

**RES-224-25-0041**

**Eating biodiversity: an investigation of the links between quality food production and biodiversity protection (PI Professor Henry Buller)**

**End of project summary**

This project investigated the links between quality food production and biodiversity protection by asking the question: can production systems that use and maintain biodiverse natural grasslands, translate that into a source of additional product value. Our aim has been to inverse the conventional understanding of landscape or environmental quality as the outcome of well managed farming to explore the idea of natural grassland biodiversity as an input into more sustainable farming and as an integral component of product quality.

We have undertaken detailed fieldwork on over 40 beef, lamb and cheese producing farms where farmers have specifically sought to graze their animals on natural grasslands and where this is or might be considered as an actual or potential source of added value. That fieldwork has followed the chain from intrinsic natural value to explicit commodity value and has included ecological surveys of pastures, farmer interviews and business surveys and, in a sample of farms, meat analysis, taste panels and consumer focus groups. We wanted to look at how the various links operated and what was their contribution to that potential or actual added value, both in monetary terms but also in terms of delivering broader public goods. Does the meat coming from animals grazed on such pasture show specific qualities, whether in the meat composition or in the taste, and again, how might consumers react and what might be the broader economic and social impacts in rural areas of such positive relationships? Finally, we have been interested in how such farm enterprises respond. What problems and hindrances impede the making of such links and their effective commercialisation and what do farmers find attractive and/or problematic about creating value out of pasture biodiversity?

The results might be divided into three sets: the contribution of on-farm grassland management to environmental value; the effects of natural grassland pasture feeding on the quality of the final animal products; and the impact of such production on farm businesses and rural development.

In terms of environmental impacts, our results show that, on certain farms, the active conversion from formerly improved pastures to natural grassland is leading to a net increase in the area under permanent grass at the farm level with an associated growth in grassland diversity. Furthermore, the extensive grazing practices we have observed on the farms studied are having an identifiable and beneficial impact upon the floristic composition of these pastures. As many of the farms concerned are located within what are recognised as priority habitats (notably heath and moorland and calcareous grassland), these high value, extensive systems are helping to reverse biodiversity loss.

A second component of our research concerns the quality of the final product and its relationship to pasture feed inputs. Here again, we have sought to assess whether or not the meat and dairy products coming from animals grazed upon quality biodiverse

grasslands is identifiably different from that available from more standard, intensive systems.

Following detailed laboratory analysis, we maintain that differences in pasture biodiversity can positively affect meat quality, chiefly as a result of the impact of plant species upon the rumen process. These are findings that confirm research that has been undertaken elsewhere. There are a number of elements to this. First, our research reveals that, when controlling for breed, lamb meat produced on biodiverse rich grassland (particularly heather pasture systems) displays higher levels of Vitamin E (a natural antioxidant affecting shelf life) than control meat. Second, lamb meat from biodiverse rich grasslands recorded generally lower skatole levels (a product of rumen fermentation which adversely affects meat taste, particularly when grilled) than control meat. Third, lamb meat from biodiverse rich grassland recorded higher levels of a number of nutritionally healthy fatty acids (notably n-3 polyunsaturated fatty acids and conjugated linoleic acid) than control meat. Fourth, beef breeds (such as Longhorn) were shown to be more suited to biodiverse pastures and generally yield higher meat quality.

Our research has provided evidence that there are indeed added product qualities to be created through the linking of the protection and maintenance of species rich grazing pastures with quality food products.

For producers, this has potentially significant implications for farm businesses and, ultimately for rural development. By integrating natural value into production chains, producers are able to increase the value of their products and, through marketing and sales strategies, retain a greater proportion of that value within the farm business. Our analysis of returns shows that despite possible lower production volumes (in body weight per animal and in the number of animals produced), the higher prices obtained, in some cases combined with payments under agri-environmental schemes for natural grassland management along with other 'Pillar 2' measures, make this form of farm enterprise profitable in what are often otherwise considered as marginally productive regions.

Furthermore, in their explicit linking of place-based environmental quality and food quality, producers are engaging directly with consumers through 'alternative' outlets and networks such as direct selling, farmers' markets, specialist local retail outlets, web-sales and so on, thereby further contributing to the flow of revenue directly to rural areas. In a number of instances studied here, this has permitted increases in on-farm employment and further rural investment.

By bringing formerly unproductive grazing lands into production, or by converting formerly improved pastures into 'natural' grasslands, producers are taking an active – and at the same time productive - role in grassland management. For some producers, often initially from outside the profession, this represents an opportunity for investment and dynamic marketing. For others, often more longstanding farm businesses, this has represented a post Foot and Mouth alternative. Many are more careful than the incoming entrepreneurs, preferring to maintain more intensive systems in parallel on improved pastures.

Nonetheless, for all the producers studied here, responding to consumer demand for more naturally embedded food products and for a greater sense of distinctive food provenance, linking biodiversity as an input to food quality represents a new source of social, economic and environmental value which requires recognition in policy objectives

and adapted policy instruments. Ultimately, this research offers a different take on sustainable agricultural production; one that is less about leaving as 'small a footprint as possible' on some pre-existing nature, and one that is more about seeing food production and nature production as being mutually constituting.