Land use and management

Scotland's land is primarily rural and is used for a range of agricultural, forestry, sporting and recreational activities.

Summary

Land use in Scotland is diverse and has a strong relationship with the intrinsic properties of the land.

Agriculture is the predominant land use in Scotland, covering around 70% of the land area. Woodland currently covers around 18% of Scotland, most of which is coniferous plantation. Large areas are used primarily for sporting activities (deer and grouse).

Only about 2.5% of the country is urban and much of this is in the Central Belt.

There is an increasing awareness that sustainable management of our land, across all sectors, has a key role in our response to climate change.

Introduction

The way land is used and managed helps shape our landscape. The types and pattern of land use in Scotland have developed over many hundreds of years to what we see today. Land use has changed in response to factors such as population growth, industrialisation and improved transport links and infrastructure.

In the past, Scotland had a much greater (entirely native) woodland cover. Much of this was removed over a prolonged period as a result of agricultural improvements, timber extraction, burning, grazing and climate change.

Virtually all of Scotland's land is rural in nature, with only approximately 2.5% classified as urban. This includes our towns and cities, our transport network and infrastructure and our industrial and retail sites. The remainder – rural land – comprises large areas of different types of semi-natural vegetation (e.g. heather moorland and blanket bog); grasslands and woodlands; and fields of cereal crops and vegetables.

Scotland's land contributes in a number of ways to Scotland's environmental, economic and social well-being. It provides a range of benefits including food, timber, energy and recreational opportunities. It also provides the buffer between our fresh water resources and pollutants, which may otherwise damage water quality. It contains an enormous stock of above and below ground carbon. Indeed, with respect to the emission of greenhouse gases, land use is the only sector that both emits greenhouse gases to and removes them from the atmosphere. The multiple benefits provided by land are recognised in the Scottish Government's Land Use Strategy.

There are a number of ways to assess the contribution of Scotland's land to our economy. A recent study argued that one in seven Scottish jobs depends to some extent on the land, providing over £17 billion to the Scottish economy. This demonstrates the value of the natural resource base to the economy of rural Scotland.

Agriculture and forestry make important contributions to the Scottish Economy. Sporting activities also make a substantial contribution in locations where other sources of income are scarce. Deer management is estimated to contribute over £100 million annually to the Scottish economy.

As well as our primary industries employing people directly, the food and drink industries which rely on those primary products (e.g. cattle, sheep and grain) employ around 360,000 people.

The direct exploitation of Scotland's land resources through mining and aggregate extraction is estimated to be worth £550 million per year.

Scotland's land is increasingly being recognised for its value in enhancing the nation's health. Activities such as walking, climbing, biking, horse riding and golf are all known to have physical and mental health benefits. They also generate substantial economic activity and income, and Scotland is actively marketing itself as an international centre for these forms of outdoor activity. Soil also supports the greenspace within our towns and cities where a large proportion of our outdoor recreation takes place.

Description of land use and management

Scotland's land is used for a variety of activities, with some areas used for more than one, for example for rough grazing of domestic livestock and for sporting management and related activities. For this reason there is no unambiguous statistic that pigeonholes each area of land into a single use.

State and trend

Agriculture is the most dominant single use of land – the most recent estimate from the Scottish 2011 June Agricultural Census is that it covers 5.63 million ha (approximately 70% of Scotland). However, within this figure, it must be recognised that almost 8% is woodland and 2.5% is classified as 'other land'. Nevertheless, it can be safely concluded that agriculture is the most extensive land use in Scotland.

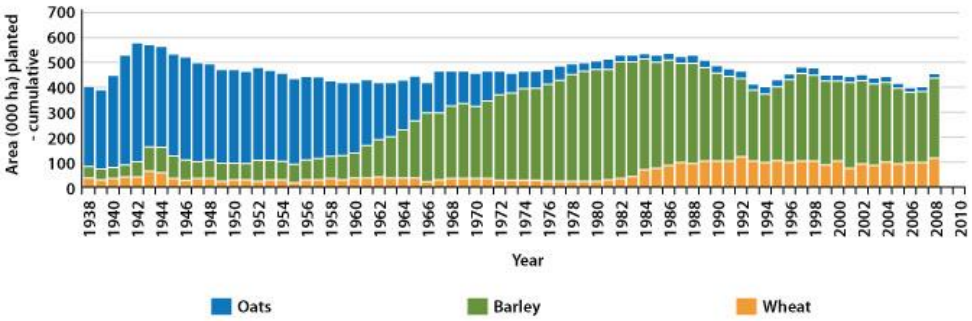
The area of agricultural land (excluding common grazings) in Scotland has declined from 5.8 million ha in 1982 to 5.63 million ha in 2011. Woodland and urban expansion are likely to be the main reasons for this.

There have also been changes in land use within the agricultural area. For example, the area under arable management has declined by about 13% and rough grazing by around 21% (or about 800,000 ha), whereas permanent (sown) pasture has increased since 1982. Care should be taken in the strict interpretation of these figures due to changes in definition and methods of reporting.

Within the arable sector, there has been a large increase in the area of wheat and a decline in spring and winter barley since 1982, nevertheless spring barley remains Scotland's principle arable crop. Oilseed rape was virtually unknown in 1982 in Scotland, but grew to a maximum sown area of 70,000 ha in 1994; however, this dropped back to just over half this figure by 2010. The area of potatoes has remained relatively stable. Until the mid-1950s, oats was the predominant cereal in Scotland, occupying around 75% of the arable land.

The introduction of autumn-sown crops such as winter wheat, changes in dietary preferences and responses to market signals are responsible for these changes (Figure 1). It should be noted that arable crops, particularly barley, are often grown in rotation with grass; this feature is more prevalent in Scotland than other parts of the UK.

Figure 1: Changes in cropping areas from 1938 to 2008

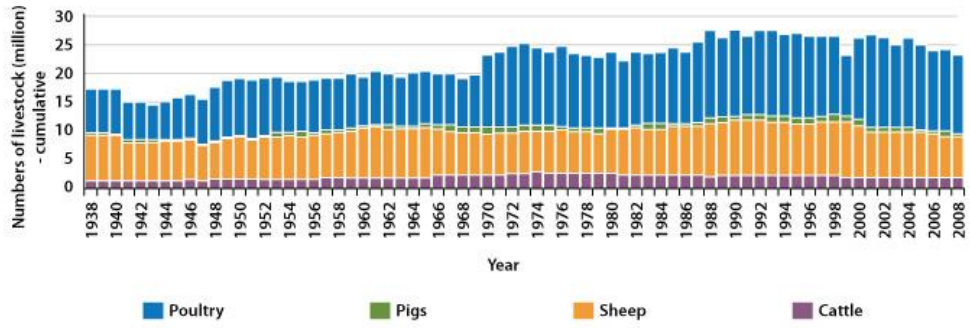


Source: [Changing Land Use in Rural Scotland - Drivers and Decision-Making: Rural Land Use Study Project 1 (Report)]

Scotland is famed for the quality of its livestock production, and their production and management covers a much larger proportion of Scotland than arable and horticultural land. Grazing also has a profound effect on the appearance of our landscape. Cattle numbers have fallen by around 500,000 to 1.8 million between 1982 and the present day. Much of this decline is due to the 40% decline in numbers of dairy cattle to around 270,000, although production has not necessarily fallen by a similar amount due to factors such as cattle weight increasing and feeding regimes.

The most significant change has been in sheep numbers, which have fallen from almost 10 million in 1992 to just under 7 million in 2011. Longer-term trends are shown in Figure 2.

Figure 2: Changes in livestock numbers from 1938 to 2008



Source: Changing Land Use in Rural Scotland - Drivers and Decision-Making: Rural Land Use Study Project 1 (Report)

The Abstract of Scottish Agricultural Statistics 1982–2011 provides further information on the June agricultural census data for those years.

Woodland currently covers 1,385,000 ha of land, approximately 18% of Scotland. This is almost half of all woodland in the UK. Seventy-eight per cent of Scotland's woodland is coniferous, the majority of which is fast growing non-native species such as Sitka Spruce or Lodgepole Pine (combined covering 650,000 ha). The remaining 22 % is made up of broadleaves. A survey is currently being undertaken to identify the location and types of all native woodlands in Scotland.

There was a large increase in new woodlands in Scotland from the end of the Second World War when woodland cover was 6.6% until the late 1980s. Planting rates of new woodland peaked in the 1970s at over 30,000 ha per year, steadily dropped back to around 3000 ha in 2009–10, but increased to 5100 ha in 2010–11. The large decline since the 1980s is primarily due to changes in taxation rules for private investors.

The Scottish Forestry Strategy has a target of 25% woodland cover in Scotland by 2050. The Scottish Government's rationale for woodland expansion suggests an increase in woodland area of about 650,000 ha.

Large areas of land classified as agricultural rough grazing are likely to have deer and/or grouse management as the principal land use. When combined with land that is not used for agriculture, it is probable that at least 20% (around 1.6 million ha) of Scotland's land area is managed primarily for sporting purposes. The total number of deer in Scotland is not known, although various estimates over the last 10 years vary from 350,000 to 600,000. This excludes any impact from the harsh winters of 2010 and 2011.

Large areas of Scotland are protected under a range of designations, many of which overlap. Some of these designations focus on nature conservation (such as Sites of Special Scientific Interest (SSSI)), while others are concerned with special landscapes (such as National Scenic Areas). The management of multi-functional protected areas (such as our National Parks) seeks to balance the needs of people, landscape and nature.

The first recognition of the value of Scotland's natural assets was the identification of the first National Nature Reserve at Beinn Eighe in Wester Ross in 1951. Now we have 1447 SSSIs covering 12.7% of Scotland and, although the European Directive Special Protection Areas (SPA) and Special Areas of Conservation (SAC) designations cover similar sized areas, there is substantial overlap between all three. Designation does not preclude land uses such as those described above – indeed many have woodland and sporting interests – but through management agreements, they do put conditions on the type of activity permitted on them.

The area of built-up or developed land is difficult to estimate as there are different ways of defining both. The Land Cover of Scotland 1988 dataset estimated it to be about 1900 km^2 (2.4% of Scotland); based on the best data available and this had increased by approximately 130 km^2 by 2003. There are no data available since then. Given these uncertainties in definition, a figure of 2.5% has been adopted with the recognition that the actual figure might vary either side. Within urban areas, some non-developed land remains in the form of parks, recreational and amenity ground and private gardens.

There are other estimates of 'urbanisation': for example the Scottish Government's urban-rural classification, but this is likely to overestimate the actual area of developed land. Aberdeen, for example, is classified as 92.9% urban, but approximately half of the area inside the city boundary is undeveloped.

Pressures affecting land use and management

There a number of high-level global drivers that already affect Scotland. These include food supply and demand, energy supply and demand, water supply, climate change and the increasing recognition that we need to protect our biodiversity. All of these impact to a greater or lesser extent on current and future land use in Scotland.

These drivers can be subdivided into a number of groupings.

Environmental drivers, including climate change, changes in biodiversity, air, water and soil quality, landscape quality and enhancement.

Climate change is potentially the most significant environmental driver. Dependent on the scale and detail of these changes, there may be opportunities for a wider range of agricultural and woodland crops to be introduced to Scotland. However, shifts in rainfall patterns and the possibility of more extreme events, may run counter to this.

Demographic drivers refer to the size, character and movement of Scotland's population. The number of households in Scotland is projected to increase, from 2.3 million in 2008 to 2.7 million in 2031, an increase of 19% (General Register Office for Scotland, 2009). Land is already being 'converted' into new infrastructure and this trend will continue. The trend of an increase in single-occupancy households is projected to continue, but as these are likely to be primarily flatted developments, the 'land take' is unlikely to be as large as for other household types.

Economic factors include the prices of different and diverse commodities such as land, crops, timber and oil, the labour market, transport costs, housing, energy and food security and exchange rates. The rapid decline in woodland planting in the late 1980s is a good example of changes to financial incentives having a dramatic effect on land use in Scotland.

Policy and institutional issues can be frameworks such as International obligations, agreements and Directives and national policy targets or the instruments required to achieve them. These include:

- grants and subsidies (e.g. the Single Farm Payment), which includes the Good Agricultural and Environmental Condition (GAEC) requirements that must be met by farmers;
- quantity measures such as milk quotas;
- regulations such as those that control sewage sludge application to land;
- our commitment to international biodiversity targets through European Directives.

There have been a number of policy drivers that have influenced land use patterns over the last 50 years or so. They link closely with economic factors and indeed are difficult to separate. These include:

- the desire to increase the forestry resource of Scotland (and the UK);
- the Common Agricultural Policy (CAP), with specific product-driven subsidies, prompted many farmers to increasingly specialise in cereals and oilseed rape;
- reform of CAP away from commodity-driven subsidies, which has contributed to large decreases in animal numbers;
- an increasing pressure to recycle organic material to land, for example, sewage sludge, compost and byproducts from specific industries such as distilling and food processing;
- the biodiversity agenda, which has prompted a number of EU- and UK-specific policy and regulatory initiatives such as the Natura 2000, Habitats Directive and Birds Directive, the Wildlife and Countryside Act (1981) and the Wildlife and Natural Environment Bill;
- the Water Environment and Water Services (Scotland) Act (2003), which has had an increasing influence on the way that land is managed in order to protect water quality and aquatic environments;
- the need for alternative energy sources to meet renewable energy and greenhouse gas emission targets set by the Scottish Government.

Technological factors have in the recent past led to an increase in the use of winter cereals and altered cropping patterns within the arable sector. In more recent times, the use of plastic polytunnels has increased but the impact of these is currently unclear. Genetic modification (GM) technology is currently not allowed in Scotland and Global Positioning System (GPS) technology, although not changing land use *per se*, can influence the way in which certain crops and locations are managed.

Cultural and social aspects can have a huge influence on the land use decisions made by individual land managers. Opportunities differ, for example, between owner-occupiers and tenant farmers, and large estates can often make decisions that reflect the owners' individual aspirations and traditions.

More land has come into community or NGO ownership over the past two decades and this is likely to impact land use into the future. Currently, there are concerns in the agricultural sector about the objective of increasing woodland cover to the 25% target as set in 2006.

Research commissioned as part of the Scottish Government's Rural Land Use Study provides more detailed commentary on current and future drivers and factors involved in decisions about the use and management of land in Scotland.

Consequences of land use and management change

Land use has a profound influence on the environment and a direct effect on soil, water and air quality, wildlife and landscape. Any change to land use or to land management will, therefore, impact on these aspects of Scotland's environment. The effects, which can be both positive and negative, are usually felt locally but, when aggregated, some can have impacts that can be measured nationally.

Land use change or altered management impact on soil carbon stocks. Converting land to arable use generally releases greenhouse gases. In contrast, conversion of land to woodland increases soil carbon stocks, although there can be a release of carbon before the woodland becomes established; this varies depending on the method of forest management employed and the type of soil. Many areas of blanket bog with peat soils were intensively drained in the 1950s and 1960s for agricultural improvement; there is evidence that many bogs dried out to some extent and sequestered less carbon. An increase in the recycling of organic materials to land may increase soil carbon stocks in specific circumstances. Changes in land use are important in the context of climate change mitigation strategies.

Conversion of land to urban or other built-up land effectively seals the soil resulting in almost a complete loss of function.

Land management, particularly in the arable sector, can have an effect on soil itself, but also on water and air quality. The increase in autumn-sown crops has led to an increase in soil erosion events and damage to water courses, and the use of heavier machinery, although there is little hard evidence, leads to more compaction, which in itself can lead to increased erosion as well as increasing greenhouse gas emissions. Guidelines are available that aim to minimise the negative impacts of agricultural and forestry management on soils and water and to promote good practice, for example the Scottish Government's farm soils plan, the farming for a better cimate initiative and the Forestry Commission's soil and water guidelines.

Above and below ground biodiversity will change in response to a land use change of whatever type. It is dependent on the precise nature of the change whether perceived as positive or negative. The predominant change over the past 50 years from open ground habitat to closed canopy coniferous woodland has had a negative impact on biodiversity and associated wildlife.

For a number of decades, high sheep (and deer) numbers have been responsible for overgrazing of important and valuable habitats; it will be interesting to see how these habitats respond to the almost complete removal of domestic animals in some areas.

Landscape quality is a highly personal judgement, but some land use changes over the past 50 years, such as the increasing intensification of arable cropping, the effects of heavy grazing and single aged monoculture forestry plantations, are generally perceived as having negative impacts.

More recently, different woodland priorities, reduction in animal numbers and agri-environment schemes have, in part, started to reverse these trends.

Our renewable energy targets also have effects on landscape character; windfarms are often highly visible and, to some, intrusive. Hydro schemes can also impact landscape. We may see an increase in short rotation woodland and biofuel crops, and these will have implications on aspects such as landscape character as well as on soil, water quality and biodiversity.

Response by society

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Society's needs and aspirations of what is wanted from land change over time, and there is a continual need to examine whether the land use balance is appropriate at a specific point in time.

One of the most significant land use changes in Scotland in the 20th century was the spread of plantation forestry, encouraged by tax policies at that time. During this period, many areas of hill and moorland were planted with mainly non-native conifers. However, more recently, the negative impact of these plantations on important moorland and peatland habitats has become better understood and forestry practice has changed as a result. For example, the establishment of new woodlands on peat more than 50 cm deep is no longer Forestry Commission policy. Recent Forestry Commission guidance "the right trees in the right place" provides Scottish Government advice to planning authorities on planning for forestry and woodlands.

The fact that land can provide multiple benefits is becoming increasingly recognised; however, this can lead to competing pressures on the same piece of land. At present the lack of integration between the agriculture and forestry sectors and also the wider environment and recreation, make it difficult to manage competing demands on land.

Land already does produce multiple benefits – an arable field produces wheat, for example, as its prime objective but it also stores carbon, is the home for a certain suite of animals and organisms and stores and filters water. We need to recognise the other services delivered by specific land uses and seek to develop management strategies to help optimise these.

The Scottish Government has recognised the need to provide a strategic framework for a more integrated approach to land use, and a series of guiding principles are suggested within which all stakeholders operate. In response to this, and as an explicit section within the Climate Change (Scotland) Act 2009, a Land Use Strategy was published in March 2011.

Unsurprisingly, the strategy has climate change at its core and identifies how land use, and specifically how land is managed, can contribute to mitigation and adaptation strategies. The strategy sets out three high-level objectives relating to the economy, environment and communities – the three pillars of sustainability:

- land-based businesses working with nature to contribute more to Scotland's prosperity;
- responsible stewardship of Scotland's natural resources delivering more benefits to the people of Scotland;
- urban and rural communities better connected to the land, with more people enjoying the land and positively influencing land use.

The Land Use Strategy sets out a number of guiding principles and the long-term direction that we need to pursue to get the best from Scotland's land.

There are a number of proposals within the Strategy that will have a direct effect on land use and on the way that land is managed.

- **further encourage land-based businesses to take actions that reduce land-based greenhouse gas emissions and that enable adaptation to climate change and opportunities**. This might include employing different methods of animal husbandry and soil management;
- **identify more closely which types of land are best for tree planting in the context of other land-based objectives and promote good practice and local processes in relation to tree planting so as to secure multiple benefits**. At present planting rates, we are not going to achieve the 25% woodland cover by 2050, but this represents by far the major planned land use change in Scotland;
- **develop a methodology to take account of changes in soil carbon for carbon accounting purposes; improve understanding of potential benefits from conservation and management of carbon rich soils; and deliver measures to help secure long-term management of all land-based carbon stores**. This relates to the management options on the greater part of Scotland's land resource;
- **investigate the relationship between land management changes and ecosystem processes to identify adaptation priorities**. This looks at the wider implications of having climate change at the heart of land management;
- **provide a Land Use Information Hub on the Scottish Government website**. This should provide a means of making more informed decisions on land use and for greater engagement in so doing.

The Land Use Strategy also recognises the role of appropriate regulation to prevent adverse impacts and unintended negative consequences from land use. For example, the General Binding Rules within the Water Environment (Controlled Activities) (Scotland) Regulations 2011 protect water quality from diffuse pollution caused by land-based activities, whereas land managers who wish to receive Single Farm Payments are required to keep their land in Good Agricultural and Environmental Condition (GAEC).

The strategy sits alongside and complements a number of other government plans, notably the National Planning Framework and strategies for biodiversity, soils and other natural assets and from infrastructure such as transport and waste. It is also aligned with other climate change strategies, such as our approach to meet emission reduction targets, the gradual shift to a low-carbon economy and our desire to plant trees in the right places.