

<b>Institution: Aberystwyth and Bangor Universities - Biosciences, Environment and Agriculture Alliance (BEAA)</b>
<b>Unit of Assessment: 6: Agriculture, Veterinary and Food Science</b>
<b>Title of case study:</b> Improving the environmental and economic sustainability of upland grazing systems
<p><b>1. Summary of the impact</b></p> <p>BEAA's large-scale research designing and testing alternative grazing management systems for the uplands has achieved impact on the environment and economy. Environmental policy and its implementation via agri-environment schemes has been directly and indirectly influenced, with the evidence provided by the research vital to the development of grazing prescriptions and related payment structures by government agencies and conservation bodies. The results have also benefitted the upland farming community by identifying opportunities for improved productivity and hence economic viability; through e.g. more efficient use of pasture resources leading to higher growth rates for forage-based systems and reduced reliance on purchased feed and fertiliser.</p>
<p><b>2. Underpinning research</b></p> <p>Forty-five percent of agricultural land in the UK is designated as EU Less Favoured Area (LFA), with most of this resource located in the hills and uplands. The traditional basis of farming in these areas is the keeping of breeding sheep and suckler cows, and livestock farming has shaped, and sometimes damaged, the upland landscape. At the time the research began the uplands carried around 12 million ewes and more than a million beef cows; in each case over 60% of the UK total. Previous hill farming research had focussed on adjusting fertiliser and stocking rate guidelines for re-seeded pastures. The new research by BEAA staff, Fraser (PI, 1994-present) and Davies (Officer-in-charge, Bronydd Mawr Research Station, 1965- 2009) addressed growing concern that loss of cattle from upland systems following reform of the Common Agricultural Policy (CAP) could exacerbate biodiversity declines related to mismanagement of native pastures, and sought to quantify the benefits of retaining cattle within the uplands. Field-scale studies were conducted at the Bronydd Mawr [3.1,3.2,3.3,3.6] and Pwllpeiran [3.4,3.5] research centres from 1998 to 2008, with collaborative input from the University of Bristol (meat characteristics [3.2,3.3], MLURI (upland beef systems [3.1,3.2,3.3]) and ADAS (botanical surveying [3.4,3.5]). An initial proof-of-principal experiment demonstrated that mixed grazing with cattle improves production efficiency relative to sheep-only upland grazing systems through complimentary pasture use and reduced parasite burdens [3.1], strengthening the case to the farming community for retention of cattle within the uplands. Other studies established ways in which the production penalty of grazing <i>Molinia caerulea</i> (purple moor-grass) dominated semi-natural grasslands to meet nature conservation objectives could be minimised [3.2], and identified potential benefits to the consumer of eating meat produced from animals grazing such pastures [3.2,3.3].</p> <p>Following reform of the CAP in 2003 subsidy payments became decoupled from production. Since then upland farmers have been offered financial incentives to manage the land to meet nature conservation and/or heritage objectives. The evidence base to support the development of grazing prescriptions within these new agri-environment initiatives was limited however. Similarly, although such schemes adopted an 'income forgone' approach to fixing payments there was a dearth of relevant data available upon which to base such calculations. Further work by Fraser and Davies explored options to enable livestock to be effectively used to deliver environmental gain without compromising overall productivity, and tested assumptions made by both farmers and conservationists regarding the relative economic and environmental value of different elements within upland livestock systems. The research confirmed the vital role that cattle can play in restoring and maintaining biodiversity within priority habitats regardless of breed type [3.3,3.4,3.6], but highlighted the need for welfare considerations to be taken into account when using stock as a management tool [3.4,3.5]. Likewise, site-to-site variation in level of animal performance and floristic responses to grazing of <i>Molinia</i>-dominant vegetation communities has demonstrated shortcomings in implementing blanket prescriptions and strengthened the case for site-specific conservation agreements [3.3,3.5,3.6]. Systems studies incorporating both sown and native</p>

grasslands has shown that increased lamb growth rates are still detected when cattle:sheep ratios within mixed grazing systems are representative of those found on farm [3.6], whilst earlier finishing lambs command a greater market value and have a lower carbon footprint.

### 3. References to the research

- 3.1 Fraser, M.D., Davies, D.A., Vale, J.E., Hirst, W.M. and Wright, I.A. (2007). Effects on animal performance and sward composition of mixed and sequential grazing of permanent pasture by cattle and sheep. *Livestock Science* 110, 251-266. DOI: 10.1016/j.livsci.2006.11.006
- 3.2 Fraser, M.D., Davies, D.A., Wright, I.A., Vale, J.E., Nute, G.R., Hallett, K.G. *et al.* (2007). Effect on upland beef finishing systems of incorporating winter feeding of red clover or summer grazing of *Molinia*-dominated semi-natural rough grazing *Grass & Forage Science*, 62, 284-300. DOI: 10.1111/j.1365-2494.2007.00581.x
- 3.3 Fraser, M.D., Davies, D.A., Vale, J.E., Nute, G.R., Hallett, K.G., Richardson, R.I. & Wright, I.A. (2009). Performance and meat quality of native and continental cross steers grazing ryegrass/white clover improved pasture or semi-natural rough grazing. *Livestock Science*, 123, 70-82. DOI: 10.1016/j.livsci.2008.10.008
- 3.4 Fraser, M.D., Theobald, V.J., Griffiths, J.B., Morris, S.M. & Moorby, J.M. (2009). Comparative diet selection by cattle and sheep grazing contrasting heathland communities. *Agriculture, Ecosystems & Environment*, 129, 182-192 DOI: 10.1016/j.agee.2008.08.013
- 3.5 Fraser, M.D., Theobald, V.J., Dhanoa, M.S., Davies, O.D. (2011). Impact on sward composition and stock performance of grazing *Molinia*-dominant grassland *Agriculture, Ecosystems & Environment* 144, 102-106. DOI: 10.1016/j.agee.2011.08.004
- 3.6 Fraser, M.D., Vale, J.E., Dhanoa, M.S. (2013). Alternative upland grazing systems: Impacts on livestock performance and sward characteristics. *Agriculture, Ecosystems and Environment*, 175, 8-20. DOI: 10.1016/j.agee.2013.05.002

### 4. Details of the impact

The experimental work described above has been “critical in providing evidence to support management and policy decisions in the uplands” [5.1]. The research was funded primarily by DEFRA, with additional funding contributions from English Nature (now Natural England) and the Countryside Council for Wales (now Natural Resources Wales). Findings were presented to and discussed with policy officers from these government departments/agencies and other key stakeholder organisations, such as the RSPB, National Trust and Welsh Government. Through these interactions the research has been “important in underpinning policy and agri-environment scheme development in recent years” [5.2]. In particular it has informed the development of mixed grazing options within the Glastir Entry (Option 15c and 15d) and Glastir Advanced (Option 41b) agri-environment schemes in Wales [5.1,5.2]. Glastir was launched in 2012 to replace the four existing schemes at that time (Tir Cynnal, Tir Gofal, Tir Mynydd and the Organic Farming Scheme). In 2012 around 1,700 Glastir Entry (also known as All-Wales Element) contracts were signed, covering a total area of 154,000 ha; and around 500 of these applicants were selected for entry into Glastir Advanced (also known as Targeted Element). In addition, the research findings have informed the development of specific policies and initiatives targeting the restoration and maintenance of priority habitats within Wales, including support payments to encourage cattle grazing on Sites of Special Scientific Interest (SSSIs) [5.1]. There are currently 179 SSSIs in the Welsh uplands, covering over 138,000 ha.

The research has also provided an evidence base for policy implementation in England [5.3], and within the impact assessment period influenced the development of the priority UL18 cattle grazing option within the Upland Entry Level Scheme (UELS; launched in 2010), and a related

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reprioritisation of the EK5 mixed grazing option within the Entry Level Stewardship (ELS) scheme. The cattle grazing option has been one of the most popular UELS options across England [5.4], and to date has been included within 3200 agreements covering an area of nearly 200,000 ha [5.3]. In addition to influencing the development of these environmental schemes, output from the research has informed the individual agreements put in place by land management advisors to meet the specified conservation targets for holdings entered into higher level schemes [5.3].

As well as influencing government policy, the research has had an impact on the work by leading conservation bodies. For example it has “shaped the science, practice and policy” of the RSPB; informing the advisory materials they produce, the advice they give to farmers, and the management implemented on their own sites [5.5]. The National Trust has similarly drawn on the work by BEAA in respect of upland grazing systems. Management prescriptions for upland habitats and future research priorities have also been influenced through Fraser’s membership of the Upland Ecosystem Group of the Wales Biodiversity Partnership and her appointment as a “recognised independent expert” on the Moorland Grazing Group for Natural England’s Upland Evidence Review in 2012 [5.6]. Through membership of the advisory group for PONT (a not-for-profit organisation affiliated to CCW/NRW which exists to encourage and facilitate grazing for the benefit of the wildlife, landscape and cultural heritage of Wales) the research has influenced management regimes put in place as part of conservation projects across Wales [5.1,5.7]; including the Anglesey Grazing Animals Project, the Gwendraeth Grasslands project in Carmarthenshire, and the Forgotten Landscape Project centred around the Blaenavon Industrial Landscape World Heritage Site in South Wales.

The wider environmental benefits that arise from increased efficiency of resource use within mixed grazing systems are associated with enhanced productivity for upland farmers. Higher growth rates can potentially lead to improved market returns, lower costs and reductions in associated greenhouse gas emissions. The advantages for producers of including grazing by cattle were summarised in a specific booklet prepared for farmers in Wales by Hybu Cig Cymru (the strategic body responsible for the promotion and development of the Welsh red meat industry) as part of its EU-funded Sheep and Beef Development Programme [5.8], which quotes results from grazing trials at Bronydd Mawr. The booklet states that in the years prior to its publication the total number of breeding beef females in Wales dropped by 5.5%, and that “a continuation with this trend could not only impact on efficiencies of production on the farm but also have a detrimental effect on the Welsh landscape”. The benefits of retaining a mixture of cattle and sheep advocated include: “a much higher utilisation of the pasture than sheep or cattle alone; improvements in animal performance; improvements in the utilisation of marginal land; more productive swards; and reductions in worm burdens reducing drench costs”. There is also growing recognition of the production benefits of utilising native grassland. One of the opportunities for improving sustainability within the supply chain that was highlighted by the HCC Welsh Red Meat Roadmap (2011) is maximising the use of grazeable habitats of principle importance (or Section 42 habitats); the policies and prescriptions for which have been influenced by the research as outlined previously. The link between environmental and economic benefits is also recognised in a recent report commissioned by the Farmers Union of Wales, which references work by Fraser and Davies on the impact of different breed types of cattle [5.9]. The research findings relating to breed differences and grazing options for *Molinia*-dominant vegetation have also informed a recent analysis of the likely biodiversity implications of changing livestock numbers in the uplands [5.10]; again contributing to the on-going debate regarding the future of LFAs within the UK.

**5. Sources to corroborate the impact**

5.1 Letter from Senior Technical Policy Advisor, Land Nature and Forestry Division, Welsh Government regarding influence on agri-environment scheme development in Wales.

5.2 Letter from Team Leader, Terrestrial Ecosystems, Natural Resources Wales regarding influence on conservation grazing in Wales.

5.3 Letter from Senior Environmental Specialist, Land Management Technical Support Team,

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Natural England regarding influence on agri-environment scheme development in England.

5.4 Defra Agricultural Change and Environment Observatory Research Report No. 29, p2.

5.5 Statement from Agricultural Advisor, Royal Society for Protection of Birds regarding influence on RSPB policy and advice.

5.6 Galbraith, C.A., Gill, M., Pepper, S. & Hill, T.O. (2013). *Natural England review of upland evidence - Assurance Group report*. Natural England Evidence Review, Number 007; pgs 4-5. Details of the membership and remit of the topic review groups.

5.7 Statement from PONT co-ordinator regarding influence on PONT activities.

5.8 HCC (2008). Mixed grazing – the benefits. Booklet prepared for distribution to farmers by Hybu Cig Cymru - Meat Promotion Wales. pg 4.

5.9 Joyce, I.M. (2013). The role of grazing animals and agriculture in the Cambrian Mountains: recognising key environmental and economic benefits delivered by agriculture in Wales' uplands. Report commissioned by the Farmers' Union of Wales. pg 30.

5.10 Cumulus Consultants Ltd (2012). Changing livestock numbers in the UK Less Favoured Areas – an analysis of likely biodiversity implications. Report commissioned by the Royal Society for the Protection of Birds. pgs 9, 95, 98.