Woodland & hill farming production: can't we have both?

Chris Badenoch *looks at managing farmland on our grassier hills to maximise soil health, sheep nutrition and trees.*

Hill farming has arrived at its present state more by unhappy accident than any conscious design or strategic scientific forethought. While there are social benefits from maintaining a farming population, and environmental benefits from having typical wildlife species in upland areas that are not grouse moor or deer forest, the benefits of keeping a human population in inherently unproductive areas is a political and (partly) social question rather than one of objective science or economics. The economic baseline for hill farming depends upon the output per unit of breeding stock, mostly hill ewes. Farm boundaries were generally established three centuries ago and more, in a very different husbandry, labour and economic climate, rendering the cosy idea of 'traditional' management as nonsense. It is essentially a low-input and low-output system, providing less than 20-30 per cent of the output of low ground sheep grazing systems.

What does 'traditional' mean? The changes in farming have certainly been more dramatic in the last half century but many contributing factors have proceeded almost imperceptibly. Increases in flock size, changes in labour costs and availability, and resultant shepherding (i.e. daily movement of sheep across the various vegetation of the hill) have been relatively gradual. We have seen a move from mutton-eating to lamb-eating and the almost complete collapse of wool markets. Greater care and attention to avoidable pests and diseases by better husbandry and, of course, veterinary medicines have also developed gradually. I seriously doubt if one could pick a time after 1800 when the hill-farming systems could have been stable enough to be called 'traditional'.

Vastly increasing labour costs have reduced the daily herding of stock which previously ensured the best use of vegetation. The extensive, and uncontrolled, situation which has arisen has meant, on our grassier hills at least, a colossal surplus of summer growth which is not effectively utilised by the sheep flock. By mid-summer this will have reached some 900 kilograms of un-utilised dry matter per acre, compared with less than a third of that on low ground systems [1]. The more digestible and nutritious plants are selected out leaving the poorer ones, such as mat grass, purple moor grass, tufted hair grass, and rushes. These 'bulk-up' and leave a huge litter layer year on year.

Over the long-term the system, unless we modify it, is unsustainable. Better utilisation of hill pasture to prevent the accumulation of poor, indigestible material and to encourage finer grass species is crucial.

Above: Shepherds crooks at the Peebles Show 2008. Photo by Flickr User Alan Stanton, used under a Creative Commons Attribution License.

This litter layer has also undergone centuries of compaction from sheep, as was concisely described by Eadie [2] over 40 years ago.

Good soil means good grazing
The interactions of hill vegetation, climate, soils and grazing have long been known. The extensive under-grazing of the hill, with the build-up of a deep litter layer carried over from season to season, has resulted in poor nutrient return from livestock to the rooting layers. There are also subsequent atmospheric losses, especially of nitrogen, from this layer and with muirburn, there can be loss of phosphorus and other available nutrients. Thus, there is a continued, inexorable decline of an already meagre fertility on the open hill. The penalty thus incurred has been paid by the nutrition, and hence economic output, of the hill sheep. Over the long-term the system, unless we modify it, is unsustainable. Better utilisation of hill pasture to prevent the accumulation of poor, indigestible material and to encourage finer grass species is crucial.

Above, left to right: Moving sheep at Gateside in Fife; A flock at Glendevon; Sheep in North West Scotland. Photos: Flickr Users B4bees, Robert Young and Jack Shainsky, all used under a Creative Commons Attribution License.

In general, hill farming practitioners have tried to get round this under-utilisation of the summer hill production in several ways, chiefly by better use of our improvable ground and 'in-bye' [3] for superior grazing and the production of forage crops for winter. The recent, nonsensical 'headage payment scheme', applied without any thought as to grazing management and long-term consequences, did not address any of these points. Key drivers have been those giving general improvement of ewe and lamb nutrition throughout the year but especially during high demand periods: prior to ovulation; in late pregnancy, when she is otherwise forced during winter to draw on her own muscle and even her skeletal reserves; and during lactation. The former Hill Farming Resarch Organisation of the Agricultural Research Council showed this clearly throughout the 1970s, and developed controlled in-bye improved paddocks known as 'the two pasture system' but much of this seems to have been ignored or forgotten.

The poor utilisation of summer biomass, even with winter housing, away-wintering and buying-in forage, is dictated by the area of improvable 'brown-forest soils' in the valley bottoms, and by the attendant proportion of steep or high un-improvable hill. In the south and parts of eastern Scotland, the proportion of productive in-bye can be as low as ten per cent, but is at best around 16 to 20 per cent of the total farm area. There would, therefore, be some advantage in considering what area of any farm can be improved in this way, and what stock levels can be 'flushed' ready for mating, wintered, lambed and held for lactation on this in-bye. This can then give a rough idea as to what the summer hill stocking can be, and so what 'extra' land can be made available for tree-planting.

Rural economy

The sale of whole farms for forestry has economic and social consequences, which have been less than acceptable to declining rural populations. Agricultural employment has fallen sharply in the last half century, with many fewer people now looking after at least the same number of sheep. The remoteness of hill farms and their low wage structure and economic returns is undoubtedly also apparent in the quite understandable aspirations of isolated and disconnected wives and children, if not of hill farmers themselves, who long for a more integrated local community, any

public services (gone are the days of the butcher/baker/fishmonger/ironmonger van) or even public transport and a mobile phone signal.

In Scotland, forestry per se has not resulted in the reduction of the national sheep flock. The hill sheep industry also contributes only about six per cent of UK agricultural output. Any decline has been due to other factors. The (partial) answer, especially on the grassier hills of Scotland, is to generate much better farm-forest integration. This would involve better use of the open hill by increasing summer grazing levels and reversing the vicious circle of virtually uncontrolled extensive grazing, thereby increasing the meagre farm output from better ewe nutrition and hence output per ewe. Controlled grazing on improvable enclosures on the better soils is essential. Taking out a proportion of the hill for planting will provide shelter, biomass, timber, landscape and game and also adds to the inherent capital value of the holding further assisting the overall hill-farming economy. Taking advantage of forest layout and fencing, useful paddocks can be enclosed, their capital expense being covered, to enable better seasonal use of grazing for improved ewe and lamb nutrition, as has been shown on a number of estates notably in Roxburghshire and parts of Dumfriesshire.

In the wider rural economy, it is generally recognised that the larger forest blocks are here to stay. They are approaching 'normality', i.e. having a varied structure with continuous production, replanting and growth, all requiring continuous labour inputs. As restructuring takes place, as the forest matures and as age classes are better spread, the continuity of employment over the forest unit will inevitably increase. This has been clearly shown by the recent Scottish Agricultural College and Confederation of Forest Industries report using Eskdalemuir as an example [4].

Changing climate

There is also increasing attention to flood control as a result of the Scottish Government's 2009 Climate Change Act and the associated Flood Risk Management Act. The establishment of riparian woodland and plantations in the upper catchments has been shown in Wales, and in various places by Tweed Forum and Dundee University, to give better interception of incident rainfall, which is increasing in intensity and periodicity under a changing climate. There is much better absorption by canopy, stems and roots, as well as improved soil permeability, and a lack of surface run-off under woodland, compared with open-grassland; these there is also a considerable evaporation off the canopy surface. Woodland blocks on stream catchments can also contribute considerable benefit to water quality, to the food supply of freshwater fish, and to the continuity of riparian 'habitat networks' promoted by Forestry Commission Scotland and Scottish Natural Heritage (SNH).

Furthermore, the developing market for wood-fuel and biomass in the shorter term and timber in the longer term are important incentives. Most of the foundation work for these ideas is old. One has to ask why we are still endlessly chewing over re-invention of the wheel when the wheel already exists!

References & notes:

1. Eadie, J. (1967). The Nutrition of Grazing Hill Sheep. In: Fourth Report (1964-67) Hill Farming Research Organisation. Agriculture Research Council. Edinburgh.
2. Eadie, J. (1970). Hill Sheep Production Systems Development. In: Fifth Report (1964-67) Hill Farming Research Organisation. Agriculture Research Council. Edinburgh.
3. 'In-bye' is that part of the farm which is used mainly for arable and grassland production and which is not hill and rough grazings. See http://tinyurl.com/psle72w
4. Bell, J. (ed). (2014). SAC Consulting. Eskdalemuir: A Comparison of Forestry & Hill farming, productivity and econoimic impact. SAC Rural Business Unit. Penicuik, Midlothian.

Chris Badenoch was formerly with the Agricultural Research Council, and later with Natural Environment Research Council, Nature Conservancy Council, and as a Regional Operations Manager with SNH in Lothians & Borders. He was a founder of the Farming & Wildlife Group in Scotland, and of Tweed Forum. He is currently an ecologist on the South Scotland Regional Forestry Forum.