4 *The agricultural perspective*

4.1 Introduction

The biological diversity of Britain's grasslands has suffered drastically since the last war (Chapter 2) due mainly to processes of agricultural intensification. (Stoate 1996). Prior to 1930, the use of external inputs was severely limited by economic constraints, which restricted the level of production to what each farm could sustain with its own resources. This helped to maintain biological diversity of farmland habitats, an effect which was enhanced by the smaller scale and wider mix of farming enterprises. The yields of all the major farm products have increased dramatically due to greater use of inputs during the last 50 years with wheat production rising annually by an average of 2.3 per cent and milk by 1.8 per cent between 1946 and 1993 (Baldock *et al*, 1996).

However, these improvements in productivity have been accompanied by growing public concern over a range of farming-related issues such as habitat destruction, environmental pollution, food safety, animal welfare and rights of access. The political pressure generated over these issues has resulted in significant efforts being made to resolve them and for nature conservation perhaps the most important change has been the introduction of the various agri-environmental schemes, which provide financial incentives for promoting positive management of land to achieve environmental benefits.

With 76 per cent of Britain's land surface occupied by agriculture, and 65 per cent of that comprising grassland (Brockman 1988), the importance of livestock farming for conserving grassland as a landscape feature remains paramount. Many managers rely on commercial farmers to implement the required grazing regimes on their nature reserves whilst some farmers are directly responsible for managing their own SSSIs or other biologically important grasslands. With only 5 per cent of permanent grasslands in lowland Britain having escaped agricultural improvement since 1930 (Hopkins & Hopkins 1994) the survival of the low-input, extensive livestock systems that have developed and maintained the ecological character of these semi-natural habitats through the ages should be a key concern for conservationists (Tubbs 1997).

The purpose of this chapter is to outline how the British agricultural industry is being shaped by various political, economic and ecological factors. It sets the context for both Chapters 5 and 6 by providing a useful insight into the underlying conflicts of interest between farmers and conservation practitioners and proposes means for resolving them.

4.2 The political context

Today, UK agricultural policy is heavily influenced by the European Union, since the majority of support payments are part funded by the Community. In 1995/96 the EU contributed £2.6 billion to the British agricultural sector and this is scheduled to increase to £3.1 billion by 1998/99 (MAFF 1997) which represents about 9 per cent of the EU's total budget for CAP.

Britain joined the EEC (European Economic Community) in 1973 when its agriculture came under the influence of the CAP (Common Agricultural Policy), which had been established to try and integrate food production within the Member Nations. The objectives of the CAP were set out in Article 39 of the Treaty of Rome which had established the first six nation EEC in 1957. Essentially these were:

- increase productivity by promoting technical progress;
- ensure a fair standard of living for farmers by increasing their earnings;
- stabilise food markets (minimise adverse effects of price fluctuation);
- ensure availability of food supplies;
- ensure reasonable prices for consumers.

There are potential conflicts that can develop between these different objectives, especially where they concern the contrasting needs of farmers and consumers. Such tensions continue to bedevil the CAP and the current round of reform proposals (Agenda 2000) are being strenuously debated within the Community.

The policy operates along two broadly different approaches:

- Financial mechanisms: arrangements for supporting farm incomes eg price support, intervention mechanisms, livestock headage payments, export subsidies, exchange rate mechanisms.
- Structural Policies: measures which influence structure and efficiency of the industry eg vocational training, marketing and cooperative initiatives, agri-environment policies such as Environmentally Sensitive Areas.

The financial mechanisms correspond broadly with the production-based system of support that has been the main thrust of the CAP throughout its existence and which has helped to shape market forces artificially. Structural policy on the other hand has, until recently, received very little emphasis because it does not influence farm prices directly and is therefore a rather blunt instrument for achieving change.

However, the CAP has come under increasing scrutiny and criticism during the last two decades because of the perceived damage it is inflicting on the biological, cultural and social fabric of the countryside, especially in Britain. It has also become increasingly burdensome to the taxpayer as well as generating tensions amongst the EU's trading partners who object to large surpluses of European commodities being 'dumped' on world markets at low prices.

Increasing pressure on the CAP throughout the 1980s eventually resulted in the McSharry reforms of 1992. As well as some very significant and complicated changes to the financial mechanisms (eg arable area payments, compulsory set-aside and livestock quotas) which indicated a commitment to controlling direct subsidising of production, these reforms also included expansion of the structural policies. In particular the Agri-Environment Regulation (2078/92) required all EU member states to establish their own schemes for paying farmers to implement conservation objectives in conjunction with their businesses.

The responses by different member states have varied considerably, with up to 70 per cent of farmed land in countries like Austria and Finland being entered for the relevant scheme, but only 8 per cent in the UK (Countryside Commission 1998). Overall, at least in budgetary terms, this commitment represents a rather modest 3 per cent of the total CAP expenditure (Baldock *et al*, 1996).

However, pressures on the EU to further de-couple farm support from the means of production have been maintained by the World Trade Organisation prior to its next summit in 1999. This is because the 50 per cent of the average income that EU farmers receive in the form of subsidies is thought to give them an unfair advantage over their counterparts in other countries such as New Zealand, Australia and USA where the equivalent levels of subsidy are 5 per cent, 10 per cent and 15 per cent respectively (Richardson 1998). This fact combined with the increasing budgetary uncertainty arising from proposals to expand the EU by inclusion of former Soviet bloc countries in central and eastern Europe, makes maintaining the existing CAP arrangements unlikely even in the relatively short-term.

The political momentum for another round of CAP reform has already produced an unprecedented level of consensus right across the rural sector. Leading conservation organisations have been demanding that support payments to farmers be (a) completely decoupled from agricultural production and (b) made conditional upon appropriate management for achieving environmental gains (cross compliance). The farmers' and landowners' organisations too have called for the same basic changes (NFU 1995 and CLA 1995).

In July 1997 the European Commission announced its proposals under Agenda 2000, a statement of its views on the objectives and future direction of EU agricultural policy. Agenda 2000 confirms the policy choice expressed in the *Agricultural Strategy* Paper of December 1995 (European Commission 1995) of developing a coherent rural policy accompanying shifts away from price support to direct payments for farms. This was based on the aspirations raised by EU Agriculture Commissioner Franz Fischler (the Cork Declaration 1995) to achieve better integration of agricultural, environment and rural development policies.

The initial proposals were subsequently developed into a set of draft regulations issued in March 1998, with the aim of completing the reforms during 1999, once they have been agreed by the European Parliament and the Council of Ministers. They develop and extend some of the initiatives from the 1992 McSharry reforms, but have been criticised for paying insufficient regard to agri-environment measures, which are still only projected to account for 5 per cent of the total CAP budget (English Nature 1997a). The specific effects of these proposed reforms on lowland livestock systems are hard to predict because of their complexity, with contrasting strategies for the different agricultural sectors (English Nature *et al* 1998).

The most significant measures would appear to be:

Beef. The 30 per cent cut in intervention support for prices will be compensated by higher levels of direct payment to beef farmers. Part of CAP funding for these direct payments is reserved for a 'national envelope' so that each member state can decide whether it its to be issued in the form of headage or area-based payments. Extensification payments will be increased to provide stronger incentives for reducing stocking rates, and these latter will be calculated more precisely by including all cattle and sheep on a holding rather than only those eligible for headage payments. Quotas will be introduced for claiming Beef Special Premium, as well as Suckler Cow Premium.

Dairy. Price support for milk will be reduced by 10 per cent with quotas for production continuing until 2006. A new headage payment for dairy cows will compensate farmers directly for this loss of income.

Sheep. No changes are proposed.

Rural development. This regulation comprises a number of measures which could affect lowland beef and sheep production:

- Agri-environment schemes – the management requirements must exceed good agricultural practice, and payments should provide financial incentive (up to 20 per cent) as well as compensation for loss of income.

- Less Favoured Areas – the LFAs are seen as the main instrument for sustaining low-input, environmentally-friendly farming.

- Early Retirement Scheme – proposals for providing pensions for farmers who retire early to promote restructuring of the agricultural industry. The UK Government has just cancelled its own plans for encouraging beef farmers to do this (Wright 1998) preferring to wait for the EU's plans to be decided.

The proposals have yet to be ratified by the council of ministers but they will be under some pressure from the Commission to complete the process before the elections to the European Parliaments take place in June 1999.

Although agricultural policy in Britain is heavily influenced by the CAP, the UK Government has frequently disagreed with its European partners over the levels for subsidising production. With significantly larger holdings and more efficient systems, the UK is better placed for withstanding reduction or removal of subsidies than most of its EU partners (Baldock *et al* loc cit). A core objective of UK agriculture policy is the de-coupling of farm support from commodity prices which would enable the EU to export more competitively at world trade prices, these being significantly lower than domestic ones within the EU. The Government has already stated that it intends to divert some of the funds released by decoupling towards specific and targeted agri-environment measures, something envisaged within proposals for 'national envelopes' under Agenda 2000.

The changes in farm structure that government policy is pursuing would seem unlikely to be compatible with the UK BAP objectives (Baldock *et al* loc cit) since efficiency of production is usually associated with intensification and specialisation, the two aspects of modern agriculture that have been most detrimental to wildlife (Stoate loc. cit). MAFF (pers comm) expects that the economic pressures which are likely to attend decoupling of farm support will enhance the attraction of agri-environment schemes as a means of maintaining profitability; certainly the majority of existing participants joined their agri-environment scheme primarily for its financial benefits (Clark 1997).

It seems likely that the uptake of agri-environment schemes could depend primarily on small and medium sized farmers, since the larger more efficient units will be better placed for competing in the free market without subsidies. However, the success of the Government's policy for restructuring the industry depends on a significant number of smaller holdings being amalgamated into larger ones, which could make them less accessible to options for extensification. The proposals for an early retirement

scheme for beef farmers could therefore be a particular cause for concern among conservationists, since the fewer beef farmers that remain in the lowlands are likely to be the more efficient and intensive ones. These proposals have been put on one side for the time being until the EU's own plans for early pensioning off farmers have been clarified as a result of Agenda 2000

It is difficult, however, to reconcile this emphasis on restructuring the industry as a means of improving competitive efficiency with the commitment to facilitating agriculture's accepted role in rural conservation. In 1992 the Government responded very positively to the Rio Earth Summit and Agenda 21, producing a clearly stated strategy for maintaining and enhancing biodiversity within the farmed environment. (HM Government 1994.) This statement listed a number of means by which biodiversity would be promoted through changes in agriculture including reduction of stocking densities. Such approaches have already been tried in the form of Countryside Stewardship and the various ESA schemes, and have been shown to be successful in achieving environmental gain when based on adequate levels of financial incentive (Coates 1997). However, these agri-environmental schemes appear likely to conflict with the strategy for restructuring and rationalisation as a means of maintaining farm incomes.

Although this dichotomy has not yet been recognised within official statements of government policy, it may find its own resolution within the context of upland and lowland situations. Already a bias is apparent in the targeting of upland areas for promotion of amenity and conservation objectives, which could leave lowland Britain increasingly exposed to market forces and the pressures of agricultural intensification. This would carry serious implications for the remaining fragments of semi-natural grassland outside the LFAs.

Current economic forces could result in an acceleration of the trend that has prevailed throughout the post-war decades and which CAP funding has been unable to stem. The number of farms has already halved since 1945 with a corresponding increase in size of remaining holdings (Office of Science & Technology 1995) while the farm workforce has also declined by 30 per cent between 1970 and 1993, with a further 12 per cent reduction predicted to occur by 2005 (MAFF CAP Review Group 1995). Such structural changes have accompanied, even driven, the intensification of modern farming systems and seem unlikely candidates for reversing the environmental damage that has resulted. (English Nature 1997.)

4.3 The relationship between farming and conservation

The divide that separates agriculture and nature conservation has been a deep and long-standing one, enshrined in the early dogmas of the post-war Nature Conservancy (Sheail 1997) and perpetuated by the ecological damage inflicted on the countryside by modern intensive farming systems. The Agriculture Act 1986 attempted to resolve the institutional basis for this rift by requiring Agriculture Ministers to strive to achieve a balance between agriculture objective and cultural, social and environmental issues.

The first of the Environmentally Sensitive Area Schemes was instated soon afterwards and helped to demonstrate the need for improving the levels of understanding and cooperation between the two sectors.

The existing semi-natural grassland resource is not evenly distributed throughout Britain; by far the largest proportion is located in the uplands of the north western half of the country. Here it frequently occurs in large, coherent blocks for which the primary form of land-use is extensive, low input farming centred on livestock production.

However, in the lowlands, the situation is very different with less than 3 per cent of permanent grasslands (ie more than five years old) still of semi-natural origin (Jefferson and Robertson 1996). Further more their remnants are widely scattered and fragmented, making them difficult to comprehend or manage in a meaningful and holistic way (Tubbs 1996). A significant proportion of these grassland sites have been isolated from the low-input farming systems that previously maintained them, as the latter were displaced by modern agriculture methods. These marginalised semi-natural grasslands have, in may cases, been subsequently acquired as wildlife reserves or in some other way designated on behalf of nature conservation.

Even so, their future remains somewhat uncertain since even dedicated nature reserves have to be managed effectively and sustainably. Many of the ecological changes, which initially accompanied agricultural abandonment, were desirable in conservation terms as expansion of the woodland and scrub, at least in its early stages. The continuing spread of scrub however, inevitably resulted in unacceptable losses of grassland. Many Nature Reserves suffered in this way during the three decades that followed collapse of rabbit population in the 1950s with the advent of myxomatosis, but because the changes were gradual they were not fully recognised until well advanced. Aerial photography has sometimes been important in demonstrating the rate at which grasslands were being overtaken and identifying the areas most affected (Robinson 1992).

When Martin Down was purchased as a National Nature Reserve in 1978 (Toynton 1994) the necessity for grazing was well understood and, although the chalk downland had been ungrazed for a number of years, steps were immediately taken to restore it using sheep owned by local commoners. The (then) Nature Conservancy Council also purchased their own sheep flock which could be used to provide a more precise management tool as and when it was required.

Other conservation bodies have followed this approach and purchased their own livestock, using sheep, cattle, ponies and even pigs, sometimes in combination on the same site to achieve particular management goals (Read 1994). This can be effective for conservation purposes but the cost implications and the practical difficulties of owning livestock make it an unsuitable option for many site managers.

Some large nature reserves, like the Ribble Marshes (Lambert 1993), have experienced no difficulty in achieving effective grazing management via commercially farmed livestock because the quality of the pasture and the numbers of animals still suit the local system of production.

Grazing management on nature reserves is therefore implemented in different ways which place varying degrees of emphasis on developing a cooperative relationship with farmers. If commercial farming's involvement were to cease, there would be strong pressure to devise alternative, autonomous arrangements, although the cost effectiveness of in-house grazing is often questioned. The National Trust (Oates *et al* 1998) with considerable experience of conservation grazing considers management of their own stock to be the last resort in terms of practicability. Any move towards ownership would be made easier by reserve managers acquiring a comprehensive understanding and detailed knowledge of the farming systems that they are currently using and hoping to emulate.

The Grazing Animals Project (GAP - a partnership between Liverpool John Moores University, EN and others) represents an important initiative in promoting dedicated conservation grazing (*Enact* 1997, 5, no.4 p10). It aims to improve the supply of suitable animals for this work and stimulate exchange of information and experience through the activities of a working group and a forum, both of which are broadly constituted, and have a collaborative approach.

The role of commercial farming on nature reserves will always by definition be secondary to conservation and the future of them is reasonably well assured as long as government grants, charitable gifts and public subscription continue to provide adequate levels of funding for the specialised management that they require. Three-quarters of SSSI land is privately owned, however, and therefore, not managed primarily for conservation but subject to more commercial management priorities.

There is some concern over the current state and future prospects of grassland SSSIs. A sample of 211 management units from 172 grassland SSSIs revealed that 46 per cent were considered to be in a sub-optimal condition for nature conservation, 14 per cent recovering and 19 per cent continuing to decline (Sketch 1995). The Wildlife and Countryside Act 1981 places lower emphasis on statutory protection for these SSSIs and much more on securing voluntary co-operation with their owners. Damage to, and inappropriate management of grassland SSSIs is often the result of agricultural activities which indicates that within this wider environmental context, conservation and agriculture are still failing to achieve the required level of understanding and mutual cooperation. Current management practice on 21 per cent of grassland SSSIs is judged to be unlikely to maintain the scientific interest (Sketch loc.cit).

The primary reasons for these shortcomings are economic ones with pressures for intensification, development, afforestation or even abandonment arising from landowners expecting to generate certain levels of income from their land assets. These pressures will increase as general farm income declines, a fact which conservationists need to appreciate when trying to develop suitable measures for sustaining the systems of farming upon which ecological value depends (Tilzey 1998).

These environmentally-friendly farming methods characterised by low inputs and extensive husbandry (Bignal and McCracken 1996) are more prevalent on the European mainland, where their significance for conservation is better appreciated than in Britain. The European Forum for Nature Conservation and Pastoralism (EFNCP) is a non-governmental organisation which draws support from many countries to promote conservation in a wide ecological and socio-economic sense (Tubbs 1997) and places strong emphasis on supporting and maintaining low input farming systems throughout the continent.

Such systems are rarer in Britain and are usually found in less favoured areas, so their significance is less recognised in and less relevant for the lowlands. Furthermore, the strong emphasis given to site-based management as the primary means for conserving biodiversity, through nature reserves and the SSSI network means that the role of farming has been marginalised.

Sustainability could, however, be the central issue with which to forge a more effective alliance between agriculture and conservation. Responsibility for establishing the necessary level of dialogue for achieving consensus will lie with conservationists, so the success being achieved by EFNCP in this regard is encouraging. A number of authors have already advocated adoption of a more integrated approach to sustaining both agriculture and biodiversity (eg Baldock 1998, Tubbs 1997, Tilzey 1998) incorporating ecological, social and cultural objectives. This has to be based on accurate assessments of real-life situations, something that will require much new information and data. Tallowin (1997) for example has

already set out a list of future research requirements which would help to achieve better integration of conservation objectives for semi-natural grassland into commercial livestock systems.

There should also be scope to trial strategic initiatives for bringing low-input farming into the mainstream of nature conservation, so that the potential for synergism between them can be developed. This might mean avoiding the short-term approach of grazing agreements, which do little to promote confidence or understanding between grazier and reserve manager. There is probably considerable potential for establishing longer-term relationships with suitable farmers based on principles of mutual cooperation and benefit. Such agreements could be based on more appropriate terms that are tailored to suit the actual situation rather than prescribed legalistic conditions that fail to generate adequate levels of trust between the two parties.

These new style management agreements would require farmers to recognise and appreciate the ecological principles which inform management objectives for nature reserves while conservationists would have to understand the economic imperatives that rule farming operation (eg Homer 1997). The following sections indicate how livestock systems function as businesses and may assist reserve managers who seek to understand the farming perspective better.

4.4 The agricultural management of grassland

4.4.1 Introduction

The important characteristics of a grass crop to a farmer are:

- the quantity of grass produced and the seasonal pattern of production;
- its digestibility and nutritional value, both *in situ* for grazing and as conserved feed (hay and silage) (see Chapter 6).

To achieve high levels of animal production, farmers require large yields of digestible herbage over a long growing season. It is rare to find more than one or two different grass species in an agriculturally improved grassland and high yielding perennial rye grasses now account for 90 per cent of the grass seeds sown each year (Newton 1993). These changes have led to a steady increase in grassland output in Europe over the past 30-40 years which together with the economic support provided by CAP, has resulted in over production in the livestock sector (ie milk and beef production). Genetic improvements in productive capacity of livestock combined with higher levels of supplementary feeding have also contributed to the generation of food surpluses.

Probably the most significant factor contributing to increased ruminant livestock production is the improvement of agricultural grassland. Much of the original semi-natural permanent grassland has been ploughed and re-sown with commercial grass cultivators and is regularly fertilised in order to maintain higher levels of productivity. Much farmed grassland is classified as temporary ley because it will be ploughed up before it is five years old to be replaced by a new, more productive sward. One or more arable crops can be grown between successive grassland reseeds as part of a mixed farming system.

Most of Britain's permanent grassland occurs in the western half of the country, where the mild wet climate favours grass production rather than cereals. Arable production is more prevalent in the eastern countries where permanent grass is frequently restricted to steep slopes and very shallow, or very wet, soils, where it will often be semi-natural in origin.

Livestock farmers therefore utilise a wide variety of grasslands and have developed different systems to suit contrasting conditions. However, the general agricultural approach to grassland management is broadly similar, regardless of situation, and comprises two main endeavours:

- Improving grassland production - obtaining the maximum yield of grass from any given farming situation.

- Increasing utilisation of grass - ensuring that as much of the grass yield as possible is consumed by livestock for conversion to saleable products.

These two aspects are considered more fully in the following sections.

4.4.2 Grassland Improvement

Sward productivity can be increased using a range of techniques which together are termed grassland improvement and it is this process which has resulted in probably the most significant losses to the pre-war semi-natural grassland resource. Improvement involves destruction of the original semi-natural sward, usually by ploughing, but sometimes by spraying with a non selective systemic herbicide (eg glyphosate). This is followed by establishment of a new sward, which is usually based on modern rye-grass (*Lolium* spp) cultivars either as a monoculture, or with companion species such as white clover. If the soil pH is below the optimal range of 5.5-6.5 lime is spread to raise it, while artificial drainage is installed on grasslands that are too wet to sustain the improved sward or withstand the damaging effects of heavy machinery and high stocking rates. Use of selective herbicides may be needed to control annual weeds which become established in the new sward following ploughing.

The cultivation process usually mobilises reserves of soil nutrients to promote an initial flush of productivity, which can only be maintained however by a regime of dressings with artificial fertilisers. These contain soluble sources of nitrogen, phosphate and potash (N P & K) which are immediately available for uptake by plant roots to promote an impressive flush of new growth. Improvement is therefore characterised by uniform, featureless swards of lush appearance and dark-green colour.

Having embarked on the process of improvement, fertility can only be maintained using external inputs because modern varieties of rye-grass have all been carefully bred to perform well under a regime of routine dressings of N. If this is not available they cannot perform to their full potential and are usually less productive than the wild grass species they have replaced (Frame 1990). Furthermore, the use of soluble fertilisers damages the soil's own systems for maintaining fertility since bacteria and fungi must have organic matter as a substrate. If organic fertilisers (ie dung) are replaced by soluble inorganic sources the population of soil decomposers declines and becomes much less effective. Chemical inputs also disrupt the natural balance between bacteria and fungi in the soil (Bardgett *et al* 1997) something which could affect the above ground plant community by damaging the mycorrhizal associations. High levels of production can then only be maintained at these very high levels as long as the inputs of soluble fertiliser are continued.

Of all the agricultural grass seed sold, about 90 per cent is rye-grass (62 per cent perennial, 18 per cent Italian, 10% hybrid) (Brockman 1988) and numerous different cultivars have now been developed. The rye-grasses combine many desirable properties of an agricultural grass: high yield, rapid growth rate, high palatability and nutritional quality, when under an improved system of grassland management. However, when managed without artificial inputs, and especially without soluble nitrogen fertiliser, the performance of these commercial rye-grasses drops back to the wild-type level or less. Under semi-natural or organic regimes then, wild species of grass can still out-perform rye-grass (Newton 1993).

Full improvement of grassland is an expensive operation and in many situations physical factors make it non-viable from a commercial point of view, although where re-seeding is not economically justified, productivity can be given a partial boost by dressing the existing sward with artificial fertiliser. Firstly it may be treated with a selective herbicide such as MCPA (See annexes 3 and 4) to kill unwanted herb species so that the grass content of the sward is increased. Such grasslands are described as being semi-improved and are usually characterised by the presence of more species in the sward, especially grasses, than a fully improved sown grassland. They will probably still have the characteristic dark-green colour and lush growth habit associated with improvement but will usually contain a wider range of dicotyledonous plants, albeit commoner species (eg buttercups *Ranunculus spp*., dandelions *Taraxacum* spp., common sorrel *Rumex acetosa* and broad-leaved dock *Rumex obtusifolius*).

4.4.3 Grassland utilisation

Having invested considerable resources in improving the productivity of their grasslands, farmers are understandably keen to ensure that as much of the useful yield as possible is channelled into animal production. Their techniques and systems of management are therefore specifically designed to maximise this efficiency of utilisation.

Figure 4.1 represents the seasonal change in biomass production in a typical ungrazed sward throughout a normal growing season. In spring, as the soil temperature begins to rise, new shoots are put out, the photosynthetic capability increases and plant growth rates (productivity) begin to accelerate. This results in a steady accumulation of plant biomass, represented by the area under the curve, which corresponds to the yield of the sward.

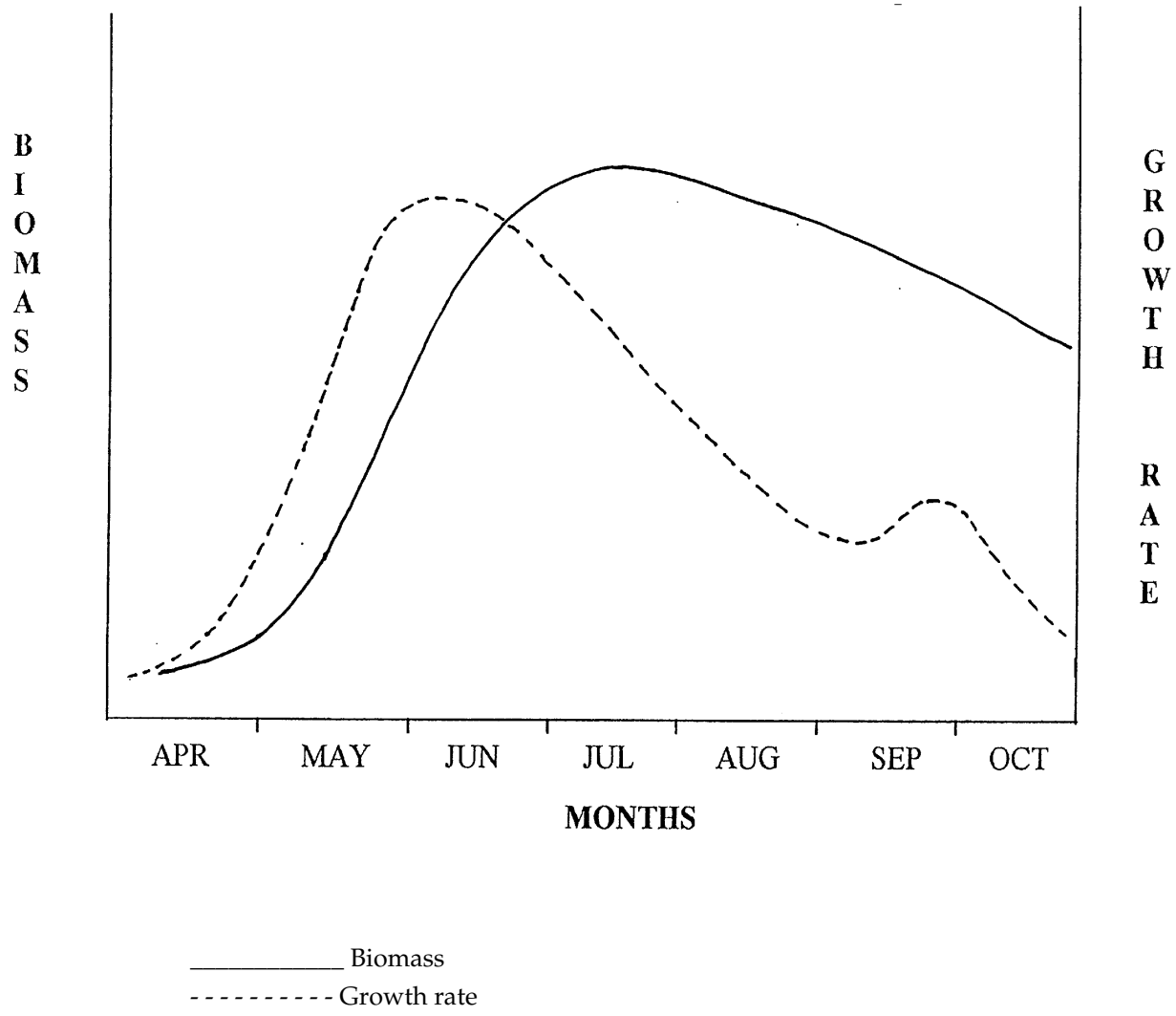

Figure 4.1 Seasonal change in an ungrazed sward

Vegetative production begins in spring and accumulation of new shoots produces increments in biomass. Plant growth rates peak in early summer but decline quickly once flowering begins and resources divert into support tissue. Biomass falls more slowly as the ungrazed sward senesces *in situ*.

By the end of May, flower heads begin to appear in the sward, marking a change in plant life-cycles as reproduction takes over and resources are diverted to production of flowers and seeds in preference to vegetative growth. Production of plant biomass therefore declines as photosynthetic capabilities are reduced through a combination of leaf senescence and shading. This fall in growth rate is accompanied by a loss of nutritional quality because the stalk in its reproductive phase contains a lot of fibrous stem and seed-head material, and much smaller amounts of the more digestible green leaves, and developing shoots, that contain soluble sugars and proteins.

After seed set, productivity usually recovers somewhat when soil moisture levels increase in the autumn. This shows up as a smaller, secondary peak in growth rate at the end of the season.

This overall pattern of production represents the typical growth curve of an improved rye grass sward; that of a semi-natural, species-rich grassland probably shows similar basic trends, but the peaks would be smaller and flatter due to lower overall productivity and the range of flowering times of the different species. Patterns of productivity in unimproved grassland have not yet been fully investigated perhaps because they are not commercially significant, although it seems that yields are at least 40 per cent lower, and show greater fluctuation between years than their improved counterparts (Tallowin 1997).

To the intensive farmer, the decline in productivity after flowering begins, represents an unsupportable waste of potential for growth which can only be avoided by repeatedly harvesting the accumulated biomass during the initial growing phase. The initial effect of grazing or cutting is to cause sward growth rate to decline sharply as leaf area is removed and photosynthetic activity is lost. However, because plant metabolism is geared up for vegetative growth, new shoots are quickly formed and growth rate recovers much more quickly than if the harvesting had been delayed until after flowering (see also Chapter 5).

If the harvesting is done by mowing, the defoliation is uniformly severe over the whole area, and recovery will be equally vigorous throughout the whole sward, assuming that soil conditions do not vary (see chapter 6). Grazing however is patchy in space and extended in time so that some parts of the sward are defoliated sooner, some later and some not at all. If the period of grazing is further extended, some parts of the sward will be grazed again, reducing the leaf area still further, and eating into the photosynthetic capital that is required for recovery. This can suppress the ability of the sward to regrow although the effect is usually short-term and localised. Utilisation can therefore represent a difficult compromise for the farmer in trying to achieve a balanced but thorough removal of material, so that as much of the sward as possible is removed without reducing its potential for future growth.

The most nutritious part of a grass plant is its actively growing shoot so the most effective use of agricultural grassland maintains optimum herbage quality by providing sufficient grazing pressure, or cutting frequency, to prevent flowering within the majority of the sward. Animal production benefits in two complementary ways (Korevaar and Van der Wel 1997):

- Increased intakes of dry matter - young swards are more palatable so livestock will voluntarily ingest more plant material compared with the same swards at a later stage of development.

- Improved nutritional quality - the herbage from young swards is more digestible so a larger proportion of it can be assimilated and channelled into growth and reproduction of farm livestock.

The timing of mowing or grazing is therefore critical in a farming context since a delay of just a few days once the sward has begun to produce flower heads, can result in a significant deterioration in quality thus lessening the efficient use of the grass crop. Stocking rate is also important and modern farming practice aims to graze pastures with an intensity that prevents flowering in order to maintain pasture quality whilst at the same time leaving sufficient leaf material to permit the sward to recover fully in the three-four weeks following removal of livestock. Figure 4.2 represents the seasonal change in biomass production in a typical grazed sward throughout a normal growing season.

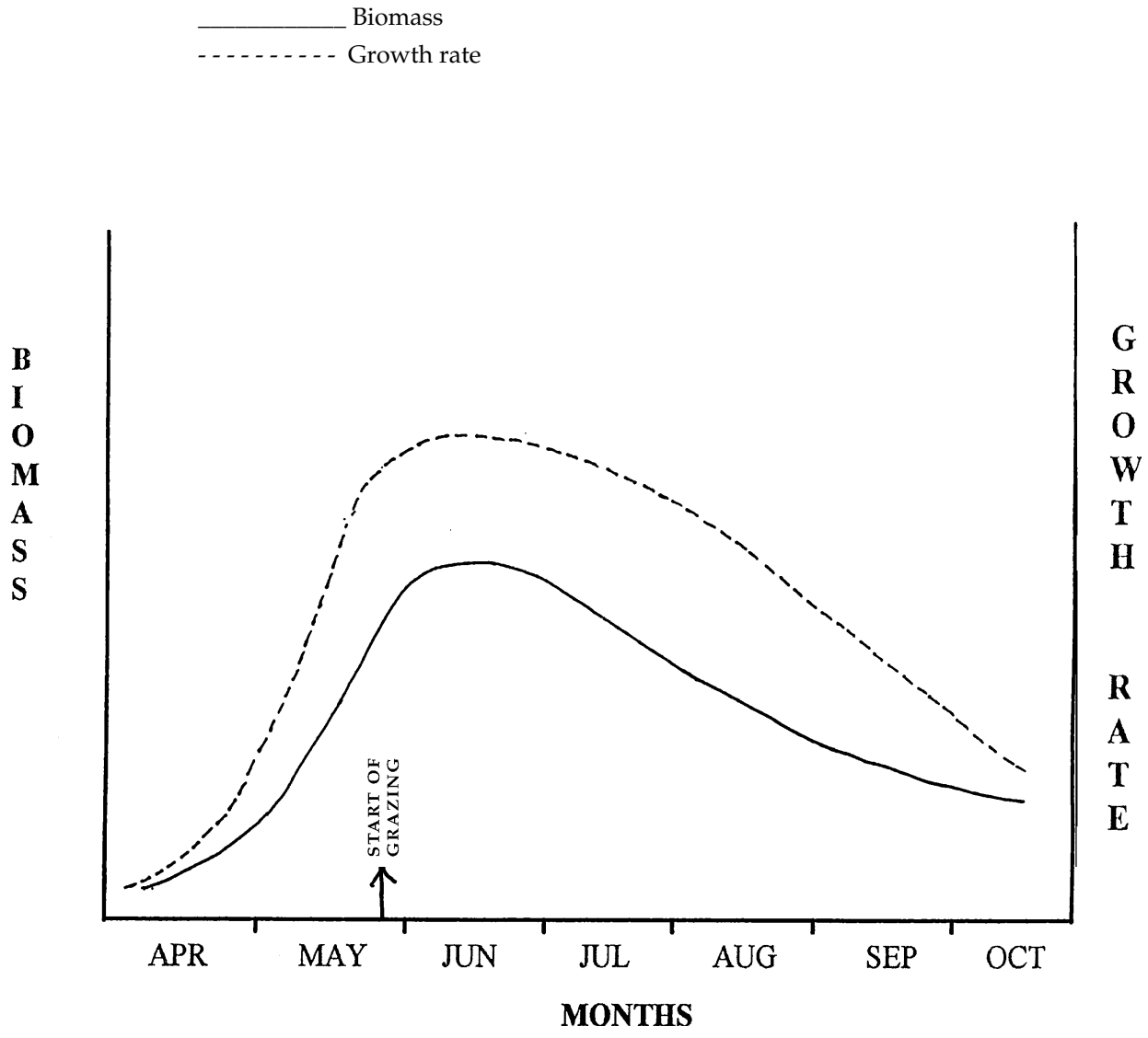

Figure 4.2 Seasonal change in a grazed sward

Natural breeding cycles of grazers are timed to exploit the nutritional superiority of early-season plant growth. This modifies subsequent food supply to the grazer's own advantage by inhibiting flowering and promoting active regeneration of leaves that contain higher concentrations of soluble nutrients.

This approach is in marked contrast to the management philosophy favoured by nature conservation where flowering and seeding are valued for the ecological diversity and visual amenity that they provide in a sward. Grassland management on nature reserves appears in many respects to represent the antithesis of everything that today's profitable livestock farmer is striving to achieve. This probably represents a conflict of interest which is too fundamental to be fully resolved although an effective compromise can be achieved in the majority of real-life situations provided that there is good-will and understanding on both sides.

4.5 Agricultural systems

4.5.1 Introduction

Geographical differences have produced a wide variety of grassland types in Britain, and agriculture is able to exploit almost all of them for livestock production. It has done this by developing a variety of farming systems, each one adapted to suit the demands of a particular physical environment. However, despite being separated by considerable distances and despite adopting different management strategies, many of the livestock systems in Britain are interconnected via shared marketing procedures.

The general situation is characterised in terms of a north-west/south-east divide, with the majority of upland grasslands situated in the northern half of Britain (60 per cent of rough grazings are in Scotland, Brockman 1988) while the south has most of the lowland grasslands which form the main focus for this handbook. The contrasting ways of farming in these separate regions form an important part of the agricultural backdrop to conservation management, while the well-structured system for marketing and moving animals between them is of great practical relevance. Indeed its significance for the sheep sector is such that it merits a special term: stratification.

4.5.2 Hill farming

Most of the 'grassland' in upland areas is infertile moorland or mountain grazing - thin, acid, often poorly drained unproductive soils, which support only the toughest and most unpalatable type of vegetation. This and the harsh climate demand specialised breeds of livestock able to survive and generate a financial return.

Most hill farms possess large tracts of this poor quality land, often unfenced and shared, at least peripherally, with the stock from adjoining farms. The sheep that graze on the hill must be 'hefted' on their own farm, perceiving it as being home territory, recognising its general limits and being prepared to stay within them. It is therefore important that continuity is maintained within the breeding flock, by recruiting mainly replacement females which have been born on the farm and are accustomed to its limits. Cattle were frequently kept in a very similar manner although this has declined dramatically as the breeds capable of coping with such harsh conditions have become unfashionable.

Hill farms do not usually operate with just hill grazings and most have better quality land situated in a valley and extending some way up the slopes where there is shelter, water and more fertile soil. The in-bye land, as it is termed, is an enclosed area surrounding the farmstead, and in winter and early spring is used for sheltering the young stock and the breeding animals while they give birth. As the summer comes in, the newly lambed or calved animals are moved out onto the hill where they have to work much

harder to find food. This leaves the fields empty of animals, shut-up to grow hay or silage, the winter forage for feeding to livestock.

The economy of the hill farm is therefore profoundly influenced by the quality and extent of its in-bye land; winter fodder is expensive to buy in and so as much as possible must be produced in-situ. The pressure to improve these ' northern hay meadows' (MG3 *Anthoxanthum odoratum – Geranium sylvaticum* grassland (Rodwell 1992)), in order to increase their productive output has been largely irresistible, resulting in severe losses of these original semi-natural communities (see Chapter 2). There is an obvious parallel here with the MG5 meadows in the lowlands.

Similar pressures have also resulted in enclosure and improvement of areas of rough grazing wherever this has been justified by their productive potential. Such areas are termed 'intake' and while not being fertile enough to support production of conserved winter fodder, they do allow for higher stocking rates on the better quality grazing while provide useful transition for younger or weaker stock moving out onto or coming back off the hill.

The harsh conditions make it uneconomic to finish growing animals on hill farms so most of them sell store lambs or calves for breeding or further fattening in the lowlands. Autumn is the main time when these animals are marketed and a steady supply of store lambs and weaned suckler calves, as well as draft and cull ewes moves from the upland areas into the lowlands where the fertile conditions are more favourable for growth and breeding .

The income from hill farming is lower in relative terms than for most types of lowland farming due to the less productive environment. A larger proportion of hill farm income comes directly from government support, most of it in the form of headage payments: ewe and suckler cow premia together with Hill Livestock Compensatory Allowance payments for both types of animal. This can amount to an extra £10-£12 per ewe or £125 per cow in the most disadvantaged areas and providing a strong incentive for farmers to keep more animals. Attempts to limit the stocking rate have therefore been imposed which include imposing quotas limiting claims for premia and establishing upper limits to overall stocking rate. Special penalties can be applied where overgrazing occurs (MAFF 1996). Under Agenda 2000 proposals payments would be switched away from a headage to an area basis (Goss 1998).

4.5.3 Lowland livestock systems

Most lowland farms have many more advantages in terms of productivity, deeper and more fertile soils, gentler slopes and kinder climate all combine to provide better opportunities for achieving high levels of output from more profitable enterprises, usually arable and dairy production. Where the land is of poorer quality, it often makes better financial sense to abandon it rather than invest time and resources in continuing to farm it.

Most lowland farms generate their main profits from a single enterprise (usually arable or dairy) concentrated on the best land that they have. If they also have areas of a lower grade, then these may be incorporated into the farming system by utilising them for an additional enterprise of lower output such as beef or sheep production if these can be linked to the main enterprise in an economically viable way. Dairy herds, for example, produce a supply of surplus calves which can be reared for beef, while many arable crops generate residues and by-products which can be fed to cattle or sheep (straw, sugar beet tops etc). So although the secondary enterprise may be less profitable, it can be justified so long as

it ultimately generates an economic return. Beef and sheep fit into this context very neatly, because they can use the farm's spare resources - land, labour, crop or dairy by-products, buildings, even spare capital at certain times of the year. On farms where there is no land of more marginal quality an intensively run beef or sheep enterprise might be an appropriate way of using spare buildings and manpower, often just at particular times of the year.

So while the hill farmer usually has little choice regarding the enterprises he operates, the lowland farmer can be much more flexible. Crop production dominates the eastern half of lowland Britain with arable units often including beef or sheep production as a subsidiary enterprise. Livestock predominates in the western half, with dairy being the preferred enterprise, but often accompanied by sheep and/or beef. Many dairy farms will rent out winter grazing for sheep from the uplands as a means of maintaining pasture quality and reducing weed problems. This is known as agistment.

4.5.4 Organic farming

Organic farms can be found all over Britain, mainly in the lowlands, but some hill farms have also adopted its precepts. They contain the same basic enterprises that are found on non-organic farms, and employ essentially similar elements of husbandry. The fundamental difference is that organic farms do not use artificial chemicals to promote and protect plant growth and they avoid the routine use of veterinary treatments for prevention of animal diseases.

The founding philosophy of organic farming is that sufficient quantities of the best quality food can only be sustainably produced by working in sympathy with natural systems. Any departure from this general approach, will, it is stated, result in deterioration of food quality, or its contamination, even though overall yield may be higher initially. Organic production is subject to European legislation (EC Regulation no. 2092/91) which requires member states to apply rules for production, inspection and labelling of organic foods.

Every organic farmer must by law be registered with one of the organic sector bodies, the best known example of which is the Soil Association. They are then subject to an annual inspection during which all of the farm's financial and physical records must be made available to an inspector who has been specifically trained for this role.

In terms of grassland management, the avoidance of artificial fertilisers and herbicides undoubtedly has very positive benefits for wildlife. On the other hand, a significant proportion, if not most organic systems are based on arable enterprises that are organised around rotational grassland. This therefore will be ploughed up on a regular basis and be unlikely to develop any significant botanical interest, although where it does use permanent grassland, organic husbandry places a strong emphasis on managing it for its herb content and overall species diversity. These qualities are valued for their contribution to animal health, since many herbs are deep rooted and capable of concentrating minerals and trace elements that grazing ruminants require in their diet (Newton 1993). Additionally, organic farming has conservation standards that specifically prohibit the destruction of semi-natural unimproved grassland or other wildlife habitats (The Soil Association 1997).

Furthermore, the organic approach to animal production is more compatible with nature conservation since grazing livestock are expected to obtain as much of their nutritional needs as possible from grazing

and home-grown forage. This provides a built-in control on stocking density since supplies of bought-in feed have to be minimised and feeding of concentrates is limited.

Organic farmers are therefore more likely to favour the traditional native breeds of livestock that are better able to cope with a diet based mainly on grass. Such animals are probably more suitable for conservation grazing projects so organic farmers are often in a better position to assist with this type of management as a result. One problem, however, is that use of herbicides for controlling the regrowth from cut stumps following scrub clearance is prohibited under the organic standards so that other means of achieving this are needed before organic livestock can be used on such sites The availability of payments from the Organic Aid Scheme for the first five years of organic management of land may serve as an important financial incentive for securing the services of an organic grazier (Grayson 1997).

4.6 Economics of livestock farming

4.6.1 Introduction

The role of specialised commercial agriculture in Britain has been expanding steadily ever since the Industrial Revolution and has been accompanied by a corresponding decline in subsistence farming. The livelihoods of most farms in the UK therefore now depend on the business profits from their farming activities, which means that the sustainability of many culturally important and environmentally beneficial land-use practices is now threatened by the present economic problems within the livestock sector.

Economists have developed a standardised system for describing and monitoring farming's financial performance which helps in the detection of business trends and improves the identification of their causal factors. The industry benefits from annual publication of several farm business survey handbooks, each of which analyses financial performance within a particular geographical region (eg Welsh Institute of Rural Studies 1997). This information is also used for making short-term predictions about future business performance, most notably in the Management Pocketbook published by Wye College (Nix 1997).

Nature conservation also utilises this standardised financial approach which is useful in shaping policy and testing strategies (eg Venus 1997). In practical terms it can also assist in the financial planning and control of grazing projects, ensuring that each enterprise is managed cost effectively. A clearer understanding of agricultural practices on the part of conservation managers and a better appreciation of the financial imperatives which confront farmers and graziers can also improve communication with them and promote better opportunities for cooperation (Bowley 1994). The rest of this section therefore provides analysis and explanation of the economics of lowland beef and sheep production to assist conservation managers wishing to increase their understanding of these issues.

4.6.2 Enterprises and gross margins

For accounting purposes each farm product is treated as a separate financial enterprise, with a budgeting period usually of 12 months, although this can be longer (eg 24 month beef finishing). Within the livestock sector, the enterprises of most importance to nature conservation are the ones which place the greatest emphasis on using summer grazing: spring-calving suckler cows, spring-lambing ewes and extensive beef-finishing systems. Production of hay is only considered as a separate enterprise when the crop is sold off the farm, a situation which sometimes occurs as part of reserve management.

The financial output of each livestock rearing enterprise is derived from the sale of animals, less their initial purchase cost, allowance being made for incidental losses (mortality, straying, etc). In the case of breeding herds or flocks the animals sold have all been born on the farm, and therefore cost nothing, but instead, allowance must be made for the cost of buying in or rearing breeding replacements. The income from any relevant headage payments is then added to this sales output to provide the total enterprise output.

The costs associated with running the enterprise are termed its variable costs ('variable' in this context denotes their relationship with the size or intensity of operation of the enterprise). The main variable costs directly associated with livestock enterprises are: purchased feed, medicine, veterinary fees, bedding, marketing and transport charges. It is also important to include the indirect costs of growing grass and forage crops to be used for raising animals on the farm. This includes the fertilisers and sprays needed for maintaining productivity of existing swards, together with the seeds for establishing new swards and crops to feed to livestock (eg fodder beet, stubble turnips, maize). These expenses are collectively known as the forage variable costs.

The difference between the variable costs of an enterprise and the financial output it generates is known as the enterprise gross margin, and it normally represents a significant gain to the business. It can be expressed in absolute terms for the whole enterprise or on a relative basis, per animal or per hectare of land used by the enterprise. These relative measures are used to compare and collate data from different farms or different years, providing the basis for the various business surveys and handbooks which monitor and predict the economic performance of agriculture.

Representative sets of gross margin data are provided (Table 4.1 a-c) to illustrate typical levels of financial performance for suckler cow, breeding ewe and beef finishing enterprises. The figures are all on a per-animal basis and can therefore be easily compared with similar enterprises operating in conservation contexts. Comparative assessments of this sort can contribute important information about the role of commercial livestock enterprises in practical conservation management, and be of considerable help in planning and costing grazing projects. Financial information for conservation projects, on the few occasions when it has been published is presented in different un-standardised ways that do not assist comparison or overview (eg Bowley 1994, Tolhurst 1994).

Table 4.1 Livestock Gross Margins (all data from Nix 1997)

a. Lowland suckler cows (single suckling, spring calving)

		£ per cow
	ENTERPRISE OUTPUT:	
Note 1	Value of weaned calves *(265 kg live weight @ 7 months @ 102.5 pence/kg)*	272
	Calf sales (*allowing for 10 per cent mortality during rearing*)	245
	Suckler cow premium	117
Note 2	LESS	
	• Herd depreciation *(herd life: 6yr = 15 per cent replacement rate replacement heifers purchase price £650, cull cows sale price £450 ie 650-450 x15 per cent*	30
	• Purchased calves *(4 per cent mortality @ birth, £115 per replacement)*	5
	• Cost of bull per cow *(depreciation or hire charge)*	12
	i. **ENTERPRISE OUTPUT**	**315**
	NON FORAGE VARIABLE COSTS	
Note 3	• Concentrates *(180kg @ £130/t)*	23
	• Veterinary costs	22
Note 4	• Bedding *(O.25t @ £48/t.)*	12
	• Miscellaneous (*transport & market charges*)	8
	ii. **NON-FORAGE VARIABLE COSTS**	**65**
	GROSS MARGIN per COW, excluding FORAGE (i-ii)	**250**
	FORAGE VARIABLE COSTS	
	• Seed, fertiliser, sprays	37
	• Additional forage purchases (0.25t @ £96/t)	24
Note 5	iii. **FORAGE VARIABLE COSTS**	**61**
	GROSS MARGIN per COW (i–ii–iii)	**189**

Notes

1. Calf birth weight 40kg. Calf Growth rate = 1kg a day if concentrates fed.
2. BSE controls now prevent cull cows being sold for meat. Max compensation = £350 per cow. This increases the depreciation costs to £45 per cow.
3. Concentrates fed mainly to calves from three months old @ .1.5 kg/calf/day
4. Cattle overwintered in cubicles. For straw yards would need 1-1.5t/cow (Lampkin & Measures 1995.)
5. Hay for one month shortfall in home-grown supply.

Table 4.1 Livestock Gross Margins

b. Finishing Suckler-bred Stores (purchased in Autumn, finished off grass @ 18 months old)

		£ per Beast
	ENTERPRISE OUTPUT:	
Note 1	• Sale of finished beast (*485kg. LW. @ £1.00/kg.*)	485
	• Beef special premium (*only males 50 per cent of herd, @ 10 month*)	44
	LESS purchase of store	283
	i. **ENTERPRISE OUTPUT**	**246**
	VARIABLE COSTS	
Note 2	• Concentrates (*425kg @ £120/t.)*	51
	• Veterinary costs	12
Note 3	• Bedding (*0.21 t. @ £48/t.)*	10
	• Miscellaneous (*transport & marketing*)	11
	i. **NON-FORAGE VARIABLE COSTS**	**84**
	GROSS MARGIN per BEAST excluding FORAGE (i-ii)	**162**
	FORAGE VARIABLE COSTS	
	• Seeds, fertiliser, sprays	41
	• Additional forage purchases (*0.17t. @ 96/t.*)	16
	iii. **FORAGE VARIABLE COSTS**	**55**
Note 4	**GROSS MARGIN per BEAST (i– ii–iii)**	**105**

Notes:

1. 1998 finished price 87.5pence/kg, live weight (Farmers Weekly 19/6/98) = £425 per beast.
2. Concentrates fed @ 2.5kg/beast/day for 170 day winter.
3. This value is for cubicle housing; costs for straw yards 4-5 times higher.
4. Gross margin @ actual 1998 price (note 1) = £46 per animal.

Table 4.1 Livestock Gross Margins

c. Lowland breeding ewes (Spring lambing) after Nix 1997 (all values to nearest £)

		£ per Ewe
	ENTERPRISE OUTPUT:	
Note 1	• Sale of finished lambs (*165 per cent reared per ewe @ £41.50* ea)	69
	• Wool sales (3kg per ewe @ £1.00/Kg each)	3
	• Ewe premium	14
	LESS	
	• Flock depreciation (*20 per cent replacement, ie five yr in flock. Culls sold @ £32.50 each* replacements bought @ £70 each & 4 per cent mortality. Ram depreciation £2/ewe)	11
	i. **ENTERPRISE OUTPUT**	**75**
	NON FORAGE VARIABLE COSTS	
Note 2	• Concentrates *(54kg per ewe 14kg per lamb @ £147/t)*	10
	• Veterinary costs	5
	• Miscellaneous (*shearing £0.90/ewe, transport, marketing, bedding etc*)	4
	ii. **NON-FORAGE VARIABLE COSTS**	**19**
	GROSS MARGIN per EWE excluding forage (i-ii)	**56**
	FORAGE VARIABLE COSTS	
	• Seeds, fertiliser, sprays	6
	• Additional forage purchases (*20kg/ewe @ £100/t.*)	2
	iii. **FORAGE VARIABLE COSTS**	**8**
	GROSS MARGIN per EWE (i-ii-iii)	**48**

Notes:

1. Finished weight 38.6kg, price 107.5p/kg average for year.
2. Feeding for one month at tupping and three months at lambing plus one month finishing for lambs *c* 0.5kg/day each

The gross margins for all the enterprises on a farm are usually combined to obtain a full picture of the whole business. Many farming systems despite the post-war specialisation trends, are still based on a number of different enterprises which are usually well integrated by the shared use of resources and the exchange of products. Calves from a suckler herd are often, for example, transferred after weaning to a beef finishing operation on the same farm. The breeding enterprise in effect, sells the stores to the finishing one, although there is no exchange of money, and the two enterprise gross margins are calculated on the basis of a single valuation of the weaned calves when transferred. The whole farm gross margin is obtained by simply adding the individual gross margins for all of the separate enterprises.

4.6.3 The whole farm business

Gross margins are not in themselves an accurate measure of business performance, only its productive efficiency. All of the farm enterprises use a number of shared resources provided by the farm but not easily apportioned between them. Such costs are not directly related to the level of production (unlike 'variable' costs) and to a significant extent must be borne even if the farm is producing nothing. They are therefore termed 'fixed' costs and represent the cost of maintaining the fabric of the farm eg:

Labour	Full- or part-time, permanent or casual, paid or unpaid (farmer and his/her family).
Vehicles/machinery	Repairs and maintenance, depreciation (replacement cost), tax, insurance, hire charges, contractor's charges.
Fuel/Power	Electricity, gas, oil, petrol, diesel.
Administration	Telephone, postage, subscriptions, accountancy charges, stationary, etc.
Finance	Rent, building repairs, insurance, services, estate maintenance, etc.

A complete picture of the whole farm business can only be obtained therefore by including all these various fixed costs in the accounting procedures together with any additional income not directly associated with commodity production (eg payments from agri-environment schemes). Table 4.2 gives typical values of fixed costs for lowland livestock farms based on The Welsh Farm Business Survey (Welsh Institute of Rural Studies 1997); it indicates the different levels of average expenditure on a per ha basis.

Table 4.2 Lowland Livestock Farm Fixed Costs 1996/97

(All data from Welsh Institute of Rural Studies 1997)

FIXED COST ELEMENTS	AVERAGE COST PER FARM (£)
Paid labour	1904
Machinery costs	
• Contractor	1840
• Repairs	2383
• Fuel	1400
• Depreciation	4950
Machinery sub-total	10573
General overheads	4598
Land expenses	1604
Rent	8167
TOTAL WHOLE FARM FIXED COSTS	**£26,846**

Sample size: 48 farms average size : 74ha
Therefore average whole farm fixed costs: = £26,846 ÷ 74 = £363/ha

The ultimate purpose of these accounting procedures is to calculate the profit generated by the farm. These are a number of different measures of profitability commonly used in farm business surveys to help in the collation of data from different sources, but the simplest and most direct is:

Farm Profit = Whole Farm Gross Margin + Other Income – Total Fixed Costs

This profit represents the farmer's disposable income and must provide for living expenses eg personal spending, taxes, pension contributions, savings etc, together with any business investment. The latter represents the capital needed for maintaining or improving equipment and facilities within the farming system, or paying off bank loans or mortgages with scheduled repayments.

Profit is therefore a fundamental determinant of a farm's viability, and a continuing decline threatens both the farmer's livelihood, and the functional integrity of the farm itself through lack of reinvestment.

4.6.4 The farm budget

The data already provided for enterprise gross margins and whole farm fixed costs allow profits for any given farm systems to be predicted with reasonable accuracy. In doing these calculations, the relative contributions of all the different components of the system become apparent so that a much clearer picture of the farm's overall economy is produced.

This section assembles these different financial estimates in a hypothetical way to try and demonstrate some of the factors that determine the economic performance of a typical livestock farm. The succeeding sections then explore the possible budgetary effects produced by adopting two different options for extensifying the system.

If national averages for a size of enterprise are used (Meat and Livestock Commission 1996) a representative livestock farm would have 24 suckler cows and 220 breeding ewes. If situated in the lowlands the young stock bred on the farm would usually be taken through to finished weights ready for slaughter, so there would be an additional beef finishing enterprise recruiting 24 weaned calves each year. All lambs should be finished on the farm in the year of birth.

The average amount of land needed to support each individual cow or sheep throughout the whole year is well known from a range of situations and these standard data allow the farm area to be calculated. Once the size of the farm has been established it is possible to estimate the whole farm fixed costs, again using published statistics (Table 4.2).

The calculation of the typical farm budget is set out in Table 4.3 based on the gross margin data from Table 4.1 (a-c), and the fixed cost data in Table 4.2 while the area of the farm is based on a conventional stocking rate for the lowlands of 2 LU/ha. Although this may be too high for conservation grazing it represents typical levels of commercial performance and the financial pressures which shape it. Many such farms are relevant to nature conservation because they include SSSI or other semi-natural, unimproved grassland within their holding while a significant number of others provide grazing management for nature reserves and other grasslands of conservation importance, through grazing agreements. The future survival of such farms is therefore a matter of some concern amongst conservation organisations (English Nature 1998).

The profits calculated from this farm's budget, at just less than £3.500, appear to provide a critically low return on the farmers' physical labour, management skill and capital investment throughout the financial year as a main source of income.

The receipts from headage payments are especially significant here since in themselves they account for more than twice the final profit. This demonstrates the livestock sectors' dependency on subsidies for economic survival and explains why any political move towards reducing or removing them causes grave concern among the majority of farmers, since such changes reduces income on a direct pound-for-pound basis.

Part of farming's present economic downturn is also due to the high value of the pound on foreign exchanges since when converted from European Currency Units (ECU) for payment of subsidies from the CAP budget, the high exchange rate reduces the size of sterling payments to British farmers. The reliance that sheep and beef farmers' economies place on these payments means that farm incomes are directly affected by the trend

Table 4.3 Lowland Livestock Whole Farm Gross Margin with Intensive Stocking Levels

(LU = Livestock Unit)

Enterprise	Stocking			Gross margin per head (£)	Enterprise G.M. (£)	Enterprise headage payment (£)
	No of head	LUs per head	Total LUs			
a. Sucklers						
• Cows	24	0.75	18.00	189	4536	2808
• Calves @ foot	24	0.34	8.16			
• Bulls	1	0.65	0.65			
• Replacement heifers (1–2 yr)	4	0.65	2.60			
• Replacement heifers (in-calf)	4	0.80	3.20			
b. 18 month beef						
• Store cattle 8–18m	24	0.65	15.60	105	2520	1056
c. Breeding sheep						
• Ewes with lambs	220	0.11	24.20	48	10,560	3080
• Rams	5	0.08	0.40			
• Store lambs (15 per cent)	55	0.04	2.20			
• Replacement gimmers	44	0.08	3.52			
Whole farm values			**78.53**		**17,616**	**6944**

Budget construction

Farm Size
Average stocking rate for intensive lowland stock farm = 2.0LU/ha (Nix 1997).
Therefore forage area required for 78.53 LU = 39.3 ha.

Fixed Costs
Average fixed costs for lowland stock farm = £361/ha (Table 4.2).
Fixed costs on 39.3 ha = £14,175.

Farm Profit
Profit = (WF gross margin) minus (WF fixed costs) plus (other income)
= 17616 - 14175 + 0

Therefore budgeted WF profit 1997/98 = £3441

4.6.5 Financial implications of extensification

The 'typical' livestock farm which forms the basis for the examples given here represents an intensity of production which would be largely incompatible with most nature conservation objectives. The usual strategy for achieving wildlife benefits on conventionally managed agricultural grassland is therefore to secure long-term reductions in stocking rates and chemical inputs, and to abandon re-seeding practices. This approach underpins the management prescriptions for Countryside Stewardship and ESA agreements, but its financial implications are not always fully appreciated by conservationists. The farm budget formulated in Table 4.3 provides a starting point from which to explore these economics of extensive livestock systems.

It is assumed for this exercise that the same 'typical' farm has undergone a successful programme of extensification in ecological terms and that the swards have assumed the main management characteristics of unimproved semi-natural grassland. This scenario may be questionable but is justified on the basis that it is implicit in the rationale of existing agri-environment schemes. In botanical terms it is represented by the change from MG6 (*Lolium perenne- Cynosurus cristatus)* to an MG5 *(Centaurea nigra – Cynosurus cristatus*) grassland (Rodwell 1992).

A review of the productivity of semi-natural grassland by Tallowin (1997) indicates that grassland of this general type is capable of yielding up to 60 per cent of the dry matter production obtained from intensively managed, improved swards. Using this as a guide, the stocking rate of the extensive system is likely to be in the order of 1.25 LU/ha, and the numbers of stock would be correspondingly lower. Table 4.4 shows how the budget is constructed for this extensive regime, using gross margin data (Tables 4.1 a-c) and the same fixed cost data calculated from the Welsh farm business survey (Table 4.2).

The extensive gross margins per animal are higher than their intensive equivalents for two reasons:

i Unimproved, semi-natural grassland incurs zero forage costs in most years because it cannot be re-seeded, fertilised or sprayed with herbicide if it is to retain its integrity. Removing these Forage Variable Costs from each of the livestock enterprises increases the individual gross margins of the extensive enterprises compared with their intensive counterparts. (Table 4.1 a-c). It is the same minimal input strategy which forms the basis of the Stewardship compared with their intensive counterparts. Scheme management prescription which now operates on the farm.

ii. The stocking rate for the farm is now below 1.4 LU/ha and therefore qualifies it to receive the Extensification Premium on all headage payments for cattle. The gross margins for the sucklers therefore include the full £30 per head on all herd members, while the beef stores gain just £15 per head. This is because 50 per cent of the enterprise consists of females which do not qualify for headage payments.

Table 4.4 Whole Farm Budgets for Extensive Livestock Systems

Enterprise	Stock nos (a)	Non organic		Organic	
		Individual GM (b) £	Enterprise GM £	Individual GM (d) £	Enterprise GM £
Sucklers (c)	15	256	3840	357	5355
8 month beef (c)	15	161	2415	273	4095
Breeding ewes	138	54	7452	64	8832
(i) Whole farm gross margins			13,707		18,282
PLUS:					
(ii) Other income					
Countryside stewardship (e)			3,930		3,930
Organic aid scheme (f)			-		2,751
LESS:					
(iii) Whole farm fixed costs (g)			14,175		14,175 (g)
Whole farm profit (i+ii+iii)			**3,462**		**10,788**

Notes:

a. Forty per cent reduction in stocking rate to 1.25 LU/ha on unimproved grassland, zero off-farm inputs. Farm size unchanged.

b. Gross margins higher than in intensive systems because no forage variable costs (tables 4.1 a-c) are incurred (no re-seeding, no purchased inputs).

c. Gross margins include additional £30/head. Extensification payment for stocking rates less than 1.4 LU/ha.

d. Gross margin data from Lampkin and Measures (1995) (updated D. Powell, Welsh Institute of Rural Studies, pers comm) Apply after two-year conversion period.

e. Countryside Stewardship: 20ha of hay meadow @ £100/ha, 19.3ha of pasture @ £100/ha.

f. Organic Aid Scheme: Average payment of £70/ha/yr for five years after start of conversion, (£175, year 1 – £15, year five).

g. Whole Farm Fixed Costs, assumed to be the same as in intensive systems, but may be lower due to more extensive methods which could reduce overall machinery costs and paid labour.

Despite the significant improvement in individual gross margins, the whole farm gross margin for the extensive regime is nearly £4,000 less than that achieved under more intensive management. This is because there are 40 per cent fewer livestock to generate income in production terms. However, the annual payments received under the Stewardship Scheme are intended to compensate for this loss.

These payments are calculated on the basis of 20ha of haymeadow and 19.3ha of pasture which, assuming that individual field size is less than 3ha both qualify for £100/ha. This earns the farmer £3,930 each year throughout the 10 years of the agreement in return for managing the fields according to the stewardship prescription. This is just sufficient to compensate for the lower Whole Farm Gross margin returned by the smaller numbers of livestock.

For this analysis, the fixed costs have been included in the budget at the same level as for the more intensive system, since there are no separately derived statistics for extensively run farms. This fixed cost value leaves the extensive system with a profit of £3,462, suggesting that farm incomes can actually be maintained despite lower stocking rates, provided that agri-environment schemes are available. This has been the policy behind such schemes until now, with payments set at a level which just compensates farmers for the income lost when output is reduced.

In fact, the proposed 40 per cent reduction in stocking rate used in this analysis would probably accommodate real savings in terms of paid labour, machinery costs and overhead charges so that the actual level of 'extensified' fixed costs might be somewhat lower, even though this is difficult to quantify directly. This should further improve the actual financial performance of the extensively-run farm.

There are, on the other hand, particular negative factors strongly associated with extensive systems of animal production which are known to adversely affect physical performance of livestock. Such factors can be difficult to quantify in financial terms and may therefore escape consideration during the budgeting process.

The switch away from silage production to haymaking is one such negative factor, that is an invariable requirement of the Stewardship Scheme. Hay is usually about 20 per cent less nutritious than silage (Nix 1997) in terms of its energy content, so that overwintered livestock may need additional bought-in supplements if they are to be able to maintain the same levels of production (see also Chapter 6). Either way, the effect will probably appear as a reduction in enterprise gross margins, and hence a lowering of profits. This would tend to cancel the extensive system's financial advantage achieved from the savings in fixed costs and restore financial parity between systems of production.

The full economic implications of this extensification process are therefore somewhat equivocal, and actual financial results will have much to do with individual farm circumstances including the attitude and values of the farmer. Size of holding is a major factor since the larger farm businesses stand to benefit more from intensification due to their improved economies of scale and may have more to lose than smaller units by fully entering into an agri-environment scheme.

The future prospects for nature conservation would be greatly enhanced if the scheme's economic advantages were much more clear-cut so that a stronger message could be directed towards livestock farmers. The Agenda 2000 proposals recognise this fact by allowing for up to 20 per cent incentivisation of agri-environment payments once the CAP reforms are in place.

Organic farming, which has enjoyed considerable market support in the wake of the BSE crisis, may also have an important role to play here because of the significant price premiums that all its livestock products have been commanding since March 1996. This could provide a strong marketing incentive for promoting extensification to livestock farmers.

A third farm budget has therefore been constructed (Table 4.4) to test this idea. It applies to the same extensively managed farm, which having completed its conversion to organic status is able to sell finished lambs and cattle at wholesale prices that are 15-25 per cent higher than conventional ones due to the premium which organically certified livestock has been commanding since March 1996 (when the announcement on BSE was made). The resulting enterprise gross margins achieved by these organic livestock are significantly better (by up to 40 per cent) than their non-organic counterparts.*

All the same assumptions regarding the non-organic extensive farm continue to apply to the organic system in respect of area and quality of land, grassland communities, stocking rate and types of enterprise. The Countryside Stewardship agreement means that the land continues to be managed according to the same prescription ,with applications of farmyard manure comprising the only routine input, and even this being restricted in terms of frequency and quantity. Although applications of herbicide can be permitted on Stewardship land, to control perennial weeds, this is not a requirement; the organic farmer would therefore be at liberty to use non-chemical methods although these may not be as cost effective as sprays.

This leaves animal husbandry and particularly the approach to disease/parasite control, as the principle strategic difference between the two systems. Organic livestock may not be treated with drugs on a routine prophylactic basis, although nearly all common veterinary treatments can be used curatively. This is often a major impediment for livestock farmers considering a move to organic production but lacking confidence in the animals' innate ability to resist pathogens and parasites. It is difficult to quantify the financial implications of this to the farm budget. There is little difference between the published statistics of veterinary costs for the two regimes (Nix c.f. Lampkin and Measures loc cit). If anything, organic veterinary costs are lower, although there may be additional labour costs in treating affected animals clinically.

The conversion period required to achieve full organic status is normally two years, although this can be adjusted if the certifying body decided that the past history of the land indicates a longer or shorter period of 'cleansing' is actually required. No produce can be sold as organic until the holding has obtained full certification on at least part of its area which can present the farmer with significant financial problems.

The Organic Aid Scheme is a MAFF-funded initiative established under the CAP 2078/92 agri-environment regulation and its purpose is to assist with overcoming the financial problems associated with the conversion period. During this time, yields usually decline sometimes alarmingly so, as the soil ecosystem adapts to the removal of soluble fertilisers.

* These data have been supplied by the Welsh Institute of Rural Studies, University of Wales, Aberystwyth, (pers comm) and have been prepared for the forthcoming new edition of the Organic Farm Management Handbook (Lampkin and Measures 1995). This publication is equivalent to the Farm Management Pocket Book (Nix 1997) and provides forecasts of organic farm business performance derived from recently sourced financial and physical data.

Organic Aid payments only last for five years from the start of conversion so early application is needed to get their full financial benefit. The scheme provides £175/ha/annum for the first year, £105/ha in the second year, £40/ha in year three and £15/ha in the last two years. This represents an average annual payment of £70/ha available to lowland livestock farms, although it is reduced to £10/ha for rough grazing. This represents significant financial support but it is important to plan for its eventual removal from the business, which in this case would leave a budgeted profit of just over £8,000.

The fixed costs of the extensive organic farm are, for the purposes of the budget, set at the same level as in the previous two examples. This is because the day-to-day operation of the farm is unlikely to alter much with a move to organic methods; labour, machinery, general overheads and rent will remain much as before, with small changes in the different categories tending to cancel each other out.

Overall then, the budgeted financial performance of the organically managed, extensively stocked farm is markedly superior, returning a business profit of nearly £11,000 which is more than three times higher than the profit estimated for the other two systems. There are two obvious reasons for this:

a. Organic Aid Scheme – the payments from this provide an additional £2,750 annually, is largely free of associated costs. This represents a sizeable cash benefit which is not available to the other types of farm being considered.

b. Organic Premia – the consistently higher prices currently commanded by organic mean that the Whole Farm Gross Margin is 33 per cent higher than on the similarly stocked non-organic holding. It is even higher than on the intensively stocked non-organic farm although the latter finishes an extra nine cattle and 100 lambs each year.

The majority of this economic advantage is due to the agri-environment payments and the £6,681 that the organic farm receives each year from the Stewardship and Organic Aid schemes combined accounts for most of its improved financial performance. However, even without these environmental payments the organic system would still be left with a profit of £4,107, which is 20% higher than the non-organic options.

4.6.6 Profitability

Profitability is the efficiency with which a business can generate profit; in other words it is the size of the profit in relation to the amount of the various resources that have been invested in securing it. The farm for which these different budgets (ie intensive, extensive non-organic and extensive organic) have been constructed will all require three basic types of investment:

i Physical labour: Farmers are usually self-employed and are rewarded for the hours of manual work they do out of the profit that their business achieves. On smaller holdings the majority of the manual work is normally undertaken by the farmer and their family unless it has been acquired for amenity purposes and is supported by off-farm income.

ii. Management: This is represented by the time which the farmer devotes to and the skill with which he or she organises, administers and develops the business. For a working farmer, this can be difficult to quantify but Nix (loc cit) suggests that, in respect of time, it is equivalent to 7½ per cent of the total hours of labour.

iii. Capital: This is the finance invested in the fabric of the farm by the owner or tenant farmer; it includes livestock, machinery and equipment, and stored crops, feedstuffs and medicines for all farmers whilst for the owner/occupier it also includes the value of the land and buildings as well.

Return on farmers labour

The most immediate of these investments is manual labour so the return on this is assessed first. It can be assessed historically from actual records kept by the farmer or it can as here, be estimated from statistical averages used in forecasting labour requirements (Nix loc.cit). These average values are expressed in Standard Man Days (SMD) which are each equivalent to 8 hours of manual work. Table 4.5 provides the SMD values for the various types of livestock enterprise and the field operations identified in the proposed farm budgets assessed on a whole-year basis. Each suckler cow, for example, requires on average 1.4 SMD per year of manual work, and an enterprise consisting of 24 cows therefore needs a total labour input of 33.6 SMD to operate throughout the year. Repeating this process for all of the livestock classes together with the field operations enables the labour requirement for each of the farm systems to be assessed by totalling all the separate SMD values. Table 4.5 shows the calculation of labour requirements for the three farm systems for which financial budgets have already been constructed. It is assumed that the organic livestock farm has the same labour requirement as the non-organic extensive system, since stock numbers and field operations are identical.

Nix (1997) emphasises that the SMD values are only approximate because a) they are sometimes based on limited data, b) they take no account of economies of scale whereby more intensive systems use labour with greater efficiency, and c) there are wide variations according to the particular circumstances associated with any given farm. This means that the calculated difference in labour requirements (36 per cent fewer hours on the extensively run farm) may not be entirely accurate; although it should provide a good indication of the overall trend. So even though the profits for the two non-organic systems are similar, the profitability of the extensive one is better than that of the intensive because it is achieved from a smaller investment of manual labour. In terms of the overall return on the farmer's own labour, neither of the non-organic systems performs particularly well. If labour is costed at £4.26 per hour, the standard minimum agricultural rate (Agricultural Wages Order 1998), the extensively–run farm manages to pay for 1022 hours which is equivalent to 58 per cent of its labour requirements out of the profit generated. The equivalent value for the intensive unit is only 30 per cent of its labour use. In other words, more than one third of the hours worked by the farmer and family on the extensive farm would go unrewarded whilst the intensive farmer is effectively working for nothing for two-thirds of the time. If the system was being run by a nature conservation body the labour costs could be as high as £6.50/hr (Elliot and Burton 1994).

Table 4.5 Labour requirements for livestock systems in standard man days (SMDs)

Type of livestock	SMD per head per year	No of animals per enterprise		Annual labour requirement SMD	
		Intensive (2.0 LU/ha)	Extensive (1.25 LU/ha)	Intensive (2.0 LU/ha)	Extensive (1.25 LU/ha)
Sucklers cows	1.4	24	15	33.6	21
Bull	3.5	1	1	3.5	3.5
Bulling heifers	1.0	4	2	4.0	2
In-calf heifers	1.4	4	3	5.6	4.2
Beef stores	1.5	24	15	36.0	22.5
Breeding ewes	0.5	220	138	110.0	69
Rams	0.5	6	4	3.0	2
Shearling ewes	0.3	44	28	13.2	8.4
		Total livestock SMD		**208.9**	**132.6**
Field type	**SMD per ha**	**Area per farm system (ha)**		**Annual labour requirement**	
		Intensive (2.0 LU/ha)	**Extensive (1.25 LU/ha)**	**Intensive (2.0 LU/ha)**	**Extensive (1.25 LU/ha)**
Silage (2 cut)	4	20	-	80	-
Hay (1cut)	2.5	-	20		50
Pasture	0.5	19.3	19.3	9.7	9.7
		Total area SMD		**89.7**	**59.7**
		Whole farm labour requirement (SMD)		298.6	192.3
		+ Maintenance @ 15%		**44.8**	**28.8**
		Total labour (SMD)		**343.4**	**221.1**
		Total labour hours		**2747**	**1769**
		Management SMD @ 7.5%		**25.8**	**16.6**
		Management hours		**206**	**133**

The organic livestock system is the only one of the three that can, using these data, provide a full return on the farmer's manual labour which would be worth, in this case, £7,536 per annum (ie 1769 hrs @ £4.26). The £2,466 of profit in excess of this can then provide the additional financial rewards due to the farmer for management effort and capital investment.

Return on farmers management

Nix's estimate of average management input (7½ per cent of total labour requirement) would indicate that the organic livestock farm needs 133 hours of management time. If this is valued at £10/hr (roughly equivalent to a manager's salary of £20K) the farmer should receive £1,330 for his management efforts. This too can be provided out of the organic farm's budgeted profit, still leaving a residual £1,136 as the return on capital investment.

Return on capital investment

It has already been assumed that the farm is tenanted, and rent paid has therefore been included in the budget as a fixed cost. It is only necessary therefore to include the tenant's capital, estimated from standard values provided by Nix; and the value of land and buildings is not relevant.

a. Livestock:

		£
15 suckler cows	@ £625 ea	9375
15 suckled calves	@ £230 ea	3450
15 store cattle	@ 415 ea	6225
1 bull	@ £1000 ea	1000
2 bulling heifers	@ £415 ea	830
2 in-calf heifers	@ £550 ea	1100
138 breeding ewes	@ £55 ea	7590
4 rams	@ £225 ea	900
227 lambs at foot	@ £20 ea	4540
28 shearing ewes	@ £40 ea	1120
Total livestock valuation		£36 130

b. Machinery:

Standard value for livestock farms less than 100ha = £400/ha
Total machinery valuation (39.3ha) = £15 720

c. Stored crops, feedstuffs & consumables:

Standard value for livestock farms less than 100ha = £150/ha
: Total crops/consumables valuation (39.3 ha) = £5 895

The total amount of tenants capital invested in this farm would therefore be £57,745 and the calculated return on this of £1,136 represents an interest rate of just less than 2 per cent. This is considerably less than a building society deposit account would yield making it a low rate of return in business terms. If the farmer had borrowed money to finance this capital investment they would normally be paying 8-10 per

cent interest charges on the loan. These are extra costs not included in the budget but which would obviously have a negative impact on the farm profit, typically by about 12 per cent based on 1996 estimates (Nix 1997).

It is also important to note that the extra livestock carried by the intensively managed system represents a significant additional investment of capital. In this case the farmer has to finance an extra £21,000 of investment for the purchase of additional animals.

4.6.7 Economic factors affecting the relationship between livestock farming and conservation

Lowland livestock farms have, during the last two decades, endured a more severe economic decline than any other agricultural sector. MAFF's records show that their net farm income in 1996/97 had declined to only 8 per cent of its 1980 value, allowing for the effects of inflation. (Nix 1997) (net farm income is a standardised comparative index of profitability). With earnings reduced to only one twelfth of their former value, the livelihood of lowland livestock farmers must be seriously threatened, especially in the present economic crisis and many are expected to quit the industry in coming years (NFU 1998).

Such instability is a matter of considerable concern for conservationists since much of the remaining lowland semi-natural improved grassland is currently being managed and maintained by sheep and beef farmers, and experience indicates that a large proportion of habitat loss and damage occurs shortly after land has changed ownership. A serious problem inevitably arises in terms of ensuring continuity of management if the new occupants have enterprises other than cattle and sheep.

The budgeting exercise set out here provides an indication of how current economic forces are affecting livestock farming in lowland Britain. Since it is the future of extensive systems using semi-natural grassland, which forms the main focus of concern for nature conservation. It is encouraging to see how such systems can, by fully exploiting agri-environment scheme payments, manage to achieve levels of profit comparable with those obtained by improved and intensified farms. Indeed, these profits appear to represent a better financial performance on the part of extensively run farms since they derive from a smaller capital base and a lower workload.

However, in commercial terms, the profits levels on most farms are still far from adequate, often equating to wages of £2 per hour for manual labour, with no return on management skill or capital invested. This creates serious doubts about the ability of livestock farms even of medium size and scale to sustain viable livelihoods into the foreseeable future.

It seems then that one possibility of achieving a viable financial return may lie with extensive farming systems that can add value to the final product. In the organic farming option considered here for example, the combination of higher prices and agri-environment payments provides a considerable boost to overall profit levels. Extensive systems can often adopt organic regimes with a minimum of disruption to their normal routine and would therefore expect to escape major increases in costs or investments. These budgets indicate that a shift towards organic farming could resolve most of the extensively-run farms' financial difficulties fairly rapidly, once the livestock can be marketed with organic certification. The advantage of this for nature conservation is that the environmental and wildlife benefits of the original system need not be compromised by the farmer's need to maintain viable levels of income.

With only 0.3 per cent of UK agricultural land currently certified as organic and 70 per cent of organic food consumed here being imported (Nix loc cit.) there is still reasonable scope for expansion. The market for organic meat had been slow in developing but responded dramatically when the possibility of BSE in cattle causing CJD in humans was identified and announced in March 1996. In fact the current price advantage of organic meat has only developed as a result of the drastic fall in value of the non-organic product, during the post-BSE period. Before March 1996 conventionally finished livestock were fetching the same level of prices that organic ones are commanding in 1998 and there was little if any premium available for organic livestock.

The more stable financial performance of organic livestock enterprises, in recent years, has attracted considerable attention from conventional farmers experiencing falling incomes. To capitalise on this interest MAFF have set up a free advisory service for would-be organic converts. (Organic Conversion Information Service, Tel No. 0117 922 7707) and have just announced higher levels of payment under the Organic Aid Scheme (Farmers Weekly 10/4/98) to be set at an average of £70/ha/yr instead of the present £50/ha/yr for non LFA grassland. Selling organic stock to gain the price premium has often been a problem in the past, and this may still deter many farmers. However, the number of wholesale buyers is increasing all the time and the Organic Livestock Marketing Cooperative is now well established and provides a reliable and convenient marketing outlet for most classes of livestock throughout the country. The market for organic meat appears set to expand, and may provide an important means for ensuring the survival of traditional, grass-based, stock-rearing systems as long as the price advantage can be maintained.

There are other ways of bolstering the profitability of livestock production and some of these are also based on the additional value gained by meat of a particular type or quality. This is particularly the case with beef, where breeds like the Highland and the Aberdeen Angus regularly command premium prices in order to supply the quality 'Scotch beef' market. The Rare Breeds Survival Trust has also successfully established a network of accredited butchers for selling meat from the particular breeds that are registered with them. However, there is little or no premium payable for stock marketed this way as yet, although it is proving very popular with consumers

Such initiatives, despite their contribution to maintaining the individual livelihoods of extensive livestock producers, are unlikely to significantly alter the general trend of people quitting farming. Even in the relatively prosperous years 1991–1996, some 12,000 full-time farmers (7 per cent for the country as a whole), gave up their holdings (Nix 1997). This rate of loss is likely to accelerate if economic circumstances deteriorate further and such a trend would obviously lead to an increasing number of farms being sold off or re-let. Most of these will have been fairly intensively managed and so be of little direct interest to nature conservation. However, the handful that may largely comprise semi-natural grassland are always likely to attract the attention of conservation organisations, a number of which have already acquired such holdings (eg EN, RSPB, and various Wildlife Trusts) to ensure that the traditional farming systems are continued and the ecological value of the site is maintained. Such farms appear to achieve their conservation objectives very effectively although little information has so far been published regarding their financial performance. This data would prove useful if, as now seems likely, more projects of this type are going to be needed as a means of ensuring that important semi-natural grasslands are not to become derelict or destroyed by agricultural intensification.

The majority of the unimproved semi-natural grassland likely to be affected by a change of occupancy, however, will come onto the market as fragments of land within otherwise improved holdings. The usual

practice of separating farms into several lots to maximise the value of sale, means that it is generally possible for conservation bodies to acquire such grasslands as reserves. However, the resource implications of managing these additional reserves becomes daunting if they are widely scattered and of such low agricultural value that finding graziers is difficult

Many reserve managers having responsibility for a number of scattered sites, are already working at full stretch to cope with their existing commitment. Taking on responsibility for additional grassland reserves acquired as a result of the continuing break-up of existing farms could further undermine their overall effectiveness. It may be necessary, therefore, to design novel systems of management to cope with this burgeoning and increasingly scattered assemblage of reserves. Such initiatives will probably still rely on commercially farmed livestock as a means of contributing towards the high management costs, but they might entail a different kind of relationship with the grazier and probably require closer cooperation between partner organisations.

Such initiatives are already developing spontaneously where the availability of wildlife sites can complement the requirements of particular farmers seeking additional land for rearing organic, rare breed or some other type of specialised animal (Grayson 1997).

The high costs of reserve management are a presiding problem, and the question of how best to sustain essential habitat maintenance indefinitely into the future when, all the time, the area of land is being added to, should be of vital concern to conservation managers. Farming in general and livestock operations in particular are expensive undertakings when managed in-hand, due mainly to the high cost of equipment and the relative expense of employed labour (Priddle 1997). Most conservation organisations therefore view it as something of a last resort and wherever possible look to outside sources to supply their grazing requirements, even though this means an inevitable reduction in the level of direct control.

This need not be a serious drawback if the agreement between site manager and grazier is clearly stated and positively conceived, and the signatories have achieved a good level of understanding. The majority of farmers will usually be quite prepared to observe special conservation clauses in their grazing agreements, provided that they can still achieve a genuine economic return on their efforts and investment. Respect for their autonomy and integrity is important in building an effective working relationship since independence is a key requirement in the personality of most farmers.

This is something which has been implicitly undermined by annual licenses which have for many years been the preferred option for letting grazing on nature reserves. Restricting the agreement to the shortest possible term and including every conceivable term and condition has been seen as necessary protection for reserves, but it has done nothing to foster goodwill, cooperation or commitment from the grazier. It is, perhaps, disappointing therefore to see that even with the advent of the Farm Business Tenancy (Agricultural Tenancies Act 1995) which gives the landlord much more control and security, the new agreements are still being restricted to short seasonal terms.

One conservation body, however, is leading the way with testing different styles of agreement. The National Trust, with its greater experience of agricultural lettings has already embarked upon contract farming, share-farming and management agreements and is reporting good results for all of them in different regions and various circumstances (eg Armstrong 1997, Priddle 1997, Homer 1997).

Besides achieving better working relations with their graziers, there is probably considerable scope for conservation managers to develop much closer liaison between themselves. Nature reserves often form coherent assemblages geographically with various types of grassland all being represented in a locality - a circumstance which lends itself to a more cooperative type of management. If the various elements of an integrated livestock system, meadow, pasture and rough grazing, can all be combined in a planned and coordinated way by using their separate managers, it could radically alter the economic prospects for managing them.

In effect this would establish a specialised conservation farming system, that could operate primarily to serve the management requirements of the nature reserves around which it was centred, using extensive, low-put husbandry. The commercial possibilities of such a system would have seemed unpromising in the early 1990's but should not be dismissed now despite the low productivity and fragmented distribution of its land-resource, together with all the restrictions on output which conservation management usually demands. This is because the current availability of agri-environment schemes (payments for which seem likely to be increased once Agenda 2000 reforms are in place) together with strong demand for organic and traditional quality meats have vastly improved the economics of conservation grazing systems. This has been clearly demonstrated in the budgeting exercise presented earlier in this chapter where the extensive organic system went much further in meeting its objectives in business terms than either of the alternatives. It is also supported by the experiences of actual farmers who have embarked on this route (Grayson 1997).

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