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EXTENSIFICATION POLICIES FOR HILL AND MOUNTAIN FARMS

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Summary

Extensification on already relatively extensive and low output hill farms must be either matched by changes to either reduce fixed costs or the management system to increase output. On hill and mountain farms reducing labour to achieve the saving in fixed costs leads to conflicting problems of reduced animal welfare, economic activity and employment. Increasing output with a lower number of existing animals is not possible. Intensification of parts of the farm to balance the extensification on another is demonstrated to be a possibility, where better land can sustain higher output ewes.

Introduction

In the hill and mountain regions of western Europe, particularly the UK and Eire, sheep farming is the dominant land use. Systems of productin have been developed involving the extensive grazing of the semi-natural pastures on an annual basis. Many of the areas grazed have important nature conservation and landscape interests. Whilst much of the policy background for exstensification from the European Union comes from a wish to reduce pollution and de-intensify intensive agriculture, the environmental policy issues in the hill and mountain regions of western Europe and driven by wishes to modify grazing intensity in already low input grazing systems.

In the UK, specific voluntary measures to decrease stocking rates on heather (*Calluna vulgaris*) moorland have been established through the Environmentally Sensitive Area Schemes and the UK Agriculture Department's Moorland Extensification Schemes eg. The Heather Moorland

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Scheme (Scottish Office 1994). Furthermore, contrl of "over-grazing" in also included within the Sheep Annual Premium regulations and Hill Livestock Compensatory Allowance regulations as a cross-compliance measure. Many semi-natural pastrures are also part of nature conservation regulated areas. In these Sites of Special Scientific Interest and Special Areas of Conservation EU Habitats Directive 1994), government agencies are charged to protect and enhance nature conservation interests. It is becoming increasingly clear that control of grazing, usually a reduction, is seen as a key tool to achieve site management requirements.

Whatever the cause of extensification processes, it is important to be able to measure their impact. Within hill and mountain areas, opportunities, for diversification are limited and the farms are already heavily penalised by problems of remoteness, poor infrastructure and difficult land and climate (Eadie 1985, Maxwell 1994).

These possible impacts are very wide. It is relevant to question the impact of such policy driven measures of animal welfare, technical performance and product quality; on farm economics, profitability and labour; an on wider regional issues of wealth creation and rural employment. It is also essential to test the success of the policy on the primary objective, to improve the environment. Some work in these areas is being carried out by our research group in Scotland.

For the purposes of this paper, the impact of extensification policies on sheep performance and welfare and farm profitability will be discussed, followed by options to achieve mixed objectives of decreased stocking rates whilst attempting to maintain farm profitability.

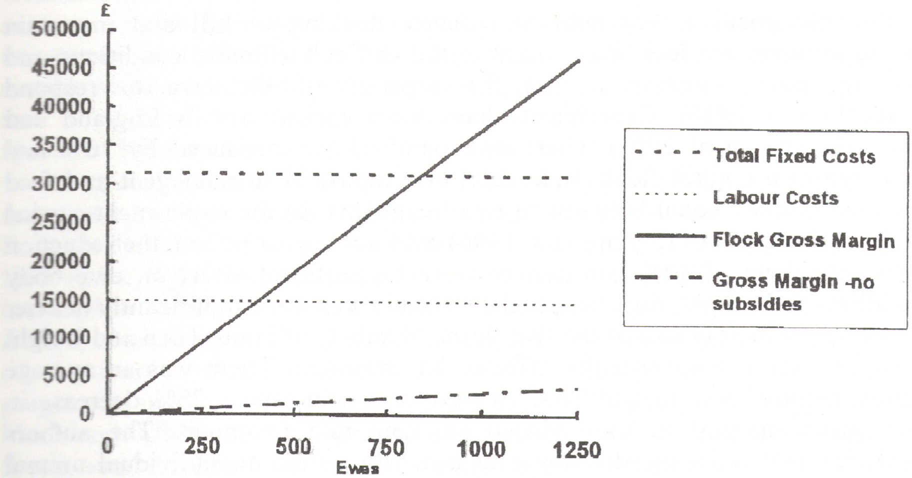
Reducing Flock Size to Reduce Stocking Rates

The most simple scenario to achieve a more extensive system, whatever the motive, is to decrease the size of the flock grazing a particular area. However, if flock size and flock income are reduced whilst fixed costs (labour, rent, machinery etc.) stay broadly the same then profitability will be detrimentally affected.

Figure 1 shows how different flock sizes and flock gross margins and typical fixed costs interact.

In 1994 data from 66 Scottish Highland Hill Farms collected (as part of the Farm Accounts Data Network of the EU) for statistical purposes show an average number of breeding ewe equivalents per full time worker of 837 (Ashworth 1994).

Figure 1. - SIMPLIFIED DIAGRAM SHOWING FLOCK GRASS MARGIN AT DIFFERENT FLOCK SIZES



Using data from SAC's Farm Management Handbook (SAC 1995), data for fixed costs for a typical sheep farm and 1995 Gross Margins are displayed. This shows a breakeven point when fixed costs intercepts with flock gross margins at 844 ewes. It is clear from Figure 1 that a major reduction in flock size would severely pressurise the capacity of the farm to meet its fixed costs.

The need to spread the fixed cost component over a greater volume of output has been described by Eadie (1985). He pointed out the value and potential for further intensification on many hill farms. Increasing stock numbers with quota implications is difficult. For many farmers, extensificaton with reduced grazing intensity must now be considered.

Financial margins per ewe can be modified by improved animal performance and reduced costs. It changes to these two factors are small then changes in profitability will be dependant on flock numbers and/or compensation payments. Using the example at the average flock size above (of 837) then a 30% reduction in flock size without compensation payment or an increase in individual ewe performance would lead to a loss in profit of £9500.

One of the key questions that, therefore, arises in relation to extensification is how does individual ewe physical and financial performance change as a result of reduced stocking rate.

Possible responses to reduced stocking include an increase in individual ewe performance, such as to increase the number and quality of lambs produced by each ewe. Furthermore it may be possible to reduce costs, such as feed and fertiliser, to increase individual ewe financial performance. Such responses to modified grazing intensities are possible in intensive and semi-intensive sheep farming in the lowlands or uplands with resseded pastures (Sibbald 1992, Maxwell et al 1984).

Possible positive responses to reduced stocking in hill and mountain farmng systems are less likely because the difficult climatic conditions and generally poor nutrition restrict the capacity of the ewe to respond (Waterhouse 1994). Experiments have been carried out in England and Wales (Byrne et al 1993) where ewe numbers were reduced by 30% and compared to a control flock. Individual ewe inputs of menamegent and feed remained broadly equal between to two treatments. In the experiment carried out at Redesdate EHF (Byrne et al 1996) over a five year period, the reduction in ewe numbers of 30% had non consistent significant effect on ewe body conditions and weight, for example the Control ewes were significantly heavier at pre mating in only two of the five years. Numbers of lambs born and weight of lambs were not consistently effected by treatment. There was an average improvement of 5% in individual ewe gross margin (and a 25% decrease in flock gross margin) in the reduced stocking rate treatment. The authors concluded that reducing stocking rate had little effect on individual animal performance and that had the treatment flock been entered into a Moorland Extensification Scheme, the increased revenue would not have been sufficient to offset the loss associated with reduced sheep numbers. It is likely that because of similar feed and management inputs the labour input per flock would have been similar.

In establishing experiments in Scotland, SAC researchers have considered the potential strategies of farmers to assess how they modify labour inputs in the situation of reduced flock size and the absence or the end of compensation payments. Compensation schemes currently have a finite life of 5 or 10 years for the Heather Moorland Scheme and ESA Stock Reduction options respectively. Is is, therefore, essential to consider the financial situation of farms after a period of compensation or where extensification is uncompensated. To model these circumstance a real reduction in fixed costs was incorporated. This is principally labour, reducing the potential for inputs of feed or animal care.

The Auchtertyre Systems Experiment

This experiment is being undertaken on SAC's Auchtertyre Farm at Crianlarich in the west Highlands of Scotland. This is a farm with a harsh climate and topography. Altitude ranges from 188 to 1033 m. Annual rainfall at the lower altitude is in excess of 3000 mm per annum. Snowfall is intermittent with complete snow cover at high altitudes form November to March, but variable at lower altitudes. There is little flexibility on lambing dates, with timing aimed to match with the onset of grass growth in the spring (late April/May). Typical output in the locality is between 75 and 100 lambs weaned per 100 ewes mated. Two separate flocks of sheep from contiguous sections of the farm have been enterd into the two treatments within the experiment in 1990. Prior to this both of these two flocks was managed in a similar manner and their performance monitored for a number of years. The size of each of the original flocks is very similar to that for the average specialist hill farm with c. 850 ewe equivalents.

Control Treatment. This section of the farm covers 895ha of semi-natural rangeland grazing that has been maintained with an average flock size of 960 Scottish Blackface ewes and their followers. Moderate inputs of supplementary feed and a high level of labour have been maintained throughout. Practices intended to achieve good levels of individual ewe performance and continued from the baseline period before the start of the experiment included: Separation of primiparous ewes (gimmers) for mid pregnancy supplementation, mid pregnancy supplementation of all ewes up to 160 g/day of compound feed-block and differential management and feeding based on real-time ultrasound foetal number. The latter involves daily supplementation of compound feed during the last 8 weeks of pregnancy of single bearing ewes of up to 225 g per head and for twin bearing ewes rising to 700 g per head. Intensive lambing management is undertaken with separate and appropriate care for ewes with twins, primiparous ewes and single bearing ewes in low body condition. Twin rearing ewes continue to graze on high quality pasture in fields throughout the summer whilst singles graze on the semi-natural hill grazings.

Table 1. - MAIN RESULTS

	Treatment Control	Extensified
Number od ewes	960	630
Lambs reared per 100 ewes mated	104	65
Labour hours per year	2550	780
		£
Annual financial impact compared to Control Treatment	Fewer lambs	-12,500
	Less subsidies	-8,100
	Saving in feed	+6,000
	Saving in labour	+10,500
	Net impact	-4,100

Summary

extensified system is £4,100 worse off than Control, leads to much reduced turnover and economic activity and employs 70% less labour. If savings in labour costs are removed then the Extensified System is £14,600 worse off per annum.

Extensified Treatment. This adjoining section of the farm covering 1100 ha of semi-natural rangeland had a major stocking rate reductin in October 1990. The 900 breeding ewes were reduced to 630 (30% reduction) by removal of sheep from all age groups and from different sections of the extensified range. The management system was changed from that described above for the Control treatment. No separation or preferential treatment is given to any class of sheep and the level of supplementation is reduced to less than 5kg per ewe per year compared with the total for the Control treatment of over 25 kg per ewe. This feed input is made by limited inputs of compound feedblocks in late pregnancy. The ewes in the flock give birth on the open range, typical of traditional low input management in the region, with little or no contact with shepherds.

The financial advantage of the Control Treatment has increased in recent years due to increased value of lambs (to Southern European markets) and other sales of livetock and maintenance of high subsidy payments. In many cases reductions in labour are not possible, because it is the labour of the farmer and his family. Even where employed labour is involved it is difficult to employ a fraction of a shepherd. Removing the labour saving advantage of the Extensified System from the simple calculations above leads to even less incentive to extensify. Net Farm Income for specialist hill farms 1993/94 (64 farms with 802 ewe equivalents) was £12134. For 1994/95 Net Farm Income for the same hill farms (823 ewe equivalents) was £10965 (SOAEFD 1996). Given that these margins must also cover the cost of the labour of the farmer and spouse then a reduction in Net Margin by several thousand pounds (£14,600 in the example above) is not tenable. If extensification is enforced, or compensation payments come to their end, then this average farm is non-viable without very significant restructuring in labour. As alternative employment is difficult in these remote regions, then further depopulation or rural unemployment are the likely outcomes.

The situation is worsened because of the influence on the rest of the rural economy. Work by Doyle et al (1996) suggests that the income multiplier on the sheep industry in Scotland is 2.26. This indicates that a fall in economic activity trickles through the economy to cause twice as big a loss of total economic activity. The same work points towards a total loss of 1.6 jobs in the total economy for each labour unit lost in the sheep industry.

Moreover, one of the major impacts of changing strategy to a much lower imput system is neither financial or social. The reduced output in lambs reared per ewe shown in Table 1 is largely due to increased lamb mortality. This increases from 6.5% before stock reduction to 23% in single born lambs in tne Extensified System, compared to no change over the same periods (6.5 and 8.5% respectively) for the Contorl Treatment. This creates considerable conflicts between policies. Thus potential benefits in environmental quality are offset firstly by major reductions in animal welfare as measured by lamb mortality and secondly, economic activity and employment in remote areas. This is described in more detail elsewhere (Waterhouse 1996, Waterhouse 1994, Ashworth & Waterhouse 1994).

Strategies to reduce grazing intensity and yet maintain welfare, outputs and employment

The following are possible approaches:
1) To Increase farm area yet maintain stock numbers.
2) To house or off winter stock.
3) To intensify management (and grazing) on one part of the farm whilst reducing in elsewhere.

1) *Increase of farm area.* In some regions of Europe, land abandonment is an important issue. Taking over abandoneed areas can achieve many of the policy objectives. However, within the UK it is rare to find such opportunities. Amalgamation of units is one means by which viability can be maintained where two non-viable units are united with an overall reduction in flock size. However, this will typically lead to less direct employment and lower economic activity than before.

With grazing over larger areas other problems can occur. Gathering of sheep for flock management tasks is more time consuming. Where lambing is carried out on the extensive pastures then supervision becomes more difficult. A simulation model considering 'search areas' to be covered by shepherds at lambing with increased land areas demonstrates how difficult it is to see all ewes when stocked at much less than 1 ewe/ha (Waterhouse 1996). Animal welfare is likely to remain an issue on these more extensively managed units.

2) *House or off winter stock.* Removal of sheep during the winter can serve two purposes. Firstly it reduces the number of sheep grazing. As grazing pressure on heather (*Calluna vulgaris*) for example, is greatest in the winter (Grant and Armstrong 1993) this has potential to have the greatest benefit.

Removal of sheep, whether breeding ewes or flock replacements is a strategy chosen by a number of farms to achieve both increased animal performance and reduced use of agriculturally valuable spring grazing resources. Large umbers of un-mated replacement females are removed to better lowland farms in the winter in the UK, this being the nearest equivalent to transhumance seen in the wet, western hills of UK.

For breeding ewes, whether housed or transferred to better grazing, the opportunity exists to select ewes for better nutrition and care. Transabdominal utltrasonography and segregation of twin bearing ewes has been shown to be highly beneficial (Pattinson and Weterhouse 1995), whilst primiparous ewes benefit from better nutrition (Waterhouse and McClelland 1987).

However, this form of partial intensification and partial extensification leads to extra feed costs and extra labour. It needs to be balanced with increased output. Capital requirements for housing are high. Often removal of sheep to better land removes their eligibility for some subsidy payments and this type of removal is often not eligible for stock reduction schemes, even though it can possibly achieve the environmental benefits without penalising the size of the business and it's economical and employment activity.

3. *Intensify management and stocking rate on one part of the farm whilst decreasing it elsewhere.* Semi-natural pasture is the priority conservation issue on many hill and upland farms. Most farms have a mix of both seminatural pasture and improved and reseeded pastures closer to the farm buildings and on lower land. The proportion differs. In recent years efforts to improve overall output and efficiency by integratint the use of hill (semi-natural pasture) and improved pasture has led to the development and promotion of the Two Pasture System (McClelland et al 1985). Application of the main components of this system, providing improved grassland to hill ewes for mating and lambing, has been extremely successufl (Armstrong and McCreath 1985).

Where there is a need or the wish to reduce grazing intensity only on the semi-natural hill grazing, one option is to reduce the number of ewes over the whole farm and run the system much as before, as described earlier. The alternative is to change the system dramatically, by continuing to farm the lower land at high, or even higher intensity and only reduce the grazing on the semi-natural pasture. This may mean reverting to a traditional system with low inputs and outputs for this hill land and stratifying production system across the farms.

Extensify the Hill and Intensify the Improved Pasture - a case study

One of SAC's hill units, Kirkton, was used for many years to successfully demonstrate the Two Pasture System (McClelland et al 1985). Over the last three years this system has been modified to test and measure the consequences of the option described in 3) above. Instead of a flock of wholly Scottish Blackface ewes, the lower part of the farm is now partly stocked with crossbred Mule ewes (Scottish Blackface x Blue Faced Leicester) mated to Texel rams. Theoretically these ewes have a higher prolificacy (Cameron et al 1983) and a potential for higher carcass weights (Kempster et al 1987). However, it is not traditional to keep these less hardy animals in these more difficult climatic areas. The higher part of the farm continued to have a flock of Scottish Blackface ewes, but grazed on an annual basis at a lower intensity than the previous flock and not having access to the better lower land that was reserved for the crossbred ewe flock. In addition to determining whether the crossbred ewes could achieve satisfactory levels of production, one aim was to determine whether the loss in income due to fewer ewes could be offset by higher output ewes on the better part of the farm unit.

We have used data on physical performance of ewes from the separate flocks to estimate the impact on overall flock income. In both situations, some of the Blackface ewes are mated with a Blue Faced Leicester to produce higher value lambs and to provide replacement female lambs for the Mule flock in the current situatin. Within the Two Pasture System this 'Crossing' Flock is managed alongside the Blackface purebred flock i.e. it is fully integrated. With the Statified management, this flock runs alongside the Mule flock. The data and financial calculations are set out in Table 2 below.

Table 2. - COMPARISON OF PHYSICAL AND FINANCIAL PERFORMANCE OF AN INTEGRATED TWO PASTURE SYSTEM WITH A STRATIFIED HILL FARM WITH EXTENSIFIED HILL GRAZING AND INTESIFIED IMPROVED GRAZING

	Number of ewes	Lambs weaned per ewe mated	Mean Lamb Weaning Wt (kg)	Total Number of lambs	Total Weight of lambs (kg)	Gross Margins per ewe (£)	Flock Gross Margin (£)	Flock gross Margin without support payments (% from support payment)
Two Pasture System - Integrated Unit								
Scottish Blackface - purebred	418	1.22	29	510	14790	41.78	17463	4509 (74%)
Scottish Blackface crossbred lambs	200	1.40	31	280	8680	55.64	11128	4930(56)
Total	618	1.28	29.7	790	23469	46.26	28591	9439(67)
Stratified Unit								
Scottish Blackface - purebred with low input/low output set stocked on hill	168	0.80	27	134	3618	34.70	5830	624(89)
Scottish Blackface - crossbred lambs on lower farm	180	1.42	31	256	7924	54.58	9825	4247(57)
Crossbred Mule ewes producint Texel X lambs	200	1.70	33	340	11220	61.87	12373	6725(46)
Total	518	1.41	31.2	730	22772	54.11	28028	11595(59)

This example illustrates the potential for partial intensification to compensate for extensification on part of the farm to achieve specific environmental objectives. Flock gross margin is maintained despite a drop in overall flock numbers of 17%, and a proportionately higher reduction in grazing intesity on the hill grazings. Following the trend demonstrated by Byrne et al (1993) etc, a drop in farm net income of approximately £4800 would be envisaged by a simple reduction in numbers from the original system. Were the current annual payment under the Heather Moorland Scheme be paid then only £2500 would be received, still leading to a reduction in income and total gross margin.

It is also worth commenting on the reliance upon support payments and the environmental payments. Comparing the proportion of gross margin that comes from support payments then for the original flock support payments make up 67% of the gross margin and for the new partially intensified flock 59%. Simply reducing flock size and accepting the extra extensification support payments increases reliance on non-sheep product income to 82% of Gross Margin. Should the partially intensified/partially extensified system merit extensification payments then this new system would leave the farmer approximately £2000 p.a. better off but still less reliant at 62% of subsidy, than the original system.

An approach such as this is only possible where hill and mountainfarms have the land and resources available. For many farms with poorer land it is not feasible.

This example shows that intensificatin is still the solution to the particular problem of reducing grazing intensity on a semi-natural component of the farm. Lamb output can be maintained by changing breeds of ewes and rams and making necessary modifications to flock management. In this way labour costs are sensibly applied to achieve adequate flock margins, with incidentally reduced reliance on support payments. In addition there is an improvement in overall product quality, although a proportion of the flock (the hill flock) will produce lighter lambs. These results are similar to those found for MAFF sponsored work in Wales (Hacking 1996 - pers. comm). Here reductions in stocking rate on semi-natural pastures have also been offset by intensification on the lower reseeded pastures.

Conclusions

Extensification on already relatively extensive and low output hill farms must be either matched by changes to either reduce fixed costs or the management system to increase output. On hill and mountainfarms reducing labour to achieve the saving in fixed costs leads to conflicting problems of reduced animal welfare, economic activity and employmetn. Increasing output with a lower number of existing animals is not possible. Intensification of parts of the farm to balance the extensification on another is demonstrated to be a possibility, where better land can sustain higher output ewes.

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POLITIKA PROŠIRIVANJA BRDSKIH I PLANINSKIH FARMA

Sažetak

Proširivanje već prilično proširenih brdskih farma niske proizvodnje mora se uskladiti s promjenama ili smanjenjem fiksnih troškova ili sustava upravljanja da bi se povećala proizvodnja. Na brdskim i planinskim farmama smanjenje radne snage, da bi se postigla ušteda u fiksnim troškovima, vodi do konfliktnih problema smanjenja dobrobiti životinja, ekonoske aktivnosti i zapošljavnaja. Povećanje proizvodnje s manjim brojem od postojećih životinja nije moguće. Intenzifikacija dijelova farme kao protuteža proširenju drugog dijela pokazala se mogućom tamo gdje bolja zemlja može hraniti ovce većih proizvodnih rezultata.

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