



Creating sustainable solutions for our land and people – rural land use research at the Macaulay

Professor Jeff Maxwell
Director

Agriculture is faced currently with many uncertainties and difficulties and it seems inevitable that in the longer term, irrespective of the policy changes that may arise from CAP reform and Agenda 2000, agriculture will be characterised by a low but highly selective growth in demand for its primary produce, downward pressure on prices, and higher resource productivity. There will be less of a requirement for resources to provide food supplies, fewer and bigger farms, and more part-time farming businesses. The consequences for land use change seem inevitable. There will be less land in conventional primary food production and there will be a change in the relative intensity that land is farmed,



depending on farm size, farm type and land quality. It is difficult to come to any other conclusion than that agriculture (as a primary food-producing activity) will become of diminishing importance in terms of rural land use in the longer term. In Scotland alternative land uses such as forestry, biomass crop production, nature conservation management and facilities for sport and recreation and tourism will become of increasing importance. New demands from society will require that future rural land use delivers multiple benefits in greater measure than they have done previously. The demands for these benefits will not be delivered by chance nor by default but rather by proactive decisions and management, and they will be paid for. Current Scottish Office proposals towards integrating agriculture within the broader context of rural development and Agenda 2000 plans to increase the proportion of structural funds, at the expense of commodity support, will provide opportunities for the development of a range of farm and land-based activities.

The benefits from this wider view of rural development can be classified as being economic, (e.g. incomes and contribution to GDP arising from agriculture, forestry and other non-food goods and services), social (e.g. diversity of employment and provision of community services), and environmental (e.g. maintaining soil and water quality, biodiversity, landscape and providing other non-market goods and services). Government policies also require that they should be lasting, that is they must be sustainable.



For example, the Government's 'Framework – Towards a Development Strategy for Rural Scotland' (1998), states 'that to enable rural development strategies to be effective, national policies must be flexible, must reflect the three components of sustainable development and must be integrated'. There is a clear recognition that 'there is no one rural Scotland for which a single, separate development strategy is appropriate; development strategies need to reflect the diversity of rural Scotland.' Because of this variation and because sustainable development is about the way people perceive their status, their lifestyles, their environment and express their aspirations for the future, its implementation is crucially dependent upon their involvement. National and local government, their agencies, voluntary bodies, land owners and local communities will all have to find new ways of interacting and finding a common purpose. This is no mean challenge and one that, in Scotland, is likely to continue for some time to exercise the minds of those who will shortly be elected to the new parliament. That there is evidence already that partnerships of a variety of kinds have been successfully put in place, augurs well for the future.

However, their success will not only depend on individuals finding a common purpose. It will also depend on the extent and quality of the information and the knowledge that they have about the resources about which they are concerned. That depends, at least in part, on the output from research undertaken at the Macaulay Institute.

The full text of this article will appear in the 1998 Annual Report, which will be published in July.



£240,000 project will investigate effect of levels of nutrition in the pregnant ewe on reproductive performance of offspring

A major three year research project on how the reproductive performance of sheep is influenced by the feeding of their pregnant dams could have practical and economic implications for hill farmers. The study is being undertaken in collaboration with Zeneca Central Toxicology Laboratory based in Cheshire and is funded by the Scottish Office Agriculture, Environment and Fisheries Department.

The main focus of the study is to assess the relationship between different levels of nutrition of pregnant ewes and the reproductive performance of their offspring. The research will also attempt to identify the periods of foetal development which are sensitive to different levels of nutrition.

Research at the Institute has shown that altering the level of nutrition during pregnancy can have an impact on the reproductive performance of the female progeny of ewes. "We have found a reduction in lambing rate of around 5 lambs per 100 ewes per year from the offspring of ewes fed lower levels of nutrition during pregnancy compared with the offspring of ewes fed well," said Dr Stewart Rhind, who is leading the study at the Institute. "The mechanisms underlying this effect are not clear, nor do we know if nutrition of male foetuses affects their subsequent reproductive performance," he added.

"The practical and economic implications of this research are potentially of great interest to hill farmers," said Dr Iain Wright, who leads the Institute's research programme on 'Land Use Options for Animals'. "This study will identify key periods of time during pregnancy when the available nutritional resources should be concentrated in order to ensure normal development of the foetus and therefore also normal reproductive performance of the flock in adult life."

Contact: Stewart Rhind

Animal health and welfare in extensive systems: conflict and resolution

The move towards an increase in extensive animal production systems in the EU is accompanied by the popular belief that the health and welfare of animals managed in this way is enhanced. This anthropomorphic view, based on the apparent 'naturalness' of such systems may be mistaken as animals in extensive systems are subject to a number of environmental and other challenges not faced by animals in more intensive systems. For example, a reduction in human-animal interaction which commonly accompanies extensive management may lead to animals becoming more fearful of humans.

The challenge for animal welfare research is to inform the debate aimed at resolving conflicts between animal- and human-centred perspectives and to allow the public and legislators to establish appropriate consumer-driven or legislative standards for optimal animal health and welfare. In order to do this, assessment of health and welfare must be made in an objective way, which is difficult given that neither can be measured directly. Assessment following a systems-based approach may be the best way to obtain an overall view. This may also accommodate a cost-benefit analysis, which attempts to address a number of welfare issues in economic terms. Specific issues for animals in extensive systems can be determined by reference to the UK Farm Animal Welfare Council's 'Five Freedoms' and include infrequent human contact/lack of supervision (a reflection of the role of the stockman), transportation (particularly of animals unused to handling), climate and nutrition, disease pattern/veterinary care and predation/neonatal care.

The full text of this paper is published in '**The implications of extensification for the health and welfare of beef cattle and sheep**' the proceedings of a workshop held at the Institute in March 1998 funded under the EU AIR programme which brought together scientists from a number of countries to consider the potential consequences for animal welfare of extensification of beef and sheep production systems.



Contact: Pete Goddard

FOCUS ON:

Overseas Projects

Sustainable rural development in North Pakistan



Around 1 million people live in the remote Northern Areas of Pakistan and most of them are engaged in subsistence agriculture. The region is semi-arid, lying as it does in the Himalayan rain-shadow. In order to grow arable crops and livestock fodder, farmers divert water from glacial rivers onto their fields through a complex system of irrigation channels. Cultivable land is a scarce resource and, to avoid crop damage, livestock are dispatched to high altitude, alpine-style pastures for the summer months. This practice of "transhumance" is typical of many mountain agricultural systems. The Northern Areas of Pakistan have undergone dramatic change over the last 3 decades as a result of two factors. Firstly, the construction of the Karakoram Highway along the ancient Silk Route has resulted in a marked increase in the movement of goods and labour between the Northern Areas and the rest of Pakistan. Secondly, community-based development activity initiated by the Aga Khan Rural Support Programme (AKRSP) has had a significant impact on local livelihoods.



Against this backdrop of change, we have embarked on a 3.5 year research project which started in December 1996 and is funded by the EU International Co-operation with Developing Countries (INCO-DC) Programme. The project is looking at ways of improving livestock production, while taking account of the impact of livestock grazing on the fragile ecological resource represented by the high altitude pastures. The project will examine current constraints to livestock production by measuring seasonal changes in feed availability and livestock productivity. It may then be possible to test ways of relieving these constraints in order to improve production in a sustainable fashion. We are particularly interested in whether changes in transhumance practices resulting from economic development are causing degradation of mountain pastures. The project has a strong focus on international collaboration, providing ourselves and our European colleagues with the opportunity to work with a leading NGO in the area of participatory rural development and research (AKRSP). The project also aims to build capacity among developing world scientists with the training of two Pakistani PhD students and close collaboration with national Pakistani research institutions.



The farming system in Pakistan's Northern Areas is highly integrated in nature with a high degree of inter-dependence between arable cropping, forestry, fruit growing and livestock production. Furthermore, there is a close inter-relationship between livestock production within the village precincts and on the high pastures. The project therefore provides an exciting opportunity to bring established Macaulay expertise in systems research and apply it in wholly new circumstances.

The collaborators in the project are: Consejo Superior de Investigaciones Cientificas; Department of Geography, University of Bonn; Aga Khan Rural Support Programme; Pakistan Forest Institute; Pakistan Agricultural Research Council; International Centre for Integrated Mountain Development.

Contact: Alan Duncan

DEVELOPMENT OF SOIL MOISTURE PROBE

Soil water content critically affects many processes including transport of solutes and particulates, uptake of nutrients by plants and atmospheric exchanges, and its measurement is therefore fundamental to a wide range of environmental studies.

Probes have been developed by Macaulay staff to allow the continuous monitoring of soil water status, even at remote locations. The probes measure volumetric soil water content and have recently been produced commercially under licence by Delta-T Devices of Cambridge. These 'ThetaProbes' are protected by British, European and American patents. Currently over 4500 ThetaProbes have been sold and are being used by research groups in over 30 countries. Details of probe performance and their applications can be found on the Institute and Delta-T web sites (<http://www.mluri.sari.ac.uk-mi014/thetaca.html> and <http://www.delta-t.co.uk>).

ThetaProbes are being used by our research staff to assess changes in hydrology and fertilizer losses in forestry catchments, to monitor long-term changes at the Environmental Change Network terrestrial sites, in the evaluation of vegetation for slope stability and in eutrophication studies.

Future developments will include new probe configurations, extending the range of applications into composting and horticultural markets and additional environmental studies on predictive modelling.

Contact: John Miller



'IN THE CHAIR'

with Dr Richard V Birnie

Job title:

Head: Land Use Science Group

Research interests:

Basically I am interested in what the future countryside of Scotland might look like. This means trying to understand enough about land resources, land use systems and countryside change to contribute meaningfully to the debate about what shapes future land use systems.

Early influences

I was brought up on the West Coast of Scotland, where my father was a GP. I spent most of my childhood outside – either in the burn beside our house, or up on the hill behind it. My elder brother (who is a biologist) kindled my interest with his 'Gerald Durrell-like' activities with a variety of living things. I became interested in finding out how the landscape arrived at the way it looks now. Later on our family moved to Peterhead and I remember being struck by the differences between west coast and east coast farming. My earliest ambition was to be a farmer, but I developed an allergy to grain dust and so I ended up at Aberdeen University studying physical geography. This led to a PhD on the glacial history of South Georgia in the Antarctic. I joined the Macaulay Institute in 1980.

What do you do to relax?

With my family of four (our latest addition has just arrived) it is difficult to find much time for this, but I really enjoy hill walking and fishing, and preferably, combining the two!

What was your scariest moment?

I have had a couple of "near-death" experiences - both products of my own stupidity. The first was falling off Lochnagar during a climbing trip; the second was an unsuccessful attempt at swimming the South Atlantic from west to east!

And your most exhilarating?

I would like to say visiting the Antarctic Peninsula ranks high on the scale, but perhaps a 5 day tramp in the Southern Alps of New Zealand to get to a field site was the most personally challenging. That required every skill I had and others that I didn't have!

Where would you still like to visit?

Greenland, Alaska, Siberia. As you see, I don't really like hot countries very much.

Greatest fear?

Three of these: having to live in a city, wanting to watch Eastenders and getting more than one sweater for Christmas.

What is your view about the future for Scotland?

Scotland is facing an enormous challenge on the margins of Europe, with a new political landscape. This could be a great opportunity for a new Scottish enlightenment, or it could be the beginning of a rapid process of marginalisation. It's up to everyone in Scotland to decide which one they want.



Dick Birnie (white shirt!), with Chinese and Australian colleagues in Wuhan, China to discuss research on the Three Gorges Project on the Yangzi.



THE MACAULAY LAND USE RESEARCH INSTITUTE

Creating sustainable solutions for our land and people

We focus on:

- Quality of life, public good and wealth creation issues
- The impact of land use on the quality of our environment
- Evaluating the trade-offs between environmental, economic and social objectives for land use

Our reputation is built on relevance and excellence

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