Changing land management

Section 1

1:1 Scottish agriculture
1:2 Different land ownership models
1:3 What future for woodland and forestry in Scotland?
Section 1:1

• To reduce reliance on support and become more resilient many farms need to innovate and adopt best practice – thereby improving profitability.
• Encouraging more young people into farming is essential for the future of the sector – younger generations often bring new ideas and methods to businesses that can drive business improvements.
• The importance of non-farm income sources in maintaining farm businesses is likely to grow - such as through the SRDP’s LEADER funding for diversification.
• The legislative framework needs to provide landowners the confidence to lease land to new tenants, whilst offering tenants adequate security to develop their business.
• Profitable beef and sheep production remains challenging for many farms without CAP support. There is scope for better use of technology, genetic selection (EBVs) and management of sheep and beef that would improve productivity and reduce production costs.
• The soft fruit sector is highly adaptive and innovative with production rapidly expanding – but it remains highly reliant on migrant labour, with the risks from Brexit obvious.
• There is scope to utilise precision agriculture technologies to drive production efficiencies and reduce environmental impacts of cereal production.
• In 2014 the farm-gate price for milk collapsed leading to major profitability challenges - and although milk prices have started to improve again, there are increasing opportunities to use future markets that can provide some certainty over their future milk price.
• As the implications of Brexit start to unfold Scottish agriculture has an opportunity to reflect and take stock of how the sector is supported and regulated in the future. The Scottish Government’s Future of Scottish Agriculture discussion document provides a useful starting point in thinking about a vision and strategy for a post-Brexit Scottish agricultural sector.
1.1.1 Introduction

Agriculture is a dynamic industry that has changed significantly over the last 50 to 60 years – driven largely through technological changes and innovations that allowed farmers to improve productivity. Whilst our farming landscapes suggest, to the lay person, that changes in agriculture are rare, the reality is that the subtlety of changing livestock breeds, crop varieties, inputs, farming methods, etc. is often lost to the untrained eye. Additionally, changes to Scottish agriculture have been stimulated by changes to the regulatory and support mechanisms for farming, particularly the Common Agricultural Policy (CAP) of the European Union. This section of the report discusses some of the changes that have occurred in Scottish farming sectors in recent times, highlighting the drivers of change, and what opportunities and challenges face the industry as we move forward.

Scotland is a diverse country that contains some 61,000 square kilometres of farmland, ranging from the Machair and mountains of the Western Isles, through the straths and glens of the Highlands, to the rolling coastal plains of the east and south. Despite this large farmland area only about 9% is cropped or fallow, with 21% used as grassland (with about 3.5% young grass) and 59% used for rough grazing - including over 9% that is under crofting common grazings.1 Figure 1 shows a consolidated version of the James Hutton Institute’s Land Capability for Agriculture map where the extent of Scotland’s poor quality farmland can be seen. The map highlights that arable areas are predominately on the east coast, alongside land that is capable of mixed agriculture (both cropping and grazing), which spreads further inland and is also more prevalent in the south and west, particularly the dairy strongholds of Dumfries and Galloway and Ayrshire. Land capable of grassland stretches further inland up river floodplains, etc. However, the majority of Scottish farmland, particularly in the Highlands and Islands, is only capable of rough grazing. It is worth noting here that farmland around the Moray Firth, Thurso and much of Orkney differs from the rest of the Highlands and Islands in that they have areas of good quality farmland, allowing a wider range of farming activities and greater intensity of production to be undertaken. Some 85% of farmland in Scotland is classified as Less Favoured Area (LFA) as a result of the biophysical constraints faced by farmers in these regions, such as poor soil quality, elevation, slope, and weather conditions. In addition, many of these areas are also peripheral regarding distance to suppliers and markets.

- There are about 54,000 agricultural holdings in Scotland.
- There are about 13,000 crofters controlling some 19,000 registered crofts in the North West of Scotland utilising some 1,100 common grazings that extend to over 580,000 hectares.
- There are around 20,000 farm and croft businesses that claim direct CAP support.

1.1.2 Agricultural Support

Price manipulation and support for agriculture is not a new phenomenon, having been around for centuries in the UK. Indeed markets for many farm products remained regulated in the UK until 25 years ago, through
statutory Marketing Boards that were introduced in the 1930s amidst growing concern over increased concentration of purchasing control into the hands of a few big food processors. Alongside the increased mechanisation of Scottish farming that occurred over the last 70 years, the main driver of change (with the exception of horticulture, pigs and poultry sectors) has been the agricultural support mechanisms that have been in place. This is particularly true of the CAP that Scottish farmers have been benefactors of since the UK joined the European Economic Community in 1973. A graphical summary of the key agricultural support over the last 70 years is provided in Figure 2.

The Common Agricultural Policy (CAP)

The CAP was originally designed to ensure farmers that could earn a fair living, ensure security of food supplies and make sure consumers could enjoy food at affordable prices. It has ultimately been a protectionist policy, traditionally using high guaranteed prices supported by a complex system of intervention stocks, import levies and export refunds. Coupled payments for beef and sheep (a subsidy per animal) became a major driver of change in the 1980s, incentivising increased herd and flock sizes as many started “farming subsidies”. An unwanted effect of protectionism and high guaranteed prices was considerable over supply of agricultural commodities across Europe, as farmers reacted to these artificial price signals. This policy-induced production increase meant that by the mid-1980s there were considerable food surpluses, in the form of butter “mountains”, beef “mountains”, wine “lakes”, etc. and a burgeoning CAP budget. This came to a head in 1984 when, in an attempt to curb the ever expanding supply of milk, production quotas were introduced in the dairy sector - quotas that remained in place for over 30 years. In addition, attempts to curb crop production saw the introduction of set-aside (where farmers were paid not to grow crops), on a voluntary basis, in 1988.

Figure 2: Key timeline of Scottish Agricultural Support Policy, 1945 to present

The McSharry reforms in 1992 signalled the first major step-change in the CAP. These reforms established a ceiling for the CAP budget and took steps to cut intervention prices, bringing farmers closer to world markets.
As the price support was cut farmers received compensatory payments, such as the Arable Aid Payment, that were based on the hectares of cropping land, or number of livestock produced, rather than on tonnes produced. Furthermore, real attempts were made to curb output through the compulsory introduction of set-aside – that lasted until 2007. Limits on support for beef and sheep support were introduced in the form of entitlement quotas, and there was an increase in support for less-intensive farming methods through the introduction of “extensification payments” in beef.

The Agenda 2000 reforms of the CAP introduced the concepts of two pillars of the CAP – Pillar I being price and income support and Pillar II being rural development measures. Pillar II, in essence, pulled together a number of disparate schemes such as agri-environment, agri-forestry, farm diversification, processing and marketing, etc. into a coherent suite of support under the umbrella of the Scottish Rural Development Programme (SRDP), which is now in its third iteration. Support for Less Favoured Areas (LFAs) was brought into Pillar II of the CAP and technically decoupled in 2002 with the introduction of the Less Favoured Area Support Scheme.

During 2001 farmers in the South of Scotland were devastated by the effects of the Foot and Mouth Disease outbreak that resulted in the slaughter of 643,900 sheep, 87,700 cattle and 3,400 pigs - with compensation payments amounting to £171 million.

The Single Farm Payment (SFP) was introduced in 2005, a formal attempt by the EU to break links between support payments and production. At this time Scotland opted for the easy choice of basing the new SFP on the historic payments each farmer had received. This meant that there was little change in the amount of support payments received – up until 2014. A new addition to the CAP rules during these reforms was the concept of cross-compliance – efforts to make sure farmers were not causing environmental damage and were meeting legal obligations, for example over livestock traceability. Since 2005, CAP recipients have had to comply with Statutory Management Requirements relating to public, plant and animal health, environment and animal welfare requirements, and also have had to maintain their land in Good Agricultural and Environmental Condition. Amongst concerns over abandonment and loss of environmental benefits from cattle grazing, Scotland also retained some coupled support payments for the Scottish beef sector through a Scottish Beef Calf Scheme.

An unintended consequence of tradeable “SFP entitlements” and the cross-compliance rules meant that individuals (not necessarily farmers) could purchase these entitlements on the open market and then rent out some land that was not being used to claim support – “naked acres” – in order to activate these entitlements. Meeting cross-compliance rules was particularly easy on rough grazing, as it was the land of choice to rent by a new breed of inactive “slipper farmers.” The Scottish Government fought to ensure that payments were only allowed to be made to active farmers but as active farming measures were not introduced until 2015, the legacy of slipper farming will still be felt until the SFP is fully phased out in 2019.

The 2014 CAP Reform

After protracted negotiations, an agreement on the 2014 CAP reform package was made in 2013. In Scotland the SFP is being transitioned out by 2019, with the new Basic Payment Scheme (BPS) gradually taking its place. The BPS is a regional payment and after extensive analysis, stakeholder engagement, and public consultation, Scotland opted for 3 agronomic regions: Region 1 – land used for crops or grassland; Region 2 – land that is rough grazing in non-LFA areas or was more intensively farmed in LFAs, and; Region 3 – more extensively grazed LFA rough grazing. By 2019 it is estimated that the support payments will amount to about €161/ha for Region 1, €27/ha for Region 2 and €9/ha for Region 3.

In addition, CAP Greening measures have been introduced and 30% of the CAP budget is conditional on compliance with three new measures: (1) Crop Diversification – where (with exceptions) a farmer must have a minimum of 3 crops if he/she has over 30 hectares of crops, with the largest crop being no more than 75% and the smallest no less than 5%; (2) Ecological Focus Areas (EFA) – where farmers with more than 30 hectares of crops (with exceptions) must put 5% of crop land into EFA measures such as field margins, fallow, buffer strips, green cover, catch crops and nitrogen fixing crops; (3) Permanent Pasture – Scotland as a whole must maintain its area of permanent pasture within 5% of the reference level. Further, there are restrictions on improving unimproved semi-natural grasslands, and farmers must maintain a nitrogen fertiliser and lime plan (an addition to mitigating climate change). The Greening payment amounts to about €83/ha in Region 1, €14/ha in Region 2 and €4 in Region 3.
As part of the 2014 reforms Scotland maintained coupled support for the beef sector through the Scottish Suckler Beef Support Scheme\(^1\) where eligible beef calves on the mainland receive about €100 and on islands €160. Additionally, a coupled Scottish Upland Sheep Support Scheme\(^2\) was introduced for Region 3 farmers, where eligible ewe hoggs receive a payment of around €85.

A key component of the CAP reforms was the “Scottish Clause”, which introduced a requirement for CAP recipients to be active farmers – although this only really applies to rough grazing areas in Scotland. To ensure that CAP support only goes to those actively farming, a “negative list” was introduced – detailing types of businesses that cannot claim support – and there now is a requirement to meet a minimum stocking density or undertake an environmental audit on rough grazing land used to claim CAP support.

**LFA Support Reform and Brexit**

As we move forward the LFA designation (and hence the LFASS support) is due to change in 2018 with the introduction of a new designation called Areas Facing Natural Constraint (ANC). Depending on the Brexit position, if a new scheme is to be launched in time, decisions and a consultation by the Scottish Government would need to take place in late 2016 / early 2017. Various scenarios for the designation have been considered with stakeholders in 2016 and for any proposed scheme the Scottish Government would have to satisfy the EU Commission that farmers in the new ANC area have lower profitability margins caused by natural constraints – i.e. the net income forgone and additional costs faced.

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**High Nature Value Farming systems**

**Davy McCracken, Hill and Mountain Research Centre, SRUC**

High Nature Value farming (HNV farming) refers to farming systems important for the environmental benefits they provide, including support for a range of habitats and species (such as butterflies and birds) considered to be of high nature conservation importance. Across Europe, half of all species depend on habitats associated with agriculture.

The HNV farming indicator (along with that for HNV forestry) was developed by the Scottish Government to help in monitoring the Scottish Rural Development Programme and other strategies, e.g. the Land Use Strategy\(^1\). HNV farming systems are traditional low intensity systems, typically with a mix of moorland, grassland and woodland. Historically, these systems have declined because of poor economic viability.

It should be noted that the indicator classifies farm types as HNV to provide an estimate of overall HNV farming, rather than identifying specific sites on the ground. The indicator is not intended to be used to inform site specific management decisions but rather to monitor how rural development measures are impacting upon the extent of HNV farming as a whole.

Scottish Government estimate that between 41% and 44% of Scottish farmland is HNV and this proportion remains relatively stable through time. The HNV farming areas support low intensity farming and therefore tend to be relatively large in area. This is evident from the fact that the 2,089 HNV holdings in 2013 represent only 4% of the total number of holdings in Scotland.

In the future, the Scottish Government will seek to understand emerging trends in HNV farming by identifying the influence of key drivers of change such as stocking rates, number of holdings no longer keeping livestock and farmers’ attitudes. They will use case studies to illustrate changes in farming practices that are known to be important in terms of impact on biodiversity and will also cross-check trends in HNV farming against other critical indicators such as relevant Scottish Biodiversity Strategy indicators\(^2\) and information on farming practices from the EU Farm Structure Survey.

Source: ClimateXChange Indicators and Trends  For more detail see: http://www.climatexchange.org.uk/files/3314/5934/5054/NA9_HNV_farming_210316.pdf

\(^1\) [http://www.gov.scot/Topics/Environment/Countryside/Landusestrategy](http://www.gov.scot/Topics/Environment/Countryside/Landusestrategy)

As CAP support is extremely important in underpinning agricultural incomes in Scotland, and amounts to around 40% of the EU budget, the implications of Brexit on the sector are likely to be significant if similar support mechanisms are not put in place as the UK withdraws from the EU. However, Brexit should also provide opportunities for those willing to innovate and be truly market driven, focusing on high quality produce.

The Importance of CAP

The reason that CAP grabs so much attention in Scotland is because it plays a very important role in ensuring Scottish farms, on average, are profitable. Table 1 shows that in 2015 only dairy farming returned a profit before CAP support, with production costs exceeding production incomes in all other sectors (by 40% in LFA sheep farms). CAP support accounted for 60% of total farm output for LFA Sheep farms and 48% for LFA Cattle and Sheep farms – but only 8% for Dairy farms. In terms of Farm Business Income (FBI - a measure of net returns to unpaid family labour and capital) the CAP payments are fundamental to all businesses, apart from the dairy sector where milk price drives everything, as most farming activity is unprofitable, on average. This helps explain why there is so much concern and uncertainty in many farming sectors when CAP reforms occur.

<table>
<thead>
<tr>
<th>2015</th>
<th>LFA Sheep</th>
<th>LFA Cattle</th>
<th>LFA Cattle &amp; Sheep</th>
<th>Cereal</th>
<th>General Cropping</th>
<th>Dairy</th>
<th>Lowland Cattle &amp; Sheep</th>
<th>Mixed</th>
<th>All Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs as % Output</td>
<td>140%</td>
<td>118%</td>
<td>125%</td>
<td>116%</td>
<td>106%</td>
<td>93%</td>
<td>110%</td>
<td>118%</td>
<td>113%</td>
</tr>
<tr>
<td>CAP as % of Output</td>
<td>60%</td>
<td>38%</td>
<td>48%</td>
<td>20%</td>
<td>17%</td>
<td>8%</td>
<td>28%</td>
<td>24%</td>
<td>27%</td>
</tr>
<tr>
<td>CAP as % of Farm Business Income</td>
<td>282%</td>
<td>184%</td>
<td>201%</td>
<td>204%</td>
<td>123%</td>
<td>53%</td>
<td>143%</td>
<td>339%</td>
<td>173%</td>
</tr>
</tbody>
</table>

The 2014 CAP reforms perhaps brought about the most fundamental change in the way that Scottish farmers have been supported since entry into the EU. The break with historic production levels means that farmers now face significantly decoupled payments, and going forward they must make hard decisions about whether, or not, to use that support to cross-subsidise loss-making enterprises. The new CAP could not maintain the status quo under the EU's rules, meaning there was no way of avoiding redistribution of payments. This redistribution essentially sees some support transferred from farms that were traditionally more intensively farmed to those that were more extensive. In particular, this means that intensive beef and dairy producers in the Aberdeenshire and Dumfries and Galloway regions will be faced with decreases in the amount of CAP support flowing to them by 2019.

1.1.3 The Economics of Scottish Farming

It is important to acknowledge that whilst farming is considered a way of life by many, farms tend to be run as businesses and therefore require a positive return on their investment to continue in the long run. The low turnover level of farms²⁰ suggests that farming, with CAP support, has generally been providing an adequate return to farming families. However, on closer inspection there is a very wide range of business profitability within Scottish agriculture, with many making economic losses, many being reliant on off-farm income sources, and a widespread reliance on agricultural support payments to survive. This section considers some of the aspects of the farming economy.

Scottish Farming Output and Expenditure

Scottish agriculture was estimated²¹ to have generated nearly £3 billion of output in 2015. Figure 3 shows that around 60% of this came from the livestock sector in 2015 with 28% from the cropping sector. Total output grew by about 50% in the decade to 2013 before tailing off slightly in the last couple of years – a direct consequence of changes in market prices for farm output. Cattle remained the largest contributor to Scottish farm output in 2015, contributing about £850 million (29%) of direct output. Dairy contributed £364 million (12%), cereals £334 million (11%), horticulture £274 million (9%), sheep £242 million (8%), other crops £213 million (including potatoes at £167 million), poultry £181 million (6%), pigs £86 million (3%) and non-
agricultural activities £263 million (9%). In particular, there was significant growth in the horticultural sector, where output grew by 115% between 2003 and 2015 – including a 250% rise in the value of soft fruit output and an 84% rise in vegetable output. In addition, non-agricultural activities grew by 138% and contracting work more than doubled to £101 million.

**Figure 3: Value of Scottish Agricultural Output, 2003-2015**

Whilst the value of output is important in determining the relative contributions of different farming systems to the Scottish economy, all farms spend money on inputs that can underpin a wide variety of rural businesses. Despite a slight decline from the 2013 peak, in 2015 farmers (excluding non-businesses purchases) were estimated to have spent over £2.75 billion on business inputs, up 56% since 2003. In 2015, feedstuff accounted for 22% of all purchases by the farming community at £593 million (down from £675 million in 2013 – a bad weather year). Around £370 million (14%) was spent on hired labour in 2015, with £169 million (6%) on fertilisers and lime and £114 million (4%) on fuel and oil. Farm input costs have experienced rapid inflation in recent years. Heavily linked to rising energy costs, in the decade to 2012, fuel and oil expenditure increased by 183%, fertiliser and lime increased by 129% and feed expenditure more than doubled (114% growth). This rapid increase in expenditure has eroded the benefits of improved farm-gate outputs experienced since 2007.

**Scottish Farming Returns**

Farm incomes across most sectors have been under pressure in recent years, despite general price increases compared to a decade ago. Figure 4 shows that since 2009-10 average farm business incomes (FBI) per unpaid full-time equivalent (FTE) worker have decreased by about half. Some farm types, such as dairy, general cropping and cereal farms have tended to out-perform other sectors, but these farm types are more exposed to the vagaries of world market prices, exchange rates and weather conditions. Nearly all sectors experienced a difficult 2012-13 where wet and cold weather conditions played havoc with harvests and livestock production.

Since 2013, a reduced CAP budget, CAP reform and reduced prices have had negative impacts on farm incomes, and the next three years will continue to be a challenge for some farmers as the new BPS fully beds in. Nearly all sectors now have a FBI of under £20,000 per unpaid FTE to act as a personal income source and provide reinvestment into the business. Mixed-farm FBIs fell by over 70% during this period to only £7,000 per unpaid FTE, with LFA sheep farms having had a decrease of two-thirds to £9,000 per unpaid FTE. This downward income trend is a challenge for the industry, particularly in attracting the next generation of farmers to join the family business or to attract “new blood”. However, when considering these figures, the ability of farm businesses to absorb some of the farming family’s living costs should be acknowledged.
Whilst farm incomes on average have been relatively poor recently, there is a very wide range of performance in each sector, and average incomes can be dragged upwards by the top 20% who tend to be very well run and very successful. Figure 5 shows the extent of performance variance within each sector, through the upper and lower quartile FBIs (25% of farms are below the lower quartile and 25% above the upper quartile). This highlights that in nearly all sectors at least 25% of farm businesses are losing money per unpaid FTE of labour, whilst in every sector (other than mixed farms and LFA sheep farms) a quarter are estimated to be earning over £40,000 per FTE of unpaid labour. Across all sectors (with the exception of LFA Sheep farms) the difference between the upper and lower quartiles is at least £40,000 per FTE unpaid labour.

This wide disparity in economic performance suggests that there is considerable scope for efficiency and profitability improvements to be made, notwithstanding that businesses across Scotland are faced with differing biophysical conditions and can have very different asset bases to work with. Furthermore, it is acknowledged that farmer motivations are an important consideration that are often overlooked when discussing profitability and technical efficiency, particularly as many farmers may not be primarily motivated by profit - rather by maintaining their lifestyle, or acting as custodian of the farm until intergenerational succession occurs.

Figure 5: Average, upper and lower quartile Farm Business Incomes per unpaid FTE, 2015
Farm Business Viability

Andrew Barnes and Steven Thomson, Land Economy, Environment and Society, SRUC

As part of the Scottish Government’s Strategic Research Programme¹ SRUC researchers have developed a method to assess different forms of farm business viability using the Farm Account Survey. This provides insights into the financial sustainability of farm businesses over time, using indicators of short and long term business viability between different farm types and through time. Short term viable means that total income (including CAP support) covers cash needs of the business and long term viable means that income covers cash needs, depreciation and unpaid family labour. Businesses can therefore be classified as being either viable or non-viable in the short and long run, or a combination thereof:

- **Viable**: where the business can cover its on-going cash needs, can cover re-investment needs, and provide a minimal wage to unpaid labour.
- **Short-term viable but long-term non-viable**: the business can meet its on-going cash needs but does not generate enough cash to cover longer term reinvestment needs or pay unpaid family labour the minimum agricultural wage.
- **Non-viable**: the farm business cannot cover its immediate cash needs and does not generate enough cash to cover re-investment needs, and provide a minimal wage to unpaid labour.

### Long and short term viability of selected Scottish farm types, 2000-2014

Across all sectors there are a proportion of farms that are economically non-viable. The figure above shows the pattern of viability of a selection of farm types over the period 2000 to 2015. For example in the LFA cattle sector there is consistently around 10-15% of farm businesses that are non-viable (purple) and a further 10-15% of businesses that are viable in the short run but non-viable in the long run (yellow). Between 5% and 30% of LFA sheep farms are non-viable in the short and long term each year and in 2014 some 40% of LFA sheep farms had some difficulty in covering short term cash needs or providing an adequate return to re-invest and provide a minimum agricultural wage to unpaid labour.

¹ Scottish Government’s Strategic Research Programme.
Further analysis reveals that a high proportion of non-viable businesses remain non-viable year on year, suggesting that motivations other than profitability are important drivers for many businesses. It is important to recognise that many of these low viability farms may face bio-physical challenges and can be important for the delivery of ecosystem services (flood management, water quality, biodiversity, forestry, etc.), particularly in High Nature Value farming systems. The viability of such farms could be improved by any future payments for ecosystem services.

Scottish Farm Borrowing

Figure 6 shows that in recent years the amount of farm debt has reached record levels of over £3 billion \(^2\), with interest payments estimated to be £103 million in 2015, some 3.5% of gross agricultural output. The rise in debt coincided with the general upturn in farm gate prices from 2007, reflected in the improvement of Total Income From Farming (TIFF) – a measure of net returns to Scottish agriculture. This period of rising farm debt also coincided with 8 years of very low cost borrowing (Bank of England base rates have been at or lower than 0.5% since 2009). Whilst debt may be funding some investment, the annual change in total debt is considerably lower than the £190-£250 million invested by farmers annually. 2014 saw a considerable jump in total debt (by £425 million) and this may have been as a result of poor financial returns following the bad weather of 2012/13 coupled with a reduction in CAP payments received as a result of budget cuts and exchange rate effects.

Both short and long term debt have increased over this period, but it is noticeable that the proportion of long term debt has risen from 39% to 50%, with more long term loans / mortgages taken out (148% more in 2015 than 2003). It would be interesting to find out how much of the additional farm debt relates to renewable energy installations which can bring long term, relatively stable income. The level of short term bank advances (overdraft) has remained relatively stable. Other short term sources of debt (creditors – outstanding bills, etc.) rose dramatically over the period, from £360m to £820m, which may be of some concern.

Figure 6: Scottish agricultural debt, investment and total income from farming, 2003 to 2015

In 2014-15 the average Scottish farm had external liabilities of £131,000, of which bank loans and overdrafts accounted for £78,000. Bank borrowing ranged from £14,000 for Specialist Sheep LFA farms to £180,000 for Dairy farms. Whilst some farms may have heavy borrowings, on average Scottish farms tend to have low debt-to-asset ratios, with the average farm only having £9 of debt for every £100 of asset. Despite increasing debt, land price increases have meant that the net worth of the sector has been improving, meaning that borrowing (in improving commodity markets) was easier for farmers than other sectors of the economy that felt the full effects of the recession. In recent years banks have moved away from asset-based lending and now have much greater scrutiny over the ability to repay and service the debt meaning it has become a tougher borrowing environment for many farmers.
1.1.4 Farming Folk

Farmers, Crofters and their Spouses

Figure 7 shows how the number of full time occupiers of agricultural holdings has fallen by about a third in the last three decades (from about 14,500 to 9,500 in 2015), whilst occupiers working part-time on their holding for more than half of their time also fell by around a quarter (to about 3,900 in 2015). At the same time the number of spouses working full-time also fell by 27% (to 1,670 in 2015), with a 25% decrease in spouses working on the holding for more than half their time. There was a significant rise in the number of occupiers (by 36%) and spouses (by 30%) working less than half of their time on their holding, with an estimated 16,000 occupiers and 8,500 spouses in this category in 2015. Whilst the rise in occupiers working less than half their time was gradual, there was a sudden rise in spouses working less than half time in the late 1980s and early 1990s that coincided with the economic recession of that time – with some spouses perhaps having no option but to return to work on the farm.

Figure 7: Numbers of occupiers and spouses on Scottish agricultural holdings, 1982 - 2015

Queens University Belfast and The James Hutton Institute are currently examining the role of women in agriculture for the Scottish Government. The research\(^{25}\) aims to identify the challenges for, and potential policy tools to improve, women’s participation in farming and leadership of the agricultural sector in Scotland. SRUC also undertook a key campaigning role in a drive to improve the gender balance in the Scottish farming sector at the 2016 Royal Highland Show and have produced a Voices of Women in Agriculture video to highlight challenges faced by women and aspirations of women in Scottish agriculture\(^{26}\).

Age profile

Much is mentioned about an ageing farm population in Scotland, with the average age often quoted as nearing 60. Table 2 shows the age distribution of farmers registered for CAP support. This highlights that across Scotland, a third of farmers and crofters are over 65 years old with nearly 60% over 55 years of age. In contrast only 10% are under 40 years of age (they classify as “young farmers” according to EU age criteria\(^{27}\)). It is apparent that the specialist farm types (pigs, poultry, dairy and horticulture) have a higher proportion of under-55 year olds in charge compared to others – suggesting there is generally earlier inter-generational transfer of business control in what are often more intensive farming systems, compared to other sectors where “maintaining a way of life” is a principal motivation for many farmers. Many of these specialised sectors were also out with the CAP support mechanism.
There is very little difference in the age distribution by region, tenure, or if the farmer/crofter is full or part time (a slightly smaller proportion of full time businesses are run by under 40 year olds). However, a higher proportion of croft owners (15%) are under 40 years of age – perhaps reflecting lower capital barriers to entry, its part-time nature, and its social role in housing provision in some areas of the Highlands and Islands.

Table 2: Age grouping of Scottish farmers and crofters by farm types

<table>
<thead>
<tr>
<th>Farm Type</th>
<th>Under 40</th>
<th>40 to 54</th>
<th>55 to 64</th>
<th>65 and over</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>8%</td>
<td>30%</td>
<td>30%</td>
<td>32%</td>
<td>1,222</td>
</tr>
<tr>
<td>General Cropping</td>
<td>8%</td>
<td>30%</td>
<td>29%</td>
<td>32%</td>
<td>476</td>
</tr>
<tr>
<td>Horticulture &amp; permanent crops</td>
<td>5%</td>
<td>42%</td>
<td>23%</td>
<td>30%</td>
<td>102</td>
</tr>
<tr>
<td>Specialist pigs</td>
<td>20%</td>
<td>45%</td>
<td>20%</td>
<td>14%</td>
<td>49</td>
</tr>
<tr>
<td>Specialist poultry</td>
<td>15%</td>
<td>39%</td>
<td>24%</td>
<td>23%</td>
<td>75</td>
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<tr>
<td>Dairy</td>
<td>14%</td>
<td>47%</td>
<td>23%</td>
<td>16%</td>
<td>722</td>
</tr>
<tr>
<td>LFA Cattle &amp; sheep (LFA)</td>
<td>10%</td>
<td>31%</td>
<td>26%</td>
<td>32%</td>
<td>9,742</td>
</tr>
<tr>
<td>Lowland cattle &amp; sheep</td>
<td>9%</td>
<td>32%</td>
<td>28%</td>
<td>31%</td>
<td>1,150</td>
</tr>
<tr>
<td>Mixed</td>
<td>11%</td>
<td>31%</td>
<td>30%</td>
<td>28%</td>
<td>1,538</td>
</tr>
<tr>
<td>Forage</td>
<td>9%</td>
<td>26%</td>
<td>25%</td>
<td>40%</td>
<td>2,278</td>
</tr>
<tr>
<td>Other</td>
<td>10%</td>
<td>13%</td>
<td>33%</td>
<td>43%</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>10%</td>
<td>31%</td>
<td>27%</td>
<td>32%</td>
<td>17,384</td>
</tr>
</tbody>
</table>

Data Source: Scottish Government – June Agricultural Census, 2015

It should, however, be noted that there will often be more than one generation working on family farms, but it is often the head of the family business (and key decision maker) who competes the official “paper work”, whilst the younger generation may be responsible for the day-to-day operational tasks on the farm. This can, therefore, suggest that the active farming population is actually older than the reality, with the younger generation actively farming (often as minor business partners) but not represented in official statistics – it is likely the same in other industries that have large numbers of small and micro businesses, but unfortunately the data does not exist for these industries.

It is acknowledged that farming, unlike many other business sectors, is often considered “a way of life”, and since farmers are both living and remaining active longer it perhaps explains the low rates of exit from the sector. Thus, the increasing average age of farmers may simply reflect an increased age at which successors take on the farm business coupled with growth in the average age at which new entrants from outside agriculture can afford the significant capital investment required to start-up in farming.

Professor Matt Lobley, in the Farmers’ Guardian Guide to Succession Planning28, discusses the “succession effect” where expectation of succession can lead to a change of mind-set of those running the family farm in-as-much as they want to pass more onto their successor, and the “successor effect” where new blood takes control of the business, often leading to business growth and investment. Lobley does, however, caution over the “farmers boy syndrome” – those over 21 years old with no delegated decision making powers – a position it is estimated that a quarter of successors find themselves in. He, and other succession experts in the guide, discuss how broaching the subject of succession is often very difficult for many farming families – but with careful management it can ultimately provide stimulus for the business and provide retirement opportunities for the older generation that might otherwise not exist.
Renewable Energy in Rural Scotland

Jim Campbell, SAC Consulting

In recent years many farmers, rural businesses and community groups have developed renewable resources aided by incentives such as Renewable Obligation Certificates, Feed In Tariffs and the Renewable Heat Incentive. This has allowed them to not only offset energy costs but also reduce their carbon footprint, helping the marketability of their produce. Developing a diversified income stream unaffected by variations in oil, crop and livestock prices has provided a further benefit. However, with substantial cuts in tariff payments for new schemes - and the prospect of these disappearing altogether in the not too distant future - developers of new schemes are now required to maximise the value gained from home produced energy by using on site energy as efficiently as possible and finding local or niche markets where a premium over basic export rates is available.

Both the range and scale of renewable technologies deployed has become fairly diverse. Along with the very visible wind turbine and solar photovoltaic projects there are a great many rural buildings now heated by biomass boilers and heat pumps. Beyond the construction phase, small scale hydro developments can often be fairly invisible in the landscape and can be popular community developments where resources are available close to towns and villages. A good example of a micro-hydro project where extra value has been gained by cooperation with a local energy user is a small scheme at Kames, Kilmelford which has been developed by the owner of an area of woodland with no on-site energy demand. Instead of exporting power directly to the grid, the hydro scheme supplies an adjacent fish farming company with any surplus being exported via the fish farm’s existing grid connection. Both the developer and the fish farm benefit from the energy produced by splitting the difference between the export value available to the generator and the import cost offset by the fish farm. Further developments in energy storage, demand management and smart grids and the commercial mechanisms for local generators to take advantage of these opportunities will improve the viability of small integrated renewable energy schemes without reliance on large scale grid upgrades.

A considerable number of farm based anaerobic digester (AD) plants have now been commissioned using waste and crop based feedstocks to produce biogas. The larger of these supply upgraded gas direct to the gas network for distribution to homes and businesses whereas smaller plants use the gas to produce electricity with the heat produced used for space heating or for drying other products. Buccleuch Estates have constructed an AD plant at Bowhill, Selkirk. The plant is fed with a diet of farm yard manure from cattle and sheep accommodation and poultry manure from laying hens, supplemented when necessary with a small quantity of ensiled crop. The plant produces 200 kW of electricity around the clock. Digestate from the end of the process is separated into liquid and solid fractions providing a consistent, nutrient rich, odour free fertiliser which when applied to crop or grassland will greatly reduce reliance on bagged fertiliser. Heat from the CHP generator is used to dry grain, woodchip and a proportion of the solid fraction of the digestate which is mixed with straw to provide a hygienic bedding for livestock.

For more information contact jim.campbell@sac.co.uk

The Scottish Government has, since 2007, been very supportive of trying to encourage a new younger generation to take control of farm businesses. They introduced an attractive package of support for New Entrants and Young Farmers through the SRDP 2007-2013 that has continued in the SRDP 2014-2020 where young farmers and new entrants can receive start-up support of up to €70,000. In addition, one-to-one specialist consultancy advice and mentoring from experienced farmers is available to young and new entrants through the Farm Advisory Service. The Scottish Government also, in recognition of the difficulty in establishing a foothold in the industry, have established a number of Starter Farms. These starter farms are managed by Forest Enterprise Scotland and successful entrants are given a 10 year lease to enable them to build up a farming business.
Farm Workers

As farming has become increasingly mechanised over the decades the number of agricultural workers has fallen significantly, although agriculture remains an important employer in many rural communities across Scotland. Figure 8 shows how the number of full time workers (including business partners and family members) has fallen from 25,600 in 1982 to 11,529 in 2015 (a 55% decrease), with full time hired labour having fallen by more than 11,000 (62%) over the same period. Over the same period the number of part time workers only increased by 8% to around 4,000 and reliance on casual and seasonal workers having increased, with their number having increased to nearly 4,600 in 2015 (an increase of 29% since 1982).

Figure 8: Scottish agricultural labour force, 1982 -2015

Agricultural Tenure in Scotland

Figure 9 shows the long term trends in the proportion of owned land and land under all agricultural tenure arrangements (including crofts) in Scotland. In 1982 let land accounted for 40.5% of Scottish land, and in the decade to 1991 it fell gradually to 38.5% of land area. In the period following the Agricultural Holdings (Scotland) Act 1991 the rate of decline in let land increased, falling to 29.9% of total farmland by 2004. The enactment of the Agricultural Holdings (Scotland) Act 2003 and the introduction of the decoupled Single Farm Payment coincided at the end of 2004, and by 2015 the area of let land fell to just under 23% of Scottish farmland. These changes represent a 44% decrease in the area of let land from 1982, a 39% decrease since 1991 and a 17% decrease since 2004.

Figure 9: Proportion of farmland owned and under agriculture tenure arrangements, 1982 to 2015

Thus, a long term downward trend in the area under agriculture tenure continues despite efforts in 1991, 2003 and 2016 to reform agricultural tenure laws. Each reform had the admirable aim of trying to stimulate the rental market. Unfortunately the 1991 and 2003 reforms did not have the desired effect despite the introduction of new forms of agricultural leases in 2003 – Limited Duration Tenancies (LDTs) and Short Limited Duration Tenancies (SLDTs). The introduction of a pre-emptive right to buy land for tenants (and the presence of the threat of an absolute right to buy) under the Agricultural Holdings (Scotland) Act 2003 did nothing to instil confidence in landowners, and the continued talk of an absolute right to buy in the lead up to the Land Reform (Scotland) Act 2016 did nothing to allay the fears of traditional landowners. The drivers of change surrounding tenancy issues are numerous, and include the obvious factor that the stock of farmland on large traditional estates has been reduced as some sitting tenants purchase their farms as the opportunity arises (either through the free market or through a pre-emptive right). It certainly appears that the limited uptake of SLDTs and LDTs relates to factors such as: the control of the land; inheritance taxation considerations; the ability of landowners to access decoupled CAP support payments (particularly as there was no “active farmer” clause under the SFP); and leasing through contract farming arrangements or seasonal lets, all playing a part in the continuing downward trend for farmland leased in the long term.

In November 2013, 1,135 tenant farmers (1,227 in October 2016) had registered their interest in a pre-emptive right to buy their lands, covering more than 190,000ha. This represented 21.4% of the estimated total area under secure 1991 Act leases in 2013, and was spread across Scotland but with some higher concentrations in counties traditionally associated with estate ownership and tenant farming. The Church of Scotland and Crown Estate were the landowners with the largest number of tenants’ interests registered for their land.

Despite a decline in the use of secure farm leases there is a very active seasonal lets market. Between 2005 and 2013 there was a significant uplift in the declared area of land let on a seasonal / temporary basis. According to IACS data there were 510,805ha of seasonally let land in 2005 (just after the introduction of the Single Farm Payment) and by 2013 this had reached 721,907ha, a 41% increase and representing some 13.5% of the total non-croft farmland. Rough grazing accounted for the majority of this land, rising in importance from 62% of the total in 2005 to 75% in 2013. The key changes in the seasonally let land market were entirely CAP driven, relating to: (a) “slipper farmers” renting “naked acres” to activate SFP entitlements and (b) “naked acres” let to active farmers who were looking for additional eligible hectares to ensure they did not receive CAP penalties for having ineligible features (scree, gorse, roads, etc.) on their land that could have led to an over-declaration of their eligible area when compared to the number of SFP entitlements they claimed. This was particularly the case following 2009 when SGRPID tightened up on ineligible features as a result of an EU audit criticism. Data for 2014 reveal that in the period of uncertainty surrounding the 2014 CAP reforms (in particular the active farming clause), the area of formal seasonally rented land fell by about 30,000 hectares, with suggestions that those changes might have been due to land owners seeking to take control of land to benefit from the new CAP support mechanism.

It is likely that contract farming will continue to blossom in the near future as landlords seek to maximise returns from their land through CAP support payments, whilst minimising longer term risks relating to land reform. It also appears that those land owners that still lease land through secure 1991 Act tenancies continue to have concerns over land reform, particularly the uncertainty it brings to the sector – something that the Independent Adviser on Tenant Farming and the forthcoming Tenant Farming Commissioner can hopefully address thereby reinvigorating this important step onto the farming.

1.1.5 Scotland’s Cropping Sector

Crops and fallow accounted for about a tenth of Scottish farmland in 2015. Cereals dominate the cropping area, covering about three-quarters of Scotland’s cropped area - accounting for about 11% of total output from farming in 2015. Spring barley (the key ingredient for the Scotch whisky industry) alone accounted for 43% of the cropped area, with wheat the next largest cropped area at 18%. Winter barley (9%), oilseeds (6%), fallow (6%) and potatoes (4%) were the next largest uses of cropping land. It may be a surprise to some that fallow land accounted for 6% of the total crop and fallow area, but this is a direct response to the new CAP Greening measures, where fallow was a popular option to meet Ecological Focus Area requirements. In fact, the area of fallow nearly trebled from 11,400ha in 2014 to 33,100ha in 2015 – jumping from 2% to 6% of Scotland’s cropping and fallow area. The area of rye grown also grew sharply from around 400 hectares in 2014, to 3,700 hectares – likely as a result of Crop Diversification requirements.
There are very strong regional dynamics within the cropping sector, and there are many ways of looking at the data - as detailed in Table 3.

- Part (a) of the table reveals how important selected Local Authorities are regarding Scotland’s total area of crop land and also how important cropping is as a land use within those Local Authorities. For example, Aberdeenshire accounts for 27% of Scotland’s crop and fallow land, with 31% of Aberdeenshire covered in crops and fallow. Although East Lothian only accounts for 5% of Scotland’s crop area more than half of its farmland is dedicated to crops (similar to Fife where the respective figures are 9% and 55%).

- Part (b) reveals how important the selected local authorities are regarding the total area of specified Scottish crops. For example, Aberdeenshire accounts for 35% of Scotland’s barley, 13% of its wheat, 29% of its oilseed rape and 17% of its potato areas. The Borders is the most important area for wheat production (21%) and Angus is the most important area for potatoes (nearly a third of all Scottish potato hectares).

- Part (c) reveals how important certain crop types are within each Local Authority. For example: 69% of Moray’s crop area is dedicated to barley, 43% of East Lothian’s crop area is dedicated to wheat, with 10% of the Borders cropping hectares made up of oilseeds and 12% of Angus’ made up of potatoes.

Table 3: Regional distribution and importance of selected Scottish crop production, 2015

<table>
<thead>
<tr>
<th>Local Authority (LA)</th>
<th>(a) LA crop area as % of: Scotland’s crop area</th>
<th>(b) % of Scottish Area of: Barley Wheat Oil-seeds Potato</th>
<th>(c) % of LA’s cropping area under: Barley Wheat Oil-seeds Potato</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aberdeenshire</td>
<td>27%</td>
<td>35% 13% 29% 17%</td>
<td>67% 9% 6% 3%</td>
</tr>
<tr>
<td>Scottish Borders</td>
<td>12%</td>
<td>8% 21% 21% 7%</td>
<td>35% 32% 10% 3%</td>
</tr>
<tr>
<td>Angus</td>
<td>12%</td>
<td>10% 13% 15% 32%</td>
<td>45% 19% 8% 12%</td>
</tr>
<tr>
<td>Perth &amp; Kinross</td>
<td>10%</td>
<td>9% 10% 6% 18%</td>
<td>46% 18% 4% 8%</td>
</tr>
<tr>
<td>Fife</td>
<td>9%</td>
<td>7% 15% 7% 9%</td>
<td>39% 30% 5% 4%</td>
</tr>
<tr>
<td>Highland</td>
<td>7%</td>
<td>7% 3% 6% 6%</td>
<td>59% 9% 5% 4%</td>
</tr>
<tr>
<td>East Lothian</td>
<td>5%</td>
<td>3% 12% 7% 4%</td>
<td>32% 43% 8% 4%</td>
</tr>
<tr>
<td>Moray</td>
<td>4%</td>
<td>6% 1% 1% 4%</td>
<td>69% 5% 2% 4%</td>
</tr>
<tr>
<td>Dumfries &amp; Galloway</td>
<td>4%</td>
<td>4% 3% 1% 1%</td>
<td>53% 17% 1% 1%</td>
</tr>
</tbody>
</table>

Data source: Extracted from Scottish Government June Agricultural Census 2015

Figure 10 reiterates the location of Scotland’s barley, wheat and potato production, revealing the proportion of farmland in a parish under each crop. Barley is a very important crop in Moray and Grampian and Tayside, with more than a third of farmland under barley in many of these parishes. The better climatic conditions in the south east of the country mean that it is an important wheat growing area, with many parishes in Fife, East Lothian and Berwickshire having wheat accounting for at least a quarter of farmland. Tayside is vitally important for the potato sector, with the majority of production concentrated there.
Soft Fruit

One of Scottish farming’s recent success stories has been that of horticulture, in particular the growth of the soft fruit sector. Fruit and vegetable production is highly concentrated in the east coast of Scotland (particularly Fife, Perthshire and Angus) in the hands of relatively few specialist producers. The sector now accounts for a tenth of Scottish agricultural output.

Being historically unsupported under the CAP, the sector has had to be innovative and entrepreneurial to thrive. The innovations that have improved technical efficiencies in the sector include: the move from field-based strawberry crops to table topped systems housed in polytunnels; the development of accurate irrigation systems that facilitate better growing and harvesting conditions, and; the development of new varieties and the establishment of new commercial fruits (e.g. blueberries). Whilst the sector has self-financed research and development programmes it also works closely with the James Hutton Institute (JHI) in plant breeding programmes. Indeed, just recently the sector received a welcome boost through a £1.3 million Agri-Tech Catalyst award to the JHI41 to help further improve production - particularly an extension of the growing season through identification of raspberry traits that make them more resilient to pests and diseases and blueberry traits that allow them to be better adapted to growing in Scotland’s cooler climate.

The soft fruit sector is a growth sector and Figure 11 shows how production is estimated to have grown by 170% between 2003 and 2015, to over 44,000 tonnes. Most of this growth is down to the rapid expansion of strawberry production (220% growth over the period) to nearly 32,000 tonnes with 190% growth in the output from other fruits – blueberries, blackcurrants, etc. Despite the price of raspberries improving by over £1,600 a tonne, production has remained relatively stable, with a slight decline since its peak in 2008. The Scottish Government estimates that the Scottish soft fruit sector’s output was over £125 million in 2015 and it is worth noting that it is also estimated that exports of UK berries trebled from £1.8 million in 2012 to £5.3 million in 201442.
Undoubtedly the Scottish fruit sector is full of innovators, seizing market opportunities and using technologies to extend production seasons, etc. Examples of this include:

- A recent Scotsman article\textsuperscript{43} highlighted how PJ Stirling (one of Scotland’s largest fruit growers) managed to bring their season forward by three months through the use of a biomass heat sources in a glasshouse system, enabling growth during the winter season. This system has the potential to extend Scottish berry production to a year round crop, with Peter Stirling quoted as estimating an additional 150 tonnes could be harvested on their farm alone.

- Recently, an article in the Courier\textsuperscript{44} explains how the Arbuckle family has introduced a new berry variety to Scotland – the Honeyberry. It is the fruit of the edible honeysuckle plant that is considered a natural health remedy in Japan, where they are highly sought after. Stewart Arbuckle was quoted explaining: “The berry market is growing year on year and there’s a demand for new fruit. I went onto Google three years ago, looking for alternatives to what we already grow and discovered honeyberries. They’re better than acai or goji berries because they taste nice on their own and the Japanese can’t grow enough of them to satisfy their home market. In the last decade Canada has got in on the act and they call them haskap berries while the Americans call them honeyberries. There is huge demand and not enough supply, so we teamed up with a grower in Nova Scotia and planted our first orchard of honeyberries two years ago. That has now grown to 12 acres and we’re bringing in and trialling new varieties.” It is expected that around 10 other growers will be extending their fruit varieties by planting honeyberries, highlighting that active cooperation in the sector is commonplace - to achieve critical mass in this instance. Opportunities to add value are never far from minds in the soft fruit sector with the world’s first honeyberry gin launched in a partnership between the Arbuckle family and Strathearn Distilleries.\textsuperscript{45}

These types of innovations are all market driven, aimed at helping satiate the growing demand for home grown berries.\textsuperscript{46} Indeed, British Summer Fruits,\textsuperscript{47} the industry body that represents 98% of berries sold in UK supermarkets (where strawberry sales account for over £500 million alone), suggest that there are four key drivers of growth in the soft fruit market: (i) increased consumer demand due to berries’ health benefits; (ii) more areas of berries grown; (iii) development of new varieties, and; (iv) innovative growing methods that have extended the British season.
Diversification at Castleton Farm

Paul Mayfield SAC Consulting

Castleton Farm is a 250 hectare arable and fruit farm owned and run by the Mitchell family, situated in the Howe of Mearns in Aberdeenshire. The Mitchells moved to Castleton in 1992 and farmed it as a mixed dairy and arable farm but decided in 1999 to stop dairy farming and to expand the existing 6 hectares of strawberries. The first poly tunnels were erected in 2000, helping to eliminate many of the weather related risks involved with growing strawberries outdoors in Scotland. Since then raspberries, blueberries and cherries have also been introduced, expanding the area of fruit to around 100 hectares and making it of Scotland’s biggest commercial fruit growers.

Castleton claims to be the most Northerly commercial blueberry farm in the world, enabling them to produce fresh blueberries after the rest of the northern hemisphere has finished production, filling the gap before the southern hemisphere starts production. The farm has its own pack house that is British Retail Consortium accredited, enabling it to supply many of the large retailers, with the majority of the fruit going to Marks and Spencer and Tesco. It employs over 600 seasonal workers each year, with 350 living and working on the farm at the peak of the season.

The farm has a reputation for innovation and its commitment to environmental sustainability and as well as LEAF Marque accreditation it has made significant investment in renewable energy including:

• 50kW roof-mounted solar PV array on the packhouse;
• a 60kW biomass boiler at the farm shop and café;
• 4 x 1MW woodchip fuelled biomass boilers to heat the caravans for the seasonal; workforce and heat 2 hectares of tunnels housing strawberries and raspberries, helping to significantly extend the growing season;
• 2 x 50kW combined heat and power biomass boilers which produces 80% of the electricity used by the farm as well as all of the heat requirements.

In 2004 a shop was opened seasonally from June until October selling their own fruit and local meats, cheeses, vegetables and much more. As popularity grew a custom built Farm Shop and Café was opened in 2008, located within sight of the main A90 Aberdeen road. This diversification became so popular that an extension was added in 2013, increasing the floor space in the shop, seating numbers in the café and providing a second kitchen for the production of the Castleton Homemade Range - a range of quality take home ready meals, pies and home baking. It also creates the Berrylicious range of jams and chutneys that adds value to the second class fruit from the farm – that had previously been regarded as waste.

In 2015, the business undertook a review of its added value berry product range and identified potential new fruit-based products that would increase the product range without drastically altering the characteristics of the Castleton brand and without the use of artificial preservatives. Using funding from a Scottish Funding Council Innovation Voucher, the business worked with SRUC hospitality / product development staff and facilities at the SRUC Elmwood Campus in Cupar to develop a range of fruit based coulis, syrup and vinegar products. These were introduced to the Castleton product range in the latter half of 2015, helping to attract new customers, grow sales and increase the utilisation of the lower grade fruit from the farm.

Castleton Farm is a leading example of a farm that has used diversification as a means of expanding its business in order to make it economically sustainable, while still retaining its core focus on producing a high quality product - in this case fruit.

1 http://castletonfarmshop.co.uk/
The horticulture sector is, however, highly reliant on seasonal and migrant labour, and Brexit could, depending on the final outcome, pose some challenges for Scotland’s soft fruit and field vegetable producers. Table 4 (a) shows that an estimated 127,000 work days are undertaken by non-family casual labour in Scottish agriculture, with 45% of this being undertaken in the horticulture sector and 44% being undertaken in Aberdeenshire (of which 88% is in horticulture) alone. More importantly, especially with regards to Brexit and the positioning over migrants, is the fact that nearly 460,000 migrant (non-UK) work days (this is about 2,090 FTEs) were undertaken on Scottish farms in 2015, with 85% of that being in Scotland’s horticultural sector, particularly the successful soft fruit industry. Three quarters of Scotland’s migrant farm work is undertaken in Angus and Perth and Kinross, with the vast majority of use being in their horticulture sector. Any Brexit consequences that restrict EU migrant labour could have significant impacts for the soft-fruit and field vegetable sector that Scotland must fight to avoid.

Table 4: Estimated (a) Casual labour and (b) Migrant labour in key Local Authorities and proportion attributed to horticulture, 2015

(a) Non-family labour employed on non-regular basis

<table>
<thead>
<tr>
<th>Local Authority</th>
<th>Holdings</th>
<th>Work Days</th>
<th>Average days per Holding</th>
<th>% of Scottish Total</th>
<th>% LA total in Horticulture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perth &amp; Kinross</td>
<td>85</td>
<td>13,147</td>
<td>155</td>
<td>10%</td>
<td>56%</td>
</tr>
<tr>
<td>Angus</td>
<td>54</td>
<td>4,414</td>
<td>82</td>
<td>3%</td>
<td>0%</td>
</tr>
<tr>
<td>East Lothian</td>
<td>30</td>
<td>798</td>
<td>27</td>
<td>1%</td>
<td>10%</td>
</tr>
<tr>
<td>Fife</td>
<td>44</td>
<td>2,872</td>
<td>65</td>
<td>2%</td>
<td>31%</td>
</tr>
<tr>
<td>Aberdeenshshire</td>
<td>193</td>
<td>56,341</td>
<td>292</td>
<td>44%</td>
<td>88%</td>
</tr>
<tr>
<td>Scotland</td>
<td>1,502</td>
<td>127,307</td>
<td>85</td>
<td>45%</td>
<td></td>
</tr>
</tbody>
</table>

(b) Migrant workers (i.e non-UK nationals)

<table>
<thead>
<tr>
<th>Local Authority</th>
<th>Holdings</th>
<th>Work Days</th>
<th>Average days per Holding</th>
<th>% of Scottish Total</th>
<th>% LA total in Horticulture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perth &amp; Kinross</td>
<td>25</td>
<td>190,992</td>
<td>7,640</td>
<td>42%</td>
<td>91%</td>
</tr>
<tr>
<td>Angus</td>
<td>33</td>
<td>152,758</td>
<td>4,629</td>
<td>33%</td>
<td>91%</td>
</tr>
<tr>
<td>East Lothian</td>
<td>7</td>
<td>60,757</td>
<td>8,680</td>
<td>13%</td>
<td>99%</td>
</tr>
<tr>
<td>Fife</td>
<td>20</td>
<td>19,952</td>
<td>998</td>
<td>4%</td>
<td>54%</td>
</tr>
<tr>
<td>Aberdeenshshire</td>
<td>43</td>
<td>14,969</td>
<td>348</td>
<td>3%</td>
<td>12%</td>
</tr>
<tr>
<td>Scotland</td>
<td>217</td>
<td>459,801</td>
<td>2,119</td>
<td>85%</td>
<td></td>
</tr>
</tbody>
</table>

Data Source: Scottish Government’s June Agricultural Census – 2015.

Potatoes

Potatoes play a significant role in the agricultural economy of Scotland, and have a wider cultural role given the historical importance in the Scottish diet. The Scottish potato sector produces seed potatoes for a number of export markets, given its favourable climatic conditions, and also ware potatoes for human consumption. According to AHDB\(^4\), in 2015, 21% of Great Britain’s planted potato area was in Scotland, with 45% of that area planted for seed. However, the area planted fell by 19% between 2011 and 2015. The trend in potato production and price is shown in Figure 12 and it does highlight this decline in production since 2009, with
a noticeable dip in 2012 due to the second wettest year on record. Ware potato production fell by 30% between 2009 and 2015 with seed potato production fairing better, only falling by 20%. Perhaps some of this decreased production is a reaction to declining UK consumption of fresh potatoes, which fell by 27% in the decade to 2013.

Figure 12: Scottish potato production and prices, 2003 to 2015

Scotland has an international reputation as a major producer of quality seed potatoes. Seed potatoes produced in Scotland must be certified by The Scottish Agricultural Science Agency under the Seed Potato Classification Scheme (SPCS). In 1984 over 20,000 hectares were dedicated to seed production, however this has declined by nearly 40% to around 12,000 hectares. In Scotland, seed potatoes can only be grown on land that has not had potatoes cultivated on it in the preceding five years and is free from potato cyst nematodes. Scotland exports seed and ware potatoes to more than 40 different countries. In 2015-16 Scotland exported seed potatoes to 24 countries that included Egypt (64% of exports), followed by Morocco (11%) the Canary Islands (6%) and Saudi Arabia (6%).

Production of potatoes can involve significant expenditures with respect to purchasing and subsequent royalty payments on the seeds. Inputs are generally high and intensive, such as fertilisers and pesticide treatment. In addition, specialist equipment is needed to maximise efficient planting and harvesting, leading to high capital costs. A further expense is the cost of storage, as well as costs for grading and upkeep of stores. Whilst planting decisions are affected by prices, farmer confidence and contractual arrangements, potato yields have been increasing due to improved agronomy, crop protection, varieties, irrigation, fertiliser regimes, etc. However, the biggest driver of potato supply in the short term is the weather. A range of factors may, therefore, affect future sustainability of the industry within Scotland. Broadly these are weather related, as the climate warms and increases the threat of exotic pests and diseases, but also structural, in terms of the willingness of farmers to grow potatoes. Additionally the importance of the export market for seed potatoes cannot be under-estimated during this time of Brexit.

Scotland's Cereal Sector

When the UK entered the CAP the relative support prices for barley were more attractive than under UK support mechanisms meaning a number of farmers (including those in marginal areas) sowed spring barley. However, by the 1980s the introduction of the “headage” payments for suckler cows and sheep made them more attractive options again. This, coupled with the realisation that growing and harvesting the crop successfully in some areas was extremely challenging, meant that the area of spring barley declined (as shown in Figure 13). This was also affected by increased wheat plantings, which have been relatively stable since 1990.

The impacts of this sudden world price rise for cereals in 2007, amidst global shortages, are apparent with rapid increases in the area of Spring Barley planted in 2008 and 2009, and the subsequent 2009 price crash.
affecting the 2010 plantings. More recently the downturn in the area planted relates to CAP Greening, with a need to diversify single crop spring barley rotations under Crop Diversification rules and the need to put land into Ecological Focus Areas. SAC Consultants estimate that the 13% decrease in spring barley area between 2014 and 2016, coupled with smaller yields in 2016 due to the weather, means that Scottish spring barley production was some 400,000 tonnes lower than in 2014.

**Figure 13: Trends in Scottish cereal production, 1982 to 2016**

Whilst the introduction of Greening rules has cut Scottish sowings of spring barley it has boosted the area grown in England where farmers have had to diversify out of continuous wheat, as well as add spring crops in to combat black grass. As a consequence more distilling barley is being grown in England and distilling demand overtook brewing demand in 2015 in the UK.

Figure 14 shows the price of Scottish wheat, malting barley and feed barley over the last 17 years. It highlights the prolonged period of suppressed prices farmers faced in the period up to 2005 as world supplies satiated demand. In 2006 and 2007 there were considerable global plantings of crops for bio-fuels – they appeared more attractive financially than conventional cereals and were encouraged by rising oil prices – and instances of drought in some major cereal production areas meant that prices more than doubled between 2005 and 2007. Since then Scottish cereal farmers have experienced good prices, with the exception of 2009 until 2012 after which they fell back significantly (by £96 per tonne for malting barley between 2012 and 2015). The situation could have been even worse more recently if UK grain prices had not benefitted from the recent devaluation of Sterling. Without it UK wheat prices would have been £20 per tonne lower in summer 2016. This situation arises as world grain prices are denominated in US dollars and Sterling has lost over 20% against the Dollar in the last 2 years. Brexit uncertainty is likely to continue to weaken Sterling and thereby indirectly support UK grain prices for the next few years.

**Figure 14: Price trends of selected Scottish cereals, 1999 to 2016**
Ballindalloch Estate Diversification

Paul Mayfield SAC Consulting

Ballindalloch Castle and Estate, situated in the Spey valley, has been the home of the Macpherson-Grant family since 1546. With a long history and strong heritage the family have developed a number of commercial enterprises to provide business diversity to enable the estate to become economically sustainable. These enterprises include:

- Farming, both rented and in-hand. The estate farm is a mixture of cropping and livestock production and is home to the oldest surviving bloodlines of Aberdeen Angus in the world, established by Sir George Macpherson-Grant in 1860;
- Commercial forestry across the estate;
- Rural activities;
- Fishing on both the River Spey and River Avon;
- Tourism to Ballindalloch Castle and Gardens;
- Hospitality through holiday lets and corporate entertainment;
- Leisure on the championship standard golf course;
- Renewable energy from the recent erection of wind turbines.

This range of enterprises means that Ballindalloch Estate is an important contributor to the local economy in terms of both employment and the income generated. As a further development the family wished to create a micro distillery to increase their business portfolio and take advantage of the growth in the Scotch whisky market. The area is renowned for whisky production with a number of existing distilleries surrounding the estate, including Cragganmore, which the family had a significant interest in until recently.

In 2013, the estate approached SAC Food and Drink to initially undertake a feasibility study into the development of the micro distillery. SRUC subsequently helped to develop a business plan and complete a successful Food, Processing, Marketing and Co-operation 1 (FPMC) grant application that was approved in June 2013, with an award of over £1.2 million.

Planning permission was granted for the refurbishment of redundant farm buildings at Lagmore Steading, situated beside the Ballindalloch golf course, to create the distillery and a second nearby steading, also unused, into a secure store where the whisky is stored in casks to mature.

This is a micro-distillery with an entirely closed loop production system: malting barley from the estate farms (malted at Bairds Malt, Inverness); water from a spring on Craggan Hill that is adjacent to the distillery. The waste draff is fed to the cattle and pot ale and lees are spread back onto the estate fields, returning any residue nutrients back to the land. The term ‘single estate’ whisky was coined by the team while developing the business plan and grant application and is an excellent example of a diversified business with a ‘Circular Economy’, a concept that is attracting increasing attention as businesses seek to become environmentally and economically sustainable.

The distillery started production in the late summer of 2014 and was officially opened on the 16th April 2015 by the Duke and Duchess of Rothesay. The whisky will be targeted at the global, ultra-premium market so it is likely to be 2026 before we see Ballindalloch Whisky released onto the market in any significant quantity. In the meantime however, increasingly popular bespoke tours of the distillery including The Art of Whisky Making that provides a ‘hands-on’ day helping to make whisky in the distillery. These tours are an example of how the estate seeks to provide new activities and enterprises that will generate jobs and income to ensure the future sustainability of the business and local community.

1 https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/food-processing--marketing-and-co-operation/
There is a premium for malting barley in Scotland (it has ranged from £10 to £54 per tonne since 2009) that reflects both international and local supply and demand factors. The majority of malting barley in Scotland is grown on contract as distillers, and hence the maltsters, want to try and ensure supply – the attractiveness (premium) of these contracts reflects the overall buoyancy of the whisky sector. Very good premiums in 2012 and 2013 reflected strong growth in whisky production and demand for malting barley. Weaker premiums more recently reflect the weaker demand for whisky and good harvests in Scotland and Europe. In 2016, while whisky demand for barley remains subdued, a poor harvest in Scotland and quality problems in Europe (wet weather) have boosted premiums. Malting capacity in Scotland is around 750,000 tonnes, however, traditionally the Simpsons malting plant in Berwick has been viewed as part of the Scottish processing sector. This means nominal Scottish capacity is higher than statistical reports suggest.

With whisky production expected to start increasing again this will create opportunities for Scottish farmers to increase spring barley area. However competition remains strong and English farmers have now begun to grow distilling barley which means efforts to improve yields and competitiveness in Scotland need to be stepped up.

The whisky sector is the single biggest user of Scottish grain – an estimated grain use of 1.6 million tonnes in 2016 (malting barley, wheat and imported maize), equivalent to 58% of 2016 grain output (2.7 million tonnes). Figure 15 shows how there has been a rapid increase in the amount of grain used by Scotch whisky distillers from 2004 (52% increase) as the industry expands output. In fact, distilling capacity has grown by a quarter since 2010, in response to a positive global outlook for whisky, although both whisky production and exports have declined since. As production and exports have fallen, it reduced demand for malting barley by about 169,000 tonnes since 2013. Demand for wheat in distilling has also been lost due to the switching of the Invergordon distillery from wheat to imported maize.

Figure 15: Scotch whisky grain use, 1980 to 2016

Whisky production operates on a cycle typically 7 years between one peak and another and the current downturn puts the industry about half way through this cycle, suggesting an upturn in the next year or two. The overall trend is upwards and it is important that Scottish cereal producers are ready and able to meet increased demand when it comes. Longer term it is essential to reverse the loss of competitiveness that Scottish wheat has seen against imported maize, otherwise further demand will be lost. Improving crop and spirit yields, trimming costs and making the most of the Genetically Modified-free and fully traceable nature of Scottish wheat will be necessary to keep it competitive.
Since 2015 reduced demand for wheat for distilling, coupled with good wheat yields, have moved Scotland from being a net importer of wheat to a small exporter. As a consequence the price premium of Scottish wheat over the UK average has declined from a typical £5 to £10 per tonne level to zero. This makes wheat less attractive versus other crops such as barley, although where good yields can be obtained, wheat remains the best-paying cereal crop in Scotland.

Rising cereal yields have been a feature of global agriculture for many decades and have played a large part in falling relative food prices. They have also been essential to maintain farm viability in the face of falling real prices for cereals. However, in the last 10 years cereal yields in Scotland have stagnated or declined. Part of this reflects poor growing conditions in several years, and that fact that Scottish cereal yields are high by global standards - making further marginal gains harder. However, in terms of competitiveness Scotland’s cereal farmers are losing ground to their global competitors as indicated in Figure 16.

Figure 16: Global and Scottish barley and wheat yield changes, 2007 to 2016.

SAC Senior Rural Business Consultant, Julian Bell assesses some of the challenges and opportunities for the cereal sector in Scotland. His analysis of Farm Accounts Survey data reveals a wide variation in physical and financial performance across Scottish cereal farms. For the 2014 crop year the top 25% of farms based on profitability achieved:

- Higher yields of 1.14 tonnes per hectare (13% higher) for winter wheat and 0.82 tonnes per hectare (14% higher) for spring barley.
- Relatively similar variable costs.
- Lower fixed costs at £135 per hectare (15% lower).
- Lower overall costs per tonne produced at £39 lower per tonne for wheat and £50 lower per tonne for spring barley.
- Profitable cereal production before CAP payments where average producers made a loss before CAP.
- Higher prices for grain through more long term contracts / better marketing and quality.

This shows that there are many innovative farmers who manage their business precisely, aiming to maximise returns. Nevertheless, there remains a reliance on CAP support across much of the sector. This does, however, mean that there is potential for the sector to move towards profitability without subsidy through innovation and adoption of best practice that can drive improved technical performance and lower fixed costs. Restructuring is a key process needed to facilitate this move.
Yields: Progress in cereal varieties and agronomy are being made with Scottish trial results matching the gains in global cereal yield. So in terms of technical improvement there is no reason why improvements in average Scottish cereal yields could not be keeping up with the global trend. Rather there appear to be other factors preventing a similar improvement in average farm yields in Scotland. Possible reasons include: lack of structural change in the sector (as better producers achieve considerably higher yields); excessive soil compaction due to the trend towards larger farm sizes; larger machinery and wetter weather; and also the reduction in attention to detail as farms expand. Possible solutions include: (i) enabling restructuring so better operators can take on more land; (ii) and improved use of precision and smart farming that enable more tailored / automation of agronomy across larger areas where management time is limiting. This also enables controlled traffic farming using GPS to reduce soil compaction.

AD crops: Anaerobic Digestion (AD) offers the potential for new sources of income for arable farmers and a diversification of crop types. Economic viability is almost entirely dependent on subsidies under the Feed in Tariff and Renewable Heat Incentive Schemes. However, in recent years rates have been cut drastically by the UK government and are expected to fall further from January 2017 under current consultation plans. AD is also likely to be increasingly restricted to wastes rather than crops, with a maximum of 50% inclusion of energy crops proposed in the feedstock mix of new plants. This limits the future expansion of the sector. However plants already built and under construction (supported by previous rounds of higher subsidy payments) already represent a significant local market for arable farmers to supply feedstock to. The viability of energy crops versus conventional arable crops is a key driver of uptake by farmers. Recently good AD tariffs have supported feedstock prices whilst grain prices have been weak which has made AD crops competitive. In 2016 the balance is shifting back towards cereal crops due to the rise in grain prices following Brexit.

Trade: In a ‘normal’ season the UK is a net exporter of cereals, however periodically poor harvests (e.g. 2012 and 2013) can plunge the UK into deficit. Trade in the last 10 years has remained predominantly within the EU, accounting for 70% of imports and 79% of exports. Exclusion from the EU single market in agricultural products could be very disruptive to both UK cereal producers and consumers (livestock) depending on the terms agreed, and in seasons of large surpluses the UK could face severe disruption to wheat and barley exports if we were subjected to the current EU tariff regime. Price fluctuations would likely be higher outside of the EU raising the importance of price insurance and risk.

Precision farming: Key innovative practices may emerge around the uptake of Precision Agricultural Technologies (PAT) to improve productivity and manage costs. Specifically PATs can lead to: reduced soil compaction; reduced fuel use; improved soil nutrient status for pH, phosphate and potash; reduced pesticide/ herbicide applications through improved targeting of pests, disease and weeds; and improved crop quality and consistency through targeted fertiliser use, etc. An on-going survey of farmers is being conducted by SRUC to examine farming intentions towards uptake of these technologies in the cropping sector and finds high levels of adoption of machine guidance and variable rate technologies but also strong intentions to invest in other PATs such as variable rate seeding/planting and variable rate pesticide application. Investigating the relationship between productivity and on-farm efficiency with these technologies is also being explored to evaluate the incentives and barriers to greater uptake within the sector.

1.1.6 Scotland’s Sheep Sector

In 2015 there were around 6.8 million sheep (including lambs) in Scotland with around 2.6 million breeding ewes and 698,000 hoggs for replacement. Scotland represents over 20% of the UK’s total sheep flock. However, Scottish flock numbers have fallen year on year from a peak of around 10 million in the 1990s meaning the national flock has shrunk by a third in under 20 years.

Figure 17 shows how Scotland’s breeding flock was hit by the devastating effects of the 2001 Foot and Mouth Disease outbreak where the number of sheep in Scotland fell by more than 11% in a single year. In addition, the longer term consequences of the decoupling of CAP support for sheep — firstly through the LFA support payments in 2002 then in 2005 with the introduction of the Single Farm Payment — are evident. The decoupling of support - that is a move away from paying on a per ewe (“headage”) basis to a per hectare of land basis - led to a 17.6% reduction in the 2005 to 2015 period, before a slight upturn in 2016.
Figure 17 also reveals that over the last three decades the number of lambs per ewe is estimated to have risen from 1.1 to 1.27 revealing some productivity gains – although recent gains are down to fewer ewes being grazed on hills. These productivity gains are likely to have been driven in the 1980s by the desire to increase the breeding flock to maximise “headage” payments, coupled with export markets for small (live) lambs. The flattening of ewe productivity in the 1990s was a result of a complex mix of factors including the introduction of “headage” quota, poor profitability and a worsening Euro – Sterling exchange rate in the late 1990s. Since decoupling of CAP support payments in 2005, there was a relatively sharp increase in lambs per ewe as farmers adjusted their management regime, with more cross breeding and less reliance on high hill grazing. The large dip in 2013 was a direct result of the weather with the 2012-13 season being particularly wet, leading to testing breeding and rearing conditions, including feed scarcity and quality issues that resulted in lower births and lamb survival rates.

**Figure 17: Change in Scottish breeding ewes and estimated lambing percentage, 1982 to 2015**

Whilst at a national level the decline in sheep numbers is perhaps alarming, there have been significant regional differences in change to sheep farming as highlighted in SRUC’s *Retreat from the Hills* and *Response from the Hills* reports. Figure 18a highlights how the change in the number of sheep has by no means been uniform across the country. Parishes in the north west of Scotland (extensive rough grazing areas) have largely has declines of more than a third, with some areas seeing sheep numbers more than halved between 1997 and 2015. Overall, Scotland lost some 2.86 million sheep and 4,017 holdings carrying sheep over that period.

There were 11 agricultural parishes that had their June sheep count (including lambs) decline by more than 20,000 between 1997 and 2015. In contrast there are nearly 60 agricultural parishes where sheep numbers increased by more than 1,000 over the period, highlighting how different regional trends can be.

Figure 18b also reveals how it is not just a reduction in sheep numbers resulting from downsizing of flocks, but there has been quite large scale abandonment of sheep production on holdings, particularly in the north west of the country. Indeed, in the Western Isles there are two agricultural parishes with more than 40% reduction in holdings carrying sheep, a combined reduction of nearly 500 holdings. It should be noted that since 1997 many areas of north east Scotland have seen sheep numbers increase and there has been greater stability in the Borders. Despite the devastating effects of the 2001 Foot and Mouth Disease crisis in Southern Scotland the overall long term decline in sheep has not been as pronounced as in the west Highlands and Islands.
However, what needs to be acknowledged in any examination of the data is that it provides a snapshot of the industry each year in June and fails to reveal just how dynamic the sheep industry is, with large seasonal movements of replacement stock and store lambs (particularly from August till November)\(^{53}\).

**Figure 18: Change in the sheep and number of agricultural holdings with sheep, June 1997 – June 2015\(^{54}\)**

Across Scotland the sheep industry is concentrated in the hands of relatively few, large, holdings with a significant proportion of holdings only having a very small number of breeding ewes. Table 5 highlights that 60% of the 12,660 holdings with breeding ewes carry less than 10% of the breeding ewes in flocks of less than 100. In direct contrast, a quarter of holdings with ewes (about 3,275) account for 80% of Scotland’s 2.6 million breeding ewes in flocks of over 250. Nearly a third of Scotland’s breeding flock are on just 505 holdings with nearly 60% on 1,600 holdings. This means that despite the industry being widespread across many small-scale sheep producers, the real focus on making improvements in the sheep sector should likely be focused on the large scale producers.

**Table 5: Distribution of Scotland’s breeding ewes by flock size- 2015**

<table>
<thead>
<tr>
<th>Flock Size</th>
<th>Holdings with Ewes</th>
<th>Ewe Numbers</th>
<th>Average Ewe Flock</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 10</td>
<td>1,737</td>
<td>8,787</td>
<td>5</td>
</tr>
<tr>
<td>10-50</td>
<td>4,077</td>
<td>100,388</td>
<td>25</td>
</tr>
<tr>
<td>50-100</td>
<td>1,680</td>
<td>118,655</td>
<td>71</td>
</tr>
<tr>
<td>100-250</td>
<td>2,093</td>
<td>337,260</td>
<td>161</td>
</tr>
<tr>
<td>250-500</td>
<td>1,482</td>
<td>529,141</td>
<td>357</td>
</tr>
<tr>
<td>500-1,000</td>
<td>1,087</td>
<td>754,503</td>
<td>694</td>
</tr>
<tr>
<td>Over 1,000</td>
<td>505</td>
<td>739,440</td>
<td>1,464</td>
</tr>
<tr>
<td>Scotland</td>
<td>12,661</td>
<td>2,588,174</td>
<td>204</td>
</tr>
</tbody>
</table>
The sheep sector is characterised by disadvantage related to biophysical constraints much of the land used for grazing sheep and remoteness that leads to high transportation costs. The large use of rough grazing in the sheep sector often means that there are limited farming alternatives available to producers, other than to extensively graze sheep. Better grazing quality enables more intensive sheep farming systems in areas such as the Borders and Dumfries and Galloway with large breeding flocks reaping the rewards of high productivity per ewe. Aberdeenshire farming systems are generally more focused on beef and cereals meaning it has a smaller number of ewes in the region, although they do have high productivity rates due to the availability of good grazing.

The Highlands and Islands had 55% of the holdings with breeding ewes in 2015, but they only carried 23% of the national flock - reflecting the large amount of small croft holdings in the region. Eastern Scotland carried over a third of the national breeding flock on 17% of Scottish holdings carrying breeding ewes. Figure 19a reveals how the relative scale of sheep production differs across, and within, the different regions of Scotland. The largest breeding flocks were found in the central Highlands and the Southern Uplands where average flock sizes tended to be over 500 ewes (June 2015). This contrasts sharply with the crofting regions where average flock sizes are generally under 200 breeding ewes, with many areas (including the Western Isles) under 100 ewes.

The relative intensity of sheep production in Scotland is provided in Figure 19b and largely reflects differences in biophysical constraints. Breeding ewe density is greatest in the Borders, where on-average holdings have more than one ewe per hectare, reflecting better quality grazing and more intensive sheep farming systems. This is in direct contrast to much of the Highlands and Islands where average stocking densities of less than 0.2 ewes per hectare prevail over large areas of farmland. Whilst the data does not allow within farm stocking densities to be examined, there is considerable anecdotal evidence that farming systems in the North and West of Scotland have significantly changed since 1997 - with greater use of better quality in-bye rough grazing and grassland and much reduced use of high hill rough grazing areas, not least because of a reduction in shepherds in these areas.

**Figure 19: Average breeding flock size and density per Scottish agricultural parish, 2015**
Related to the biophysical constraints faced, as well as the scale and type of management systems used, is productivity per ewe. Figure 20 shows the significant differences in ewe productivity between the West Coast Highlands and Islands and the rest of east and Southern Scotland. Areas in the Borders, Central Scotland, Orkney, Aberdeenshire and Dumfries and Galloway have notably higher average productivity rates with more than 1.5 lambs per breeding ewe generally achieved (some farms will have much greater rates – closer to two – but the figures reflect the parish averages). The least productive areas are the extensive hill farming and crofting systems of the Western Isles, Lochaber and Skye where average ewe productivity is less than one lamb per breeding ewe.

Figure 21 shows the wide range of seasonal prices that Scottish lamb producers have been faced with over the last decade – with differences of up to £1.70 a kilogram live weight being achieved between years. Most of the low prices were achieved in 2006, as the market picked up significantly between 2007 and 2012. The seasonality of prices is clear from this with a peak in late spring when spring lamb starts becoming available, followed by a trough in early autumn as the bulk of lambs come to the market. Carcase weights have remained relatively stable over time for lamb (about 19kg dressed weight) although there are seasonal changes – for example in the new year as older, over wintered lambs come onto the market. Lamb prices are affected by the global market, particularly the strength of supplies from UK producers and from key trading partners (i.e. New Zealand) and the strength of demand from the UK’s biggest market - France. With a strong export market for Scottish Lamb the exchange rate can play an important role in setting prices.
The changes in lamb price, coupled with input cost variations can significantly affect the profitability of the sheep sector. Quality Meat Scotland (QMS) annually produce a report called *Cattle and Sheep Enterprise Profitability in Scotland*\(^{55}\). These reports give an indication of how different parts of the sheep sector are performing on an annual basis and the average figures are summarised in Figure 22. Whilst all sheep enterprises returned some profits in 2004, this was due to the coupled “headage” payments under various CAP schemes. Since 2005 the Single Farm Payment does not appear in these profitability figures, as it was technically decoupled from production. This reveals how, despite rapidly rising sheep prices between 2007 and 2012, hill farmers still did not make a profit as variable costs also doubled over the period. The upland sheep producers have generally made some profits in recent years whilst lowground breeders have generally been making more than £20 per ewe net profit. These figures highlight the reliance of Scottish sheep farming on CAP support (for lowland flocks you would need a flock of 750 to 1,000 ewes to provide a pre-CAP profit of around £25,000).

**Figure 22: Average annual profitability of sheep enterprises under different systems, 2003-2014**

There is considerable variability in performance within the sheep sector – largely down to management factors. In 2014 hill sheep farmers, on average, were losing over £220 for every 10 ewes they had – although the top performers were only losing £27 per 10 ewes compared to losses of £270 per 10 ewes for the bottom third. For example, the top hill sheep performers had significantly lower replacement costs and variable costs per kilogram of output, more lambs reared per ewe, heavier lambs, lower concentrate costs, etc. – all factors that are in control of the farmer. AHDB figures\(^{56}\) for 2015 reveal that only 57% of UK lambs marketed met their target specification (fat and conformation), with 27% too fat and 16% of poor conformation (particularly in heavier lambs sold). This reiterates that there is significant scope for many farmers to adapt their practices, innovate, and generate improved profits from their sheep. However, with such a high proportion of sheep missing specification it suggests that the price incentives for meeting (or missing) market specification are not strong enough to encourage behavioural change.
SAC Livestock and Business Consultant, Robert Logan has highlighted some of the key drivers of change in the sheep sector and what opportunities and challenges the sector is likely to be faced in the future. Robert believes that whilst the top farmers are hungry for knowledge there is general apathy in much of the sector – driven by uncertainty, fixation on prices, small flocks, small farms and prohibitively high capital reinvestment requirements:

Drivers of change:

• The sector has low profitability with less (skilled) labour available to undertake shepherding tasks.

• The weakening of Sterling since the Brexit vote has translated into a £10-15 per head lift in lamb price. This is driven by the fact that approximately 30% of UK sheepmeat is exported. The vast majority of exports go into the EU and in particular, France, who account for over half our annual exports annually – meaning there is also risks should this demand waiver.

• Production remains highly seasonal and is very weather dependent with anecdotal evidence that some farmers are moving to later lambing in attempt to avoid inclement weather during lambing.

• Successive slow springs have delayed grass growth and increased the surge of lambs ready mid-season. This has meant reasonably good trade in early season but few producers are able to capitalise.

• There is wide variation in carcase specification as producers sell when they think the market is best (they either delay or hasten sales – depending on their price projections).

• All but the most extreme hills are typically net benefactors of CAP reform which will start to change farmer outlooks but their cash flow concerns remain from low prices and delayed payments.

Opportunities and challenges:

• The outcome from Brexit trade negotiations for sheepmeat will be critical – particularly regarding access to the EU market. There could be a period of greater market volatility for the sector to deal with.

• Increasing global demand for sheepmeat is positive but offers few immediate opportunities for anything other than fifth quarter material. Demand from China is increasing but is unpredictable, although it does absorb 35-40% of NZ lamb.

• Scotland needs to adopt innovative sheep systems that reduce production costs per kilogram of meat sold to benefit the producer and mitigate falling consumption and aggressive retailing. This will also reduce the carbon impacts per kilogram of product.

• Lamb is an expensive protein, with high ‘on the plate’ wastage and has had limited product development with an ageing consumer demographic. Ethnic sheepmeat sales are propping up average UK consumption. Within the younger generations, sheepmeat increasingly needs to compete directly with chicken and beef.

• The current EUROP grid classification system lacks market focus and the grading system needs to develop to reward saleable meat yield that will lead to innovation in the sector through progressive Estimated Breeding Values (EBV) and CT scanned tups, etc. There is wide variability in carcases due to the vast range in breeds and production systems, and only moderate uptake of EBVs to date. Significant improvements could be made with greater use of EBVs.

• The industry needs more resilient production systems. Despite the weather and price, top performers seem to have a similar cost of production (per ewe) but rear and finish more lambs.

• The industry is challenged by an ageing farmer profile, and whilst there are relatively low barriers to entry, getting access to land and buildings can be difficult – support such as that available through the SRDP 2014-2020, may help encourage some new entrants into the sector – but quicker intergenerational transfer is required to give the sector the stimulus it requires. Of primary importance must be to present ways of providing improved access to land and demonstrating farm sheep profitably. These will be key to stimulating younger farmers entering the sector.

• Farmers should be making better use of Electronic Identification as a management tool and faecal egg count kits should become common place to overcome increasing wormer resistance. In addition, selection of stock with resistant traits would see a reduced need for, and cost of, worming.
In 2016 the *Scottish Sheep Sector Review: A pathway to a profitable future: a vision for the future of the Scottish sheep industry* led by John Scott, was published. This sets out a suite of recommendations relating to: production profitability; abattoir profitability; functionality of the supply chain; growing the demand for sheepmeat; increasing sheep slaughterings in Scotland and; encouraging new entrants. It calls for improved physical and financial benchmarking, identification of skills gaps, development of sheep farming modern apprenticeships, finding ways of better matching supply with demand, provision of carcase feedback to producers, greater added value in more integrated supply chains, greater promotion of share farming and sheep farming as a career, improvements in the genetic potential of the national flock – particularly through genomics and selection of stock resistant to economically important diseases, etc. As with all Scottish agricultural strategies that set out a vision for the future, and pathways to achievement, it is essential that progress towards them is not hindered by the unquestionable attention that Brexit has grabbed.

### Developing the Food and Drink Sector

**Paul Mayfield SAC Consulting**

Food and drink is a significant sector for Scotland’s economy employing around 34,000 people, 19 % of all Scottish manufacturing jobs and generating a turnover of £14.4bn in 2014 (Scotland Food & Drink). The most recent Bank of Scotland Food and Drink Research Report (2016)\(^1\), conducted in the wake of the Brexit result, confirms an uplift in business confidence and growth expectations compared with 2015. Across the food and drink sector businesses expect turnover to increase by an average of 24% over the next five years - achieved by a variety of means including entering new UK markets (49% of businesses) and new product development (45% of businesses).

Arguably, this growth means that there has never been a better time for our food and drink businesses to innovate and expand. Product quality, provenance and heritage are ways in which brands can differentiate themselves and Scottish firms have done this effectively to date – although markets are becoming increasingly sophisticated. Product and process innovation along with collaboration across the supply chain are ways to provide that all important point of differentiation. Business as usual will not suffice, as consumers look for new and healthier products. Demand for products with reduced salt, fat, sugar, ‘artificial’ additives and flavourings, as well as growth in non-allergen foods, also mean that food producers and manufacturers need to continue to innovate to exploit these new growth opportunities.

Food and drink companies also face other challenges such as improving productivity, risk management in terms of people and markets, building sustainability into their business and resilience into their supply chain. Growing recognition of the need to reduce waste both pre and post farm gate provides opportunities to improve efficiency and to help develop a circular economy by developing new products from what was previously considered ‘waste’.

Funding and support is currently available for the sector to help them achieve these goals, through grants such as the Food Processing, Marketing and Co-operation Grant Scheme which, although competitive, is open to food businesses of any size and Interface Innovation Vouchers that are available to qualifying businesses and projects. Connect Local (www.connectlocal.scot) is a collaborative project managed by SAC Food and Drink working in partnership with SAOS\(^2\), Scotland Food and Drink and Seafood Scotland. The project is a successor to the highly successful Think Local and is focussed on smaller food, drink and seafood businesses seeking opportunities to expand into new growth areas through improvements in support, network infrastructure and collaborative working. The Market Driven Supply Chain project is managed by SAOS in collaboration with SAC Consulting and other organisations and has delivered a number of projects helping to increase supply chain efficiency and collaboration across the sector.

Growing strong, credible and sustainable brands will help support Scotland’s global reputation as a Land of Food and Drink\(^3\) but investment in skills, innovation and efficiency will be required if this vision is to be realised and maintained. In addition, credible environmental and sustainability credentials are important to brand growth. Businesses need to understand their target markets, have a clear and future-proofed brand Unique Selling Point, be seen by their customers and consumers as credible and have a long term vision.
Alongside this is the need to capitalise on the changes in purchase and eating behaviour and have a 'tangible' online presence.

Across the supply chain the industry needs to increasingly work together to provide planning, investment in skills, customer insight, infrastructure and product and process innovation in order that Scottish food and drink companies minimise the challenges and exploit the opportunities that will undoubtedly emerge over the next few years. Despite the current uncertainties, it is encouraging to see an increasing number of emerging rural food and drink businesses developing innovative new products, who are prepared to adapt to meet the changes and opportunities that are occurring within the marketplace.

1.1.7 Scotland’s Beef Sector

The beef sector accounted for about £850 million or nearly 30% of Scottish agricultural output in 2015, supporting a wide array of rural businesses reliant on the sector: feed, energy, machinery, veterinary services, fertilisers, hauliers, livestock markets, abattoirs, etc., including the wider beef supply chain through to retailers and caterers. Scotland currently has around 28% of the UK breeding herd and in 2016 there were 437,000 beef cows (or suckler cows) with calves in Scotland with a further 83,000 female beef cows over two – that consists of replacement heifers and animals for slaughter. In total there were 1.8 million cattle in Scotland in 2016.

The suckler cow herd is relatively well spread across Scotland with 31% located in the south west of Scotland, 27% in the Highlands and Islands, 26% in eastern Scotland, and only 16% in the north east of Scotland. As the cattle statistics do not readily allow finishing cattle to be identified, male cattle over one (including a small proportion of breeding bulls) was used as a proxy. This shows that north Scotland had about 28% of the finishing herd in June 2015, with the south west having 35% and eastern Scotland 22%. As with sheep, the industry is highly dynamic and the June Census data simply provides a snapshot of the industry and does not account for the large “store” cattle movements from suckler cow breeders in the hill and upland areas to specialist lowground finishers that occur throughout the year60.

The beef sector has become pretty concentrated with a large proportion of the industry reliant on relatively few farmers. Whilst Table 6 shows that there are around 10,250 holdings with suckler cows in Scotland, a third of those holdings have less than 10 cows and account for only 2% of the national beef breeding herd. In contrast about 400 holdings (3.5%) account for nearly a quarter of Scotland’s suckler cows in herds of over 200. There is even greater concentration in the finishing sector where – using this proxy of males over one – 13% of the finishing males are on 45 holdings (0.5%) in herds of over 400, with a further 14% on 139 holdings. Overall 45% of all Scottish male cattle over one are located on just 550 holdings.

Table 6: distribution of suckler cows and male cattle over 1 by herd size, 2015

<table>
<thead>
<tr>
<th>Herd Size</th>
<th>Holdings with Suckler Cows</th>
<th>No. of Suckler Cows</th>
<th>Holdings with finishing males</th>
<th>No. of finishing Males over 1</th>
</tr>
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<tr>
<td>&lt;10</td>
<td>3,376</td>
<td>12,968</td>
<td>5,132</td>
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<tr>
<td>10-50</td>
<td>3,414</td>
<td>88,125</td>
<td>3,161</td>
<td>75,318</td>
</tr>
<tr>
<td>50-100</td>
<td>1,894</td>
<td>136,083</td>
<td>862</td>
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<tr>
<td>100-200</td>
<td>1,181</td>
<td>160,583</td>
<td>367</td>
<td>50,399</td>
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<td>200-400</td>
<td>352</td>
<td>91,129</td>
<td>139</td>
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<td>&gt;400</td>
<td>50</td>
<td>30,592</td>
<td>45</td>
<td>34,612</td>
</tr>
<tr>
<td>Scotland</td>
<td>10,267</td>
<td>519,480</td>
<td>9,706</td>
<td>274,789</td>
</tr>
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</table>

Data Source: Extracted from the Scottish Government’s 2015 June Agricultural Census
Based on the Scottish Government’s data, Figure 23 reveals the average herd size across Scotland’s parishes. In the main crofting parishes in the north and west (excluding Orkney) average suckler cow herd sizes are small – generally lower than 20 cows. In contrast in Southern Scotland and the north east Scotland average suckler cow herd sizes are much bigger, as a result of better quality grazing land and bigger farms.

The second map in Figure 23 shows that suckler cow intensity (per hectare) is greatest around the Solway Firth in Dumfries and Galloway, in Orkney and in upper Grampian. These farming areas are heavily reliant on cattle and are an important source of cattle for the beef industry. The finishing sector is vitally important for the entire beef sector, and as previously discussed, is highly concentrated in the hands of a relatively small number of specialist producers. The third map in Figure 23 highlights how important Aberdeenshire and Dumfries and Galloway are for the finishing sector – with high densities of male cattle over one (a pattern replicated when looking at finishing cattle per holding).

Figure 23: Location, herd size and density of Scottish suckler cows and finishing (male) cattle, 2015

The long term trends in the beef herd are difficult to portray due to a change in the way that cattle statistics are recorded - there was a move from using farmer filled June Census returns to using the Cattle Tracing System data which farmers have a statutory obligation to keep up-to-date. For this reason there is not full compatibility in the long term trends shown in Figure 24, although it provides approximated trends to be shown for the entire period. The impact of CAP “headage” payments is apparent, with increased national herd size in the 1980s and throughout the 1990s. The weakening of Sterling against the Euro in the early 1990s also gave farmers a windfall gain per cow through their support payments. The McSharry CAP reforms slowed the increase in suckler cow numbers through the introduction of entitlement quota and an extensification premium, designed to reduce stocking densities to more environmentally friendly levels.

The beef herd peaked in 1998 before a downturn caused, in part, by poor market prices and a strengthening of Sterling against the Euro effectively reducing CAP payments. The devastating impacts of the 2001 Foot and Mouth disease outbreak are apparent – after which there was a period of stability in numbers until 2006, when some restructuring took place in light of decoupling of CAP support, depressed beef prices, and lifting of the ban on over 30 month old cattle entering the food chain that had been in place because of BSE. As beef prices rose (so did input costs) from 2007 to 2012 there was some stabilisation in the national beef herd before further decline in 2013 and 2014, driven by decreased prices.
The BSE (Bovine Spongiform Encephalopathy) crisis started in 1988 and culminated in a ban of UK beef exports to Europe, followed by a worldwide ban in 1996, and the introduction of a slaughter scheme for all cattle over 30 months of age (1996). The BSE crisis artificially caused suckler cow numbers to increase throughout the late 1990s as farmers tended to keep their beef cows longer than they traditionally would - until the lifting of the ban on older cattle entering food chain in November 2005. After the ban was lifted there was a widespread disposal of surplus cows that were not performing (cows born pre-1996 were never allowed into the food chain) and herd numbers dropped back to a level they should likely have been at without the BSE restrictions. Scotland has been officially BSE free since 2009.

Whilst there has been an approximate 15% reduction in the national suckler cow herd since 1998, the decline has not been uniform across Scotland. Figure 25 shows an approximation of changes in total cattle numbers (including the dairy herd) at parish level between 1997 and 2015 alongside changes in the suckler cow herd between 2006 and 2015 (where the Cattle Tracing System (CTS) source is consistent). There appear to have been large decreases in cattle numbers in the central Highlands but also in the south of Scotland and parts of Caithness and Sutherland. A lot of the increases in cattle in the parishes in the north west were likely a result of agri-environmental incentives that encouraged native breeds. However, it is noticeable that cattle numbers have fallen so much despite the presence of LFA support payments that favoured cattle, and coupled support payments for calves. The second map in Figure 25 shows that since 2006 (just after the introduction of the Single Farm Payment and Scottish Beef Calf Scheme) there have been widespread decreases, of more than a quarter (areas in red), in suckler cow numbers in many parts of Scotland. However, despite this there are also a number of areas where the suckler cow herd has increased showing there is no real geo-spatial pattern to the changes.
The Scottish beef industry is dominated by a small number of breeds. Using data extracts from the CTS, operated by the British Cattle Movement Service (BCMS), Figure 26 shows that Limousin crosses were the most common suckler cow breed in 2016, accounting for 23% of beef cows over three years of age, followed by Simmental crosses (19%) and Aberdeen Angus crosses (15%). Pure breed Limousin, Simmental and Aberdeen Angus cows collectively make up about 9% of the beef breeding herd in Scotland in 2016. Figure 26 also shows the number of beef cattle under two years of age (mostly calves and finishing animals, but also replacement heifers) where Limousins account for 27% of the animals. Aberdeen Angus is the second most common breed of young cattle (19%) followed by Charolais (18%) then Simmental (16%) – with these four breeds accounting for over 80% of younger cattle in 2016. It is noticeable that there is a very low nucleus of Charolais cows compared to calves and this is due to the popularity of cross breeding with Charolais bulls as a terminal sire - a breed known for fast growth and good conformation.

Figure 26: Scottish beef breeding cows over 3 years of age and beef cattle under 2 year old, 2016
Breed figures published by the Scottish Government reveal that whilst Limousins remain the most common cattle breed, their numbers fell by more than 120,000 (27% decrease) between 2006 and 2015. Charolais cattle also fell by 27% moving it from the second most common breed of cattle in Scotland in 2006 to the fifth most common in 2016.

Scotch Beef and Scotch Lamb have been protected by the EU’s Protected Geographical Indication status for over 25 years providing consumers with confidence they are buying genuine beef and lamb from quality assured farms that have been reared in Scotland. With this brand in mind, Scottish cattle tends to receive a premium of around 15-20 pence per kilogram (kg) deadweight over beef reared in England, with the result that the vast majority of Scottish beef producers are registered with Quality Meat Scotland’s (QMS) quality assurance scheme for beef. In addition there are price premiums often paid for specific breeds, such as Aberdeen Angus – depending on the market.

Following a prolonged period of suppressed beef prices, the market outlook for beef in Scotland has been reasonably positive over the last 8 years. Figure 27 shows the long term average deadweight price for steers moved gradually from about £1.75/kg in 2003 to about £2.20/kg in 2007. Since 2008, tightening of global supplies and increased demand from growing economies (e.g. China, Russia) led to rapid price increases for beef that peaked at over £4/kg in 2013 before falling back before a mini revival in late summer of 2016. Figure 27 also highlights the high degree of seasonality in beef slaughterings, even when shown as three month moving averages. The number of steers and heifers being slaughtered in Scotland has also declined – with 2015 steer slaughterings down 16% on 2004 levels, and heifers 20% down. The increased prices in 2008 slowed the decline, but with the national herd continuing to fall until 2014 there continued to be fewer animals slaughtered.

Figure 27: Monthly beef slaughterings and deadweight steer price, 2003 to 2016

Although there have been fewer animals put forward to slaughter, statistics show that dressed carcase weights have increased in weight over the period (meaning total meat output is less affected by decreases in the number of animals slaughtered). For example, between 2006 and 2016 the average dressed carcases weight of a Scottish steer increased 6.5% to 385kg with similar gains shown in heifers. This long term increase is likely to come to a halt as the impact of Scottish abattoirs penalising heavy carcases takes effect. In 2016 it was announced that farmers delivering animals with a carcase weight of 420kg would be faced with increased price penalties. This move has seen the market react quickly, as finishers are now looking for younger animals so they can control calf growth and weight gain more readily – this means there is need for rapid behavioural change for some store calf producers regarding the timing of selling their store cattle onto finishers.
During the 2007-2013 period of price increase farmers were, however, also faced with significant increases in input costs – particularly feed, fertiliser and energy - thereby negating price increases. The sector is very heavily reliant on CAP support payments to make profits and this is a legacy of over reliance on historic “headage” payments (that amounted to around £400 in 2004) to justify herd expansions – something that decoupling of CAP support in 2005 did not address, in the most part, as farmers were content to use their historically based SFP to subsidise loss making enterprises.

Having these historic coupled payments in mind fully explains the significant reduction in net margin received by Scottish beef producers between 2004 and 2005 as the decoupled SFP did not appear in enterprise accounts for the first time. For the first time in over 50 years farmers did not have to spend their support payments to maintain suckler cow numbers – they had a “freedom to farm” rather being tied to “headage” payments. Figure 28 shows QMS’s beef enterprise figures between 2003 and 2014 and this reveals that all beef rearing systems have needed to cross subsidise their enterprises from SFP (or other sources) to justify their existence, even when prices were rising. These figures, however, take into account depreciation charges, which of course are irrelevant if businesses are taking a short-term view and not reinvesting in buildings, facilities and machinery. Only intensive cereal finishers appear to make profits, and this is in part to do with quicker finishing time and therefore lower operating and overhead costs.

**Figure 28: Net profitability of Scottish beef enterprises, 2003 to 2014**

As with all sectors of Scottish agriculture, there is wide variation in the performance of individual farms based on motivations, land quality, climate, breed type, etc. Table 7 show that the range in performance between the bottom and top third of performers can be significant (up to £300 per cow). This, therefore, suggests that there is considerable scope for some beef farmers to innovate and make technical performance improvements thereby improving business profitability and reducing reliance on the CAP. Generally, the top performers had better cost control – both variable and fixed – with a tendency for lower concentrate usage. In addition, the top performers generally had higher calf rearing percentages, higher daily liveweight gains, sold heavier calves and tended to get a price premium for their calves over the poorer performing farms.
Table 7: Range of beef enterprise performance, 2014^70

<table>
<thead>
<tr>
<th>System</th>
<th>Bottom Third</th>
<th>Average</th>
<th>Top Third</th>
<th>Top - Bottom Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFA Hill</td>
<td>£-297</td>
<td>£-180</td>
<td>£-70</td>
<td>£227</td>
</tr>
<tr>
<td>LFA Upland – early weaning</td>
<td>£-178</td>
<td>£-109</td>
<td>£22</td>
<td>£200</td>
</tr>
<tr>
<td>LFA Upland – late weaning</td>
<td>£-158</td>
<td>£-58</td>
<td>£155</td>
<td>£313</td>
</tr>
<tr>
<td>Lowground suckler</td>
<td>£-180</td>
<td>£-33</td>
<td>£-115</td>
<td>£65</td>
</tr>
<tr>
<td>Rearer-finisher</td>
<td>£-293</td>
<td>£-217</td>
<td>£18</td>
<td>£311</td>
</tr>
<tr>
<td>Cereal finishing</td>
<td>£-16</td>
<td>£55</td>
<td>£155</td>
<td>£171</td>
</tr>
<tr>
<td>Forage Finishing</td>
<td>£-132</td>
<td>£-126</td>
<td>£-89</td>
<td>£43</td>
</tr>
</tbody>
</table>

Data Source: QMS (2015) Cattle and Beef Enterprise Profitability in Scotland

AHDB figures^71 also reveal that whilst 55% of UK prime beef carcases met target specification in 2015 (up from 42% in 1995) there is significant room for improvement in the delivery of animals to slaughter. They report than 31% of animals were lean but have poor conformation, 9% were too fat and 4% were both too fat and of poor conformation. With such a high proportion of animals missing specification it suggests that the price incentives for meeting (or missing) market specification are not strong enough to incentivise behavioural change. This again suggests scope for driving profitability improvements for farmers by changing behaviours and adopting best practice.

In 2014 a short life industry group developed a vision for the Scottish beef sector: “A confident market driven grass based cattle industry using leading edge technologies capable of delivering profitably to the home and world market high provenance, quality beef from sustainable production systems.” The Beef 2020 report^72 sets out a suite of 23 action points that can help revitalise the sector and drive forward changes that are required in a rapidly changing policy and market environment, including the need to react to climate change. There was recognition that change takes time in the sector (conception to slaughter is usually be 24-30 months). The group called for a number of innovations in the sector to drive efficiencies: an improved payment system based on carcase yield and value; electronic identification to improve data that can be used with other data collections to drive efficiencies and genetic improvements; action to improve health status – particularly around liver fluke and Johne’s disease; improve opportunities for new entrants into the sector; more collaboration across the supply chain regarding pricing and supply of animals to meet specification and develop new market outlets for Scotch Beef; etc.

The Beef Efficiency Scheme^73 was introduced in Scotland in 2016 in attempt to try and drive long term improvements in the beef herd that CAP support, to date, has perhaps suppressed. The £45 million scheme focuses on improving cattle genetics and management practices on farms with long term benefits expected through “improved genetic selection in respect of growth rates, feed conversion, maternal behaviour, nutrition practice and disease resistance.” A five year scheme, as part of the SRDP 2014-2020, pays farmers £32 per calf for the first three years to collect and enter data about their herd, as well as giving them access to advice to help them identify and drive efficiency gains.
SAC’s Senior Beef Consultant, Gavin Hill, has pointed out a number of opportunities and challenges facing the industry. Gavin believes that there a number of important drivers of change, and challenges within the beef sector, including:

• A lack of profitability with current systems and current price and cost structures is a major constraint – with around 90% of the beef sector returning negative margins. It is unlikely that there will be major improvements in profitability in the near future so farmers will need to adapt systems in order to improve their bottom line.

• The reduction in direct support is having the greatest impact on the beef sector – due to the historically high coupled payments that amounted to around £400 per cow/calf. Many farmers will be challenged going forward to adopt new innovations, and adapt to this era of reduced support.

• The newly introduced deadweight limits will drive more efficiency and the saying that “weight pays” is no longer correct – 380kg carcases can give the same return as 450kg carcases with many leading processors. The majority of finishers want cattle that are approximately 12 to 14 months at the 420 kg plus stage.

• Bull beef demand from major retailers has diminished recently and although it is a technically efficient system it will force many to change to steer production. Well managed steer production systems can finish animals at similar ages to young bulls but they will not have the weight or grade that often provided a price bonus.

• Sterling exchange rates are important and the weakening of Sterling does make Scotch Beef exports more competitive in the world market. However, the downside is that imported feedstuff, fertiliser, etc. have become more expensive for all producers.

• There is a great deal of uncertainty surrounding CAP and Brexit so there has been limited investment in the sector, or expansion of production – this is likely to continue until there is greater clarity over post Brexit trade and agricultural support. Brexit may deliver new opportunities and challenges alike and tariff agreements will be vitally important as the sector is currently protected from cheaper imports.

• It is becoming increasingly difficult for farmers, hauliers and processors to find skilled, dedicated staff that are willing to work in the sector.

• The LFASS scheme helps support a number of beef farmers and any fundamental redistribution of these support payments through the new ANC scheme could have unwanted negative impacts on beef production in many areas.

• It is vital for Scotch Beef to keep its market share in the future as the brand can open up new international market opportunities and maintain the price premium Scottish producers receive for their product.

• The increasing used of sexed semen allows dairy farmers an opportunity to cross more cows with beef sires. This could increase the supply of beef in Scotland thereby having negative impact on traditional suckler cow systems.

Opportunities Going Forward

• Aligned to the AgriTech Innovation Centres (see the end of the chapter) it is important that farmers and the wider agri-food supply chain are empowered to embrace big data and related technology, when confronting sustainable intensification challenges. In addition the development of innovative technologies (such as through Agri-EPI) can help: improve heat detection in cattle – meaning more efficient production; develop live Video Imaging Analysis (VIA) that allows farmers to assess body condition and meat yield of animals in a scientific manner, etc.

• There will continue to be a need for supporting the sector through advice and knowledge exchange programmes to drive management improvements and system changes in the beef herd.

• Farmers need to embrace the opportunity that improved genetic lines developed through the use of genomics can bring, particularly in selection of breeding stock.

• It will be important to continue to develop our understanding of meat eating quality and the factors that affect it, particularly as consumers become more discerning and cheaper forms of protein are readily available.
Farming for a Better Climate

Jim Campbell and Rebecca Audsley, SAC Consulting

The Scottish climate is possibly the major factor that has affected both the success and daily challenges of agriculture in the country since prehistoric times. Any change in the climate, therefore, needs careful consideration and potential long term negative effects on the climate from agricultural activity need to be understood and mitigated against.

SRUC runs the Scottish Government’s Farming for a Better Climate (FFBC) initiative which promotes improved farm efficiency as the key to reducing greenhouse gas emissions. Since 2010 the initiative has focused on five key action areas: (1) Using electricity and fuels efficiently; (2) Developing renewable energy; (3) Locking carbon into the farm; (4) Making the best use of nutrients, and (5) Optimising livestock management.

Events and on-farm workshops are run across Scotland featuring specialist speakers in the key action areas. The initiative also works with nine Climate Change Focus Farms across the country where regular discussion group meetings are held demonstrating a range of practical mitigation and adaption measures. The carbon footprint of host farms is measured at the outset and end of the initiative, using AgRE Calc® software, with a variety of steps taken in between to improve carbon efficiency. Those who have completed the programme have had average savings of 10%, worth around £20,000, that were achieved through:

- Efficient of use of slurries and manures resulting in financial savings in artificial fertiliser.
- Generating renewable energy on-site and using it efficiently to bring immediate financial benefits.
- Adopting minimum tillage techniques where appropriate, thereby reducing crop establishment costs.
- Improving the efficiency of livestock production resulting in more saleable product for each unit of input.

Focus group members at each farm, and others attending the events, are given the opportunity to benchmark their own businesses against the host and other farmers. The dissemination of knowledge on current best practice and research findings among attendees is augmented by discussion and sharing of experiences between individual farmers and further information can be obtained from the dedicated website (www.farmingforabetterclimate.org) which includes practical guides and case studies.

The FFBC initiative has been an effective forum for raising awareness of climate change issues affecting agriculture and continues to amass a data bank of knowledge which is made freely available to farmers across Scotland. The opportunity it presents for knowledge exchange from farmer to farmer as well as between farmers, specialists and researchers continues to be its main strength. The ability to gain knowledge from the practical experience of their peers is highly valued by the large number of farmers who have so far engaged with the initiative.

An arable focus group discuss soil robustness and carbon sequestration during an on-farm meeting.

For more information contact rebecca.audsley@sac.co.uk or jim.campbell@sac.co.uk
1.1.8 Scotland’s Dairy Sector

The dairy sector is economically important, producing about £365 million output in 2015 and supporting around 2,000 processing jobs. However, Figure 29 shows that the sector has experienced a long term decrease in the dairy herd, from about 450,000 cows and heifers in 1983 to around 275,000 cows and heifers in 2016. This represents around a 38% decrease. During that time milk yields have also improved, largely through genetic improvements (especially with the use of Artificial Insemination – AI). Dairy Co estimates suggest that average milk yields in the UK increased from 5,512 litres in 1995 to 7,912 litres per cow in 2016 (a 44% increase).

The figures show that the long term decline in dairy numbers was stopped between 1992 and 1997 as milk prices rose from about 21p per litre to 25p per litre. When milk prices then fell back and didn’t recover till until 2007, the long term decline in numbers continued. When the price started rising from 2007 to 2014 it is clear, again, that cattle numbers stabilised and actually started increasing. However the sudden fall in the price in 2015 will have long term consequences in so much that very few dairy cows were Artificially Inseminated (AI) with dairy semen in 2016 meaning the national herd will shrink over the next couple of years — although with market improvements in Autumn 2016 many remaining dairy farmers are looking for stock.

Figure 29: Scottish dairy cow numbers and average UK milk price, 1982 to 2016

It is notable that a number of EU Member States started to ramp up milk production before the abolishment of milk quotas on 1st April 2015, and this has meant that EU supplies of wholesale milk delivered to processors increased by 10% between the year ending August 2013 and the year ending August 2016. Over that period the UK delivered 12% more milk (there was a 9% increase between 2013 and 2014) but milk production in the Netherlands increased by 19% and in Ireland by 29%. In France and Germany (that account for 37% of the EU 28 deliveries) production only increased by 6% and 8% respectively.

In 2015 world milk prices started to collapse, a reaction to increased global supplies a slowdown of the Chinese economy and an embargo on EU food products by Russia in 2014. SAC Consulting report that world milk production recently declined in response to the difficult global trading conditions thereby correcting some of the supply and demand imbalance that has existed – leading to a recent uplift in price. They do note that industry expectations are an average milk price of 23- 26 pence per litre for the next 5 -10 years (although the significant reduction in supply (see above) has caused great shortage in the market for liquid and butter, which has increased the milk price more rapidly than expected). A noticeable thing in the UK milk market is the divergence in contract prices farmers receive after process collapsed – with the difference between minimum and maximum prices going from 3.4 pence per litre in February 2004 to 19.5 pence per litre in June 2016. The pattern of these individual contracts and the Defra average milk price (black line) is highlighted in Figure 30, where the sudden down-turn in process, for most contracts, is evident. Some fortunate farmers are on “aligned” contracts with the supermarkets that cover average production costs, and pay above the market rate for milk.
Things can change rapidly in farming, as witnessed by the milk price collapse, and that has impacted on the long term vision for the sector. It was only 2012 when export opportunities for the Scottish dairy industry were championed, with a paper highlighting that “there is a growing world dairy market for dairy products, with good provenance, of the type that Scotland can produce. Branding, market research and investment are required but opportunities for Scottish dairy produce exist in niche, value added and premium markets.”

A strategy for the sector followed in 2013 - Scottish Dairy Review: Ambition 2025 – that resulted in the establishment of the Scottish Dairy Hub in 2014. This strategy, in a period of growing milk demand and prices, set out a vision to build on Scotland’s strengths in producing high quality milk by increasing production by 50% over a 10-12 year period. In 2015 the Scottish Government launched its detailed Dairy Action Plan in reaction to a downturn in prices, aiming to “improve the resilience of the Scottish dairy sector and provide the right platform to ensure the entire sector can thrive in the context of volatile market prices”.

The dairy sector has become increasingly specialised since the deregulation of the Milk Market Board. Data from the Scottish Government’s 2015 June Census shows that there were 786 specialist dairy farms in Scotland with an average of 229 cows over two years old. Some 80% of Scotland’s dairy herd and 76% of its dairy holdings are located in the south west of Scotland with about 9% of cows and 10% of holdings in eastern Scotland. 6% of Scottish dairy holdings carry 22% of Scotland’s dairy cows in large herds of over 500 (where the average herd size is 776 cows). 46% of the national herd is on 37% of the holdings in herds of between 200 and 500 cows. The 17 holdings with an average herd size of three are a statistical anomaly based on the method of assigning farm types.
Table 8: Number of specialist dairy holdings, number of cows and average herd size, 2015

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<thead>
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<th>Number of Holdings</th>
<th>Number Cows</th>
<th>Average Herd</th>
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<tr>
<td>100 - 200</td>
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<tr>
<td>&gt;500</td>
<td>52</td>
<td>40,329</td>
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</table>

<table>
<thead>
<tr>
<th>Region</th>
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<th>Average Herd</th>
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</thead>
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</tr>
<tr>
<td>Highlands &amp; Islands</td>
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<td>North Eastern Scotland</td>
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<td>5,665</td>
</tr>
<tr>
<td>South Western Scotland</td>
<td>605</td>
<td>145,183</td>
</tr>
<tr>
<td>Scotland</td>
<td>786</td>
<td>179,642</td>
</tr>
</tbody>
</table>

Data extracts from the CTS operated by the British Cattle Movement Service (BCMS) show that in 2016 the majority of Scottish dairy cows over 30 months of age were Holstein Friesians (57%), followed by Holsteins (14%), British Friesians (10%) and Ayrshires (6%) with Jersey’s only accounting for about 2% of the national herd.

In September 2016, as a result of the dairy crisis, the EU opened its voluntary Milk Reduction Scheme to farmers. The scheme pays compensation (equivalent to about 12 pence per litre) to producers who reduce the amount of milk they produce (there is a minimum of 1,457 litres) over a fixed three-month period, with a maximum eligible reduction of 50%. This scheme may be attractive to those looking to exit the market or those looking to sit back and see if market conditions become more favourable in 2017. The Herald reported that there had been a “massive” uptake of the scheme with 1,800 UK producers applying in the first application period with around a fifth of Scottish producers signing up to reduce their milk production by about 15 million litres, when compared to the same period in 2015.

SAC’s Senior Dairy Consultant - David Keiley - has pointed out a number of opportunities and challenges facing the industry. He points out that the 2016 drop in UK supply (by 7% for cumulative deliveries to October compared to 2015) has led the market into a period of significant volatility. For example, although Yew Tree’s price for a litre of milk has doubled from 14 pence in the spring of 2016 to 30 pence in October 2016 the wider market is still lagging behind this. David thinks it is likely that Arla (and possibly Muller) will recruit Scottish farmers in late 2016 or early 2017. Another immediate issue is that stock piles in intervention storage will be released onto the market soon, thereby potentially diluting price gains.

Challenges

• The largest challenge going forward is maintaining the core dairy herd under supressed milk prices, which are in general considerably below the average cost of production – around 27 pence per litre.

• There is likely going to be further erosion of dairy farmer numbers in 2016 and 2017 as long-term business decisions are made as losses hit balance sheets.

• There will be likely further processor rationalisation in Scotland as the effects of a reduced milk supply hit home and increased milk deliveries are made south of the Border – e.g. to Yew Tree Dairies.

• The major milk price difference between supermarket “aligned” and “non-aligned” producers will likely continue meaning some producers are at much higher financial risk.

• The “cheese price lag” has not yet fully played out, with many cheese processors still supplying supermarkets cheaply due to forward contracts. A number of farmers supplying cheese manufacturers
in south west Scotland have recently resigned in favour of the more lucrative contract offered by Yew Tree Dairies – who now take more than 10% of Scottish milk. Cheese manufacturers have responded by increasing price (e.g. Lactalis to 25 pence per litre by December 2016). The amount of producers resigning from Lactalis will potentially leave the factory with only 50% of its capacity from its own supplier base. This may have significant impact on the overhead costs of operating the factory – placing it at a major strategic disadvantage.

- There is increasing pressure in the dairy industry from milk buyers, retailers and consumers to reduce the use of antibiotics, due to concerns about antibiotic resistance in human medicine. This will be a challenge to traditional practices – but with veterinary and specialist support it should be possible to overcome.

Opportunities

- There will likely be increasing demand for milkfat and protein solids that may provide some producers a uplift in price depending on dairy breeds they have.
- Dairy farms in Scotland will be subject to the same trend as the rest of the EU, with more larger herds. In Scotland given climatic restrictions most producers will opt to intensify their business and develop a housed (confined) system. There will, however, be some polarisation of productions systems with some farmers opting for extensive grass-based grazing systems and others opting for intensive concentrate feeding systems.
- There are increasing opportunities to use future markets and provide a degree of future certainty in prices received. Yew Tree Dairies in Lancashire is already offering this and is taking increasing supplies from the south of Scotland.
- Farmers looking to minimise input costs will look to make better use of grass, either as grazed grass or from improved silage quality, to improve efficiency and therefore margin per litre.
- Processor investment, such as Muller at Bellshill, offers some certainty of longer term markets for Scottish producers in their catchment area.

1.1.9 Technical Efficiency Gaps

Work has been on-going by SRUC within the RESAS Strategic Research Programme 2016-2021 examining the technical efficiency of farming sectors using the Farm Accounts Survey, where technically efficient farms are maximising their output compared to their inputs. The most efficient farm within the sample gets a score of 1 and the remainder are scored in comparison to this (i.e. a farm with a score of 0.75 is operating 25% below the most technically efficient farm in the sample). Figure 31 shows the median (red line) alongside the upper and lower quartiles for key sectors. It is noticeable that in most illustrated sectors there is considerable, and consistent, variance between the upper and lower quartile performers, revealing that there is scope to improve technical efficiency through generating greater output per unit of input. It is worth noting that the dairy sector has actually seen some convergence between the upper and lower quartiles over the time period and this is probably due to less efficient dairy farmers exiting the sector.
The technical efficiency performance of individual farms within the Farm Accounts Survey was tracked between 1989 and 2013. This reveals the probability of farm businesses moving between technical efficiency performance bands over time. Table 9 illustrates that LFA Sheep farmers in the lower quartile in one year have a 64% likelihood of remaining in the lower quartile in the next year; with a 22% chance of them moving up a performance band. Equally, there is a 55% probability that a farm in the upper quartile will remain in the top 25% of performers. This reveals a static level of mobility in technical efficiency performance over the 25-year time-line of this analysis. There does, however, appear to be greater movement between performance brackets with those in the middle (second and third quartiles).

Table 9: LFA specialist sheep farm’s probability of moving between technical efficiency performance quartiles over time, 1989 to 2013

<table>
<thead>
<tr>
<th>Technical Efficiency Band</th>
<th>Current Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First Quartile</td>
</tr>
<tr>
<td>Previous Period</td>
<td></td>
</tr>
<tr>
<td>Lower Quartile</td>
<td>64%</td>
</tr>
<tr>
<td>Second Quartile</td>
<td>22%</td>
</tr>
<tr>
<td>Third Quartile</td>
<td>10%</td>
</tr>
<tr>
<td>Upper Quartile</td>
<td>6%</td>
</tr>
</tbody>
</table>

This analysis reveals that there is considerable scope for the least technically efficient farms to make management changes that would likely improve their economic and carbon-related performance at the same time. A minimum target for the industry going forward would be to aim to narrow the gap between the upper and lower quartile farms through targeted campaigns. However, there is a requirement to improve our understanding of farmer motivations regarding technical efficiency and to recognise that factors other than profitability may be causing lower performance on some farms. In order to make improvements it may take a mind-set change for some farmers but equally there may be barriers that exist that prevent them becoming more efficient and it is important to establish what these are if the desired improvements are to be made.
For the farming sector to improve performance there needs to be clear understanding of the financial and technical performance baselines and future targets in order to gauge the scale of the task of achieving the vision. This would allow progress to be effectively monitored from the baseline and help assess if agriculture has become more profitable and by how much. However, unless farmers regularly benchmark (financial and physical) then there is a high risk that these technical improvements will be unachievable. There appears to be some farmer fear of cost structure transparency through financial benchmarking that may provide retailers with greater market power, without recognition of the role of world commodity markets in price setting decisions. There is still limited uptake of technical performance benchmarking and both industry-led and Scottish Government initiatives demonstrating the benefits of benchmarking could play a significant role in improving the financial performance, resource efficiency and climate change impacts of the sector. Initiatives such as Planning to Succeed, Farming for Profit, QMS Business Improvement Groups\textsuperscript{89}, Monitor Farms\textsuperscript{90}, etc. have demonstrated the farm level benefits of regular benchmarking. Farmers should be encouraged by industry and the Scottish Government, where appropriate, to undertake benchmarking – for example through the Scottish Government’s new one-to-one and one-to-many Farm Advisory Service\textsuperscript{91} funded through the SRDP\textsuperscript{92}.

1.1.10 Brexit and The Future of Scottish Agriculture?

Throughout this section the issue of Brexit has largely been avoided on purpose. At the time of writing there is so much uncertainty on the issue that it would be purely speculation as to possible outcomes and impacts that may result. It is highly likely that Brexit will bring changes to our agricultural support system. The UK Treasury and Defra would prefer to reduce direct Pillar 1 type support (that is so important for Scottish farming systems) in preference for more targeted Pillar II (rural development) support mechanisms.

What is certain is that Brexit will cause, and already has caused, uncertainty in the sector. A recent survey conducted of SAC Consulting farmer and crofter clients found a number of interesting facts on Scottish farmer’s thoughts on Brexit (see Table 10):

- A fifth of the sample said they felt that Brexit may increase the likelihood of retirement from farming. This was lowest in those under 54 years of age but a quarter of farmers and crofters that were 55 and over said it may bring forward retirement. The impact on retirement plans was lowest amongst the specialist sectors – horticulture, dairy, pigs and poultry.
- 57% of the sample reported that Brexit has increased business uncertainty – something that inevitably leads to lower on-farm investment, as witnessed during the recent CAP reforms – with inevitable impacts on the wider rural economy. Increased uncertainty was highest in the younger farm and croft population and on mixed farms and the beef and sheep sectors (which have historically been heavily supported by CAP).
- Over half of those surveyed though that Brexit would increase the challenge of maintaining the farm / croft business. Again this was highest in the younger generations and the beef and sheep sector.
- Overall 37% saw Brexit providing them with increased opportunities for maintaining their business – noticeably higher in the larger farms\textsuperscript{93}, with lower confidence shown in the beef and sheep sectors.
Table 10: What Brexit is likely to mean to Scottish farm businesses

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Sample Size</th>
<th>Increased likelihood of retirement</th>
<th>More uncertain business future</th>
<th>Increased challenges to maintain the business</th>
<th>Increased opportunities for maintaining the business</th>
</tr>
</thead>
<tbody>
<tr>
<td>under 40</td>
<td>61</td>
<td>15%</td>
<td>67%</td>
<td>61%</td>
<td>52%</td>
</tr>
<tr>
<td>40-54</td>
<td>184</td>
<td>14%</td>
<td>60%</td>
<td>53%</td>
<td>35%</td>
</tr>
<tr>
<td>55-64</td>
<td>203</td>
<td>25%</td>
<td>57%</td>
<td>54%</td>
<td>40%</td>
</tr>
<tr>
<td>65 and over</td>
<td>259</td>
<td>24%</td>
<td>57%</td>
<td>50%</td>
<td>33%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Business Size</th>
<th>Sample Size</th>
<th>Increased likelihood of retirement</th>
<th>More uncertain business future</th>
<th>Increased challenges to maintain the business</th>
<th>Increased opportunities for maintaining the business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Small</td>
<td>206</td>
<td>24%</td>
<td>54%</td>
<td>45%</td>
<td>28%</td>
</tr>
<tr>
<td>Small</td>
<td>201</td>
<td>21%</td>
<td>60%</td>
<td>56%</td>
<td>35%</td>
</tr>
<tr>
<td>Medium</td>
<td>167</td>
<td>18%</td>
<td>56%</td>
<td>59%</td>
<td>40%</td>
</tr>
<tr>
<td>Large</td>
<td>114</td>
<td>11%</td>
<td>59%</td>
<td>50%</td>
<td>49%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Farm Type</th>
<th>Sample Size</th>
<th>Increased likelihood of retirement</th>
<th>More uncertain business future</th>
<th>Increased challenges to maintain the business</th>
<th>Increased opportunities for maintaining the business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef &amp; Sheep</td>
<td>434</td>
<td>20%</td>
<td>61%</td>
<td>53%</td>
<td>33%</td>
</tr>
<tr>
<td>Cropping &amp; Horticulture</td>
<td>56</td>
<td>14%</td>
<td>45%</td>
<td>46%</td>
<td>36%</td>
</tr>
<tr>
<td>Dairy / Pigs / Poultry</td>
<td>47</td>
<td>13%</td>
<td>43%</td>
<td>40%</td>
<td>47%</td>
</tr>
<tr>
<td>Forage/Other</td>
<td>84</td>
<td>24%</td>
<td>44%</td>
<td>49%</td>
<td>46%</td>
</tr>
<tr>
<td>Mixed</td>
<td>68</td>
<td>24%</td>
<td>65%</td>
<td>63%</td>
<td>41%</td>
</tr>
</tbody>
</table>

| Total Sample    | 689         | 20%                                | 57%                            | 52%                                            | 37%                                               |

Data Source: SAC Customer Satisfaction Survey, 2016

Table 11 also shows that 11% of survey respondents thought that Brexit would lead to downsizing of their business, with 15% thinking it would cause their business to grow. 16% felt that Brexit would lead to them farming less intensively whilst over a fifth felt that as a consequence of Brexit they would increase intensity. Nearly two-thirds felt that Brexit would not affect the mix of crops and livestock that they have, with around 20% thinking it would have some impact. Perhaps the most interesting finding was that nearly a third of the farmers and crofters surveyed believe that Brexit will mean that they will have to increase off-farm income sources or diversify their business.

Table 11: How Brexit may impact on Scottish farm businesses

<table>
<thead>
<tr>
<th>How Brexit might impact on your?</th>
<th>Sample</th>
<th>Don’t know</th>
<th>Decrease</th>
<th>Stay the same</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Size</td>
<td>676</td>
<td>17%</td>
<td>11%</td>
<td>57%</td>
<td>15%</td>
</tr>
<tr>
<td>Farming Intensity</td>
<td>671</td>
<td>14%</td>
<td>16%</td>
<td>49%</td>
<td>21%</td>
</tr>
<tr>
<td>Mix of farm products</td>
<td>670</td>
<td>15%</td>
<td>10%</td>
<td>63%</td>
<td>13%</td>
</tr>
<tr>
<td>Diversification &amp; off-farm income</td>
<td>659</td>
<td>12%</td>
<td>13%</td>
<td>42%</td>
<td>32%</td>
</tr>
</tbody>
</table>

Data Source: SAC Customer Satisfaction Survey, 2016
As the implications of Brexit start to unfold it provides Scottish agriculture an opportunity to reflect and take stock of how the sector is supported and regulated in the future. As such, we should all take an opportunity to revisit the work of Brian Pack OBE through his independent *Inquiry Into Future Support For Agriculture In Scotland*\(^4\) and the *Doing Better Initiative to Reduce Red Tape for Farmers and Rural Land Managers*.\(^5\) If the shackles of the EU Commission and auditors are indeed broken - providing we adhere to the minimum rules required under any future EU trade deal – then there must be opportunities to design a better agricultural support policy and make farming less stressful and bureaucratic. As such, revisiting the recommendations made by Brian in designing a new support policy that is fit for purpose and in how to reduce the red tape burden on Scottish land managers would surely be a logical place to start.

Additionally, in 2015, the Scottish Government set out a vision for the Future of Scottish Agriculture through their discussion document\(^6\). This, and the sectoral strategies, is an excellent starting point for thinking about what we would like a post Brexit agricultural sector to look like in Scotland, with many of the responses\(^7\) (such as SRUC’s\(^8\)) helping set out a roadmap for achievement of the vision. As we begin to understand the implications for Brexit it is worth revisiting the useful work that has already been undertaken and help develop a set of support mechanisms that can drive the necessary changes that build on our international reputation for quality food and drink products and will lead to a viable and sustainable industry that best uses Scotland’s unique natural resources.

The industry is not alone in driving forward change. Indeed the Scottish Government’s commitment to the sector is evident from its significant investment of £32.9m in world leading research in agricultural matters through the Rural Affairs, Food and the Environment Strategic Research Programme\(^9\). This Programme supports three main Themes of research: Natural Assets; Productive and Sustainable Land Management and Rural Economies; and Food, Health and Wellbeing. £5.5m is being spent on three current Centres of Expertise, forming an important policy-research interface on the issues of water resources, animal disease outbreaks and climate change (with a fourth due on plant health). £8.3m is being invested in Underpinning Capacity ensuring key assets which support the research base are maintained and their long term sustainability secured. £0.8m is being spent on Knowledge Exchange to create a focal point for communications ensuring outputs and outcomes of the research are disseminated effectively to a wide range of stakeholders. A new £0.5m fund encourages innovation funding, levering knowledge from the Strategic Research Programme into joint projects with industrial collaborators.

In addition, the UK government has invested in four new Agri-Tech Innovation Centres\(^10\) that aim to collaborate with industry to improve the adoption and exploitation of new technologies in the agri-food sector thereby driving growth in the sector by supporting innovative ideas, helping farmers become more profitable and sustainable. The Centre for Innovation Excellence in Livestock\(^11\) (CIEL) received £29.1 million in government investment to create new livestock technology and products to boost the profitability and productivity of livestock farming. The Agricultural Engineering Precision Innovation Centre\(^12\) (Agri-EPI) received £17.7 million in government investment in the new, fast-moving market of precision agriculture to help the UK’s agri-food sector develop advanced technologies that will increase productivity and sustainability in UK agriculture. The Centre of Agricultural Informatics and Metrics of Sustainability\(^13\) (Agrimetrics) received £12 million in government support and aims to be the most reliable and innovative evidence base for the sustainable agri-food system, using data science and modelling to develop tools and information based solutions to drive innovation in farming. The Centre for Crop Health and Protection\(^14\) (CHAP) was awarded £21.3 million in government investment to revolutionise how farmers manage crop threats including pests and disease, both in the UK and overseas.
Access to the best and most up-to-date advice is essential for the future viability of any farm and croft. To provide this, Scotland’s new £20 million integrated Farm Advisory Service (FAS) was launched in September 2016 and will run until the end of December 2020.

The FAS is being delivered by SAC Consulting, part of SRUC, and Ricardo Energy & Environment. It will provide a faster and less complicated entry point for farmers and crofters to a range of relevant practical advice, information and tools from business efficiency and viability to compliance and climate change advice. A FAS website (www.fas.scot) has been established and is supported by a dedicated telephone advice line (0300 323 0161).

At the heart of the website is a calendar of events that will detail all of the workshops, network farm meetings, conferences and training courses that will be planned and delivered as part of the FAS. The advice line operates Monday to Friday, between 9 am and 5 pm. It covers a wide variety of topics including cross compliance, water framework directive requirements, climate change and many other technical issues.

The website hosts the entry point for grant applications for Integrated Land Management Plans (ILMP); Specialist Advice; Mentoring for New Entrants; and Carbon Audits. Application forms can be downloaded from the website which provide access to up to £2,200 grant assistance for ILMP and £500 for carbon audits. The new Crofter & Small Farm Advisory Service also provides discounted subscription and consultancy services for crofters and small farming businesses (under 30 ha) across Scotland.

Changes to agricultural support policies, increases in environmental regulation and ongoing climate change all mean that the need for relevant and accessible advice for all of Scottish agriculture has grown substantially over the last eighteen months. As a result, every active farmer and crofter in Scotland will need to look more closely at what they do and how they do it.

As the FAS approach expands it will address not just business efficiency and viability but also climate change, environment, compliance and greening in an integrated manner through the provision of sustainable and practical advice. The new FAS will enable better coordination of advice and guidance across Scotland and ensure that a wider range of relevant and applied advisory material is made more accessible.

Scotland’s Farm Advisory Service is part of the Scottish Rural Development Programme (SRDP) which is co-funded by the EU and Scottish Government.
Section Endnotes

1 http://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubAbstract/AbstractPub

2 http://www.hutton.ac.uk/learning/exploringscotland/soils-and-sustainability/land-capability-for-agriculture

3 Support for Less Favoured Areas has been in place since 1975 in the EU and is designed to help maintain the countryside in areas where farming activity is more difficult because of natural handicaps and is at risk of abandonment (that may have negative impacts on biodiversity, landscape, etc.) due to the handicaps to farming.

4 Named after the then European Commissioner for Agriculture, Ray MacSharry.

5 http://www.gov.scot/Topics/farmingrural/SRDP


7 http://www.gov.scot/Topics/farmingrural/Agriculture/grants/Schemes/Crosscompliance/article/06096976

8 https://www.ruralpayments.org/publicsite/futures/topics/inspections/all-inspections/cross-compliance/detailed-guidance/statutory-management-requirements/


10 For example, see: http://www.bbc.co.uk/news/uk-scotland-north-east-orkney-shetland-37503895

11 The European Parliament was involved as a decision maker for the first time under these CAP reforms.

12 http://ec.europa.eu/agriculture/cap-post-2013/


14 https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/basic-payment-scheme/basic-payment-scheme-full-guidance/greening---bps/

15 https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/basic-payment-scheme/greening-guidance/greening---crop-diversification/

16 https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/basic-payment-scheme/greening-guidance/efa-ecological-focus-areas/

17 https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/basic-payment-scheme/greening-guidance/greening---permanent-grassland/

18 https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/scottish-suckler-beef-support-scheme/

19 https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/scottish-upland-sheep-support-scheme/

20 In 2007 it was estimated that only 0.6% of British farmland was sold annually – and there is low turnover in agricultural tenancies. See Study on the Functioning of Land Markets in the EU member states under the Influence of Measures applied under the Common Agricultural Policy. http://ec.europa.eu/agriculture/analysis/external/landmarkets/index_en.htm)


22 Farm Business Income represents the return to all unpaid income and capital invested in the farm business, including land, buildings and machinery. See: http://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/Publications/FBI
SRUC have recently appointed a PhD candidate to examine aspects of farmer income and wealth.


See https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/new-entrants/young-farmers-and-new-entrants-start-up-grant-schemes/young-farmers-start-up-grant-scheme-full-guidance#49181 for eligibility criteria for young farmers in accordance with EU rules


http://www.gov.scot/Topics/farmingrural/SRDP/RuralPriorities/Packages/NewEntrantsandYoungFa/SettingUpYoungFarmers

See http://www.sruc.ac.uk/download/downloads/id/2394/2015_scottish_agricultural_tenure_evidence_review_-_seasonally_let-in_grazing_land

Farmers must declare the amount of land that they rent in on a seasonal basis on their IACS forms. However, it is likely that the figures underestimate the seasonally rented cropping area, with many informal arrangements in place, particularly in the field vegetable and potato sectors.

http://www.gov.scot/Publications/2016/04/2814/0

For example see: https://www.fginsight.com/news/lochhead-issues-warning-to-landowners-on-seasonal-let-cap-payment-grab-3130

To be appointed under the Land Reform (Scotland) Act 2016 – see http://www.gov.scot/Topics/farmingrural/Agriculture/agricultural-holdings/Tenant-Farming-Adviser

http://www.hutton.ac.uk/news/%C2%A313-million-new-research-could-mean-sweeter-deal-scottish-berry-producers


http://www.arbuckles.co.uk/honeyberry-gin

http://www.britishsummerfruits.co.uk/html/news_polytunnels.htm
47  http://www.britishsummerfruits.co.uk/


49  https://www.sasa.gov.uk/seed-ware-potatoes/classification-scheme


52  https://www.sasa.gov.uk/publications?keys=&tid=326


54  Areas in grey cannot be shown due to non-disclosure requirements set out by the Scottish Government.

55  See http://www.qmscotland.co.uk/sites/default/files/qm2783_cattle_sheep_enterprises_aw_1115_issuu.pdf for the 2015 edition


57  Estimated Breeding Values (EBVs) provide a measure of the breeding potential of an animal for a specific trait. They take into account performance data collected on known relatives, the relationships between performance traits (correlations) and the degree to which traits are inherited from one generation to the next (heritabilities).

58  See http://www.sruc.ac.uk/info/120580/smarter_livestock_farming/1338/project_electronic_identification_as_a_tool_for_precision_livestock_management for some insights into how EID can be better used on sheep farms.

59  http://www.gov.scot/Topics/farmingrural/Agriculture/Livestock/Meat/Sheep/Sheep

60  See endnote lxi

61  Prior to the launch of the Euro in 1999 the European Monetary System was in place and its Exchange Rate Mechanism and unit of account – the European Currency Unit (ECU) was the fore-runner to the Euro. The ‘Green Pound’ was the exchange rate at which European Union’s farm subsidies set in Brussels were converted to sterling.

62  An overview of regional changes in the beef sector are available in SRUC’s Response From the Hills: Business as Usual or a Turning Point. http://www.sruc.ac.uk/info/120484/support_to_agriculture_archive/81/2011_response_from_the_hills

63  http://www.gov.scot/Publications/2016/08/7029

64  It is acknowledged that caution should be taken in reading this data due to changes in data collection approach, particularly for businesses with holdings in more than one location.

65  https://secure.services.defra.gov.uk/wps/portal/ctso

66  http://www.gov.scot/Publications/2015/10/6201/320420


68  http://www.qmscotland.co.uk/cattle-sheep-standards

69  See http://beefandlamb.ahdb.org.uk/markets/industry-reports/uk-statistics/

70  http://www.qmscotland.co.uk/sites/default/files/qm2783_cattle_sheep_enterprises_aw_1115_issuu.pdf

http://www.scotland.gov.uk/Publications/2014/08/2085

https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/beef-efficiency-scheme/

See the new Agrimetrics innovation centre http://www.agrimetrics.co.uk/

https://www.agri-epicentre.com/

http://www.gov.scot/Publications/2015/03/8562


See https://dairy.ahdb.org.uk/market-information/supply-production/milk-production/eu-milk-deliveries/ for data

http://www.fwi.co.uk/business/dairy-farmers-should-forget-about-russia-ban-end.htm


http://www.gov.scot/Publications/2015/03/8562

Scottish farm types are based on standard outputs (e.g. a standard value per dairy cow, or per hectare of wheat). A holding is classed as specialist dairy if two-thirds of their standard output coming from dairy. The very small herds are likely minor holdings with very little activity and a single cow may make up more than two-thirds of its standard output.

https://secure.services.defra.gov.uk/wps/portal/ctso

https://www.gov.uk/guidance/milk-production-reduction-scheme-how-to-apply#how-and-when-to-apply


http://www.gov.scot/Topics/Research/About/EBAR/StrategicResearch

http://www.qmscotland.co.uk/business-improvement-groups-big

http://www.gov.scot/Topics/farmingrural/Rural/business/monitor

https://www.fas.scot/

http://www.gov.scot/Topics/farmingrural/SRDP

Where size is based on standard labour requirements (i.e. labour needs from cropping and stocking) rather than hectares.


http://www.gov.scot/Topics/farmingrural/Agriculture/doingbetter

http://www.gov.scot/Topics/farmingrural/Agriculture/The-Future-of-Scottish-Agriculture


http://www.sruc.ac.uk/info/120167/consultation_responses

http://www.gov.scot/Topics/Research/About/EBAR/StrategicResearch/strategicresearch2016-21
100 https://agritech.blog.gov.uk/2016/02/11/centres-for-agricultural-innovation-launching-in-2016/
and https://agritech.blog.gov.uk/

101 http://www.cielivestock.co.uk/

102 https://www.agri-epicentre.com/

103 http://www.agrimetrics.co.uk/

104 http://www.chap-solutions.co.uk/
Recent policy shifts have placed increasing pressure on all landowners to deliver increased public benefits and involve communities in land use decision-making processes.

Despite the continued dominance of private landownership, some diversification has occurred in recent decades, including ownership by public, NGO and community bodies.

Private estate owners often emphasise long term estate viability and deliver significant local economic impacts, contributing an estimated £127/ha to the economy and over 8000 jobs.

Private owners also provide housing, although the extent of community engagement and emphasis on community development varies widely between estates.

NGO landowners play a key role in conservation and deliver social outcomes through maintaining paths, interpretative/educational initiatives and partnerships with communities.

Conservation NGOs also employ 1355 people and spend £64M annually, including £37M (£181 per/ha) on site management, with site visitors spending over £100M annually.

Community landownership can facilitate the development of a framework for development, in combination with enhanced participatory governance and rebuilding of community capacity and confidence through access to assets. Specific outcomes include increased employment, business development, housing, inward investment and community retention.

All landowners face challenges, including financial pressures, public and political perceptions and expectations, long term uncertainty and conflicts within communities, between landowners or between landowners, communities and wider stakeholders.

Diversification opportunities for addressing challenges include renewable energy, adding value to products, nature-tourism in conjunction with conservation and development of new markets and incentives for key ecosystem services (e.g. carbon).

‘New’ landownership models (e.g. NGO, community) offer considerable potential for enhancing rural resilience. Nevertheless, a pro-active approach by private landowners, incorporating regular structured community engagement and increased community-estate partnership working, also offers potential for enhancing community outcomes.
1.2.1 Background

Scotland has one of the most concentrated patterns of private landownership in the world, with the current dominance of large private estates a legacy of the longevity of feudal tenure. This legacy, combined with the fact that the relationship between the land and the people is recognised as “fundamental to the wellbeing, economic success, environmental sustainability and social justice of the country”, has led to landownership becoming one of the most contentious and politicised topics in Scotland. Scotland’s private estates represent local power bases, which historically have had considerable influence on rural communities and economies.

Private landowners through their control of land have been recognised as the de facto rural planners in many areas. However, despite their potentially central role, private estates have often been criticised for restricting rural development and excluding communities from estate decision-making processes. Land management on sporting estates has also been questioned in relation to environmental impacts. However, the positive role of some private estates has been increasingly highlighted, with long-term family owners and some new (environmentally oriented) landowners in particular, recognised for their contributions to habitat conservation, community resilience and economic development.

While private landownership continues to dominate rural Scotland in terms of land area, a gradual diversification of land ownership and management patterns has occurred, driven in the first half of the 20th Century by state acquisitions of land and from the 1970s and 80s onwards through acquisitions by conservation NGOs and community bodies. Although these alternative landownership models have made only limited impact upon wider landownership patterns, they are expected to continue to expand over time.

Landowners of all kinds have a variety of aims and deliver a range of different public and private benefits. Generalising about landownership ‘types’ is therefore difficult; however, approximate comparisons are useful in broadly assessing the differing outcomes, opportunities and challenges associated with different ownership models. Community landownership has been much lauded in Scotland as a successful model of asset-based community development and NGO landowners are often viewed as representing exemplary models of conservation management. Nevertheless, comparative assessments of the socio-economic and environmental impacts of different models are limited. This chapter attempts to compare and contrast key models of large-scale rural landownership in Scotland, with a specific focus on private estates, community trusts and conservation NGOs. Public landownership is quantified; however, the main focus is on these three models, due to their specific relevance to land reform and the availability of relevant up to date information in each case. Following an overview of the policy context, the extent, current trends and drivers of different landownership models are reviewed. This is followed by an assessment of the socio-economic and environmental outcomes from different models based on findings from key sources referred to at the beginning of each sub-section. The chapter finishes with a discussion of key challenges, opportunities and solutions for different landownership models in relation to delivering on key Scottish Government policy objectives.
1.2.2 Landownership Policy Context

All Scottish landowners are affected by a broad range of policy frameworks and instruments (e.g. subsidies, taxes, regulation), some of which are determined at European level, some at UK level and some within Scotland. One area which has had a considerable impact is the European Common Agricultural Policy (CAP). Reform of the CAP since 2000 resulted in a move away from direct support for production, in favour of an area-based approach and greater support for rural development objectives, including agricultural modernisation, agri-environmental improvements and community development. Together with increased regulatory constraints (e.g. through the Water Framework Directive), this has placed increasing pressure on landowners to respond to shifting societal demands for non-market goods and services as well as become more market-orientated in terms of commodity production. Financial pressures and regulatory burdens have increased for landowners over time, with further change anticipated. Nevertheless, currently demand for farmland and estates remains high, and values are at record levels, reflecting both a desire amongst existing farmers to expand and external interests seeking tax-efficient and/or lifestyle investments (e.g. sporting estates). Promotion of renewable energy has introduced a further dimension to rural landownership, with onshore windfarms and hydroelectric schemes in particular representing opportunities for some owners.

Contemporary land reform policy

The Land Reform Policy Group (LRPG) was established by the Scottish Office in 1997 "to identify and assess proposals for land reform in rural Scotland". A year later the LRPG concluded that the existing system of landownership in Scotland was inhibiting development in rural communities and causing degradation of the natural heritage as a result of poor land management. This led to the adoption of the main objective of Scottish land reform policy: "to remove the land-based barriers to the sustainable development of rural communities" that could "only" be achieved through: i) increasing diversity in land ownership – between private, public, partnership, not-for-profit and community sectors; and ii) increasing community involvement in local decision-making about how land is owned and managed. The first key step in the contemporary land reform process was the Abolition of Feudal Tenure etc. (Scotland) Act 2000 which removed the centuries-old system of feudal tenure.

Linked to this wider political momentum, the community land movement emerged, with a number of community ‘buyouts’ occurring in the late 1990s. The establishment of the Community Land Unit (CLU) in 1998 and the Scottish Land Fund in 2001 (to support community land purchases) signalled increasing support for community landownership. The Land Reform (Scotland) Act (2003) further legitimised buyouts through introducing the ‘community (pre-emptive) right to buy’ (Part 2) granting communities first right of purchase where properties are put on the market, and the crofting community (absolute) right to buy (Part 3), which empowers crofting communities with the right to pre-emptive purchase; as well as statutory non-motorised rights of responsible access over most land (and inland water) for all (Part 1). Further acquisitions followed and in 2013 the Scottish Government announced their ambition for 1 million acres of land to be in community ownership by 2020.

In March 2016 the Land Reform (Scotland) Act was passed by the Scottish Parliament. The Act represents a landmark achievement for the land reform agenda and includes a broad suite of measures designed to respond to the recommendations of the Land Reform Review Group established by the Scottish Government in 2012. As well as provisions related to tenanted agricultural holdings, the Act includes provision for development of a Scottish Land Commission and the development of regulations on access to, and provision of, information about owners and controllers of land. These measures reflect an emphasis on increasing transparency around landownership and the placing of greater responsibility on landowners to manage their land sustainably.
Building on the 2003 Act, the 2016 Act should impact further on ownership change, particularly in relation to specific provisions for tenants to buy land from their landlords where the landlord is in breach of a court order, and measures providing a right of acquisition of land by communities where sustainable development is being inhibited. The Act also incorporates provisions on engaging communities in land use decision-making and specific provisions to reinstate non-domestic rates for sporting land uses and develop further measures relating to deer management and access rights. The act is wide ranging and is likely to impact on landowners, tenants and wider society further over time, as supplementary legislation emerges.

Wider Policy Measures

A growing emphasis on community engagement and empowerment in land management decision-making is further enshrined in the Community Empowerment (Scotland) Act 2015 and Scotland’s (revised) Land Use Strategy. The Community Empowerment Act provides a strategic framework for ‘empowering community bodies through the ownership of land and buildings and strengthening their voices in the decisions that matter to them’. The Act also introduced an absolute community right to buy land if the land is abandoned or neglected.

The Scottish Government’s Land Use Strategy (LUS) has as its vision: “A Scotland where we fully recognise, understand and value the importance of our land resources, and where our plans and decisions about land use deliver improved and enduring benefits, enhancing the wellbeing of our nation”. The LUS contains specific objectives to better connect urban and rural communities with the land and to ‘Identify and publicise effective ways for communities to contribute to land use debates and decision-making.’

Collectively, these measures (including Land Reform) have placed increasing pressure on landowners (of all kinds) to deliver a wider range of public benefits, to ensure their land is effectively and efficiently managed and to involve and empower communities with respect to land use decision-making processes. Landownership is therefore under increasing scrutiny and land reform is likely to remain firmly on the political agenda for the foreseeable future.

1.2.3 Current Landownership Models – Extent, Drivers and Trends

Public landownership

Public landownership accounts for some 11% of rural Scotland (914,000 ha), with this group including the Crown Estate, the Scottish Government and Scotland’s 32 Local Authorities. The Scottish Government and various non-departmental public bodies (NDPBs) own and manage land to deliver on a range of different aspects of government policy (Table 1). The largest component of public land is the national forest estate, established through government acquisitions of land following the establishment of the UK Forestry Commission in 1919 (and subsequently transferred to Scottish Ministers following devolution). These acquisitions constitute the single biggest change to the balance of landownership in Scotland over the last 100 years. Nevertheless, relative to many countries public landownership represents a comparatively small proportion of Scotland.

Crown Estate holdings are managed by the Crown Estate Commission (CEC) under the Crown Estate Act (1961), with Crown property in Scotland belonging to Scotland. Crown Estate holdings in Scotland represent a relatively small component (35,500ha across four rural estates) of rural land, although significantly the Crown Estate also holds the rights to Scotland’s territorial seabed and half of Scotland’s foreshore. Crown Estate property is managed with the aim of returning revenue to the UK Government. The Scotland Act (2016) includes specific measures relating to the transfer of CEC rights and revenues in Scotland to the Scottish Parliament, with a Scottish Government consultation undertaken in 2016 to help shape interim arrangements for the devolved management of CEC holdings in Scotland. Local Authorities in Scotland hold a wide range of landholdings (in rural and urban Scotland) managed for a variety of purposes, accounting for an estimated 33,000ha (Table 1).
Table 1: Public landownership in Scotland and area of land managed by different public bodies\textsuperscript{23}

<table>
<thead>
<tr>
<th>Public body</th>
<th>Resource (Hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crown Estate</td>
<td>35,500</td>
</tr>
<tr>
<td>National Forest Estate</td>
<td>651,300</td>
</tr>
<tr>
<td>Crofting Estates</td>
<td>95,200</td>
</tr>
<tr>
<td>Scottish Natural Heritage</td>
<td>35,700</td>
</tr>
<tr>
<td>Scottish Water</td>
<td>24,300</td>
</tr>
<tr>
<td>Highlands &amp; Islands Enterprise</td>
<td>4,000</td>
</tr>
<tr>
<td>Estimated Other</td>
<td>10,000</td>
</tr>
<tr>
<td>Local Government</td>
<td>33,000 (estimate)</td>
</tr>
<tr>
<td>UK Ministry of Defence</td>
<td>25,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>914,000 (889,000 excl. MOD)</td>
</tr>
</tbody>
</table>

Conservation NGOs

From the 1980s onwards increasing societal environmental awareness and a growing willingness to contribute financially towards conservation began to translate into a substantial increase in the memberships of conservation NGOs in the UK, giving these organisations greater political weight\textsuperscript{24}. As their resources increased, a number of NGOS purchased or otherwise acquired sites across Scotland\textsuperscript{25}. This included the acquisition of eight properties by the John Muir Trust (JMT) since 1983 and the purchase by NTS of the 29,380ha Mar Lodge Estate in 1995. The Scottish Wildlife Trust (SWT), Woodland Trust Scotland (WTS) and RSPB also expanded their landholdings considerably during this period, with the RSPB increasing their landholdings by over 30% since 2000 alone\textsuperscript{26}. Commonly, land acquisitions by these organisations have occurred with the aim of permanently protecting high value natural heritage and landscape features and/or in direct response to perceived threats from inappropriate development\textsuperscript{27}. Conservation ownership provides a degree of continuity and creates opportunities for practical demonstration and implementation of innovative approaches to land use and management to influence wider land management practices\textsuperscript{28}.

Table 2: Land owned and/or managed by conservation organisations\textsuperscript{29}

<table>
<thead>
<tr>
<th>Organisation and year established</th>
<th>No. of sites</th>
<th>Owned land (ha)</th>
<th>Land under agreement (ha)</th>
<th>Total area (ha)</th>
<th>% of NGO-owned land</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Trust for Scotland (1931)</td>
<td>128\textsuperscript{a}</td>
<td>77,206</td>
<td>3.40</td>
<td>77,209</td>
<td>37%</td>
</tr>
<tr>
<td>Royal Society for Protection of Birds  (1889)</td>
<td>74</td>
<td>53,389</td>
<td>17,725</td>
<td>71,114</td>
<td>34%</td>
</tr>
<tr>
<td>John Muir Trust (1983)</td>
<td>9</td>
<td>24,461</td>
<td>-</td>
<td>24,461</td>
<td>12%</td>
</tr>
<tr>
<td>Scottish Wildlife Trust (1964)</td>
<td>121</td>
<td>12,125</td>
<td>7,698</td>
<td>19,823</td>
<td>10%</td>
</tr>
<tr>
<td>Woodland Trust Scotland (1984)</td>
<td>57</td>
<td>8,643</td>
<td>-</td>
<td>8,643</td>
<td>4%</td>
</tr>
<tr>
<td>Borders Forest Trust (1996)</td>
<td>5</td>
<td>1,324</td>
<td>-</td>
<td>1,324</td>
<td>0.6%</td>
</tr>
<tr>
<td>Plantlife (1989)</td>
<td>1</td>
<td>1,261</td>
<td>-</td>
<td>1,261</td>
<td>0.6%</td>
</tr>
<tr>
<td>Trees for Life (1989)</td>
<td>1</td>
<td>4,028</td>
<td>-</td>
<td>4,028</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>396</td>
<td>182,438</td>
<td>25,426</td>
<td>207,865</td>
<td>100%</td>
</tr>
</tbody>
</table>

\textsuperscript{a}‘Land under agreement’ includes land leased to the organisation and/or land managed by agreement.

\textsuperscript{b}This figure includes NTS ‘built and countryside properties’.
Land currently owned and managed by conservation NGOs accounts for over 180,000 hectares (Table 2). Land under conservation NGO ownership in Scotland is generally managed with habitat and ecosystem restoration and the enhancement of public access and recreational opportunities as key objectives. NGO owned land includes a wide range of iconic landscapes, such as the mountains of Glencoe (NTS), Ben Nevis (JMT) and the Central Cairngorms (NTS), high value semi-natural habitats, such as the Caledonian pine woodlands of Abernethy (RSPB) and sites of considerable cultural significance, such as the NTS-owned islands of Iona and St Kilda. NGOs continue to acquire land in Scotland, through direct purchase, gifts, legacies or other means; however, a general decline in the number of acquisitions is evident in recent years.

**Community landownership**

Ownership of land by communities has become an established model of landownership in Scotland over the last 20 years. The foundations of the current Scottish community land movement were laid by the crofting community and particularly influenced by the purchase of the 21,300 ha North Lochinver Estate by the Assynt Crofters Trust in 1993, which was followed by a number of smaller-scale buyouts by crofting collectives and community buyouts on the Isle of Eigg (1997) and in Knoydart (1999), both of which occurred as a response to perceived irresponsible private landownership. Inspired by these pioneers and the passage of the Land Reform Act (2003), further buyouts followed, including Gigha (2001), North Harris (2003) and South Uist (2006).

The emergence of community buyouts is often linked to community insecurity and feelings of disempowerment. Acquiring the land and with it the development rights, is viewed as a mechanism to facilitate employment creation, reverse out-migration, build community capacity and stimulate inward investment. Specific drivers and contextual factors for buyouts vary, although the aims of community buyouts generally centre on long term socio-economic development and sustainable resource management.

Currently some 196,415 ha of Scotland is community owned, ranging from large estates to smaller assets, including community owned shops, industrial units and lighthouses. This represents less than 3% of rural Scotland, with the majority held by 19 rural estates. While some buyouts have occurred directly under the provisions of the Land Reform Act (2003), many have occurred without utilising the Act’s provisions and in fact some loss of momentum in buyouts was apparent post-2003. Momentum has increased in recent years, due to the re-establishment of the Scottish Land Fund in 2012.

**Private landownership**

Landownership in Scotland continues to be dominated by private owners who own some 83% of Scotland, with just over 400 owners (0.008% of the population) estimated to account for 50% of privately-owned land, resulting in a pattern of private ownership more concentrated than in any other country. The degree of concentration of landownership increased from the 17th Century, due to feudal tenure and increased interest in sporting estate ownership, with some reduction in private ownership from the 1920s onwards due to farm sales and increased public landownership. Nevertheless, the overall number of private landowners has not increased substantially and some re-concentration has also occurred in recent decades due to re-amalgamation of farm units and some new landowners expanding their holdings. Some changes are apparent in relation to the types of landowners acquiring land, with increasing overseas ownership and ownership by corporate bodies, partly due the attractiveness of Scottish land as an investment. Analysis carried out by SRUC provided an estimate of the size of the sector, with an estimated 1,125 estates covering 4.14 million ha. As 83% of rural land is privately owned these 1,125 owners control some 70% of all privately owned land.

Researchers acquire or retain their land for a range of reasons, including managing a land based rural business, delivering conservation outcomes or engaging in field sports. Drivers vary between owners; however, for most owners ensuring family members inherited a financially sustainable estate was a core motivation. A survey of 84 private estates in 2013 showed that 91% of respondents, regardless of whether they had inherited or purchased their estates, wished to pass the estate to their heir. Research on
motivations of private estate owners in 2010-13 also identified economic factors (and succession planning) as a primary motivator, with revenue focused estates often having a resident landowner and a mixture of land uses. Field sports remain a common motivation for many existing and new owners, with less diversified sporting focused estates often supported by private off-estate income. Environmental considerations were often an important secondary motivation, subject to financial positioning, with conservation management often linked to sporting interests and landscape and asset enhancement, with a number of new conservation focused landowners evident in recent years. Social motivations (i.e. community development) were more apparent where a long-term family link was apparent and a history of the estate playing a role in ‘place shaping’ (Figure 1).

![Diagram of motivations]

**Figure 1: Generalised order of key estate motivations on private estates in Scotland**

**Table 3: Number of national estate survey respondents in different estate categories**

<table>
<thead>
<tr>
<th>Type of Estate</th>
<th>Nos.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed</td>
<td>143</td>
<td>57%</td>
</tr>
<tr>
<td>Agricultural</td>
<td>40</td>
<td>16%</td>
</tr>
<tr>
<td>Forestry</td>
<td>8</td>
<td>3%</td>
</tr>
<tr>
<td>Residential</td>
<td>12</td>
<td>5%</td>
</tr>
<tr>
<td>Commercial</td>
<td>6</td>
<td>2%</td>
</tr>
<tr>
<td>Sporting</td>
<td>26</td>
<td>10%</td>
</tr>
<tr>
<td>Conservation</td>
<td>12</td>
<td>5%</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>2%</td>
</tr>
</tbody>
</table>

Based on the 2013 survey of estates in Scotland (with a respondent sample of 263 estates), private estates can be characterised according to a number of key factors:

- Estate ownership exhibits a high degree of continuity; on average estates have been in the same ownership for 122 years, 35% for over 100 years and 5% for over 500 years.
- The majority (143) self-categorised themselves as ‘traditional mixed estates’, with 40 self-categorising as ‘agricultural estates’ and 26 as ‘sporting estates’ (Table 3). Many mixed estates also placed considerable emphasis on sporting activities, set within a wider land use mix, including forestry, agriculture, housing provision and tourism.
- In terms of size (Table 4) medium sized estates dominated, with estate sizes remaining relative stable over the last 10 years. The 16 largest estates accounted for 42% of the total represented land area, with larger estates managing less land in-hand than smaller estates.
- A total of 26% of all land covered by the sample estates was under tenanted farms, with most estates generally dominated by low productivity or unproductive land.
Table 4: Number of estate survey respondents and % in different estate size categories

<table>
<thead>
<tr>
<th>Size Category</th>
<th>No.</th>
<th>% Sample</th>
<th>Hectares</th>
<th>% Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Small (&lt;100ha)</td>
<td>27</td>
<td>10%</td>
<td>1,238</td>
<td>0%</td>
</tr>
<tr>
<td>Small (100-1000ha)</td>
<td>88</td>
<td>33%</td>
<td>35,652</td>
<td>3%</td>
</tr>
<tr>
<td>Medium (1000-10,000ha)</td>
<td>112</td>
<td>43%</td>
<td>417,896</td>
<td>33%</td>
</tr>
<tr>
<td>Large (10,000-20,000ha)</td>
<td>20</td>
<td>8%</td>
<td>265,770</td>
<td>21%</td>
</tr>
<tr>
<td>Very Large (20,000ha+)</td>
<td>16</td>
<td>6%</td>
<td>530,956</td>
<td>42%</td>
</tr>
<tr>
<td>Total</td>
<td>263</td>
<td></td>
<td>1,251,512</td>
<td></td>
</tr>
</tbody>
</table>

1.2.4 Outcomes from key landownership models Scotland

Private Estates

Unless otherwise stated the findings in this section are based on two landowner surveys carried out in 2013; the Cairngorms Landowner Survey\(^42\) and National Landowner Survey\(^43\). The national survey received 277 responses from landowners that collectively manage 1.25M hectares of land.

Economic Outcomes

Private estates have a number of economic impacts, including job creation, direct spend in the local economy and indirect economic impacts. Estates generate direct income from a variety of sources (Figure 2), with agricultural income accounting for the highest proportion (34.9%), followed by residential accommodation (12.6%), agricultural tenancies (9.3%), forestry (7.9), sporting land uses (7.7%), heritage (5.2%) and tourism accommodation (4.3%). Income from public support payments and grants is an important component for some sectors, accounting for 28% of agricultural income and 80% of conservation income. Total direct income across the national survey sample amounted to nearly £162M or an average per/ha income of £129 (Table 5). Per/ha income varies by size, with smaller landholdings generating much higher per/ha incomes, partly due to smaller landholdings often occurring in areas with more productive land (Table 5).
Table 5: Direct income (£) generated by activities on (263) private estates shown by size groupings

<table>
<thead>
<tr>
<th>Business Sector</th>
<th>Very Small</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
<th>Very Large</th>
<th>Total</th>
<th>Sectoral importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>636,201</td>
<td>15,677,545</td>
<td>18,137,009</td>
<td>13,185,323</td>
<td>8,864,906</td>
<td>56,500,985</td>
<td>34.9%</td>
</tr>
<tr>
<td>Residential Accommodation</td>
<td>195,160</td>
<td>2,737,114</td>
<td>7,774,572</td>
<td>5,203,996</td>
<td>4,474,412</td>
<td>20,385,254</td>
<td>12.6%</td>
</tr>
<tr>
<td>Ag Tenancy</td>
<td>51,355</td>
<td>845,795</td>
<td>5,079,590</td>
<td>4,624,435</td>
<td>4,409,397</td>
<td>15,010,572</td>
<td>9.3%</td>
</tr>
<tr>
<td>Forestry</td>
<td>76,000</td>
<td>1,060,323</td>
<td>4,987,454</td>
<td>2,709,178</td>
<td>3,989,841</td>
<td>12,822,795</td>
<td>7.9%</td>
</tr>
<tr>
<td>Sporting</td>
<td>4,275</td>
<td>899,172</td>
<td>4,843,719</td>
<td>1,813,465</td>
<td>4,859,985</td>
<td>12,420,616</td>
<td>7.7%</td>
</tr>
<tr>
<td>Heritage</td>
<td>3,237,300</td>
<td>1,354,868</td>
<td>980,500</td>
<td>2,780,920</td>
<td></td>
<td>8,353,588</td>
<td>5.2%</td>
</tr>
<tr>
<td>Tourism Accommodation</td>
<td>64,488</td>
<td>731,120</td>
<td>2,163,255</td>
<td>921,500</td>
<td>3,115,291</td>
<td>6,995,654</td>
<td>4.3%</td>
</tr>
<tr>
<td>Renewables</td>
<td>84,500</td>
<td>649,550</td>
<td>2,381,972</td>
<td>1,373,477</td>
<td>857,000</td>
<td>5,346,499</td>
<td>3.3%</td>
</tr>
<tr>
<td>Business</td>
<td>75,900</td>
<td>964,810</td>
<td>2,431,618</td>
<td>1,038,574</td>
<td>669,520</td>
<td>5,180,422</td>
<td>3.2%</td>
</tr>
<tr>
<td>Retail</td>
<td>-</td>
<td>92,000</td>
<td>1,311,410</td>
<td>827,000</td>
<td>2,551,000</td>
<td>4,781,410</td>
<td>3.0%</td>
</tr>
<tr>
<td>Minerals &amp; Quarrying</td>
<td>-</td>
<td>653,000</td>
<td>678,686</td>
<td>1,269,269</td>
<td>718,550</td>
<td>3,319,505</td>
<td>2.0%</td>
</tr>
<tr>
<td>Conservation</td>
<td>471,468</td>
<td>833,895</td>
<td>524,199</td>
<td>994,900</td>
<td></td>
<td>2,824,462</td>
<td>1.7%</td>
</tr>
<tr>
<td>Food &amp; Beverage</td>
<td>-</td>
<td>746,000</td>
<td>611,000</td>
<td>340,500</td>
<td>352,000</td>
<td>2,049,500</td>
<td>1.3%</td>
</tr>
<tr>
<td>Sports &amp; Recreation</td>
<td>155,180</td>
<td>705,815</td>
<td>162,384</td>
<td>693,950</td>
<td></td>
<td>1,717,329</td>
<td>1.1%</td>
</tr>
<tr>
<td>Other Activities*</td>
<td>656,590</td>
<td>1,940,336</td>
<td>585,000</td>
<td>871,391</td>
<td></td>
<td>4,268,827</td>
<td>2.7%</td>
</tr>
<tr>
<td>Total £</td>
<td>1,282,879</td>
<td>29,487,967</td>
<td>55,538,199</td>
<td>35,331,300</td>
<td>40,337,073</td>
<td>161,977,418</td>
<td></td>
</tr>
<tr>
<td>Total £ per hectare</td>
<td>1,036</td>
<td>827</td>
<td>133</td>
<td>133</td>
<td>76</td>
<td>129</td>
<td></td>
</tr>
</tbody>
</table>

*Income sources in the ‘other’ category include fish farms, professional services, manufacturing, added value and horticulture.

Direct expenditure on estates in the national survey sample was recorded by sector and separated into four broad categories (inputs, investment, marketing and staff costs). Agriculture represented the most substantial area of spend (£42M), with just under £17M spent on both accommodation and sporting, followed by heritage, forestry and agricultural tenancies (Table 6). Traditional land uses (agriculture, sporting, forestry) required the highest spending on inputs, with accommodation requiring the greatest investment (nearly £12M) and the highest staffing costs occurring in agriculture (£12.5M), heritage (£9.9M) and sporting (£7.4M). Direct expenditure across all sectors (including staffing) totalled over £145M, the majority of which occurred in the local area. Specific sectoral impacts vary regionally, with agricultural productivity higher in the East and South-East and sporting activities, such as grouse shooting, more dominant in specific areas (see Case Study 1). Estate owners were generally confident that income and spend would be maintained, with the majority indicating investment levels would remain similar or increase in the future.
Employment on estates in the national survey accounted for 1,965 FTE jobs, with the largest number (522) in tourism, followed by administration (394) and sporting land uses (366) (Figure 3). The use of Scottish Government employment multipliers estimated that this direct estate employment maintains an additional 1,147 FTE jobs in the wider economy.

Direct estate expenditure also has indirect economic impacts (Figure 3). Using multipliers the direct expenditure (excluding staffing costs) by estates in the national survey sample was estimated to contribute an additional £79M to the Scottish economy through supply chain induced effects, giving a total economic impact of (non-staff) spending by estates in the national survey sample of £171M. Additionally, the £54.8M million direct expenditure on staffing by the survey sample estates was estimated to have contributed an additional £89.9M to the Scottish economy. Similarly to estate income, per/ha expenditure impacts were higher on smaller landholdings, with very large estates generating an impact of £37 per/ha, relative to £806 and £369 per/ha on very small and small landholdings.
Table 6: Direct expenditure (£) by sector and spending category on private estates (263 estates)

<table>
<thead>
<tr>
<th>Business Sector</th>
<th>Inputs</th>
<th>Investment and Repairs</th>
<th>Sales and Marketing</th>
<th>Staff Costs</th>
<th>Total Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>22,231,328</td>
<td>6,642,259</td>
<td>1,120,076</td>
<td>12,547,346</td>
<td>42,541,009</td>
</tr>
<tr>
<td>Residential Accm</td>
<td>994,270</td>
<td>11,700,232</td>
<td>218,561</td>
<td>4,053,379</td>
<td>16,966,442</td>
</tr>
<tr>
<td>Sporting</td>
<td>6,201,822</td>
<td>2,954,003</td>
<td>298,153</td>
<td>7,429,426</td>
<td>16,883,404</td>
</tr>
<tr>
<td>Heritage</td>
<td>3,083,211</td>
<td>694,779</td>
<td>9,872,469</td>
<td></td>
<td>13,650,459</td>
</tr>
<tr>
<td>Forestry</td>
<td>4,995,358</td>
<td>2,159,649</td>
<td>177,064</td>
<td>3,547,956</td>
<td>10,880,027</td>
</tr>
<tr>
<td>Ag Tenancy</td>
<td>6,675,619</td>
<td></td>
<td></td>
<td>3,552,440</td>
<td>10,228,059</td>
</tr>
<tr>
<td>Other activities</td>
<td>3,388,589</td>
<td>4,474,472</td>
<td></td>
<td>170,921</td>
<td>8,033,982</td>
</tr>
<tr>
<td>Renewables</td>
<td>4,976,636</td>
<td></td>
<td></td>
<td>2,637,196</td>
<td>7,613,832</td>
</tr>
<tr>
<td>Tourism Ac</td>
<td>1,916,933</td>
<td>421,055</td>
<td></td>
<td>3,697,522</td>
<td>6,035,510</td>
</tr>
<tr>
<td>Sports &amp; Recre</td>
<td>903,375</td>
<td>714,660</td>
<td></td>
<td>3,966,381</td>
<td>5,584,416</td>
</tr>
<tr>
<td>Conservation</td>
<td>2,068,951</td>
<td>504,500</td>
<td></td>
<td>1,635,473</td>
<td>4,208,924</td>
</tr>
<tr>
<td>Business</td>
<td>814,123</td>
<td>802,224</td>
<td></td>
<td>1,645,440</td>
<td>3,261,787</td>
</tr>
<tr>
<td>Totals</td>
<td><strong>39,880,318</strong></td>
<td><strong>46,805,012</strong></td>
<td><strong>4,446,572</strong></td>
<td><strong>54,755,949</strong></td>
<td><strong>145,887,851</strong></td>
</tr>
</tbody>
</table>

Scaling the financial sample results to the landowning membership of Scottish Land and Estates (SLE, a large proportion of the total population of estates in Scotland) estimated combined direct and indirect (non-staff) estate expenditure contributed £290M (£127/ha) to the Scottish economy. Additionally, SLE members spent a further £99.7M directly on staff, which was estimated as contributed £248M (£109/ha) to the Scottish economy. Aggregating employment figures estimated that 5,232 FTE jobs are directly reliant on the landowning membership of SLE. Once indirect and induced impacts were accounted for it was estimated that 8,114 FTE jobs across the Scottish economy were dependent on the land area of the SLE membership.
Figure 3: Direct and indirect expenditure impacts on a sample of Scottish private estates
This case study presents findings from a study of community perceptions and economic impacts of grouse shooting, based on a community survey (266 respondents), estates survey (26 estates covering 116,000 ha) and interviews, in the Monadhliath and the Angus Glens in 2014-2015.

A majority of community survey respondents (70% in Angus and 53% in the Monadhliath) perceived community-level benefits from grouse shooting, with employment and estate spending the most commonly identified benefits. This is reflected in the estates survey, with 186 (FTE) jobs provided on estates (130 in Angus and 56 in the Monadhliath), some 60% of which relate to sporting activities. Due to lower numbers of estates and less commercial activity, sporting revenues and expenditure were lower in the Monadhliath (Table 7). Expenditure was higher than revenue in both areas; sporting activities ran at a net cost in 2014 of £3.4M in Angus and £1.2M in the Monadhliath. Considerable investment on grouse moors was evident in both areas (Figure 4). Wider economic impacts included use of accommodation and local businesses, particularly in Angus.

Table 7: Sporting expenditure figures for estates in both areas and extrapolated per/ha spend

<table>
<thead>
<tr>
<th></th>
<th>Angus</th>
<th>Monadhliath</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sporting costs (and no. of estates providing data)</td>
<td>£6M (12)</td>
<td>£1.7M (8)</td>
<td>£7.8M (20)</td>
</tr>
<tr>
<td>Costs per/ha of grouse moor</td>
<td>£108.87</td>
<td>£61.13</td>
<td>£92.56</td>
</tr>
</tbody>
</table>

Figure 4: Total annual expenditure on sporting activities on respondent estates in both study areas for 2010-2014 divided by staff, inputs and investment costs
Community engagement

More respondents in Angus were satisfied (48%) with the level of communication between estates and communities than unsatisfied (20%), with opinion more divided in the Monadhliath (31% satisfied, 35% unsatisfied). A degree of perceived ‘disconnect’, between estates and communities was evident in both areas. A majority of community respondents (74%) were supportive of the continuation or expansion of grouse shooting in Angus, with a smaller supportive majority (52%) in the Monadhliath, with a minority (5% in Angus, 16% in the Monadhliath) unsupportive. Lower support reflects lower socio-economic benefits and differing community demographics.

Grouse shooting and the environment

The majority of community respondents in both areas viewed grouse moors as attractive or extremely attractive (75% in Angus and 60% in the Monadhliath). Perceptions of environmental damage from grouse moor management varied, with a higher proportion perceiving environmental damage (30%) in the Monadhliath than in Angus (13%).

Key points

• Grouse shooting and moorland management can have significant local socio-economic impacts in areas with concentrated activity and limited alternative economic activity.
• Opportunities for enhancing community involvement and engagement exist, including i) engagement with local schools; ii) estate ‘demonstration days’; iii) estate engagement with community councils; and iv) recruitment of seasonal staff from local communities.

Social Outcomes

Private estates also generate community-level impacts, particularly through the provision of housing, access and interpretation, community facilities and contributing to community context. Within the national estates survey sample residential property and letting occurred on 235 Estates, with estates maintaining 7645 houses. Residential properties represented the largest sector of investment spending, with expenditure on housing surpassing income on larger estates. Estates in the Cairngorms National Park provided 15% of total housing stock in the park, with estates also playing a role in relation to facilitating new housing through plot sales.

The Cairngorms landowner survey identified a number of activities on estates in the park relating to community outcomes, including:

• Access and interpretation initiatives, including path development and restoration (22), car parks development (19), heritage interpretation (15) and ranger staff (11);
• Estates (16) owned or ran community facilities and provided land for community events (23);
• Estates (37) regularly communicated with the local community, although wide variability occurred in terms of the emphasis on engagement, which often involved ‘ad-hoc’ communication, with 21 attending community council meetings.

Community-landholding partnerships were evident on estates in the national and CNP survey, but were limited. Twelve estates in the national sample reported that they had supported community energy projects and 39 that their energy installations provided community benefits. Community development was not always an explicit objective although landowners recognized their role in maintaining the context for tourism and land-based employment. Direct formal community engagement occurred (see Case Study 2), but was more common on larger estates. Research on family owned private estates at SRUC identified wide variability in the extent to which private estates become involved in community development, while recognising how pro-active, resident, family estates can contribute to the on-going vibrancy of rural communities on or near the estate, through employment and services provision and by developing shared local plans.
Case Study 2: Finzean – Community development and engagement on a private estate

The 4000 hectare Finzean Estate in Royal Deeside has been owned by the resident Farquharson family since 1580. The estate is managed by a family partnership with the aim of maintaining a diversified, financially viable business for future generations. Land management includes in-hand and tenanted farming, grouse shooting and deer stalking, salmon fishing and woodland management. Finzean has a long history of linking estate activities to community development. This builds on a cohesive local community. Key community-oriented practices, resulting community outcomes and lessons learned by the estate include:

- Release of land/assets for community use where a need emerges and this reflects estate aims. This has included: i) transfer of Finzean hall to Finzean Community Association; ii) release of land to the football club, for community and charitable events; iii) donation of land to extend Finzean Church; iv) donation of land for a graveyard, developed by local volunteers.

- An emphasis since the 1970s of supporting housing development and selling off housing plots at reduced cost to locally born young people. This has resulted in nearly 30 homes being facilitated (with further housing planned), which contributed to increasing the school roll, from twenty in the 1970s to sixty currently. Additionally the first rural sheltered housing scheme (9 cottages) in the North east was established on Finzean in 1983.

- Development of a farm shop in 2006, which acts as a community hub and outlet for game and beef from the estate and products from other local producers. The establishment of the shop included a survey to incorporate community input. The shop employs 24 (18 part-time), with 8 employed elsewhere on the estate and 14 jobs on tenant farms and leased businesses.

- Finzean, together with other estates, supported the formation of BCT in 1998 for the benefit of the inhabitants of the old Parish of Birse, through the transfer of land rights of forested areas, two water mills and land surrounding a war memorial to the community.

- Community woodlands facilitated by the estate include: i) a School Wood developed in partnership with the Royal Scottish Forestry Society in 1973 (recently extended); and ii) a community woodland walk around in 1993, leased to Birse Community Trust (BCT).

- In partnership with BCT, the estate developed a pathway linking the school to the village to enable children to walk or cycle to school in safety off the public road.

- Liaising with key local groups including Finzean Community Council, Community Association and Birse Community Trust and an emphasis on encouraging public access (including opening Finzean House to the public), which results in a wide range of sporting, community and charitable events.
Lessons learned

- Regular and formal estate-community communication is key to fostering shared aims.
- The community represents the strongest asset of the estate and estate-community working increases community and estate viability.
- Provision of housing is key to addressing out-migration and building a resilient community.
- Community ‘hubs’ are important for building community spirit and fostering development.
- Well designed path networks are important for spatial community-estate integration.

Environmental Outcomes

Private estates in the national survey sample indicated that conservation management occurred on over 260,000 hectares of their land, with the largest areas relating to moorland, peatland, and native woodland. Of the estates that carried out forestry management, over 40% indicated that habitat management and creation was of high importance. The majority of estates expressed an interest in increasing conservation activities on their land. The CNP landowner sample provided detail on specific measures occurring on CNP landholdings (number of estates in brackets) including:

- Control of invasive species (22), protecting native species (21), and expansion/restoration of native woods (34), wetlands (14), riparian woods (19), montane scrub (12) and peatlands (7).
- Almost all landholdings manage deer, including for sporting objectives, habitat management, and protection of trees and crops with most represented on Deer Management Groups.
- Access and interpretation, including path restoration (22), new paths (12) and car parks development (19), heritage interpretation (15) and employing rangers (11).

While landowner interest in renewable energy often relates to income potential, renewable energy developments also indicate progress towards Scottish Government climate change targets. Within the national estates sample renewable energy developments had occurred on 106 Estates. These Estates have invested in 123 installations operated for their own use or as an Estate business and host 30 installations for third party renewables businesses on which they collect rent.

NGO Landownership Outcomes

Unless otherwise stated, the findings in this section are based on a 2013 review of NGO landowners. The review was focused on conservation NGOs, which constitute the bulk of charity landownership in Scotland.

Economic Outcomes

Scotland’s landowning conservation NGOs collectively employ 1,355 (FTE) personnel, of which 742 (55%) are employed in posts relating to site management (Table 8). Not all NGO-owned sites have on-site staff and the numbers employed in site management as a proportion of total organisational employment varies considerably (Table 8). Conservation NGOs employ considerable numbers of staff on a per/ha basis (1 FTE per 134 ha), even after removing non site-related employment (as most NGOs have centralised headquarters some employment is outwith rural areas).
Table 8: Number of full-time equivalents (FTEs) employed by conservation NGOs in 2011/2012

<table>
<thead>
<tr>
<th>NGO</th>
<th>Number of sites</th>
<th>FTEs in site management</th>
<th>Total FTEs (in organisation)</th>
<th>% FTEs in site management</th>
</tr>
</thead>
<tbody>
<tr>
<td>JMT</td>
<td>24</td>
<td>7.08</td>
<td>35.3</td>
<td>20%</td>
</tr>
<tr>
<td>NTS</td>
<td>128&lt;sup&gt;i&lt;/sup&gt;</td>
<td>582.77</td>
<td>793</td>
<td>74%</td>
</tr>
<tr>
<td>RSPB</td>
<td>74</td>
<td>113.2</td>
<td>368</td>
<td>30%</td>
</tr>
<tr>
<td>SWT</td>
<td>121</td>
<td>26</td>
<td>112</td>
<td>23%</td>
</tr>
<tr>
<td>WTS</td>
<td>57</td>
<td>7</td>
<td>24</td>
<td>29%</td>
</tr>
<tr>
<td>BFT</td>
<td>1</td>
<td>6</td>
<td>9.63</td>
<td>62%</td>
</tr>
<tr>
<td>TFL</td>
<td>1</td>
<td>Not available</td>
<td>14</td>
<td>Not available</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>406</strong></td>
<td><strong>742.05</strong></td>
<td><strong>1,355.93</strong></td>
<td><strong>54.7%</strong></td>
</tr>
</tbody>
</table>

<sup>i</sup> This figure includes NTS ‘built and countryside properties’

Total expenditure across the seven main landowning conservation NGOs for 2011-2012 totalled nearly £64 million, of which £37 million (54.3%) was on site management (Table 9). Using the lower figure (£37m), this equates to an average spend of £181 per hectare, or £83 per hectare if NTS is excluded from this calculation (as a number of NTS site-related jobs are linked to historical site management, rather than land management).

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**Case Study 3 The RSPB’s Abernethy Forest Reserve**

The RSPB’s Abernethy Reserve covers 13,714 ha and includes the Loch Garten osprey site. The reserve is managed to conserve its ecosystems and promote forest regeneration. On-site employment accounts for 12.2 FTEs (compared to 1.5 under the previous private owner) and direct site-related annual spend is over £500,000. Employees include wardens/stalkers, researchers, shop and hospitality/interpretation staff and forestry workers. Other employment impacts include jobs for contractors on the site; jobs supported by the local spending of staff and contractors and buying supplies; and impacts for local timber and venison dealers. Woodland management activities are shared between reserve staff, locals employed on winter contracts, and larger forestry companies, provided they can guarantee to use local contractors. In order to diversify income to the local economy, the reserve produces, processes and markets goods, including forestry products and venison and emphasises the use of locally-based businesses wherever possible.

The reserve, and particularly the Osprey Centre, attracts 30,000 visitors annually, who spend money locally. Based on an average day visitor spend in the park of £26.48<sup>49</sup>, this equates to a total local spend of over £790,000 (not including accommodation). A series of way-marked walks are well-used by visitors and locals, and an additional 100 km of access tracks are maintained. The reserve is used regularly as a venue for seminars and training courses with delegates using local accommodation. Visitor expenditure in the area is estimated to support 69 FTE jobs locally.
Table 9: Expenditure on sites owned and managed by conservation NGOs in 2011-2012

<table>
<thead>
<tr>
<th>NGO</th>
<th>No. sites</th>
<th>Total (Ha)</th>
<th>Direct spend on sites (£)</th>
<th>Total organisational spend (£)</th>
<th>% spend on sites</th>
<th>Direct spend per site (£)</th>
<th>Direct spend per Ha (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JMT</td>
<td>24</td>
<td>24,461</td>
<td>821,142</td>
<td>1,595,937</td>
<td>51.5%</td>
<td>91,238</td>
<td>33.57</td>
</tr>
<tr>
<td>NTS</td>
<td>128(^a)</td>
<td>77,209</td>
<td>28,530,000</td>
<td>42,116,000</td>
<td>67.7%</td>
<td>222,891</td>
<td>369.51</td>
</tr>
<tr>
<td></td>
<td>74</td>
<td>71,114</td>
<td>5,151,000</td>
<td>12,590,000</td>
<td>40.9%</td>
<td>69,608</td>
<td>72.43</td>
</tr>
<tr>
<td>SWT</td>
<td>121</td>
<td>19,823</td>
<td>1,017,315</td>
<td>5,201,355</td>
<td>19.6%</td>
<td>8,408</td>
<td>51.32</td>
</tr>
<tr>
<td>WTS</td>
<td>57</td>
<td>8,643</td>
<td>1,046,500</td>
<td>1,181,500</td>
<td>88.6%</td>
<td>12,746</td>
<td>84.05</td>
</tr>
<tr>
<td>BFT</td>
<td>1</td>
<td>1,324</td>
<td>567,925</td>
<td>680,117</td>
<td>83.5%</td>
<td>113,585</td>
<td>428.9</td>
</tr>
<tr>
<td>TFL</td>
<td>1</td>
<td>4,028</td>
<td>160,000</td>
<td>560,000</td>
<td>28.6%</td>
<td>160,000</td>
<td>39.72</td>
</tr>
<tr>
<td>Total</td>
<td>389</td>
<td>206,604</td>
<td>£63,924,909</td>
<td>54.34%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^i\) These figures include land-related staff costs.
\(^a\) This figure includes NTS ‘built and countryside properties’

The figures in Table 9 do not account for indirect impacts, which are potentially considerable, particularly on flagship sites, which often employ a range of staff and attract high visitor numbers (Case Study 3). A minimum of four million people were found to have visited sites owned by conservation NGOs in Scotland in 2011-2012: JMT (236,450 visits); NTS (2M visits); RSPB (494,794 visits); SWT (265,000 visits); WTS (1m visits)\(^50\). Based on a daily visitor spend estimate of £26.48 per day\(^51\) (not including accommodation), the approximate cumulative annual economic impact of these visits can be estimated at £105.8 million.

**Social Outcomes**

In relation to social impacts NGOs play a specific role in improving visitor access, particularly by maintaining and/or constructing footpaths. The JMT, for example, raised over £800,000 to fund path restoration work on Schiehallion in Perthshire between 1999 and 2003\(^52\) and is currently carrying out path repairs on Skye (2015-2017) at a cost of £200,000, with path works also planned for Suilven in 2017 in partnership with a community body\(^53\). The NTS, which maintains 82 high level paths established the Mountain Heritage programme in 2003, resulting in £1.9 million being spent on footpath repairs from 2003 to 2009\(^54\). Their ‘Mountains for People’ programme ran from 2009-2013 and cost £1.25 million, with the NTS raising £149,000 for path works in 2015\(^55\).

On many sites volunteers undertake a range of activities, often in work parties, including: interpretation; wildlife protection; litter picking; footpath maintenance; removal of invasive plants and ecological monitoring. Some 5,000 volunteers are active on NGO-owned land in Scotland, contributing over 290,000 hours annually. Based on the current minimum hourly wage (£6.70), this equates to approximately £1.94 million in equivalent staffing costs (or £2.9M if based on a wage of £10.00 per hour). Volunteering has a range of impacts in relation to public health and well-being and the development of social capital\(^56\).

Conservation NGOs also often employ staff and volunteers to manage access and interpret the natural heritage (e.g. rangers). Many NGO-owned sites have...
also developed interpretative facilities, including wildlife watching infrastructure, such as the capercaillie and osprey watching hides at the RSPB’s Abernethy Reserve. Conservation NGOs engage directly in educational initiatives, with most having developed educational materials linked to the National Curriculum, as well as arranging more informal educational events and groups for children, such as SWT’s Wildlife Watch groups. The John Muir Award, run by the JMT, also develops awareness and responsibility for the environment through direct experience, with over 100,000 awards having been made since 1997.

Most conservation NGOs have set up local or regional groups to increase local engagement, although often such groups are only open to NGO memberships. NGOs have also become directly involved in partnerships with communities pursuing community landownership. The JMT is involved in partnerships with four community land trusts, having provided these bodies with funding and/or advice before, during and after land acquisition. The Scottish Wildlife Trust played a similar role during the community buyout of the Isle of Eigg.

**Environmental Outcomes**

GIS analysis of the extent of land designated for conservation and landscape values under NGO landownership demonstrated that 47% of the land owned by conservation NGOs is designated as Site of Special Scientific Interest (SSSI) or Special Protection Area (SPA) (or both), with over 30% designated as Special Area of Conservation (SAC), and over 19% designated as National Nature Reserve (NNR). Conservation NGO landownership is considerably more prevalent on designated sites than elsewhere, particularly in the case of NNRs, with 31.5% of all NNR designated land owned by conservation NGOs. Over 48% of land owned and managed by conservation NGOs is also designated as National Scenic Area (NSA). Conservation NGOs therefore own and manage a disproportionate amount of land with high natural heritage and landscape values, highlighting the role these bodies play in conservation in Scotland. Conservation NGOs also undertake a wide range of habitat and species conservation initiatives on their land. The most active area of restoration activity relates to the re-establishment and expansion of native woodland ecosystems, which is occurring on a range of NGO owned sites across Scotland. The development of strategic partnerships between conservation NGOs, other organisations and other landowners, has increased in importance in delivering integrated landscape-scale approaches to conservation and land management. For example, the Coigach and Assynt Living Landscape project represents a partnership between NGOs, private landowners and community groups.

**Community landownership**

Unless otherwise stated findings in this section are based on research conducted on community landholdings as part of the Sustainable Estates project (2007-2012), an SRUC review of community land in 2011 and a 2014 Community Land Scotland (CLS) review of community landholdings.

**Economic Outcomes**

Case study based research has highlighted how community ownership can impact on the long-term process of rural development within a locality, through facilitating the development of a framework for economic development, in combination with enhanced participatory governance and rebuilding of community capacity. This is further evidenced by findings from the 2014 CLS review, which identified key economic impacts occurring since acquisition on 12 community landholdings. The community bodies had all owned their land for more than 5 years and collectively accounted for some 75% of community land in Scotland. Since acquisition the total turnover across the 12 landholdings had increased from £1.7M to £6.1M, with staffing increasing from 22 to 103 over the same period, with £2.5M spent on staffing and local contractors in the 2012-2013 financial year (a fourfold increase since acquisition). Capital investment since acquisition on the 12 landholdings totalled £34M, with this investment resulting in significant local spending, with the 12 landholdings awarding contracts worth over £900,000 to local contractors in 2012. Investment spending has occurred across multiple areas, with renewable energy (£16M), housing (£4.5M) and communications infrastructure (£4.7M) key (Table 10, Case Study 4), with approximately half of this sourced from grants and the remainder provided by the community bodies.
Case study 4: Investment on community landholdings; Scotland’s largest community windfarm

Storas Uibhist secured funding (£2.4M from the European Regional Development Fund, £1M in grant and loan funding from Social Investment Scotland and £8M in loans from the Co-op Bank) and planning permission to install three 2.3MW wind turbines on Lochdar Hill Common Grazings at Lochcarnon. The turbines generate 6.9MW, with a net income to Storas Uibhist of £1.5M per annum. Approximately two thirds of this will be used for loan repayments in the first 10-12 years, with total income available after this period. Income is being utilised to support community development and the establishment of new businesses locally, with direct community involvement in deciding spending priorities.

The project proposal received considerable community support, with 77% of the total community and 95% of the common grazings holders near the site in favour of the proposal.

Wider investment in infrastructure in buyout communities has also occurred, due to the increased confidence of public bodies (e.g. Local Authorities) as a result of the newfound security of tenure and the associated resurgence of community activity. The resulting initiatives include the (£6M) refurbishment of the Knoydart Ferry Terminal and the ongoing (£9M) Lochboisdale Port of Entry development. The development of new business hubs (to foster private business development) by community land bodies has also occurred on some community holdings (e.g. North and West Harris Trusts). Business development has generally increased post-buyout, with the total number of private enterprises on the 12 CLS surveyed landholdings having increased from 83 to 185 since the time of acquisition.

Table 10: Cumulative and planned investment since point of acquisition on 12 community landholdings owned for at least five years

<table>
<thead>
<tr>
<th>Sector of Investment</th>
<th>Cumulative Investment (£)</th>
<th>Planned Investment (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>4,505,627</td>
<td>2,126,000</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>16,486,000</td>
<td>10,030,000</td>
</tr>
<tr>
<td>Land Management</td>
<td>1,334,401</td>
<td>620,000</td>
</tr>
<tr>
<td>Tourism and Recreation Infrastructure</td>
<td>1,136,700</td>
<td>6,525,000</td>
</tr>
<tr>
<td>Business Development</td>
<td>1,252,694</td>
<td>865,000</td>
</tr>
<tr>
<td>Communication Infrastructure</td>
<td>4,873,101</td>
<td>5,003,000</td>
</tr>
<tr>
<td>Community Facilities</td>
<td>205,000</td>
<td>22,000</td>
</tr>
<tr>
<td>Training/Skills</td>
<td>20,550</td>
<td>3,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>34,428,073</strong></td>
<td><strong>25,194,000</strong></td>
</tr>
</tbody>
</table>
Social Outcomes

Social outcomes are fundamental to community landowners, with recent evidence suggesting that out-migration has reduced on community landholdings, with populations either steady or having increased since community acquisition. Community retention is linked to business development, employment creation and affordable housing provision. Since acquisition the 12 surveyed community landowners have upgraded 151 houses, with a further 33 new houses built in partnership with public bodies (e.g. Case Study 5) and 141 house plots sold or released through shared ownership.

Case Study 5: Working together for affordable housing in North Harris

Through consultations and discussions with local crofters the North Harris Trust identified an opportunity to develop an affordable housing initiative in Bunavoneader. Land was leased from Ardhasaig Common Grazings and a partnership established between Hebridean Housing Partnership (HHP), Tighean Innse Gall (TIG), North Harris Trust and Ardhasaig Grazings. Construction was completed in Spring 2011, with 8 affordable homes established for rent and 3 fully serviced plots also available for purchase next to the housing development.

Table 11: Key outputs since acquisition on 12 community landholdings owned for at least five years
Case studies have also highlighted the importance of less-tangible impacts, with the increased individual and community confidence associated with security of tenure enhancing community capacity and motivation over the longer term\textsuperscript{67}. The experience gained by community members through involvement in buyouts (e.g. by acting as trustees and engaging in training) can have a direct impact on community energy and the degree to which community members feel empowered in relation to local community decision-making processes\textsuperscript{68}. Wide community involvement is critical, with the 2014 CLS study estimating that the 12 surveyed community land bodies depend on over 900 days of volunteer input annually.

Figure 5 illustrates key process related outcomes linked to community landownership. The freedom to utilise the asset-base and the collective increase in confidence, both within the local community and among wider stakeholders, increases both funding availability for infrastructural and housing initiatives and the levels of in-migration and entrepreneurial activity. These factors, combined with direct community involvement in the community bodies, increase local capacity and collective energy and lead to the gradual emergence of local leaders. This further empowers the community, resulting in an on-going cycle of community interest and involvement. The establishment of transparent and accountable local decision-making processes further secures the support of wider stakeholders and releases opportunities for knowledge sharing and developing strategic partnerships, thereby delivering more resilient natural resource management. A cascade effect is apparent which impacts at multiple levels on the processes of rural development. Specific impacts occur at social, economic and environmental levels, which are in effect enhancing community resilience.

**Environmental Outcomes**

Case study analysis suggests that community landownership has the capacity to re-configure resource management away from passive approaches towards more proactive, community-centred approaches incorporating the re-working of traditional land uses and the reconnection of communities with the land and environment\textsuperscript{70}. 

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**Figure 5: The sustainability ‘cascade’ effect as evident on community owned landholdings based on case study analysis\textsuperscript{69}**

Empowerment

- Participative Democracy
- Consensus
- Sustainable deer management
- Sustainable resource management

Buyout

- Effective governance
- Transparency
- Partnership
- Knowledge sharing

Community + stakeholder confidence

- Long-term view
- Enabling investment
- Affordable housing
- Business development

Boosted volunteer energy and emergence of local leaders

Social capital development

Business/community diversification

Stakeholder investment
Specific examples of shifts in approaches evident on community landholdings include:

- An emphasis on renewable energy development and increased energy efficiency;
- Changing emphasis in deer management; increased culling, deer counts, habitat monitoring, local venison marketing and deer management planning;
- Developing opportunities for new entrants to crofting and provision of advice to crofters;
- Restructuring of conifer plantations, native woodland planting and biomass plantings.

Significant environmental change and shifts in land management are long-term processes. Nevertheless, the 2014 CLS review specifically identified that 17 new crofts had been developed on community landholdings, with 12 additional small-holdings created, as well as 16 allotments. Novel approaches to natural resource management are evident in some cases, including the development of a community stalking group on North Harris (Case Study 6).

**Case Study 6: Community based deer management on North Harris**

An example of the changing dynamic between communities and natural resources on community land is evident on North Harris, where the responsibility for deer management was passed to the community. As part of the buyout agreement, the fishing rights and the rights to stalk 30 stags were purchased separately by a private individual; the remaining stalking rights (primarily hinds) were obtained by the community. A community stalking club was established to manage hinds cost-effectively. The club has instigated processes to professionalise their approach and now has 26 members and is open for membership (for a £5 annual fee and a payment of £10 per hind) to people from Harris and certain outlying areas (to ensure sufficient numbers and to include certain crofting groups with firearms experience). All members are required to have a level 1 Deer Stalking Certificate, a firearms certificate, insurance and a game licence. The group carries out deer population counts, agrees cull targets and carries out culling. This is proving to be a cost-effective approach, with no specific cost associations for the Trust as it negates the need to employ a deer manager, as well as acting as a barrier to illegal stalking and limiting the potential for future conflicts.

1.2.5 Challenges, opportunities and solutions

**Existing landownership patterns and ownership diversification**

Generalising outcomes by ownership model is challenging, due to the variability evident within landowner groups linked to location, scale, length of time of owner involvement and the preferences of individual owners/landowning bodies. Nevertheless, the existing dominance of private landownership, combined with the recognition of diverse positive outcomes of NGO and community landownership, suggests continued diversification of landownership (by type) offers considerable potential for increasing rural resilience.
Nevertheless, predicting specific outcomes of landownership change is challenging. Recent research on the impacts of diversification of scale of landownership on rural communities\textsuperscript{72} (i.e. fragmentation of large landholdings into smaller parcels), concluded that, while landownership fragmentation may result in greater economic returns, due to the complexity of wider factors (e.g. policy, demographic change, economics) it is unclear how important landownership scale is to long term community development.

An increasing emphasis on delivering public and private benefits from land management has increased pressure on all landowners to adapt their approaches, with private estates in particular commonly linked to restricting development opportunities for rural communities\textsuperscript{73}. New landownership models offer the potential for expanding the delivery of public benefits in rural areas. However, a stewardship-led approach by proactive private landowners also offers considerable potential to address evolving policy agendas and deliver community outcomes\textsuperscript{74}.

Financial pressures and income diversification

Financial pressures and limitations on income potential is a key challenge for all landowners. Despite the increasing importance of tourism and newer activities (e.g. renewables), traditional land uses remain core to many landowners, particularly private estates; however, declining subsidies represent a threat to these activities longer term. Nevertheless, examples of new estate owners re-establishing grouse moors or carrying out extensive habitat restoration\textsuperscript{75} highlight the potential of private investment to deliver economic and environmental outcomes.

The beneficial outcomes from NGO and community landowners are clear; however, NGO acquisitions have slowed in recent years, with these organisations faced with the challenge of balancing organisational development against funding new land acquisitions. Community landownership offers significant potential to positively transform rural communities. Nevertheless, it remains a relatively new model of landownership, which is often heavily dependent on public support in the acquisition and subsequent establishment phases\textsuperscript{76}. Community landowning bodies face challenging agendas (e.g. housing provision and reversal of out-migration) and the outcomes of buyouts can vary considerably, dependant on: the income potential of the asset base, the length of time since purchase, community capacity and the existence of strong partnerships with stakeholders. Assets incur liabilities and the income generation potential of assets may be insufficient to deliver long term financial self-sufficiency for some communities\textsuperscript{77}. Community landownership therefore requires a long-term commitment of public support to achieve its full potential, particularly where existing income potential is limited.
Renewable energy has provided a key source of income for landowners in Scotland in recent years. While onshore wind has dominated thus far in terms of income provision, recent changes to the subsidy regime and Feed In Tariff (FIT) have decreased the attractiveness of this sector, with Hydroelectric, biomass and solar of increasing interest longer term. Addressing food security concerns and adding value to estate products through processing and direct marketing (e.g. farm shops) also offers diversification potential. Landscape scale woodland regeneration is increasingly being linked with nature-tourism and high quality accommodation provision (particularly on private landholdings). Rewilding (i.e. species reintroductions and landscape scale habitat restoration) therefore offers opportunities to contribute to community development, as well as enhancing ecosystem services\textsuperscript{78}. Such approaches have also been linked to the potential development of new commercial sporting opportunities, such as hunting wild boar\textsuperscript{79}. Critically, the approach all landowners of all kinds take to fostering private business development can have potentially major impacts on local economic development.

**The policy and regulatory context**

The expansion of the Scottish land reform agenda in 2016 and potential changes to the tax regime around sporting land uses and changes to farm tenancy arrangements, are widely perceived by private estate owners\textsuperscript{80} as a major threat. The wider regulatory and planning context for land management has also been identified as a constraint on development and investment by private landowners\textsuperscript{81}. Public financial support is critical to both NGO and community landowners. However, the political context can also present challenges; community landowners face high public expectations, with outcomes often expected over relatively short timescales. More broadly, declining subsidies and the impending withdrawal of the UK from the EU has increased uncertainty around funding long term. The development of new markets for key ecosystem services (e.g. carbon) is therefore of key importance going forward. Payments for ecosystem services offer potential benefits to all landowners of all kinds. In particular, regional targeted grant schemes offer potential to reward landowners for delivering strategic objectives for landscape scale ecosystem management.

**Conflict, capacity building and partnerships**

Private landowners can play a key role in contributing to building community resilience\textsuperscript{82}. In practice, the emphasis on 'community' on private estates varies widely, despite estate-community engagement increasingly highlighted as playing a key role in perceptions of estate activities\textsuperscript{83}. As a result, a disjuncture can occur between resident communities and estate owners, with specific concerns including the inaccessibility of landowners, access-related conflicts and a perceived weak emphasis on development by some landowners.

Environmental NGOs have also been criticised by some for prioritising wildlife and landscape protection above traditional land uses and rural livelihoods\textsuperscript{84}. The 'community' involved on NGO-owned sites represents a community of interest, as opposed to purely one of place, with the memberships of NGOs often not resident on the land in question. Management decision-making relating to NGO-owned land can appear remote; decisions are made in organisational headquarters with varying weight being given to local concerns relative to conservation priorities\textsuperscript{85}.

Community landowners also experience conflicts, both within communities and between the community and wider stakeholders. Challenging demographics and a limited pool of staff, volunteers and local expertise, can affect the degree of community cohesion on community landholdings\textsuperscript{86}. The dispersed and diverse nature of some buyout communities, which can include factions vested in the previous system of ownership, can result in challenging local conflicts\textsuperscript{87}. In this respect, ‘conflict’ arguably represents a natural component of local democracy and community empowerment. Nevertheless, in a private estate context, community-estate conflicts can indicate community dis-empowerment and a lack of engagement.
Community landownership demonstrates the role localised decision making processes play in building social capital and generating win-wins. Lessons exist for all landownership models, with increased engagement and emphasis on community development on private estates potentially contributing to both estate and community sustainability (Case Study 2). Thriving engaged communities provide estates with a ready market for products, a supply of tenants and potential support for estate initiatives. In contrast, a lack of emphasis on community and weak engagement can lead to community decline and reduced estate sustainability.

In practice, challenges exist for engagement across all landownership models, including community apathy, staffing and resource limitations, managing strong personalities and ensuring the approach and timing of engagement is suitable. A pro-active, structured approach (e.g. community workshops, surveys) by landowners and effective visible estate representation is therefore key. These processes can decrease estate-community disconnect, release community capacity, knowledge and entrepreneurial energy, open access to new resources, reconnect people with the land and ensure robust decision-making. Increasing capacity also relates to skillsets, and training of land managers and landowners (and community members) in community-estate working and conflict management. As well as structured learning around engagement, training offers the potential for sharing of experiences and good practice.

Engagement and empowerment of communities can occur across a range of scales from simple estate communication to co-management and estate-community partnerships. Empowering participants requires the development of beneficial land-people interactions, including, for example, community deer stalking groups, community woodlands, affordable housing partnerships and landowner-community renewables initiatives.

The potential of landscape scale approaches for delivering environmental outcomes is being increasingly recognised and examples occur across all landownership models (e.g. landscape scale ecological restoration, catchment management planning and deer management groups). Such approaches face challenges, including balancing individual landowner or organisational goals against the delivery of shared goals. The development of conflict management and dialogue skills therefore has applications at multiple scales, with collaborative governance processes of increasing importance to all landownership models. Partnership working, in addition to wider landownership diversification, represents an opportunity to build on the collective strengths of partners and deliver a wide array of public and private benefits, thereby reflecting a number of key policy aims relating to land in Scotland.
Section Endnotes


10 Hunter, J. (2013) *From the Low Tide of the Sea to the Highest Mountain Tops; Community Ownership of Land in the Highlands and Islands*. The Island Books Trust.


14 See Footnote 2


17 [http://www.scottish.parliament.uk/S4_Bills/Land%20Reform%20(Scotland)%20Bill/b76s4-introd.pdf](http://www.scottish.parliament.uk/S4_Bills/Land%20Reform%20(Scotland)%20Bill/b76s4-introd.pdf)

18 See Footnote 2


21 See Footnote 1


23 See Footnote 2


36 See Footnote 35

37 As part of the national landowners survey economic analysis (Footnote 38)


41 See footnote 40


43 See Footnote 38

44 See Footnote 38

46 See Footnote 7

47 Case study based on findings from CNP landowner Survey (Footnote 43) and supplementary communication with the estate owner

48 See Footnote 11


50 Visitor numbers are based on a combination of estimates provided by conservation NGOs and data from people counters and can be considered as underestimates, with counters only accounting for people passing key access points and estimates generally conservative.

51 See Footnote 50


58 GIS analysis based on overlays of NGO owned sites with datasets of Scottish environmental and landscape conservation designations for the NGO Landownership project (See Footnote 11). Data provided by Scottish Natural Heritage and Scotland's NGO landowners.

59 See: http://coigach-assynt.org/

60 See: www.sustainable-estates.co.uk/ for background information and outputs from the Sustainable Estates project


64 See Footnote 62

65 See Footnote 62

66 See Footnote 62

See Footnote 33

See Footnote 63


See Footnote 30 (original case study source)

See Footnote 35


See for example grouse moor investment on private estates in case Study 3 and investment in habitat restoration on Glenfeshie estate: [http://www.highlandbiodiversity.com/glenfeshie-forest-restructuring-project-5.asp](http://www.highlandbiodiversity.com/glenfeshie-forest-restructuring-project-5.asp)


See for example wild boar hunting opportunities on Glendessary estate: [http://www.glen-dessary.com/wildboar.html](http://www.glen-dessary.com/wildboar.html)


See Footnotes 38 and 42


See for example Footnote 46


See Footnote 27


See Footnote 63

Glass, J. et al. (2012) ‘Working Together for Sustainable Estate Communities’ - Exploring the potential of collaborative initiatives between privately-owned estates, communities and other partners’

See Footnotes 82 and 88

See Footnote 88
What future for woodland and forestry in Scotland?
Professor Davy McCracken

Section 1:3

KEY POINTS

- The Scottish Government has a stated aim to increase woodland cover in Scotland from its current level of 18% to 25% by 2050.
- To achieve this the proportion of woodland and forest under private ownership will need to increase from the current level of two-thirds of the total cover.
- There is currently a tension between ensuring the Scottish forestry sector continues to be productive and also ensuring woodlands and forests contribute to social and environmental outcomes.
- But if existing and new productive forests were restructured or designed to be much more resilient to climate change, many of these environmental and social objectives would flow from them naturally.
- And if more native woodlands were managed more appropriately, or even just managed at all, they could also become more ‘productive’ from the economic, environmental and social perspectives.
- There are a range of practical and climate change associated challenges to meeting the 2050 target, but information and guidance are available about how many of these can be overcome.
- Nevertheless, existing planting targets of 10,000 ha of new woodland and forest each year between 2012 and 2022 are currently falling short of the target.
- Many foresters still do not see the need to increase the resilience of their woodlands and forests now and into the future.
- Many farmers and landowners still do not see the need to integrate woodland much more into their farms and estates to increase economic viability and long term sustainability of their businesses.
- Leadership is needed to change attitudes and perceptions on the ground towards woodland and forest management and creation.
- To provide this leadership, the Scottish Government and its Divisions and agencies will need to work even more in partnership with forestry and wider rural land use representatives in the future.
1.3.1 The current situation

In March 2016, Scotland’s forests and woodlands covered 1.44 million ha or 18% of the total land area. Forestry Commission Scotland owns or manages 470,000 ha (33%) with the remainder either privately owned or owned and managed by local authorities.

Forests are regarded as being large areas dominated by trees, while woodlands are often considered to consist of smaller elements in a landscape where open space is dominant or at least is equal to tree cover. Plantation is a term used to describe woodland planted to a particular design, usually with rather narrow management production objectives. Plantations can be established using conifers or broadleaves, and the main tree species can be non-native or native. Typically, plantations have less variety of tree species, tree sizes, dead wood, ground vegetation, and open spaces than mature semi-natural woodlands.

Native woodlands are defined as woods in which over 50% of the canopy is made up of tree species native to the region, and can be semi-natural (self-sown) or planted. The Native Woodland Survey of Scotland (NWSS) published in 2014 provided for the first time a national overview of the extent and condition of Scotland’s native woodlands. The survey indicated that the area of native woodlands in Scotland was 311,153 ha, or just over one-fifth of the total woodland area (at March 2011) and 4.0% of the land area of Scotland.

The map in Figure 1 shows the distribution of native and other (mainly plantation) woodland across Scotland. Although there has been additional creation of native woodland since 2011 the vast majority of Scotland’s woodland cover is still in the form of plantation forestry.

The NWWS found that native woodland condition was moderate overall with only 46% of the total area in satisfactory condition for biodiversity. Most of the other 54% was identified as needing a single key threat to be addressed in order to achieve satisfactory biodiversity health, with the most widespread threat being browsing and grazing by herbivores such as deer and sheep.

Figure 1: Woodland distribution across Scotland

![Figure 1: Woodland distribution across Scotland](image_url)
Native woodlands are generally considered as having a high value for biodiversity. However, the actual value of any woodland for biodiversity depends on its condition, tree and shrub species composition and whether or not it is being actively managed, with some low intensity form of management usually considered to increase opportunities for a wider range of plants, insects, birds and mammals to occur within the woodland.

An assessment in 2011 estimated that actually 41% of Scotland’s woodland was considered to be of High Nature Value (see the Case Study box), indicating that a relatively high proportion of plantation woodlands also contained a diverse structure and range of plant species.

Woodland cover in Scotland increased, primarily driven by the increase in plantation forestry, relatively slowly from 7% (0.51 million ha) in 1947 to 8% (0.66 million ha) in 1965 and then increased more rapidly to 12% (0.92 million ha) in 1980 and 16% (1.28 million ha) by the late 1990s.

Proportion of woodland in Scotland under High Nature Value Forestry

High Nature Value forestry (HNV forestry) refers to forestry systems important for the environmental benefits they provide, including support for a range of habitats and species (such as butterflies and birds) considered to be of high nature conservation importance.

Woodland supports a large number of plant and animal species and is an extremely important habitat for priority species listed in the UK Biodiversity Action Plan. There is considerable concern over the potential impact of climate change on forest biodiversity; the Scottish crossbill and capercaillie are among species likely to be adversely affected.

The HNV forestry indicator (along with that for HNV farming) was developed by the Scottish Government to help in monitoring the Scottish Rural Development Programme and other strategies, e.g. the Land Use Strategy. Native and ancient woodlands and planted woodlands that have a diverse structure and range of plant species are all defined as HNV forestry systems. This definition of HNV forestry derives from European Commission guidance for the Rural Development Programme and includes the following sub-categories:

- HNV Forestry Type A: semi-natural woodland features and low intensity managed woodland.
- HNV Forestry Type B: diversity of features and low intensity managed woodland.

The overall extent of woodland and forestry in Scotland rose from 1,296,000 ha in 2010 to 1,410,00 ha in 2013. There was no significant change in the estimated percentage of forestry that was HNV between 2010 and 2013. The area of HNV forestry increased slightly (from 529,000 ha to 575,000 ha) but the percentage of total woodland area estimated to be HNV forestry remained the same at 41%. Of that 41% of woodland that was HNV forestry, the percentages of HNV Forestry Type A (52%) and Type B (42%) remained the same in both years.

In the future, the Scottish Government will seek to understand emerging trends in HNV forestry by identifying the influence of key drivers of change such as woodland creation and loss and other land use changes, and changes in woodland design and composition. They will use case studies to illustrate changes in forestry practices that are known to be important in terms of impact on biodiversity and will also cross-check trends in HNV forestry against other critical indicators such as relevant Scottish Biodiversity Strategy indicators.

The indicator classifies forestry management systems which are HNV rather than specific sites on the ground that are HNV. As such, the indicator is not intended to be used to inform site specific management decisions but rather to monitor how rural development measures are impacting upon the extent of HNV forestry as a whole.

Source: ClimateXChange Indicators and Trends For more detail see:
Through the 1960s to early 1980s many concerns were raised about such non-native species dominated plantations, from their adverse impact on biodiversity, through blanket afforestation of inappropriate areas such as the Flow Country, to the commercial planting of entire hill farms removing livestock and people from many upland glens.

However, over the last 30 years there has been a marked change in the approach to designing new woodlands in Scotland, with a strong emphasis on providing multiple benefits. At the same time, an approach to managing existing plantations has been developed that uses the opportunities created by timber harvesting to transform plantations more quickly into forests by diversifying tree species, age structure and the proportion of open spaces. This process, known as restructuring, is now routinely applied in Scotland to develop forests that are increasingly valuable as wildlife habitats as well as a timber resource.

In recent years, it has also been recognised that forestry is now an extremely valuable part of Scotland’s rural economy. The report on The economic contribution of forestry in Scotland published in November 2015 highlighted that the contribution of forestry to Scotland’s economy had increased to £954 million GVA (Gross Value Added) from the 2008 figure of £670 million GVA.

Figure 2 highlights that of this £954 million, £771 million comes from forestry and timber processing and £183 million comes from forest recreation and tourism. Employment levels have also increased with over 25,000 FTE (Full Time Equivalent) people now working in the sector.

1.3.2 Future aspirations and expectations

Scotland’s woodlands and forests are clearly bringing large direct economic benefits. But it is also recognised that a wide range of other benefits to society arise from appropriately sited and managed woodlands and forests.

Health and well-being

Human health and well-being benefits arise from people having access to wooded areas for relaxation and recreation. And it has long been recognised that ensuring woodlands are welcoming and accessible does not just apply in the countryside, but is also vitally important in and around urban areas where the vast majority of Scotland's population live and work. Scotland has one of the greatest health challenges of Europe’s developed nations. Forestry Commission Scotland (FCS) is committed to ensuring that the whole forest sector can contribute positively to improving the nation’s health.

For example, since 2007 FCS have been running courses for groups of adults with long-term mental health conditions. Branching Out is an innovative development for adults who use mental health services in Scotland. For each client, the service consists of around three hours of activities per week in a woodland setting, over 12 weeks. The course content was developed by green exercise and health training consultants in collaboration with FCS staff, healthcare organisations (NHS Health Scotland and the Scottish Association for Mental Health) and with reference to other similar courses in Australia and Canada. 
Climate change mitigation

To help to mitigate the effects of climate change, Scotland has set the ambitious target of achieving an 80% reduction in greenhouse gas emissions by 2050\textsuperscript{13}. Woodlands and forests have an important role to play in helping achieve that target. They can particularly contribute through locking up carbon in actively growing trees in existing and new woodlands, but wood fuel is also a much more sustainable and renewable energy than fossil fuels\textsuperscript{14}.

Forestry Commission Scotland also has an ambitious target to extend woodland cover in Scotland by an additional 100,000 ha over the period 2012-2022. This would make a significant contribution to Scotland’s overall emission reduction targets by locking up around 4 million tonnes of extra carbon dioxide by 2027, whilst also providing a range of other environmental, economic and social benefits\textsuperscript{15}.

Ongoing climate change in Scotland is resulting in more regular and extreme flooding events, which can have devastating effects on local communities and cause damage to businesses, agricultural land and transport infrastructure. Sustainable flood risk management requires the integration of traditional hard engineering with techniques that work with natural features and characteristics. This approach is often referred to as Natural Flood Management (NFM)\textsuperscript{16}.

NFM seeks to store or slow down flood waters through measures such as the planting of woodlands, wetland creation, river restoration, or the creation of intertidal habitats. In addition to flooding benefits, NFM measures can also provide benefits to biodiversity, water quality and recreation. The role that different types of woodland can play is recognised in SEPA’s Natural Flood Management Handbook\textsuperscript{17}.

For example, floodplain woodland is thought to offer the greatest potential for downstream flood mitigation, although its value as an NFM measure depends on the size and positioning of the woodland in relation to the size of the floodplain. A number of small blocks spread across the floodplain could be as effective as one large block spanning its entirety.

Woodland expansion

The wide range of benefits that can be achieved from woodland and forests have underpinned the vision stated in the Scottish Forestry Strategy\textsuperscript{18} to increase woodland cover in Scotland from its current level of 18% to 25% by 2050.

This ambitious target will require the creation of between 10,000 ha and 15,000 ha of new woodland per year, including 2,000 ha on the national forest estate. Scottish Natural heritage (SNH) also intend that at least 4,500 ha of native woodland will be created - or restored from woodland planted with non-native species - per year, to help meet biodiversity targets and develop habitat networks\textsuperscript{19}.

The importance of woodlands and forests to the Scottish economy also means that there is an industry need for more woodland expansion to ensure a constant supply of timber over the decades to come. This will require a balance to be struck between the proportion of native and more productive conifer woodlands that are created.
It will also require finding ways to integrate new woodlands and forests into and around existing valued agricultural land, open space and wetlands, or society accepting that there are trade offs and compromises associated with any major land management practice or land use change.

It is accepted that most of this expansion will have to occur on privately owned land. Therefore landowners objectives and aspirations for the use of that woodland will also need to be taken into account when decisions are taken on what type of woodland goes where and at what scale. Nevertheless, the Scottish Government does seek to influence how and where this happens by providing incentives to encourage the development of woodland in ways most beneficial to society.

These can help ensure woodland is created on the most suitable soils and support designs that improve landscapes on degraded urban fringes, provide habitats for wildlife or mitigate diffuse pollution in watercourses. Spatial planning tools are available to help landowners and their adviser consider how best they can develop woodland in order to maximise benefits for wildlife through improving habitat connectivity.

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**Encouraging the Scottish forestry sector**

Forestry and timber in Scotland is a £1 billion industry, and employment has grown by 50% since 2008. Scotland’s sawmills and processors use 7.5 million tonnes of Scottish timber every year, and this is set to continue to grow for the next 20 years. The success of the sector was illustrated in January 2016 when Norbord announced a new investment of close to £100 million in its panel-board factory near Inverness. However, continued investment needs a constant supply of new timber; that means planting more trees, but at the moment Scotland is struggling to meet its planting targets.

In her speech to The World Forum on Natural Capital, at the EICC in Edinburgh in November 2015, First Minister Nicola Sturgeon said: “Trees help to absorb carbon dioxide and store it as carbon. In recent years, Scotland has been responsible for almost three quarters of the UK’s new tree planting. We are committed to increase planting rates even further so that we plant 100,000 hectares of trees in the decade to 2022.”

Matthew Bell, CEO of the Climate Change Committee speaking to the Scottish Parliament’s Environment, Climate Change & Land Reform Committee in September 2016, restated their advice that if Scotland is to reach its commitments on CO₂ then we should actually be planting 16,000 ha of new woodland every year.
I believe that there are three key requirements to encourage the Scottish forestry sector:

- **PLANT MORE PRODUCTIVE WOODLANDS** Scotland needs to meet The First Minister’s pledge to secure the future of the sector and deliver a wide range of economic, environmental and social benefits.

- **IMPROVE THE FORESTRY APPLICATION SYSTEM** A straightforward, efficient application system is crucial to meeting new planting targets. However, an over-complex process is delaying and discouraging applications.

- **STIMULATE MARKETS FOR WOOD AND TIMBER** Wood is by far the best building material for the environment. A tonne of brick requires more than four times the energy to produce than a tonne of sawn softwood. Concrete requires five times more energy than wood and steel 24 times more.

There is a balance required between native and conifer woodlands, between traditional agriculture, valuable open space and wetlands, and new forests. Approximately 80% of all the timber produced in Scotland comes from forests that are certified by the global sustainability schemes, FSC and PEFC using the independent UK Woodland Assurance Standard. UKWAS is developed by a steering group which includes RSPB, Woodland Trust, CLA and representatives from industry.

The future of rural Scotland post Brexit will remain uncertain for several years to come. What is clear is that there will be a continued and growing demand for the products and services from our forests and woodlands. These products and services are not just timber, but also carbon sequestration, flood mitigation, recreation and many others; by planting more trees we can continue to support rural employment and begin to mitigate the uncertainty of climate change.

Andrew Heald
Technical Director
Confor

**1.3.3 Practical challenges to overcome**

There are, however, a wide range of challenges that will need to be overcome if the overall extent of woodland and forest cover in Scotland is to reach anything like 25% by 2050.
The Crichton Institute highlighted a number of these when it was considering the role of forests and woodlands to the economic development of the south of Scotland: policy ambiguities including competing targets and vague implementation plans; multiple competing land uses and a need for appropriate land management arrangements with clear implementation plans; insufficient levels of investment in the sector; workforce skills and supply challenges; road network infrastructure challenges; impact of climate change and tree disease; new planting and replanting; competition for softwood; global timber market fluctuations.

All of these challenges are relevant across the whole of Scotland, but only a few are currently being addressed quickly enough to make a difference now and into the future:

- The continued growth of the forestry industry has led to increased mechanisation and technological enhancements in equipment and machines. This means that forest workers at all levels need appropriate training and education. SRUC’s Barony Campus in the south of Scotland and UHI’s School of Forestry in the north are ensuring that appropriate training for new entrants and existing foresters is in place.

- Harvesting of timber is putting pressure on many minor and unclassified public roads, especially as large part of the rural roads infrastructure is not suitable for large vehicles. This is because not all the existing planting considered how the timber would be accessed when harvested. FCS recognise this as a constraint and are committed to supporting timber haulage best practice. In support of this they have established the Strategic Timber Transport Fund which facilitate the sustainable transport of timber in rural areas of Scotland and the Timberlink Service which moves timber by sea on the west coast of Scotland, removing nearly one million lorry miles a year from Scottish roads.

However, major issues still remain to be addressed, particularly with regard to maintaining a consistent supply of timber for the future and ensuring that new and existing woodlands and forests are resilient to the challenges posed by climate change.

**Maintaining a consistent supply of timber**

Until recently, the Forestry Commission has produced 25-year forecasts of softwood timber availability - even though the life cycle of a softwood tree is more like 35-50 years. In response to calls from Confor, the leading industry trade body, of the need for more information to help the industry plan for the future, a 50-year report – together with a 100-year projection – was published earlier this year.

The report shows that Scotland’s forestry industry has a very strong short-term future, with a significant increase in availability of timber to the mid-2030s. However, the subsequent drop-off in supply (see Figure 3) to 2050 and well beyond is causing major concerns within the industry.

While this projection covers the whole of Great Britain, Scotland dominates in both the provision and consumption of the softwood resource and hence Scottish projected softwood availability will track very closely the 100-year British projection.
Confor has recently called on the Scottish Government to do two things to prevent this damaging trough in supply, which could otherwise seriously damage investment, reduce jobs and undermine Scotland’s world-leading climate change targets:

- Ensure that the existing planting targets of 6,000 ha of productive forestry each year between 2012 and 2022 are met, as it currently looks likely to fall short of the target
- Extend the 6,000 ha of annual productive planting for another 20 years through to 2042

By doing this, and filling the ‘trough’, Confor has estimated that an additional 55 million tonnes of carbon could be sequestered. They have highlighted that without a commitment to plant 6,000 ha a year, this carbon would not be ‘saved’ and would have a detrimental impact on Scotland’s climate change targets. In addition, Confor believes that more than 1,000 long-terms jobs in the primary processing industry could be secured if the target of 6,000 ha of productive planting was maintained through to 2042.

The scale of the action required to fill the projected ‘trough’ has also been emphasised by the publication this autumn of preliminary estimates of the changes in canopy cover in British woodlands between 2006 and 2015. Although there are lots of caveats associated with the data (especially the fact that satellite observations cannot easily distinguish very young trees from clearfell), the preliminary data suggests that harvesting of timber is outstripping the replanting of harvested areas.

For example, the average rate of clearfell across Britain between 2006 and 2015 was 20,900 ha per annum (of which 15,000 ha per annum was within Scotland), but the report highlights that the amount of restocking reported through grant aid over that period was an average of only around 14,800 ha per annum (of which 8,800 ha were in Scotland).

The challenge facing Scotland in the future is therefore not only to encourage new planting of woodland and forests but also to encourage restocking of existing ones once they have been harvested. Only then will there be any chance of reaching the 25% woodland and forest cover target by 2050. This will require not only continued engagement with those landowners who have historically been amenable to woodland planting but will also require increasing engagement with the wider farming sector who historically have shown less interest in tree planting.
This increased engagement does, however, have to recognise that there is a tension between expanding woodland and forest cover and maintaining productive agriculture, which is important in terms of food security and employment, and between using land for onshore wind farms and for forests.

With finite land assets it will be challenging to meet different objectives and targets. It is therefore essential to ensure that forestry and woodland developments are discussed in wider strategies associated with land use and that all relevant stakeholders are consulted to identify the best use of land³¹.

**The Sheep and Trees Initiative**

The *Sheep and Trees Initiative* is a national campaign to encourage Scottish upland and hill sheep farmers to grow more trees. It reflects the fact that basic agricultural area payments in Scotland can now continue to be obtained from eligible farmed land afforested under the new Forestry Grant Scheme. There are therefore opportunities for farmers and landowners to consider planting trees to assist with farm management and income generation whilst still maintaining the same number of sheep on the holding.

There is recognition of a history of conflict between hill farming and forestry. Blanket afforestation and the commercial planting of entire hill farms in the past has meant that many upland and hill farmers do not currently think of woodland and forestry as something that can be integrated into their farming systems. But if planned carefully and strategically then farm productivity and profitability could be improved through increased tree planting on the farm.

The *Initiative* highlights that planting trees on between 5% and 10% of upland and hill farms could help improve sheep productivity by providing shelter, make flock management and movement on the hill easier through the establishment of new fencing and make areas less suited to sheep grazing more profitable to the farm business. The fact that there are good processing facilities in Scotland and a strong commercial market means that there will be a continued demand for timber in the future.

Following an awareness raising launch event at Teviothead in the Borders in March 2016, a series of on-farm events across Scotland are taking place through late 2016 and early 2017 to highlight the possibilities and opportunities that the integration of sheep and trees can bring to hill sheep farmers.

Sheep and Trees is an initiative supported by National Sheep Association (Scotland), National Farmers Union Scotland, Forestry Commission Scotland and Scottish Government.

The *Sheep and Trees Initiative* (see the Case Study box) launched in spring 2016 is a new national campaign to encourage Scottish upland and hill sheep farmers to grow more trees. It recognises that there is a history of conflict between hill farming and forestry, but seeks to highlight that, if planned carefully and strategically, farm productivity and profitability could be improved through integrating woodland management onto the farm.
To-date the Initiative, which is in its early stages of development, has been asking farmers to consider planting between 5% and 10% of their farms and, because of economies of scale with regard to the fencing costs, to consider creating blocks of woodland that are 40 ha in size or larger. However, there needs to more of a recognition by this Initiative, and the others that are needed to engage with other types of farmer, that woodland creation and management is something that is alien to many upland and hill farmers.

This shouldn’t be taken to suggest that they are not interested in engaging, but rather that woodland creation operates over a different timescale than they are used to and many won’t feel confident that they know what type of management will be required at different stages or that they themselves are competent to get that management ‘right’. This is likely to mean that many will not be comfortable with creating such large blocks as are being talked about at the moment without additional guidance and advice being available.

SRUC’s Hill and Mountain Research Centre has long recognised the need for woodland to be integrated much more into upland and hill farming systems32, but the question remains as to how best to achieve this in practice.

Indeed, there is currently a tendency within Scotland to translate the 10,000 ha per annum planting target as meaning that large blocks of primarily productive conifer are all that can deliver towards that target. As indicated above, there is a need for more such woodland and forest to maintain a timber supply into the future. But the rationale behind the desire to have more trees on the ground in Scotland was also to help sequester carbon and mitigate climate change.

In that respect, increasing the number of trees in hedgerows, establishing more riparian woodland next to watercourses and creating shelter belts on farmland all have a role to play in meeting the 10,000 ha target. Encouraging upland and hill farmers to do more of these sorts of tree planting may encourage more to dip their toe into woodland creation and management on their farms in the first instance.

The mention of management is also important. Many of Scotland’s native woodlands are not being actively managed to maintain them for the future33. This is not only reducing their usefulness from a wildlife perspective but also limiting the economic gain being obtained from them. The UK currently consumes over 0.5 million cubic metres of hardwood each year, much of which comes from tree species grown in the UK, but less than 10% of this is obtained from UK sources.

Recent research by Grown in Britain has suggested that a 20% increase in UK hardwood production is quite possible in the short term, with a 100% plus increase possible over the medium term34. They estimate that 400,000 cubic metres could be available every single year for 40 years, without reducing the overall stock still standing in the woods, if there was increased recognition by both landowners and the construction industry of the value and availability of home grown hardwood.

But as colleagues in Confor and SAC Consulting Solutions (see Case Study boxes) highlight, probably the greatest issue is that current incentive levels outwith central Scotland are not high enough to stimulate much new woodland creation of any scale, or the restocking of many harvested woodlands. Increased bureaucracy associated with the current Forestry Grant Scheme is also markedly increasing the time to process applications and acting as a disincentive to potential applicants.

Developing a straightforward, efficient application system is therefore crucial to meeting new planting targets and ensuring landowners are incentivised to consider planting trees at any scale on their land.
Woodland and forestry creation on Scottish farms and estates

Opportunities

Scottish Government woodland planting targets of 10,000 ha per annum have created a strong policy pull for more woodland creation to help tackle a range of environmental issues, support rural and community development, enhance urban areas and improve landscapes.

There is also a strong and growing interest in the use of wood biomass for heat and renewable energy production and an increasing demand within the construction industry for timber products, such as I-joists, for use in green buildings. To help meet this demand for a consistent and reliable timber supply for timber processing and wood fuel investments now and in the future, wood processors across Scotland have invested £50 million per annum over the last 5-10 years.

Land owners are showing an increased interest in woodlands across Scotland. Many traditional estates are restructuring their businesses and, with uncertainty in the financial markets, are seeing forestry investment as a safer option. An increasing number of farmers are also being attracted to woodland from an on-farm diversification perspective, succession planning or simply as an investment in a retirement fund.

Challenges

There is now a high demand, with associated high prices being paid, for any established woodlands that come on the market in Scotland. However, there has been limited interest in woodland creation in Scotland over the past couple of decades, leading to concerns about future timber availability.

Some of this is driven by practical difficulties in creating new woodland. The occurrence of large areas of bracken and high deer populations are a major constraint to woodland establishment, requiring high costs to ensure successful establishment. Lack of investment by local authorities in the rural road network is also seen as an added constraint on future timber haulage logistics. Land owner attitudes towards the permanence of the change in land use can also be a sticking point.

Probably the greatest issue though is that current incentive levels outwith central Scotland are not high enough to stimulate much new woodland creation, or the restocking of many harvested woodlands. Increased bureaucracy associated with the current Forestry Grant Scheme is also markedly increasing the time to process applications and acting as a disincentive to potential applicants.

Solutions

Increasing woodland cover across Scotland from the current 18% to the targeted 25% by 2050 is feasible in principle. But it will require an increased awareness of the current funding available and of the multiple benefits delivered by forestry, as well as a marked increase in grants available, or the reestablishment of tax incentives to encourage new planting and restocking, and the establishment of markets to reward woodland owners for carbon sequestration and offsetting.

Brexit will certainly pose a major challenge to the wider Scottish economy. But it also provides an opportunity to stimulate an informed discussion in Scotland about how best we can achieve the amount of woodland and forestry growth we require to provide for all wider society needs in the future.

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Climate change challenges

At whatever scale new woodlands and forests are created, it will be essential to ensure that they are resilient to the challenges posed by climate change. As highlighted by ClimateXChange\textsuperscript{35}, Scotland’s centre of expertise connecting climate research and policy, climate change is expected to bring both risks and opportunities to Scotland’s productive forestry.

The projected warmer climate will increase tree growth generally across the country (though there will be significant regional variability) with a resulting increase in productivity in areas not limited by water and available nutrients.

Whilst a wider selection of species will be able to grow, particularly favouring high quality broadleaved trees in the South, the climatic changes will also alter the suitability of sites for species of trees already growing commercially in Scotland - which could impact both positively and negatively on the productivity and sustainability of the forestry sector. Changes in the seasonable distribution of rainfall are also projected to increase the risk of drought in summer with a resulting decrease in suitability for species more sensitive to water limitations, such as Sitka spruce\textsuperscript{36}.

An increase in periods of drought will heighten the threat to Scotland’s forests from wildfires. Though typically in Scotland the main damage from such events is to the understorey, even if tree mortality does not occur, fire damaged surviving trees are more susceptible to subsequent attack by pathogens or other stressors. Wind throw can also cause significant damage through uprooting and snapping of stems.

Though there is still a high degree of uncertainty surrounding the projected impact of climate change on high winds and storm events in Scotland, it is known that forest stands in wetter soils are at greater risk from high winds\textsuperscript{37}. Furthermore, the projected increase in growth rate may mean forest stands reaching a height which puts them more at risk at a younger age.

Milder winters and warmer wetter springs are likely to favour the abundance and distribution of over-wintering pests and diseases, and damage or stress resulting from drought, temperature extremes or storm damage will increase susceptibility to these pathogens\textsuperscript{38}. Two of the most significant risks come from:
• **Phytophthora ramorum** - a fungus-like pathogen whose distribution and prevalence is to a large extent determined by climatic factors (Figure 4). It poses a particular threat to larch, one of Scotland’s most important timber species, causing significant damage and mortality to infected plants. Latest figures indicate that 10,341 ha of larch (Japanese, European and Hybrid) in the FCS’s National Forest Estate lies within the current *P. ramorum* Risk Zone 1 (which encompasses the general area of higher climatic risk where infection has been, or is considered most likely to be, found on larch). This represents 41% of the total larch stock within the whole of the FCS National Forest Estate. For Japanese larch alone this figure is slightly higher at 45% (6,386 ha).

• **Dothistroma** needle blight - which has become the most significant disease affecting coniferous trees in the UK and poses a particular threat not only to Scotland’s commercial forestry but also to native Caledonian pinewoods. It is believed that an increase in intense rainfall episodes coupled with warmer springs may have optimised conditions for spore dispersal. Latest figures indicate that 60.7% (55,402 ha) of total (high forest) pine woodland on FCS’s National Forest Estate and 9% (1,614 ha) of total (core) Caledonian Pinewood are within 1km of known outbreak of needle blight.

To reduce potential risks to all the above climate change challenges, rather than relying on single species future new planting needs to develop diverse woodlands with increased tree resilience. Despite there being many uncertainties about the future, a lot is already known about how to build forest resilience. What is clear is that there is no ‘silver bullet’ that will protect forests, but applying existing best practice in the following areas should help to increase long-term resilience:

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**Figure 4: Summary position of *P. ramorum* disease on trees July 2016**

To reduce potential risks to all the above climate change challenges, rather than relying on single species future new planting needs to develop diverse woodlands with increased tree resilience. Despite there being many uncertainties about the future, a lot is already known about how to build forest resilience. What is clear is that there is no ‘silver bullet’ that will protect forests, but applying existing best practice in the following areas should help to increase long-term resilience:

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**Table 1: Summary Position of Ramorum Disease on Trees July 2016**

<table>
<thead>
<tr>
<th>Year</th>
<th>P. ramorum core disease zone</th>
<th>P. ramorum Galloway Red zone 2013</th>
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• Selecting the most suitable species and genotypes for the sites, to create thriving forests which are likely to cope with future stresses (rather than necessarily defaulting to what has gone before). To do this involves going back to basics – ensuring an accurate knowledge of the soils and site types present in the forest or woodland, to allow those parts most at risk from the impacts of climate change to be identified. To help choose the most appropriate species for the next rotation, Forest Research has an Ecological Site Classification tool that can match the suitability of over 50 species to site and soil type (Figure 5).

• Reducing other pressures on forests – to give the forests the best chance to thrive, whatever the climate does. This includes using the information available on best practice for deer management; managing and controlling *Rhododendron ponticum* (an aggressive coloniser which reduces woodland biodiversity, prevents regeneration and acts as a host for *Phytophthora ramorum*); and building wildfire resilience into forest management planning.

• Maintaining or adding diversity in structure and species. A practical guide to *Achieving diversity in Scotland’s forest landscapes* explains how to do this, and is aimed primarily at the managers of productive conifer forests. Species diversity can be introduced at restocking and tools such as Forest Research’s Ecological Site Classification can help show what other species would be suitable. The use of natural regeneration to restock woodlands can also help to increase the genetic variation among the trees which, as well as giving opportunities to create forests well-suited to the site, may reveal some trees that are less susceptible to pests and diseases.

![Figure 5: Ecological Site Classification inputs and outputs](image)

Resilience doesn’t mean ‘resistance to change’ since change is inevitable. Rather it means that the woodland or forest can recover from unforeseen events and continue to provide the benefits required from it, even as the climate changes. This will likely mean that it has to be a different woodland or forest in its composition and structure, but nevertheless still does what it was planted for in the first place, e.g. to provide a habitat, produce timber or look attractive in the landscape.

FCS have a wide range of information, guidance and resources available to help inform woodland and forest owners and managers how best to build resilience into their new and existing woodlands and forests. The jury is, however, still out with regard to how much the need to take account of resilience is actually being put into practice.
1.3.4 The need for leadership

There is currently a tension within Scotland between ensuring that the Scottish forestry sector continues to be productive, and thereby continues to make a major contribution to the rural economy in the future, and also ensuring that woodlands and forests contribute to a wide range of social and environmental outcomes, including climate change mitigation, biodiversity, natural flood management, recreation and people’s health and wellbeing.

However, in reality these production, environmental and social objectives are not always mutually exclusive. Indeed, if existing and new productive forests were restructured or designed to make them much more resilient to climate change challenges, many of these other environmental and social objectives would flow from them naturally. Similarly, if more native woodlands were managed more appropriately, or even just managed at all, they could also become more ‘productive’ from the economic, environmental and social perspectives.

This section was originally going to be entitled “The need for discussion and debate”. There is clearly a need for more engagement with owners and managers of existing woodlands and forests to encourage more active management in native woodlands and more restructuring of forests to make them more resilient. There is also clearly a need for greater engagement with a wider range of landowners to encourage new planting, at a variety of scales, to meet woodland expansion targets. And clearly there is a need for some more discussion about what suite of incentives (such as grant-aid, tax incentives or establishing markets for carbon sequestration and offsetting) need to be put in place to allow this to happen in practice.

But we do not need more debate over why we should manage existing woodlands and forests better or whether we should aspire to increase woodland and forest cover in Scotland. As the preceding sections highlight, the economic, environmental and social benefits to be gained from more woodland and forest are clear. There are a range of practical and climate change associated challenges, but there is also lots of information and guidance available about how many of these can be overcome. And the work of the Woodland Expansion Advisory Group has considered in great detail what type of woodland or forests would be most practical or appropriate to create where (in terms of types of land) and at what range of scales.

What is needed is leadership to change attitudes and perceptions and ensure the behavioural change that is needed on the ground in order to make progress. There is still too much of a “business as usual” approach, not only among foresters, where many still do not see the need to increase the resilience of their woodlands and forests now and into the future, but also among farmers and other landowners, where many still do not see the need to integrate woodland much more into their farms and estates to increase economic viability and long term sustainability of their businesses.

At the time of writing, the Scottish Government are consulting over proposals to move the functions currently performed by FCS into the Scottish Government as a dedicated Forestry Division and to turn Forest Enterprise Scotland into an Executive Agency of Scottish Government, to be called Forestry and Land Scotland and be responsible for the development and management of the Scottish Ministers’ National Forest Estate.

Increasing woodland cover across Scotland from the current 18% to the targeted 25% by 2050 is feasible in principle. It is not yet known whether or not these new governance arrangements in Scotland will help stimulate more action on the ground to manage, restock and create woodlands and forests. But what is known is that if the 2050 woodland cover target is to be achieved, then the proportion of woodland and forest under private ownership will need to increase markedly from the current two-thirds level.

The Scottish Government and its Divisions and agencies will therefore need to work even more in partnership with forestry and wider rural land use representatives in the future, in order to provide the leadership that is needed to change attitudes and perceptions on the ground towards woodland and forest management and creation.
Section Endnotes

4. http://www.environment.scotland.gov.uk/media/26700/Fig2-Woodlands_300dpi.jpg
23. http://www.sruc.ac.uk/info/120562/forestry_and_arboriculture
27. http://www.forestry.gov.uk/forecast#forecastSoftwood