2) Why (and how) does agricultural land use change?
3) What is the role of land users' social and informational networks in this process?

Interviews were conducted on 12 farms and 3 estates in the Upper Deeside Region (Finzean to Braemar) from February to April 2006. These largely qualitative interviews addressed issues surrounding the experience and causes of land use change, and in particular the role of social networks.

Pilot Study Findings

Analysis of pilot study interviews revealed subtle changes in land use on Upper Deeside farming operations over the past 20 years: increasing scale of operation and intensity of livestock production, reduction in number of commodities, decreased use of inputs and increasing participation in environmental programming. Estate managers reported actively encouraging their tenants to engage in environmental programs and to increase the scale of their operations. As a result, total numbers of tenancies have reduced and there has been limited development of hobby farming in highly tenanted areas. Due to the subtlety of land use changes in the region, it will be important to develop an operational definition of 'land use change' for the purposes of the research.

The primary reasons given by land managers for changes in land use were economic – the perceived necessity to respond more efficiently to market and subsidy trends, in order to maintain profit margins. Increasing mechanisation and reduced farm labour availability were also of importance. However, due to the nature of agricultural production, changes in land use and farming operations in general do not respond immediately to changes in economic signals. Agriculture is highly based on seasonal and climactic factors – land managers perceive it to be unfeasible to make rapid changes to either livestock or crop

production. Land managers also believe that commodity markets follow cycles, and that quick response is imprudent. Similarly, land is a scarce resource and therefore must be acquired when it becomes available, not according to a long term plan. Thus, land use change processes are both slow and complex.

The role of social networks in land use change were initially considered on four levels: access to information, social norms, resource sharing and community engagement. From the interviews, it became clear that the reputation of the primary farmer is also important for securing access to rented land. This appears less true for markets. Land managers reported accessing information from discussion groups, printed publications, SAC advisors, contract workers and input salespeople visiting the farm, informal farm visits, international farm visits and general observation of other farmers' activities. They also identified social norms about the meaning of being a good farmer. They reported that sharing of labour and machinery is limited, but has increased in recent years due to financial necessity. All of the interviewees were members of the National Farmers Union, and most had other active community involvement. At this point in the research it is difficult to say what impact social networks are having on land use change, as although the respondents varied in terms of social network engagement, they appeared to be making fairly uniform changes in their land use.

Next Steps

A total of 50 interviews with land managers (farmers and estate managers), including approximately 10 'successors' are planned for the CAVES project as a whole. These will be supplemented by approximately 20 key informant interviews (members of the agricultural industry who are not land managers). Interviews will occur throughout 2006, in three phases: February to April (pilot test); June – July (primary research); October – December (testing of decision-rules and follow-up).

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