

Socio-economic and biodiversity impacts of driven grouse moors in Scotland.

Part 1. Socio-economic impacts of driven grouse moors in Scotland



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Contents

Summary of the key findings from the research	1
1 Background	3
1.1 Policy context.....	3
1.2 Objective of the research.....	3
2 Introduction	4
3 Employment impacts of grouse moor management	5
3.1 Introduction	5
3.2 Employment impacts	6
4 Direct non-staff economic impacts of grouse moor management.....	9
4.1 Introduction	9
4.2 Direct economic impacts	10
4.3 Sport and grouse moor profitability - a net private cost?	11
4.4 Capitalisation of game bags into property values	14
5 Indirect and GVA impacts of grouse moor management	16
5.1 Introduction	16
5.2 Wider rural economy impacts.....	16
5.3 Community-related impacts	18
5.4 Total indirect and GVA impacts	19
6 Well-being and wider societal impacts of grouse shooting and moorland management.....	20
6.1 Use values and impacts relating to community well-being	20
6.2 Conservation-related economic impacts	20
6.3 Costs associated with negative externalities of driven grouse.....	20
7 Driven grouse moor management – data insights from recent studies.....	22
7.1 Regional Moorland Groups Survey	22
7.2 Angus Glens and Monadhliath Grouse Study	24
7.3 Scottish Estates Survey	27
8 Alternative land uses on grouse moors	31
8.1 Conservation / NGOs	33
8.2 Agriculture	34
8.3 Renewable Energy.....	36
8.4 Tourism and Rewilding.....	36
8.5 Afforestation	37
8.6 Alternative land-use summary.....	37
9 Conclusions and Evidence Gaps	38
References	41
Appendix A. Sources of information.....	46

Summary of the key findings from the research

1. There is a narrow base of evidence that specifically focuses on the socio-economic impacts of grouse shooting, with some additional evidence relating to the wider game shooting or estate sectors. The dated nature of much of this research means that the social and economic impacts of more recent intensification of driven grouse moor management, on some estates, are missing from the evidence base. Therefore, industry-collated and reported data is often cited in contemporary discourse regarding grouse moor management.
2. Much of the commissioned research and industry-collated socio-economic evidence suffers from self-selection and self-reporting bias. The lack of a definitive dataset that includes all estates engaged in grouse moor management means that it is impossible to assess how representative research and industry data is of the whole sector.
3. The narrow evidence base and inconsistency in data collection approaches mean that evidence on socio-economic impacts is open to criticism. As most of the research has been commissioned by representatives of the grouse or wider estate sector, the objectives of the research have been criticised, by some, as only focusing on demonstrating the positive aspects of grouse moor management. However, despite the limitations, the existing evidence base does provide some context relating to the social and economic contributions of grouse moor management.
4. Grouse moor management and shooting activities on estates do not sit in isolation. Rather, the range of estate activities (e.g. management for sheep, deer, walked-up grouse shooting, driven grouse shooting, wind energy generation, tourism, conservation) are not mutually exclusive. Different land management activities can be undertaken together on the same piece of ground, and some staff members on estates may be engaged in other activities than grouse moor management and grouse shooting.
5. Grouse shooting and related activities can be important to some remote and fragile local economies. The review of evidence suggests that that around 2,500 FTE jobs (both direct and indirect) were reliant on the grouse moor sector in 2009 with £14.5 million spent on wages related to grouse moor management and support activities, with a total Gross Value Added contribution of £23 million to the Scottish economy. There appears to be no evidence on the informal wage market driven by gratuities (tips) from those undertaking grouse shooting.
6. Grouse moor related expenditure varies significantly between estates, often depending on moorland scale and intensity of management activities. Recent data collected by the Scottish Moorland Groups suggests average annual wage spend of £210,000 on those estates reporting significant grouse moor activity, with expenditure on their suppliers averaging £515,000 per year. As data does not exist for the wider rural business base or the scale of the estates the data was gathered on, it is impossible to assess how important this expenditure is to local economies.
7. Incomes from grouse shooting are highly variable, often dependent on the mix of private versus commercial shooting and/or driven versus walked-up shooting days. Evidence from land agents suggests that the capital value of estates can be enhanced through improving the annual grouse bag (intensification) with each brace of grouse worth up to £5,000 in capital terms.
8. There is limited evidence on the socio-economic impacts of alternative land uses on moorland areas, particularly of the emerging rewilding and conservation approaches being taken on some private estates. Some alternatives (e.g. farming, forestry and renewables) are heavily reliant on public payments to justify the activity economically, with others (e.g. rewilding, conservation) more reliant on the benevolence of owners or members. It is challenging to make comparisons between land uses as there are regulatory limitations (e.g. for wind farms, forestry and woodland management) and biophysical constraints (e.g. to farming, forestry and woodland

management, wind energy, housing) on some alternatives, meaning they are only viable or permitted across some of the current grouse moor area.

9. There is evidence that the grouse shooting industry leads to some localised population retention, maintenance of cultural aspects and community identity (although little is reported on the social and cultural aspects of alternative land uses). Evidence revealed some disconnect between communities and grouse estates – which the establishment of Regional Moorland Groups has sought to rectify.
10. There is a paucity of evidence that identifies the costs of the (often contested) negative externalities associated with grouse moors. Negative impacts (perceived or actual) may limit visitor spending within an area from the estimated half million domestic visits, 2.7 million accommodation nights and £187 million spend on visits that included watching wildlife / bird watching in 2015.
11. Suggestions for further research and data collection to help provide more robust evidence on the socio-economic impacts of driven grouse shooting are provided. In particular, we suggest that more systematic approaches to data collection are required, and suggest that the majority of the information gaps would benefit from data collection and analysis over a longer time-period than the ‘snapshot in time’ approaches that studies, to-date, have used.

1 Background

1.1 Policy context

The Cabinet Secretary for Environment, Climate Change and Land Reform in May 2017 announced commissioning of “*research into the costs and benefits of large shooting estates to Scotland’s economy and biodiversity*”¹. A related Programme for Government (2017-2018) commitment published in September 2017 states that a research project will be commissioned to “*examine the impact of large shooting estates on Scotland’s economy and biodiversity.*”

The focus of the Cabinet Secretary’s announcement concerns ‘driven grouse shooting’ estates.

1.2 Objective of the research

The main objective of the overall research project – of which this review on socio-economic impacts is a component - was to consider the socioeconomic and biodiversity impacts of driven grouse moors in Scotland. Previous research in this field has already estimated the actual (direct and indirect) economic contributions of shooting estates in Scotland whilst also providing evidence for the wider social and environmental impacts (Hindle et al. 2014; Wightman and Tingay, 2015; PACEC, 2014; Mc Morran et al. 2015). There is also other pre-existing research that can help understand the environmental and biodiversity impacts of the activities which take place on grouse moors (Grant et al. 2012; Mustin et al. 2011).

From July to October 2018 analysis was undertaken by James Hutton Institute and Scotland’s Rural College (SRUC) on the socioeconomic and biodiversity impacts of driven grouse moors in Scotland. This report is one of three main documents reporting the findings of this research:

Socio-economic and biodiversity impacts of driven grouse moors in Scotland: Part 1: Socio-economic impacts of grouse shooting: an evidence review of the impacts of grouse moors (driven where identifiable) on estate employment, wages, capital assets, etc. as well as on the wider rural business base and on local communities. The socio-economics of a selection of alternative land management models is also considered.

Socio-economic and biodiversity impacts of driven grouse moors in Scotland: Part 2: Biodiversity impacts of driven grouse shooting in Scotland – an evidence review of impacts from a range of management activities associated with driven grouse moors, including: muirburn; grazing (sheep and deer); legal predator control; mountain hare management; and a review of ecosystem service delivery by driven grouse moors.

Socio-economic and biodiversity impacts of driven grouse moors in Scotland: Part 3: Use of GIS/remote sensing to identify areas of grouse moors, and to assess potential for alternative land uses – using GIS and remote sensing to estimate the extent, intensity and characteristics of grouse moors in Scotland, including opportunities and constraints for alternative uses.

These three documents are summarised with key findings in:

Socio-economic and biodiversity impacts of driven grouse moors in Scotland: Summary Report

¹ <https://news.gov.scot/news/golden-eagle-deaths>

2 Introduction

This report provides evidence on the socio-economic impacts of driven grouse moors that helps address the Scottish Government's commitments to "*examine the impact of large shooting estates on Scotland's economy and biodiversity.*" The review collated evidence relating to the socio-economic impacts of driven grouse shooting in Scotland, with some additional material included relating to the impacts of wider shooting and game management at UK and Scottish levels. A number of regional/local level studies were also identified and have been included where relevant to illustrate findings at more localised levels.

The red grouse (*Lagopus l. scoticus*) is a ground nesting bird that is found in heather moorland areas. Grouse shooting in Scotland refers to the shooting of red grouse on moorlands, an activity that has been highly prized for over a century due to the bird's speed and agility that provide testing game shooting. Productive grouse moors are now mainly found in Scotland and the North of England (red-grouse management and shooting in Wales declined to virtually nothing in the last century), where moorlands are managed (e.g. muirburn, predator control, medication) by gamekeepers at different intensities to provide these wild birds with favourable breeding and rearing habitats.

The opening of the shooting season is known as 'The Glorious 12th' – referring to the 12th of August each year – and runs until the 10th of December. Grouse cannot be reared like pheasants, meaning numbers vary considerably between years, with weather, habitat, disease and predators all having potential impacts on numbers. In poorer years, such as 2018 (hard winter and spring followed by a very dry summer) many shoots are cancelled, or the number reduced due to insufficient grouse numbers. In such poor years the loss in commercial estate income and additional local spend by shooters and their families (e.g. accommodation, hospitality, ancillary activities) is reported to have negative effects in some local rural economies.

There are three different types of grouse shooting that are undertaken:

- **'Driven' grouse shooting:** This is the most intensive form of grouse shooting and accounts for the majority of commercial grouse shooting in Scotland. Grouse are flushed by a line of 'beaters' towards a line of (normally 8-10) shooters who are generally stationary, positioned in a line of 'butts' – hides for shooters traditionally screened by stone or turf, but now also constructed from wood.
- **'Walked-up' grouse shooting:** This is a less intensive form of grouse shooting that requires much less co-ordination as it relies solely on a small party of shooters walking over the moor and self-flushing the grouse that they shoot. Shooting parties tend to be smaller than for driven grouse shooting and there is no reliance on employing beaters to flush the grouse.
- **Grouse shooting 'over pointers':** This form of grouse shooting utilises trained dogs to 'point' to where grouse coveys (groups) are. Once the dog is on point that small party of shooters progresses towards the area under 'point' for preparation for shooting once the grouse are flushed by the dogs on command.

There is limited research and evidence on the socio-economic impacts of grouse moors and related activities and therefore this review has conducted an extensive search for information including academic literature, commissioned research, media (papers, parliamentary evidence statements, videos, etc.), and parliamentary evidence (see Appendix A for a summary of the main research sources relating to socio-economics of driven grouse). In addition data gathered for specific commissioned research were revisited with a focus on driven grouse moors, and summary data from the most recent survey of grouse estates conducted by the industry representative group (The Scottish Moorland Groups: 2015-2017) was assessed.

The report is structured around key socio-economic themes that emerged from the evidence base:

- Section 3 examines employment impacts arising from grouse moor management, particularly on the number of direct employees and their wages, but also on employment created indirectly to those supply goods and services to grouse sector or game processing.
- Section 4 examines the direct economic impacts of grouse shooting, in particular looking at the running and investment costs and sporting incomes received from commercial shooting dates.
- Section 5 reviews the studies that provide estimates of the macro level (Scotland-wide) impacts derived from direct and indirect expenditure and how much the sector contributes to Scottish Gross Value Added.
- Section 6 presents the limited evidence on how grouse moor activity impacts on communities and how estates and communities interact.
- Section 7 re-examines 2013/14 research data through the lens of driven grouse moors (removing estates only engaged in walked-up grouse) and also presents some of the industry collected data that is often quoted in the media.
- Section 8 is a short section on some of the costs that may be associated with the negative externalities (e.g. reduced opportunity for wildlife tourism) arising from grouse shooting.
- Section 9 provides some initial evidence on the economic returns alternative land uses may offer on grouse moors.

3 Employment impacts of grouse moor management

3.1 Introduction

One of the key socio economic impacts that driven grouse moors have relates to employment creation and associated earnings in (often remote) rural areas. These employment impacts are either generated directly through working for the estate, or indirectly through working in businesses that supply the estates (e.g. gunsmiths, tailors, veterinary medicine, machinery), or provide associated services (e.g. hotels, restaurants, game dealers). Grouse related employment can lead to population retention in sparsely populated areas that can help support/maintain service provision in these areas (e.g. hotels, shops, and primary schools). The multiplier effects of wage expenditure² also means that money earned on grouse estates can have economic impacts beyond those directly employed by the estate.

It is challenging to make comparisons between the different socio-economic studies due to: (a) different methodological approaches; (b) different scope of studies – grouse shooting focus or overall game shooting; (c) different samples; (d) different study periods.; and (e) different methods for grossing up to Scottish level estimates. Few gamekeepers are fully engaged on grouse-related activities throughout the year (with many undertaking other important estate work, such as: deer management, fishing ghillie, agricultural predator control, etc.) meaning disaggregation of their ‘grouse’ input can only ever be a best estimate. That said, Fraser of Allander (2010) estimated about 2,500 full-time equivalent workers’ jobs (with wage spend of over £30 million) across the Scottish economy were reliant on the grouse sector, with about 1,070 being direct estate employment.

This section examines the published evidence relating to the employment impacts of grouse moor management in Scotland.

² Some estate wages are spent in the local area which, in turn, supports employment and incomes in other businesses which, in turn, increases local spend in other businesses, etc.

3.2 Employment impacts

A number of studies have estimated both the direct and indirect employment impacts associated with grouse moors. Direct employment includes gamekeepers, shoot managers and other estate staff, as well as seasonal and casual employees used by the estates. Indirect employment relates to 'upstream' jobs (i.e. to those that directly service or supply the estates) and downstream' jobs (i.e. in game processing and game sales) and associated sectors (e.g. those providing food, travel, accommodation, etc. to shooters and their families).

Employment related to grouse shooting is generally regarded as more important when considered at the local scale (within a defined radius of the estate), rather than at a regional or national scale. That said, national surveys have been conducted to ascertain the extent of the impact of all types of sport shooting on direct and indirect employment – usually quantified in terms of the number of resulting Full Time Equivalent (FTE) jobs.

Table 1 captures the range of estimates of direct and indirect employment impacts made by previous studies, at both UK and Scottish scales, and for all sport shooting as well as grouse shooting specifically. The results of regional Scottish case studies are also summarised in Table 2. The majority of the sources included in these tables are published primary research, with some unpublished review documents also included.

The more recent national estimates for the UK and for Scotland (e.g. PACEC 2014, Hindle et al. 2014) suggest that all types of game shooting create a meaningful numbers of jobs at that scale, with the PACEC (2014) study estimating that 74,000 (combined direct and indirect) FTE jobs are supported by the shooting industry at a UK level. This includes a significant seasonal/part-time component and 39,000 FTEs supported by supply chain activity, including in relation to travel, vehicle and machinery maintenance, accommodation and game processing. There is considerable consistency between the PACEC 2006 and 2014 figures for direct and indirect employment in game shooting in Scotland (approximately 11,000 FTEs).

The National (Scotland) Estates Survey (Hindle et al. 2014) identified a much lower combined (direct and indirect) 1,867 FTEs linked to sporting activities³; however, these only represented estate-based sporting employment (and related indirect employment) and excluded all wider (non-estate) sporting employment (e.g. shooting providers not based on estates). Additionally, these figures are based on grossing up the survey sample to the membership of Scottish Land and Estates, which does not account for all Scottish estates – total estate-based sporting employment is likely to be considerably higher than this figure. These figures also only represent the sporting component of estate employment, with estates (all sectors) estimated to have maintained 10,445 FTE jobs (direct and indirect) across Scotland in 2013.

Although The Scottish Moorland Group figures (Table 1) for employment within the grouse shooting sector are higher than other studies, they are reasonably consistent with the Fraser of Allander Institute (FAI) study (2010) which suggested the grouse sector was responsible for 2,358-2,640 FTEs, when direct and indirect employment estimates are combined. Using previous FAI/Game Conservancy Trust economic surveys (1990, 1996, 2001), FAI (2010) identified that there had been an upward trend in the number of people employed in grouse shooting and moorland management since the mid-1990s that related to increases in the number of shooting participants and the number of grouse shot. This trend was also reflected in more recent regional studies (e.g. Mc Morran et al. 2014; Mc Morran et al. 2015).

³ This was a different sampling framework to PACEC, and was not principally looking at sporting or grouse activities.

- Notably, while employment estimates are reasonably consistent, the national studies vary in: the sample sizes they refer to; the calculation methods they employ, and whether they include data relating to clay/target shooting. FTE calculations are also often based on estimates, with incomplete information on the total estate/business population from which samples are drawn.

Table 1 Employment linked to grouse shooting and grouse moor management (and wider game management) in the UK and Scotland

Scale and focus	Source	Direct employment impacts (FTEs)	Indirect employment impacts (FTEs)
UK level – all sport shooting activity	PACEC (2014)	35,000 FTE jobs provided by shooting providers (large seasonal/PT component).	A further 39,000 FTE jobs supported indirectly through supply chain activity.
Scotland – all sporting shooting	McGilvray et al. (1990)	2,171 FTE jobs directly dependent (at least 1,500 keepers/stalkers).	5,041 FTE jobs supported indirectly through supply chain.
	PACEC (2006)	5,300 FTE jobs directly dependent.	5,700 further indirect and induced jobs.
	Hindle et al. (2014)	Estimated 733 FTE jobs in sporting land uses ⁴ (based on a sample of 186 estates)	1,134 FTE jobs supported indirectly by sporting land uses
	PACEC (2014)	8,800 combined direct and indirect FTE jobs and a further 2,000 FTE jobs related to conservation/wildlife management in moorland habitats.	
England/ Wales - grouse shooting	Moorland Association <i>Unpublished</i> ⁵	Grouse shooting estimated to support 1,520 FTE jobs on 175 moors in England and Wales (700 FTE jobs from direct employment and 820 from indirect employment).	
Scotland - grouse shooting	Fraser of Allander Institute (2010).	Estimated 1,072 jobs directly dependent based on a grossed up sample of 93 estates.	Estimated 1,286 jobs supported indirectly through supply chain.
	McGilvray (1995)	Estimated 940 FTE jobs directly linked to industry supporting £14.7m in wage spend.	
	Scottish Moorland Group <i>Unpublished</i> ⁶	Grouse shooting (2011/12) estimated to support 2,640 FTE jobs (direct and indirect) and generated wage spend of £30.1 million.	

A sample of media articles related to ‘driven’ AND ‘grouse’ AND ‘shooting’ since 2008 collated for this review found the 1,072 jobs figure for direct employment from the FAI (2010) economic study was most commonly cited. Regular reference was also made to ‘2,640 jobs in the grouse sector’, drawn from the unpublished SLE/Scottish Moorland Group paper (shown in Table 1⁷) and presumably also based on the combined direct and indirect employment estimated in the FAI (2010)

⁴ Both direct and indirect sporting employment figures for the national estates survey based on grossing up from a sample of 277 survey respondent estates to all Scottish Land and Estates members

⁵ Figure referred to in a number of BASC and Moorland Association reports and promotional material (e.g. the Value of Grouse Moor Management, Countryside Alliance 2014) but could not be directly sourced to a published report.

⁶ Figure referred to by the Scottish Moorland Group but not sourced in an existing published report (<http://www.scottishmoorlandgroup.co.uk/grouse-shooting>)

⁷ For example: ‘[Low grouse stocks to hit start of Glorious Twelfth](#)’ Financial Times (13.08.18); ‘[Starting gun is fired on the grouse shooting season](#)’ Daily Mail (12.08.17); ‘[Ban grouse shooting](#)’ The Mirror, 12.08.16

study. This means that the data often reported in media discourse around grouse moor management and grouse shooting is based on data that is ten years old.

It is important to note that direct employment figures often relate to gamekeepers who spend a proportion of their time on activities not directly related to grouse moor management. This was recognised by FAI (2010), Hindle et al. (2014) and Mc Morran et al. (2015) where estates were asked to estimate the proportion of employees' time spent on grouse moor management. In Mc Morran et al.'s (2015) study of grouse moors in the Monadhliath and Angus Glens the 92 gamekeeping staff (from a total of 186 FTE jobs on the estates) only spent 53% of their time (on average) on grouse-related activities (as opposed to deer management, for example). This is consistent with FAI's (2010) estimate of 46% but that distinction was not always made in other regional case studies reported in Table 2 and additional verification would be required to establish accurate estimates of full-time equivalent, grouse-related employment. However, as many estates in the regional studies listed in Table 2 noted, most of the estate-based employment on estates with active grouse moors was linked to the grouse shooting industry to some extent.

Table 2 Employment linked to grouse shooting and grouse moor management (and wider game management) at UK, Scotland and regional levels (within Scotland)

Scale and focus	Source	Direct employment impacts (FTEs)
Monadhliath and Angus Glens	Mc Morran et al. (2015)	110 direct FTE jobs in Angus, 44 in Monadhliath, seasonal jobs increase this to 130 and 56 FTE jobs (26 estates, 55,981ha moorland).
Cairngorms National Park	Mc Morran et al. (2013)	52 landholdings with sporting activity reported 133 FTE jobs linked to sporting activity (27% of total estate employment in the sample). Estimated total estate employment (all sectors) at 559 FTE jobs (direct) and a further 940 (indirect) FTE jobs resulting from supply chain impacts of estates.
Tomintoul	Mc Morran (2009)	38 direct equivalent FTE jobs and five trainees (on nine estates) and a further 12 related FTEs (e.g. cooks, cleaners) (9 estates).
Scottish Borders	Scott Wilson Resource Consultants (2002)	68 direct equivalent FTE jobs on 27 estates.
Upper Findhorn valley	Mackenzie (2000)	47 equivalent FTE jobs supported on nine estates (44,515 ha).

Driven grouse shoots are labour-intensive with high demand for permanent, seasonal and casual employees. A day of driven grouse shooting typically involves 20–50 people hired to work as beaters, gun loaders and pickers up, with catering staff also usually required (Sotherton et al. 2009). As a result, seasonal employment is significant and inflates the FTE figures. Actual numbers of people employed are generally much higher than the FTE estimations and these seasonal roles are also the most likely to be lost during years with poor shooting opportunities (McGilvray 1995; PACEC 2006). Additionally, much of the employment within the sector is correspondingly low paid, part-time or very short term, and (to an extent) insecure. Although accurate data on wage rate is limited, the FAI (2010) staffing and wage spend figures can be used to calculate an annual wage of £13,526 (in 2009), with exact wage rates likely to be lower for seasonal staff and higher for permanent staff.⁸

The regional case studies (Table 2), while sometimes based on relatively small estate samples, demonstrate significant employment impacts at regional/local levels, with impacts often varying in

⁸ Care has to be taken in calculating average wage rates and drawing conclusions from the data – for example: the £30 million wage spend associated with 2,640 FTE jobs reported by the Scottish Moorland Group suggests an average wage of £11,401 associated with grouse shooting - yet the majority of these jobs are indirect jobs, off-estate, in other sectors of the economy (e.g. hotels, garages, etc.).

terms of numbers of staff employed by estates and employment impacts across regional estate clusters. The level of commercialisation of sporting activity can vary considerably across estates, with corresponding impacts on employment levels. Mustin et al. (2017) categorised sporting estates in Scotland into three main categories: (i) commercial shooting estates; (ii) non-commercial shooting estates; and (iii) diversified estates, with commercial estates having much larger numbers of employees as a result of their emphasis on satiating client demand and providing (relative) value for money. Sporting employment was found to be disproportionately important for some regions. Similarly, a community survey in the Angus Glens and Monadhliath study found that over a quarter of respondents in both areas stated that their livelihoods were in some way (directly or indirectly) linked to the grouse shooting industry (Mc Morran et al. 2015).

The FAI (2010) study of the economic impact of grouse shooting concluded that the majority of employment in the sector was likely to be created in remoter parts of Scotland where comparatively few alternative employment options exist (with three quarters of jobs recorded in Aberdeenshire, Highland and Perth & Kinross). The regional studies (Table 2) also demonstrate the importance of non-permanent employment, with the 68 estimated FTEs in the Borders study represented by almost 750 different jobs, which were mostly seasonal and/or part-time (Scott Wilson Resource Consultants 2002). In this example, overall employment levels had been sustained over the preceding decade, despite economic and ecological challenges during that timeframe. However, data from other studies at the time (e.g. Warren 2002; Park 2008) demonstrated reductions in employment linked to historical decline in grouse numbers and active moorland management. For example, a contraction in grouse numbers on six moors in Muirkirk in East Ayrshire in the 1980s resulted in a decline in related employment, from ten active keepers pre-1980 to one keeper in 2011 (Moorland Forum 2011).

Notably, driven grouse is associated with higher employment impacts compared to walked-up and grouse shooting over pointers, and Sotherton et al. (2009) identified an 'optimal keeping' level of one keeper per 1,000-1,200 hectares of moorland managed for driven grouse. Warren and Baines (2014) also suggest any shift from driven to walked-up grouse would likely result in decreased demand, revenue and employment in moorland management. In areas of higher management intensity there appears to be greater employment on a per hectare basis, with keeping levels in the Monadhliath of one keeper per 1,038 hectares and one keeper per 875 hectares in the Angus Glens in 2013-2014⁹, in line with higher levels of investment and large grouse bags in Angus (Mc Morran et al. 2015).

4 Direct non-staff economic impacts of grouse moor management

4.1 Introduction

Beyond the direct staff costs associated with managing grouse moors and grouse shoots, estates also have wider socio-economic impacts in the Scottish economy through the purchase of goods and services used as part of their annual running costs or through capital investment relating to grouse activities. When estates spend money on vehicles and machinery, plant operators, builders, joiners, electricians, painters, accommodation, hotels and restaurants, caterers, gunsmiths, sawmills, fencers, specialist clothing, garage services, fuel, etc. – they are supporting a wide range of businesses and associated employment in the Scottish economy, with many of these businesses located in rural areas.

⁹ Note these figures relate to the numbers of gamekeepers employed only and not the larger number of staff for these estates which includes other land management staff, catering staff etc.

Many of the estates do, however, earn income through the sale of commercial grouse shooting days, where individuals and groups pay for shooting and hospitality on the day (around £120 - £150 per brace on average excluding gratuities¹⁰). Beyond income from shooting parties, guests sometimes also pay the estate for accommodation, hospitality and other activity packages thereby adding to the overall estate income. Whilst this appears an attractive income stream for estates, it is often claimed that these revenues do not fully cover the running and reinvestment costs required for effective grouse moor management – rather the grouse management activities are reliant on the owners to underpin income shortfalls. In both the Monadhliath and Angus Glens the net cost (after accounting for income) to owners of grouse moor management was found to be around £40 per hectare in 2014, regardless of the scale of intensity of grouse activities.

Part of the reason for grouse activities often running in at a financial loss relate to: (a) seasonal fluctuations in bird numbers, with some poorer seasons having much reduced shooting (and therefore income earning) days, and; (b) variable proportions of shooting days that are ‘commercial’ (i.e. revenue generating) across estates – with many having more emphasis on family and invited guest days (with no revenue stream). It is often highlighted that this expenditure (and economic impact) is at the behest of private individuals rather than being reliant on public support like some other alternative land-uses. This net-investment can, however, lead to longer-term economic gain if the estate is ever sold – with each brace of grouse estimated to add £3,000 - £5,000 capital value to the estate.

This section examines the evidence relating to the direct non-staff costs and revenues of grouse moor management in Scotland, including the capitalisation of grouse bags into property values.

4.2 Direct economic impacts

A number of studies have addressed the direct economic impacts (estate revenue and expenditure) of game management and grouse shooting specifically (see Table 3). PACEC (2014) identified significant spending and income associated with game shooting at UK level (£1.1 billion for all shooting activity), with operational costs the most significant area of spend whilst shooting fees and rental income (sport rented to third parties) were the most significant income components. Income for 93% of shooting providers remained steady or increased in the five years preceding the PACEC study. Across the UK in 2012/13, 62% of providers declared that their shooting provision (all types) was self-financing and roughly broke even, whilst 16% reported profitable activity and 22% confirmed that their shooting provision was loss-making and financed from estate-based or other sources (PACEC, 2014).

¹⁰ For example: <https://www.roxtons.com/shooting/destinations/europe/scotland/grouse-shooting-estates/> or <https://www.telegraph.co.uk/news/0/grouse-shooting-12-facts-about-the-glorious-12th/> or <https://www.shootinguk.co.uk/grouse-shooting/walked-up-grouse-2-76565>

Table 3 Direct expenditure (wages, investment and operational costs) and income from all sporting activity and grouse shooting in the UK and Scotland

Scale and focus	Source	Direct Expenditure	Direct Income
UK level – All sport shooting activity	PACEC (2014) (2012-2013)	£1.1 billion annual spend by providers (£630m operational costs, £370m wages). 42% of providers spent £1-9,000, 27% £10-49,000 and 15% over £50,000.	£1.1 billion annual income to providers (incl. £360m shooting fees, £260m shoot rents and £170m subscriptions).
Wales and England – grouse shooting	Countryside Alliance (2015)	£52.5m annual spend by 190 Moorland Association moorland owning members (90% privately invested) ¹¹ .	
Scotland – all sport shooting	McGilvray (1990) (1998-1999)	£32.7m spend, with a deficit of 14% of turnover.	£28.6m income (including game/venison sales).
Scotland – Estate income/ spend on sporting activity	Hindle et al. (2014) National Estates Survey	£16.97m sporting expenditure including wages (£7.4m) management costs (£6.2m) and capital investment (£2.9m). (186 of 277 respondents engaged in sporting activities).	£12.4m sporting revenue (grouse-specific revenue not differentiated). 172 (of 277) estates derived income from sporting activities, with 63 engaged in grouse shooting.
Grouse shooting Scotland	Fraser of Allander Institute (2010).	£10.78m spent (2009) on wages (£5.2m) and operational costs (£5.6m) and £5m capital investment (sample of 92 estates engaged in grouse shooting, from 304 surveyed), with an average spend per estate of £82,330. £5.1m operating/wage spend relates directly to grouse.	£2.69m revenue in 2009 (compared to 2005-2009 average of £1.58m). Average revenue in 2009 of £76,972 (average 2005-2007 of £49,647).
Grouse shooting Scotland (combined regional data)	Scotland's Regional Moorland Groups 2018 ¹²	£23m annual spend by 45 grouse shooting estates in 2017 (in 7 regions) predominantly in local area (not including wage spend of spend on a/c providers). £6.7m annual wage spend by 32 estates across 7 regions in 2015	

4.3 Sport and grouse moor profitability - a net private cost?

Hindle et al. (2014) found that on average direct sporting expenditure (of which grouse was one component) was 27% higher than sporting revenues on 277 Scottish respondent estates, confirming 'average' net contributions by owners to their sporting enterprises (see Table 3). This corroborated the earlier findings from McGilvray et al. (1990) who reported average sporting incomes were 14% lower than associated costs in Scotland. Macmillan et al. (2002) also reported that sporting activities were only profitable on 32% to 38% of Scottish estates.

¹¹ Figures referred to by Countryside Alliance and Moorland Association (<http://www.moorlandassociation.org/grouse-2/>) not linked to a published report.

¹² Data collated by Scotland's Regional Moorland Groups and the Scottish Moorland Group (this is detailed further in Section 7.1)

4.3.1 Changing profitability of grouse moors?

Two specific issues which can affect grouse numbers, and therefore the profitability of grouse moors, identified in the literature are: (a) tick burdens and transmission of louping ill; and (b) predation of grouse from raptors and other predators. Tick burdens are increasingly being addressed through the use of sheep as 'tick mops', with Savills (2010) estimating annual running costs for a sheep flock to manage tick of about £40 per head.

- On Farr Estate, using an 800-strong sheep flock to reduce the tick burden across their grouse moor over a five year period resulted (as part of a wider grouse moor management programme) in reducing average tick burdens on shot stags from 150 to 10 ticks. Grouse numbers increased over the same period from 80 brace in 2005 to 1,500 in 2009, with a corresponding increase in profitability (Moorland Forum 2011).

Predation on grouse by raptors and other predators can result in economic losses which may have implications for local economies (Thirgood et al. 2000; Park 2008; Hanley et al. 2010). Redpath and Thirgood (1997) estimated in relation to Langholm moor (41.4km²) that an average of 2,277 grouse needed to be shot annually to financially break-even. Based on long term data at Langholm, Ludwig (2017) noted that existing predator control and habitat restoration, in combination with diversionary feeding of hen harriers, has to date not resulted in a sufficiently high grouse density to recommence (economically viable) driven shooting (Elston et al. 2014).

Thompson (2009) and Robertson (2017) noted that profitability from grouse shooting can be highly cyclical, due to fluctuations linked to long-term grouse population cycles, and in instances losses may be acceptable due to recreational interests from the owners. BASC (2015) highlighted that in the UK between 1911 and 1980 the numbers of grouse shot declined by more than 80%. However, BASC report that grouse populations have recovered in recent years, likely linked to a combination of factors, including: increased input to moorland management; use of medicated grit; tick 'mopping'¹³ and decreased loss of heather habitats – activities that can be relatively expensive.

Management costs can vary by estate size and the intensity of grouse management, with FAI (2010) recording an average total estate expenditure over 92 estates of £122,000 in 2009. Park (2008) reported costs of £99,500 for maintaining the grouse moor at Langholm in 1996 (with very limited income from grouse over the same time period). Savills (2013) estimated the cost of employing a gamekeeper at £45,000 per annum (including housing, vehicle, salary and equipment) and the cost of running a day of driven grouse at approximately £2,500 (including staff time, catering, pickers-up and beaters' costs and transport) – although this does not include capital costs of the supporting infrastructure, which is often considerable. These costs tend to erode shooting revenues very quickly.

Linked to improved grouse numbers the profitability of grouse shooting appear to have improved in recent years. FAI (2010) reported that grouse revenues increased 70% between 2005 and 2009, largely attributed to increased fees (from £98 per brace in 2001 to £131 in 2009 and upwards of £150-£180 per brace currently compared to £100 per brace of walked up grouse¹⁴) as opposed to larger bag sizes.

- Savills (2016) estimate the value of a day of driven grouse shooting for a party of nine at between £20,000 and £40,000.

¹³ The use of sheep treated with acaricide to act mop-up ticks to minimise the impact of ticks on the grouse population.

¹⁴ Costs are before VAT. Costs per brace of grouse vary between providers with some current providers and agents noting costs of £150-180 per brace plus VAT e.g. see: <https://countrysportscotland.com/2013/07/early-indications-are-predicting-a-good-grouse-season/>. This can be compared to a cost of £100 + VAT for a brace of walked up grouse.

In comparison, Sotherton et al. (2009) noted that the returns from walked-up grouse were relatively low due to there being much fewer participants and considerably lower numbers of grouse being shot. FAI (2010) noted a general longer-term trend towards increased commercial activity (in terms of the number of shooting days and participants) and increased profitability - with only 2.1% of surveyed estates reporting profitable grouse shooting in 1994, compared to 17.6% in 2001 and 43% of respondent estates in 2010. Based on comparison of the 2009 data with data from previous surveys (1990, 1995, 2001), FAI (2010) also identified a substantial increase in the number of let grouse shooting days being offered by estates in addition to a greater proportion of estates offering paid (commercial) shooting – a trend also noted by Savills (2016). Grouse moors in the 5,000-10,000 hectares range experienced the greatest levels of investment and returns in terms of increasing bag sizes and income (FAI 2010).

4.3.2 Net private costs of running grouse moors

At a national level FAI (2010) reported that spending (£10.78m) on grouse shooting in 2009 outstripped income (£2.69m) even more significantly than for all sport shooting, confirming that the grouse shooting sector operates at a considerable net cost to owners – a point that is often stressed in debates on grouse moor management. This was also a finding in the regional studies (see Table 4), where grouse shooting operated at a net cost of £3.45m in the Angus Glens (one of the most concentrated areas of driven grouse shooting in Scotland) and £1.2m in the Monadhliath (Mc Morran et al. 2015). This equated to a net cost (losses) of around £40 per hectare across both regions, despite having widely different average cost and revenue structures (and grouse management intensities). Along with similar income shortfalls reported in studies in the Scottish Borders (Scott Wilson Resource Consultants, 2002) and Upper Findhorn Valley (Mackenzie, 2000), the evidence reveals that a high degree of sporting expenditure, particularly for grouse, is funded from other on or off-estate sources of finance.

Some studies have, however, highlighted that income from commercial grouse shooting can be effective in substantially reducing the overall costs of grouse moor management and private (non-commercial) grouse shooting activity. For example, in the Scottish Borders, estates engaged in commercial grouse shooting were able to fund nearly three quarters of their grouse moor management and staffing costs from income, resulting in costs of £4-6 per hectare as opposed to £18.90-£26 per hectare on estates with no commercial grouse shooting. As Wightman and Tingay (2015) argue, grouse moors are often not managed as businesses but as personal recreational assets and this should be taken into account when assessing their relative 'profitability' – reflecting the division of estates into commercial, non-commercial and diversified activities (Mustin et al. 2017), with some owners more focused on increasing the profitability of the estate than others.

Table 4 Direct expenditure (wages, investment and operational costs) and income from all sporting activity and grouse shooting in regional case studies in Scotland

Regional case study impacts	Source	Direct Expenditure	Direct Income
Cairngorms National Park	Mc Morran (2013) (sample of 52 estates (2012 data))	£6m sporting expenditure on 33 estates on wages (£2.8m), management inputs (£1.9m) and repairs and investments (£1.4m) ¹⁵ .	4.47m sporting income (15% total estate income in sample). £934,000 of this from grouse shooting (82% driven grouse over 230 driven days); 15,954 grouse shot on 22 estates.
Monadhliath and Angus Glens	Mc Morran (2015) (2014 data)	£6m sporting expenditure in Angus Glens on 12 estates (£2.9m investment, £1.9m management costs, £1.3m wages) and £1.7m on 8 estates in Monadhliath (£0.7m investment, £0.45m management costs, £0.55m wages). Est. 60% of costs on grouse management (both areas). Per/ha spend on grouse moors of £120 (Angus) and £51 (Monadhliath).	£2.6m revenue (£2m from grouse) in Angus and £545,000 (£207,000 from grouse) in the Monadhliath. Per/ha grouse revenues averaged £77/ha in Angus Glens and £12/ha average in the Monadhliath. Net costs (losses) of £44/ha in Angus Glens and £39/ha in Monadhliath.
Scottish Borders	Scott Wilson Resource Consultants (2002) (1999 data)	£0.8-£1.1m expenditure on 27 grouse shooting estates. Net costs (losses) incurred varied from £4-6 per/ha on commercial estates.	£144,000-£155,000 income from 100 grouse shooting days (45% commercial).
Upper Findhorn valley	Mackenzie (2000)	£1m annual expenditure (on 9 estates, 44,515 ha), average of £22 per/ha. Additional capital expenditure over preceding 3yrs of £3.6m	£388,000 income

4.4 Capitalisation of game bags into property values

As ECRA (2017) note, investment in grouse moors is at times framed as philanthropic private investment into rural development. However, in reality, increased management intensity and investment in related infrastructure has considerable impact on both grouse bags (and therefore profitability) and the capital value (see Figure 1) of the estate, due to increased demand for driven grouse shooting and a continuing link between game bags and land value in Scotland (GWCT 2016).

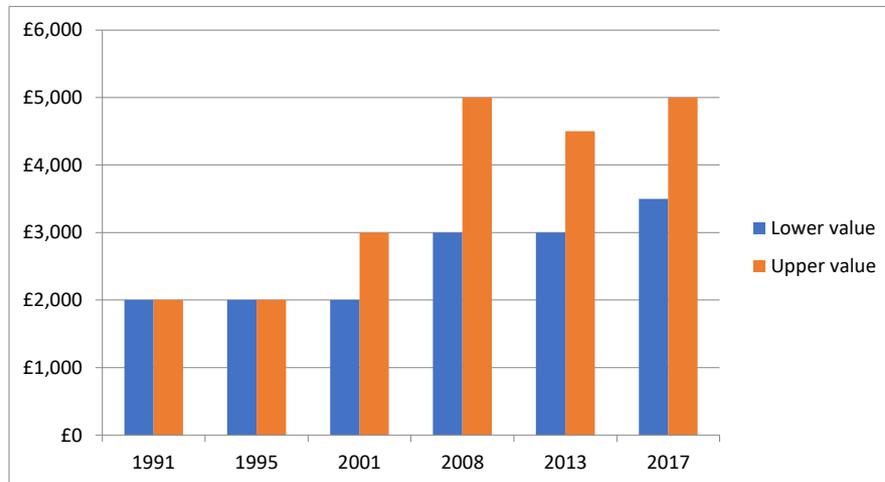
- For example, based on an additional capital value of £5,000 per driven brace of grouse (with walked-up grouse valued at less than half this amount) (Savills 2013), increasing grouse numbers through a sustained period of investment in management from 100 brace to 2,000 brace could add £9.5m to the value of an estate.

Referring to Knight and Frank's annual Sporting Property Index (2004-2014), Wightman and Tingay (2015) noted that grouse moors have outperformed all other sporting properties (e.g. deer, salmon), with the average capital value of grouse moors having increased by 49% over that period (an annual 4.1% return). Savills (2015) noted that as the value of grouse moors is based on the number of birds they yield, owners are incentivised to invest in their management, and wider estate housing and

¹⁵ Indirect spending impacts are not differentiated in report for specific estate sectors, only for total estate spend.

estate infrastructure, as this increases their value over the long term. Nevertheless, the slow turnover in estate sales and longevity of ownership of many estates (see Hindle et al. 2014) suggests that maximising capital values may not be the key driver of grouse moor management for some owners.

Figure 1 Upper and lower capital values per brace of grouse, various years



Source: Source: Bell Ingram Annual Reviews

While grouse moor management is not directly supported from public monies, areas which are managed for grouse may receive agricultural support payments or agri-environment / climate grant support (see for example Animal Aid, 2013). Whether these grouse shooting estates receive public monies for other activities / outputs or not, many owners invest considerably in infrastructure related to grouse shooting such as: grouse butts; shooting accommodation; staff housing; access tracks; and, lunch huts (Sotherton et al. 2017). Increased investment in infrastructure has been apparent in some areas of Scotland in recent years, linked with increased commercialisation and management targeted at increasing grouse numbers to maximise the potential for driven grouse shooting (and therefore profitability).

- For example, in the Angus Glens owners of grouse shooting estates invested £2.9m on grouse shooting infrastructure in 2014, with one estate having invested £16.6m over the preceding ten years and a second estate having invested £10m over eight years. Estate survey respondents in these areas predicted investment levels as holding or increasing in the near future (Mc Morran et al. 2015).

Notably, when investment costs were removed from the total estate spend on grouse moors in the Monadhliath's and Angus Glens, Table 4 shows that net costs fell to a combined £1 million across both areas in 2014 (Mc Morran et al. 2015).

BASC (2015) argued that as grouse moor management is driven by private investment (as opposed to public support payment), any sustained reduction or loss of driven grouse (as the most profitable component of grouse shooting) is likely to result in a decline in overall investment into these areas that would lead to a reduction in related employment and an increase in out-migration from these remote communities. This view is contested by groups like Revive¹⁶ who advocate that there would be alternative, even improved, economic activity in these areas without grouse moors (Common Weal and Lateral North, 2018).

¹⁶ See: <https://revive.scot/>. During the final preparation of this report Revive published a report commissioned from Common Weal and Lateral North (2018) that suggests alternative economic models for grouse moors – their findings are commented on in Section 9 of this report on Alternative land uses on grouse moors.

Historical evidence of the impacts that BASC (2015) refer to is currently limited, although it was evident (qualitatively) in some regional cases studies, including Muirkirk, where grouse population declines resulted in the loss of keeping jobs and declining investment by estates in the local area (Moorland Forum 2011). Looking further afield, whilst acknowledging geographical differences, perhaps some evidence of the long term withdrawal of investment (and activity) in grouse moor maintenance could be established:

- In Wales, whilst there was historically an active grouse shooting sector (Prestage, 1996; Jones, Undated) lack of investment and turning land over to other activities meant that there were only *“ten keepered moors in 1990”* and *“by 2010 there was not a single moor in Wales with a full-time grouse keeper”* (Powys Moorland Partnership, 2018a). Dimplebey (2018) stated that the reasons for the abandonment of grouse moor management *“are complex....since the 1960s as the great estates disappeared, many of the Welsh uplands were ploughed or planted with woods and the remaining heather moors became isolated.”* Further Jones (undated) also suggesting the decline was caused by *“lack of active moorland management, increasingly stocking moors with sheep and the presence of the tick borne disease, louping ill.”* Whilst there is no apparent evidence of the socio-economic impacts of the grouse shooting decline in Wales, it is clear that other economic activities continued (sheep farming) or were introduced (afforestation) on moorland areas. However, amongst concerns over the *“decline of our iconic moorland bird species”* the Powys Moorland Partnership initiative was created through Welsh Government and EU funding that means (it is claimed): *“the Welsh Government are supporting the notion that grouse shooting can be a cornerstone land use since this activity is the key economic driver to pay for full time moorland management from which so many public benefits flow”* (Powys Moorland Partnership, 2018b).

5 Indirect and GVA impacts of grouse moor management

5.1 Introduction

As with all economic impact studies, in assessing the impact grouse moor management on the Scottish economy it is important to consider the impacts beyond the direct expenditure undertaken by estates, but are linked to the grouse moor management / shooting activity – that is the second round expenditure, or multiplier effects arising from / related to grouse estate activity. For example, increased demand / expenditure for: transport arising from shooting guests travelling; food supplies for local hotels where shooting parties stay / eat; forest products from sawmills that supply estates; tweed cloth from specialist tailors that supply the estates; etc.

In addition, many economic impact studies also consider the impact of a sector on the Scottish economy as a whole. A standard measure of economic contribution a sector makes to the national economy is Gross Value Added (GVA) which is then used to help inform economic, regional, and sectoral policy decisions. GVA is the total value added by a sector excluding taxes and subsidies on products (and Gross Domestic Product is GVA *plus* taxes *less* subsidies) and is the *“difference between the value of goods and services produced and the cost of raw materials and other inputs, which are used up in production”* (O’Connor, 2018). In 2016 Scotland’s GVA was £134 billion (and agriculture, forestry and fishing accounted for £1.89 billion GVA, or 1.4% of the Scottish economy (O’Connor, 2018) and estimates in the literature suggest that grouse shooting accounts for about £23-£50 million GVA, which would be roughly equivalent to 0.02% to 0.04% of the Scottish economy.

5.2 Wider rural economy impacts

An important area of supply chain impacts often quoted in relation to the grouse shooting industry relates to expenditure by grouse shooting participants in the local areas during their stay. This can

include accommodation costs, food, general tourism spend, etc. PACEC (2014) estimated that 270,000 trips were made to Scotland on an annual basis as a result of participation in field sports, resulting in 910,000 overnight stays. Over half (54%) of providers in the PACEC survey indicated that their sporting provision led to overnight stays (the survey did not account for day visits), with 30% providing overnight accommodation and 39% generating overnight stays for other accommodation providers in the local area, with an estimated tourism spend of £155 million. This can be compared with an estimated total expenditure by sporting participants in Scotland of £78 million in 1989 (McGilvray et al. 1990).

BASC (2015) reported that an estimated 40,000 shooting visitors utilise grouse moors across the UK on an annual basis. Data on participant spend in Scotland is limited, however, FAI (2010) estimated that 1,531 non-Scottish UK grouse shooting guests generated £335,334 of additional non-Scottish tourist spend in Scotland – based on an average of £73 per person per night (using Scottish Enterprise figures) with an average stay of three nights. This is likely an underestimate of total participant spend due to the exclusion of Scottish and non-UK participants, and the use of an average tourism sector expenditure figure (many grouse shooters will spend considerably more on accommodation and hospitality than an average visitor). Additional data on local spend of grouse shooting participants is limited or dated, with Scott Wilson Rural Consultants (2002) estimating, for example, that expenditure by grouse shooting participants amounted to between £1.5 and £2.6 million in 2001. Notably, FAI (2010) explained that participants increasingly originated from the rest of the UK market (as opposed to internationally), with 93% of grouse shooting revenue coming from UK guests in 2010. This trend is also reflected in the findings of PACEC (2014) and the Scottish Country Sports Tourism Group (2017) in relation to participants in all field sports in Scotland.

It was regularly reported in the media articles sampled for this review that the sport shooting industry in the UK is estimated to bring around 50,000 visitors to the country's grouse moors each year, drawing on the figures listed in the PACEC studies (2006, 2014). The indirect impacts of these visitors, as reported in the media, include: the annual trade at the CLA and GWCT Game Fairs; the hundreds of gun makers in the UK who supply the industry; local jobs supported by the industry; and the impacts on tourism infrastructure in remote areas. Publicly-available videos recently produced for Scottish Moorland Groups by Pace Productions UK¹⁷ draw on interviews with estate staff and local business representatives to understand some of the indirect impacts in those places, as well as reflect on the impact of a reduction in grouse shooting on the tweed clothing industry.

Direct spending by estates on local businesses also generates additional economic impacts linked to the further indirect and induced effects. This includes the impacts of game dealers, equipment suppliers, catering establishments, transport operators, building companies and tradesmen, accommodation providers and garages, many of whom operate in relatively rural areas with a limited customer base. FAI (2010) estimated that some 88% of all moorland management and grouse shooting operational expenditure is made in Scotland - meaning there is very low economic leakage from the Scottish economy from grouse estate expenditure. Local case studies also highlighted an emphasis on estates spending locally 'where possible'; a point confirmed by local businesses and community members via interviews and community surveys (Mc Morran 2009; Mc Morran et al. 2015). In the Cairngorms National Park, for example, the bulk of all sporting-related expenditure occurred in the local area, with 89% of staffing costs and 77% of spending on management inputs occurring within the local area (Mc Morran et al. 2014).

Regional case studies (e.g. Mc Morran 2009; Mc Morran et al. 2015) illustrated the role of indirect spending by shooting participants and estate staff in local communities (with staff custom particularly valued in quieter winter months). The use of local accommodation by grouse shooting

¹⁷ The full playlist is available here:

<https://www.youtube.com/playlist?list=PLjw5QV0eC1o74QMNwShwvLUeCmrmQHYZO>

participants resulted in 675 and 338 bed nights in Angus and the Monadhliath respectively in 2014. Additionally, community survey respondents in both areas referred to the role of gamekeepers in using a wide range of rural businesses in the quieter winter months in remote rural areas.

Nevertheless, some respondents to community surveys (Mc Morran et al. 2015) noted that grouse shooting participants did not stay in the areas for long, and in some cases remained confined to their chosen estate. As ECRA (2017) note, the grouse shooting season is relatively short, with a limited number of shooting days per year and limited potential for capturing participant off-estate spending. Furthermore, the currently available data on local-level indirect and induced economic impacts of grouse shooting activity is limited and a more in-depth study of multipliers at the local level would offer potential for capturing the full extent of the indirect impacts of businesses which benefit from estate and participant spending.

5.3 Community-related impacts

Further evidence of indirect impacts linked to the grouse shooting industry include: population retention; direct linkages between rural communities and the industry (e.g. cultural aspects and community identity), and; engagement between communities and estates. BASC (2015) argues that grouse shooting plays a role in retaining young people in remote rural areas (e.g. through gamekeeping jobs, training and skills development), providing children to boost school role and through the visible custodian role of gamekeepers. Community surveys in grouse shooting areas (Mc Morran 2009; Mc Morran et al. 2015) demonstrated that many community members value the role of gamekeepers as community members, with a majority (in both surveys) perceiving grouse shooting as providing benefits for the local community and as constituting a component of local community culture and heritage. More specifically, 70% of survey respondents in the Angus Glens and 53% in the Monadhliath perceived community-level benefits from grouse shooting, with employment and spend the most important benefits at personal and community levels. Nevertheless, in Angus and the Monadhliath 8% and 15% of respondents respectively did not recognise any community-level benefits and 17% recognised negative community impacts – such as on wildlife (Mc Morran et al. 2015). It should be highlighted that the views of the 80% of households¹⁸ that were non-respondents in these communities remain unknown.

In relation to community linkages with the sporting industry, PACEC (2014) reported that 87% of survey participants felt shooting contributes to the social fabric of the local area; although this was a particularly biased sample as it only accounted for the views of those participating in or providing sporting opportunities and did not account for the views of non-participants. BASC (2015) highlighted the ‘custodian’ role of gamekeepers, which is perceived as facilitating connections between people in dispersed upland communities. Nevertheless, as Midgley et al. (2008) noted, there is much evidence of a steady decline in the contribution and influence of land-based sectors in terms of rural employment and presence in rural communities, with a degree of de-linking of the land-based sectors from their surrounding communities occurring across Scotland.

- In the Monadhliath and Angus Glens, a majority of community survey respondents in both areas had ‘good’ or ‘some’ awareness of estate management (74% Angus, 62% Monadhliath) although 26% and 37% had limited or no awareness (Mc Morran et al. 2015). 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). As mentioned above, views of the non-respondent households remain unknown.

Reflecting the aforementioned conclusions of Midgley et al. (2008) and Mc Morran et al. (2009), a degree of perceived ‘disconnect’ between estates and communities was evident in both areas (the

¹⁸ That includes vacant and second home owners

Monadhliath and Angus Glens), with a decline in community participation in driven grouse days (e.g. as beaters) and significant numbers of respondents (40%) in both areas expressing interest in learning more about grouse shooting (perhaps reflecting the changed demography of these areas over the last 30 to 40 years – with fewer residents with any connections to the land-based sector). As a result of this community disconnect the network of Regional Moorland Groups was established in 2015 to improve communications between grouse moors and other communities.

5.4 Total indirect and GVA impacts

Despite Midgley et al.'s (2008) observation that the overall economic contribution of the rural land use sector has declined in terms of employment impacts, its contribution to local and regional economies remains important. For example, estates in the Cairngorms National Park were estimated to generate £31.9 million in income (from all estate business sectors) in 2013, which contributed £55.5 million to Scotland's output after indirect and induced impacts were included. These estates were also recognised as providing a significant component of the raw material for a number of important park-based wider industries such as timber processing and local food. Nevertheless, as Thompson et al. (2009) noted, wider evidence suggests that game management and grouse shooting in particular, represent relatively small components of the rural economy. Wightman and Higgins (2000) also argued that mountaineering and hillwalking in the Highlands and Islands region alone generated over 6,000 FTE jobs in the late 1990s, with participant expenditure over five times higher than for all sporting (hunting/shooting) activities across the whole of Scotland at that time.

In general, the evidence base for the indirect economic impacts of sporting land use is more limited, although a number of the studies referred to previously have quantified indirect economic impacts to some extent. The total (direct and indirect) contribution of all sport shooting was estimated to be £2 billion GVA across the UK (PACEC, 2014).

It should be noted that despite widespread use and referencing of PACEC (2014) the study has been critiqued in some detail (see Cormack et al. 2014), with these reviewers arguing that the employment and GVA estimates are open to question due to inappropriate use of multipliers and a failure to discuss public cost factors (i.e. subsidies), among other criticisms.

Overall the figures on total economic contribution of the grouse sector remain debatable due to methodological approaches and dated data. However the studies reviewed suggest that the total GVA contribution from the Scottish grouse sector between 2009 and 2014 was somewhere between £23 million and £50 million GVA - equivalent to 0.02% to 0.04% of the Scottish economy based on Scotland's 2016 total GVA of £134 billion (O'Connor, 2018). These impacts are derived from:

- BASC (2015) suggested a 'total economic impact' of grouse shooting in England and Wales of £67.7 million¹⁹ and a combined economic impact at UK level of over £100 million, with the majority of this funded through shooting incomes and private expenditure by owners (with the exception of 10% for government approved agri-environment schemes) – therefore implying that the 'economic impact' in Scotland was £22.3 million.
- PACEC (2014) estimated that all sport shooting in Scotland generated £38 million in direct GVA (first round expenditure impacts from estates) with total GVA contribution of about £200 million after accounting for all direct, indirect and induced spending related to grouse moor management. Grouse interest groups²⁰ claim that about 25% of this impact is associated with grouse moor management and grouse shooting – or roughly £50 million total GVA impacts.

¹⁹ Although the underlying data and calculations for this figure are based on Moorland Association figures and not based on a published report.

²⁰ For example see: <https://www.dailymail.co.uk/video/news/video-1517469/Glorious-Twelfth-Bid-make-grouse-shooting-accessible.html>.

- Based on grossing up and multipliers, FAI (2010) calculated a total wage spend impact of £14.5 million from the grouse shooting industry in 2009 and a total contribution to GVA of £23.3 million, although it should be noted these figures are now somewhat dated and based on lower participant costs than those available currently.

6 Well-being and wider societal impacts of grouse shooting and moorland management

It is often reported that grouse moor management leads to wider nature conservation benefits, producing habitats for waders and mountain hares and producing a network of paths for people to access the countryside for recreational purposes that can improve well-being. There is also a great deal of focus on the reported negative impacts that grouse moor management have, particularly on raptors, predatory mammals, water pollution and landscapes. However there is little evidence on the economic impacts of these positive and negative ‘externalities’²¹ that arise from grouse moor management. This section looks at some of the evidence to highlight issues and ultimately reveal that that this is a much understudies aspect of grouse moor (and perhaps wider land management) activities.

6.1 Use values and impacts relating to community well-being

Over 97% of shooting participants (a relatively small population) responding to the PACEC (2014) survey agreed or strongly agreed that shooting contributes to their well-being and 93% agreed or strongly agreed that that shooting sites are ‘healthy’ and ‘attractive’. In the surveys of the Tomintoul community (Mc Morran 2009) and Angus and Monadhliath communities (Mc Morran et al. 2015), a majority of community respondents²² used grouse moors for recreational or other purposes (e.g. work). A majority of community respondents also viewed grouse moors as attractive or extremely attractive in Angus (75%) and in the Monadhliath (60%).

6.2 Conservation-related economic impacts

It is difficult to determine accurately the full extent of conservation-related impacts from grouse shooting in economic terms due to differing perceptions of what constitutes conservation land management. PACEC (2014) estimated that all types of shooting providers in the UK spend £230 million per year on habitat and wildlife management practices specifically for shooting sports (61% of this on labour). BASC (2015) also specifically noted that 90% of English moors fall within a National Park or Areas of Outstanding Natural Beauty (AONB). GWCT (2016) also identified a number of conservation benefits of grouse moor management and discusses these in relation to moorland drainage, disease control, upland predator control and breeding success of wading bird species on managed moors.

6.3 Costs associated with negative externalities of driven grouse

Reed et al. (2009) reported that the British uplands have “*perhaps the most wide-ranging set of ‘economic externalities’ found in any land use context in the UK*” highlighting how the beneficiaries of upland ecosystem services are often remote from the area in urban settings leading to “*a mismatch of costs incurred by those who manage uplands and those who enjoy their [non-private] benefits.*” There are, however limited studies that identify the costs of the externalities arising from the management of upland areas, or specifically of areas managed for driven grouse.

²¹ Externalities occur when someone undertaking an activity (grouse moor management here) causes impacts that affect others.

²² Caveated that only 20% of households responded.

Whitfield and Fielding (2017) reported that 31% of the 131 young Golden Eagles that were satellite tagged and tracked during the research had disappeared “*under suspicious circumstances significantly connected with contemporaneous records of illegal persecution,*” concluding that there was evidence that persecution was “*associated with some grouse moors in the central and eastern Highlands of Scotland.*” Whilst this evidence has been contested by the Scottish Gamekeepers Association,²³ it is evident that a great deal of time and resources are spent in monitoring Scotland’s raptor population, assessing causes of raptor deaths and in prosecuting perpetrators of wildlife crime where evidence merits action. There does not appear to be any evidence as to the extent of costs borne by the public sector (e.g. Scottish Government, Police Scotland, Crown Office and Procurator Fiscal Service,²⁴ SASA, SRUC Vets, Scottish Natural Heritage, etc.) in dealing with wildlife crime, nor how much is spent by private membership groups in raising wildlife crime issues (e.g. RSPB Scotland, Scottish Raptor Study Group, etc.). It is reported that the satellite tags for these eagles cost around £3,000 each, with annual data charges of £750²⁵ – meaning that the accumulated cost of physical tag losses (which Whitfield and Fielding (2017) attributed to grouse moors) accounted to over £120,000.

If there are, indeed, smaller raptor populations in-and-around grouse moors, as attested by many, it may have a knock-on effect to the wider, non-game related recreation and tourism earning potential of local economies. Bird watching and wildlife tourism are important in many parts of Scotland, and there may be reduced visitor numbers in areas with managed grouse moors. Bryden et al. (2010) estimated that nature-based tourism (defined as an “*overnight stay that is related wholly or partly to Scotland’s natural heritage – its wildlife, habitats, landscapes and natural beauty*”) accounted for nearly 40% of tourism expenditure in Scotland, generating £1.4 million revenue and 39,000 FTE jobs. Further, Visit Scotland (2017) estimated that in 2015 there were 494,000 domestic visits and 2.7 million accommodation nights generating £187 million spend on visits that included “*watching wildlife / bird watching.*” At a more local level, Progressive (2015) in their survey of 2,458 visitors to the Cairngorms reported that wildlife / bird watching was the main reason for the trip for 5% of the respondents, with 12%(18% in the 2008-10 sample) having participated in the activity during their visit. Data relating to wildlife recreation and tourism on moorland areas of different management regimes does not appear to exist meaning it is hard to determine the extent of any negative impact that driven grouse moors may have.

²³ See: <https://news.scottishgamekeepers.co.uk/2018/11/sga-calls-to-assist-police-over-loss-of.html> and <https://www.bbc.co.uk/news/uk-scotland-45954568>

²⁴ Scotland has a specialist team of prosecutors dealing with wildlife and environmental crime: <http://www.copfs.gov.uk/about-us/what-we-do/our-role-in-detail/10-about-us/296-specialist-reporting-agencies>

²⁵ <http://www.roydennis.org/animals/raptors/golden-eagle/satellite-tracking>

7 Driven grouse moor management – data insights from recent studies

Whilst the previous sections have presented the findings relating to the socio-economic impacts of grouse from published studies, data recently collected by the grouse sector have increasingly been used in contemporary discourse regarding the economic impact of driven grouse. Further, data collected for commissioned academic studies into the economic impact of estates and grouse shooting contain economic data specifically pertaining to driven grouse moors that has not previously been analysed in isolation from total data that includes those only engage in walked-up grouse – or in the case of the national estates survey the grouse data was never analysed in isolation, rather reported with wider sporting expenditures and incomes. This section therefore presents these data to provide some new evidence, but also to reveal what further analysis and understanding of the sector could be provided from more systematic and robust collection of data from the sector.

7.1 Regional Moorland Groups Survey

The Scottish Moorland Group (SMG) gathered regional grouse-related financial information from member estates which viewed grouse shooting as either a principal or core element of their business between 2015 and 2017. Whilst the study has not been peer reviewed, and is not in the public domain a summary was provided²⁶ for consideration by this socio-economic.

SMG member estates with core grouse shooting activities supplied information voluntarily and confidentially through estate offices, factors, land agents and head gamekeepers:

- Whilst there was a very high response rate amongst Scottish Moorland Group members it is fully acknowledged that they do not represent all grouse estates in Scotland. Therefore, as with many surveys, the self-selection and self-reporting bias means the results should not be aggregated beyond the sample.
- An acknowledged weakness of the study was that the information submitted by estates was not in a consistent form, with some estates providing full financial breakdowns taken directly from accounts, with others providing summaries or extrapolated/estimated figures.
- As with other economic studies, it was evident that for many estates allocating staff and costs to specific activities / enterprises within the estate was challenging (e.g. gamekeepers working on grouse, deer, pheasant activities, or estate accommodation activities that are also used by grouse shooting guests).

Despite these methodological weaknesses, the information does provide additional and more up-to-date socio-economic information on grouse moor activities than that available in the literature. The surveys took place amongst regional moorland group members in 4 distinct phases between 2015 and 2017 with initial surveys initiated in Angus, followed by wider roll-out. It perhaps marks a start of more systematic data gathering from the sector.

Survey 1: This 2015 wage survey only covered the Angus Glens Moorland Group area with six (out of seven) respondent estates. There were 45 gamekeeper jobs dependent upon grouse shooting as the



²⁶ A summary of the methodology and findings were made available by the Scottish Moorland Group.

principal activity within the Angus Glens Moorland Group, with 512 beating staff employed during the course of the 2015 season. There were 30 employees under the age of 25 plus 7 students benefitting from placement opportunities across the surveyed estates. In total £990,000 wages were paid on these six grouse estates in 2015.

Survey 2: This 2015 survey examined the upstream (supply) effects of the Angus Glens Moorland Group estates in the 2014/15 financial year. Whilst not a local multiplier survey, it does however, provide some useful evidence of the non-wage direct expenditure impacts of grouse estates in the study area. As with Survey 1, six respondent estates submitted evidence that they had spent £4.7 million to 941 local and wider Scottish businesses during that year. This figure does not include any additional expenditure (travel, hospitality, other activities, etc.) that shooting parties may spend in the local and Scottish economy.

Survey 3: This 2016 wage survey expanded Survey 1 to encompass each of the 7 regional moorland groups (Angus, Tayside and Central Scotland, Tomatin, Loch Ness Rural Communities, Lammermuirs, Grampian and Speyside). Across the 32 respondent estates £6.7 million in wages were paid out in 2015 at an average of £210,000 per estate (see Table 5).

Table 5 Scottish Moorland Group grouse estate wage survey, 2015 data

Moorland Group	Respondent Estates	2015 Wages	Average Wages per Estate
Angus	8	£1,861,819	£232,727
Grampian	5	£1,192,827	£238,565
Lammermuirs	5	£1,008,036	£201,607
Loch Ness Rural Communities	6	£865,903	£144,317
Speyside	4	£981,200	£245,300
Tayside and Central Scotland	2	£411,626	£205,813
Tomatin	2	£393,395	£196,698
Total	32	£6,714,806	£209,838

The success or failure of grouse seasons is largely down to nature, however estates still pay their permanent workforce regardless of how successful the season is (although there will be reduced tips in poorer years, and this informal payment mechanisms can provide useful bonuses to staff). In poor years with reduced shooting provision it can affect the casual grouse estate workforce and upstream expenditure - on other businesses supplying goods and services to the estate (hotels, caterers, etc.). As part of the evidence submitted by Scottish Moorland Group there were a few individual examples of over 100 local beaters, pickers-up, flankers, loaders, etc. being casually employed alongside two or three permanent gamekeepers during the shooting season. The evidence also reiterated that seasonal variation on the success of the season can affect local economies, with one estate revealing that their wage expenditure on beaters was around £23,000 lower in 2015 than 2104 due to 2015 being a poor grouse season for them.

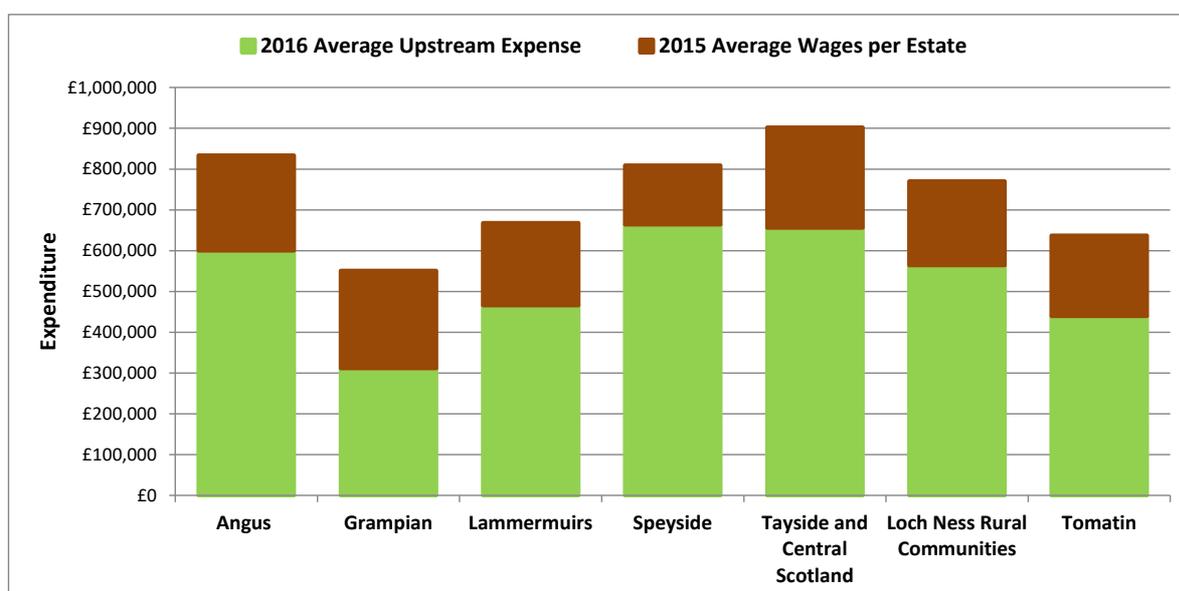
Survey 4: This 2017 non-wage upstream expenditure survey expanded Survey 2 to encompass each of the 7 regional moorland groups (Angus, Tayside and Central Scotland, Tomatin, Loch Ness Rural Communities, Lammermuirs, Grampian and Speyside). Table 6 reveals that across the 45 respondent grouse estates they spent £23 million on local and national businesses that supply goods and services to them (e.g. garages, building firms, tweed outfitters, machinery dealers, gunsmiths, etc.) at an average of £515,000 per estate.

Table 6 Scottish Moorland Group grouse estate upstream expenditure survey, 2016 data

Moorland Group	Respondent Estates	2016 Upstream Expenditure	2016 Average Upstream Expense
Angus	7	£4,204,258	£600,608
Grampian	10	£3,121,898	£312,190
Lammermuirs	6	£2,797,648	£466,275
Loch Ness Rural Communities	11	£6,208,969	£564,452
Speyside	6	£3,987,228	£664,538
Tayside and Central Scotland	3	£1,969,758	£656,586
Tomatin	2	£880,130	£440,065
Total	45	£23,169,889	£514,886

Aggregated Impacts: Using the results from the Scottish Moorland Groups Survey 3 and Survey 4 it suggests that across the grouse estate respondents to the Scottish Moorland Group’s survey spent an average of £725,000 on regular and casual workers and on purchases of goods and services across the Scottish economy, as illustrated in Figure 2.

Figure 2 Estimated average annual grouse estate expenditure by Regional Moorland Group (2015-16)



Source: Derived from Scottish Moorland Group 2016 and 2017 members’ survey.

7.2 Angus Glens and Monadhliath Grouse Study

Mc Morran et al.’s 2015 study of grouse estates in the Angus Glens and Monadhliath’s found that 17 of the 27 estates surveyed were engaged in driven grouse to varying degrees in 2014. Many of the others participated in walked-up grouse shooting with a couple of estates having up to 25 days walked-up shooting with 5-10 brace daily. This study had a high response rate within the two locations meaning it is likely highly representative of estate activity in these areas, although there will have been self-reporting biases, and it was evident allocating staff, income and costs to different estate activities was challenging for many. The reporting was for a single year meaning figures relating to income, expenditure and grouse bag may be skewed by the relative success of the grouse season that year. To date, the data for the estates only engaged in driven grouse has not been published and this section looks at some of that data.

Table 7 reveals that the 17 driven grouse estates in the sample extended to 98,000 hectares with 86% of the total area considered grouse moor. In 2014 there were 265 driven grouse days and 64 walked-up days across these estates, yielding nearly 30,000 brace. The smaller estates, on average

had half as many driven days as the larger estates with each driven day yielding about 85 brace compared to the larger estates where the average bag was over 120 brace per day. Interestingly private grouse days (compared to commercial days) accounted for 50% of the driven grouse shooting days on the larger estates, but about 70% on the smaller estates (i.e. smaller estates tend to a smaller proportion of commercial driven days). The average length of estate ownership was also quite a bit higher, at 46 years, for the larger estates, perhaps with more family tradition around private grouse shooting. On average the 17 estates each employed 9 full-time equivalent staff with 6.6 full-time equivalent sporting staff (that includes seasonal and casual staff). Gamekeepers on these estates also undertook other sport management activities (e.g. deer, salmon, etc.), working for 60% of their time on grouse.

Table 7 Summary data on driven grouse estates in Angus Glens and Monadhliath, 2014

	Estate Size (hectares)		Total
	1,000-5,000	5,000-10,000	
Estates	9	8	17
Total area (hectares)	25,912	72,490	98,402
Grouse Moor % of total estate	97%	82%	86%
Driven Grouse days	94	171	265
Walked Up Grouse days	31	33	64
Total brace shot	8,405	21,311	29,716
Commercial grouse days	72	119	191
Private grouse days	31	117	148
Average length owned (years)	27	46	36
Estate workers (FTE)	65	94	159
Sporting workers (FTE - including casual)	45	68	113
Average % keepers time on grouse	60%	64%	60%

Figure 3(a) shows that there is a relationship between the physical scale of the grouse moor and the intensity of grouse shooting, represented by brace shot per hectare, (R^2 -0.5) there is a group of 3,000 to 7,000 hectare estates where grouse shooting intensity is very high compared to the smaller and larger estates. Figure 3(b) shows a strong relationship between the total number of grouse shot on an estate and the intensity of grouse shooting (R^2 0.75) whilst Figure 3(c) shows a relatively strong relationship between the number of days estates had driven grouse shoots and the intensity of grouse shooting (R^2 0.58).

Figure 4 shows that for the majority of the estates with driven grouse days surveyed in the Monadhliath and Angus Glens sporting activities were considered to have 'high' importance to the owners. However, sport and grouse were one of multiple activities on these 'grouse' estates, with agriculture forming part of the business activities on every estate with 70% saying it was of high or medium importance to their business. This is also shown in the heat-map in Figure 5 where the motivational-mix of individual estates can be seen (each column represents the individual estate and the rows represent different motives). Other activities estate owners reported as being of importance included renewable energy (high or medium importance to 76% of the estates) and conservation (of high importance to 41% of estate owners) in particular. A small proportion of the estate owners also reported that asset growth was a key driver for them.

Figure 3 Relationships between brace of (a) grouse shot per hectare and number of driven days; (b) brace of grouse per hectare and total brace shot; and (c) area of grouse moor and brace shot per hectare

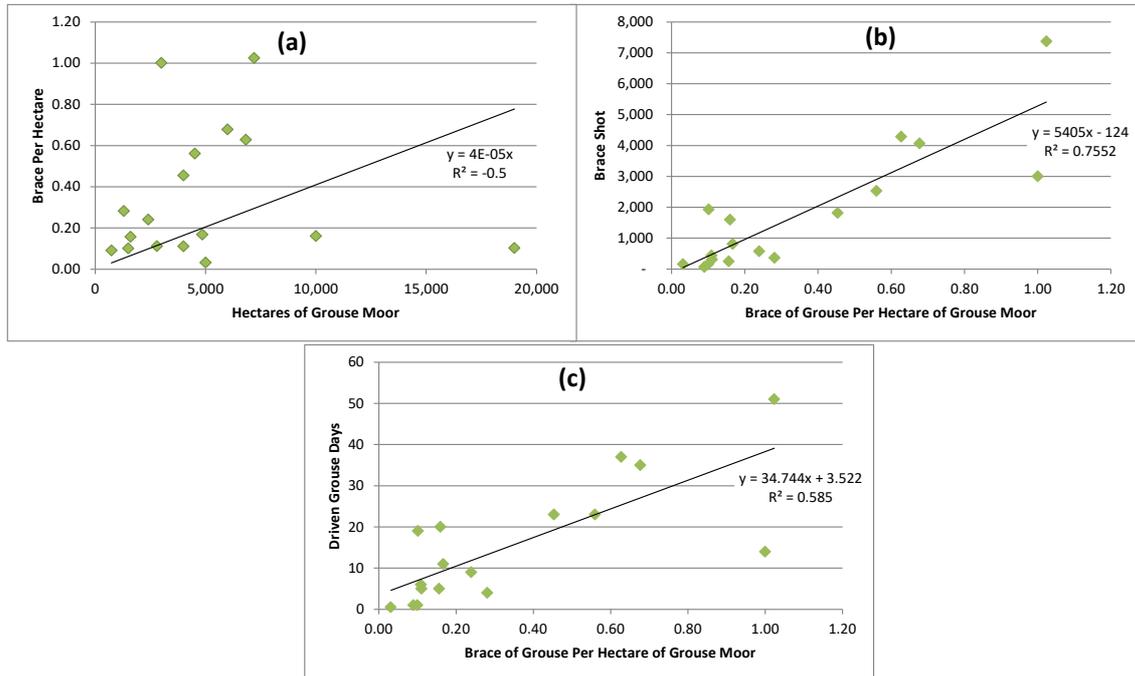


Figure 4 Importance of different activities on driven grouse estates in Monadhliath and Angus Glens estates (2014)

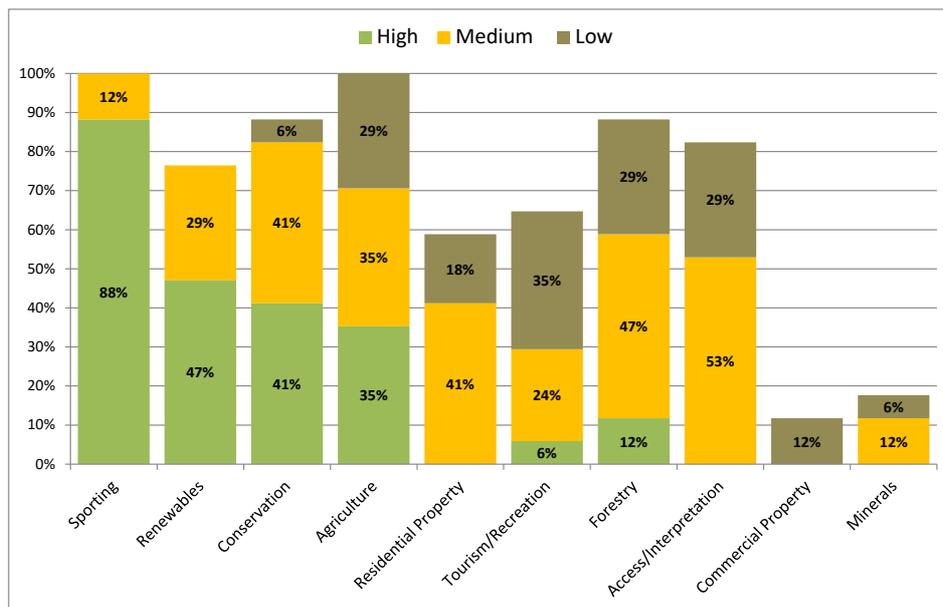
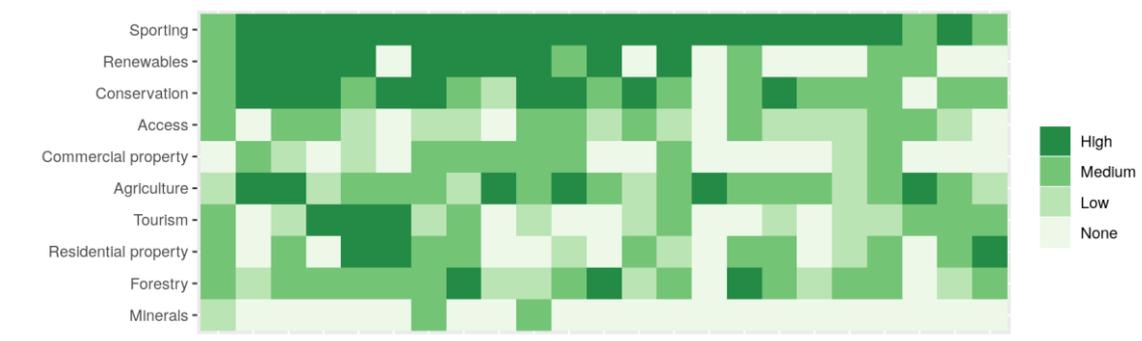


Figure 5 Heat-map show mix of importance of activities on individual estate



7.3 Scottish Estates Survey

Scottish Land and Estates and the Cairngorms National Park funded studies to assess the economic impact of (a) estates in Scotland (Hindle et al. 2014) and (b) of land holdings in the Cairngorms (Mc Morran et al. 2014) collected detailed management and financial data of estates across Scotland in 2013. The financial and management data requested was a three-year average from 2011 to 2013 to reflect that single year ‘snapshot’ data for estates can sometimes give a misleading portrayal of impact, if for example non-regular income (e.g. tree felling) or expenditure (e.g. replanting, capital developments such as new buildings, access roads, etc.) occurred in a single year.

- As with most surveys of this type it suffered from self-selection and self-reporting bias where estates and land owners, perhaps with vested interest in the politics of land ownership, were more likely to respond. As there was, and still is no definitive list of estates in Scotland, Scottish Land and Estates members, and land owners in the Cairngorms were actively encouraged to complete the survey (and it was open to others to complete).
- The questionnaire was very detailed to try and assess the impacts of the variety of different activities and income and expenditure streams that estates have. As with other surveys of this nature, many estates reported that it was challenging to disaggregate activities and financial data as many estate activities are not mutually exclusive from others (e.g. gamekeepers are engaged in all types of country-sport management, sheep graze on grouse moors, estates report that conservation work occurs on many grouse moors, etc.).

Acknowledging these weaknesses, the survey did, however, gather quite detailed profiles of estate activities and their financial and staffing profiles. The focus of the 2013 survey was not grouse, but data has been re-analysed²⁷ focusing only on those estates that reported driven grouse days (those that only engaged in walked-up grouse shooting have been excluded here).

Table 8 reveals that there were 39 estates, with total area of over 450,000 hectares, engaged in driven grouse shooting during the survey period. Over the 2011 to 2013 period there were an average of 462 driven grouse days and 35,000 brace of grouse bagged per year on these estates. The scale of driven grouse activity varied significantly from very small, single day ventures, to over 30 driven days per year. Driven grouse moor accounted for 41% of the total area of these estates, highlighting that driven grouse activities are but one of many activities on many estates (particularly the larger ones). Table 8 shows that many of these estates were also actively engaged in other sporting activities, with many also having significant pheasant shoots, alongside fishing and deer shooting activities.

Table 8 Summary of sporting activity on estates engaged in driven grouse, 2013

	Total Estate Size (hectares)				Total
	<1,000	1,000-5,000	5,000-10,000	>10,000	
Estates	2	12	13	12	39
Total Area (hectares)	1,619	39,033	90,643	354,522	485,818
Driven Grouse Moor %	38%	74%	63%	32%	41%
Driven Days	12	110	161	179	462
Brace Grouse	1,030	8,283	12,899	12,855	35,067
Pheasants	8,000	22,029	23,908	66,299	120,236
Stags	68	253	242	881	1,444
Hinds	67	229	344	1,691	2,331
Salmon	25	132	201	3,313	3,671
Brown Trout		50	360	423	833
Sea Trout		2	46	874	922

²⁷ We are grateful to Scottish Land and Estates for providing permission for further analysis of this dataset.

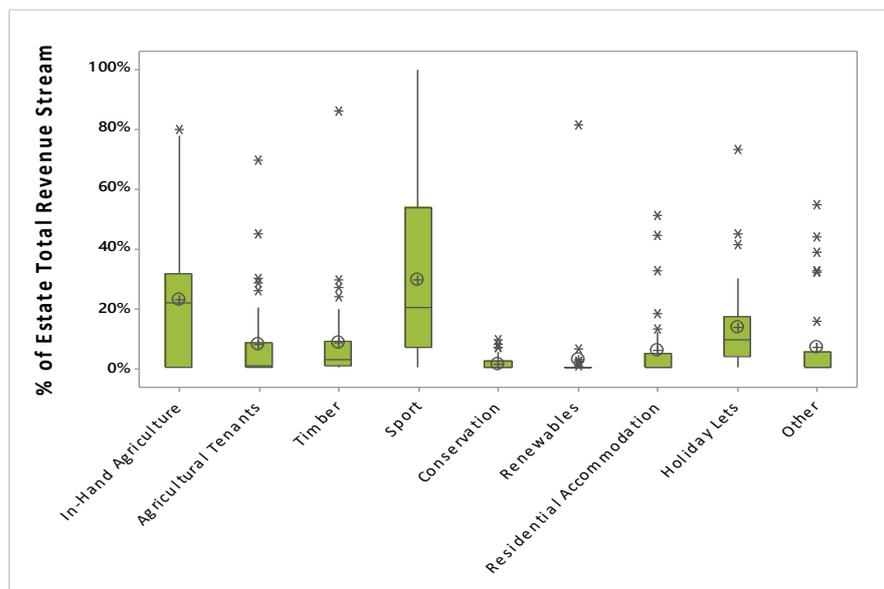
Indeed, when asked about the importance of differing sporting ventures to their estate none solely expressed that a single sporting activity was all they were engaged in. All respondent estates had more than one form of sport that was of high importance to them, including walked-up grouse (often undertaken by owners and their friends and family). A summary of the relative importance of sporting activities is shown in Table 9.

Table 9 Level of importance of different sporting activities to estates engaged in driven grouse 2013

Importance	Number of Estates						
	Driven Grouse	Walked-up Grouse	Red Deer	Pheasant/ Partridge	Salmon	Roe Deer	Trout
High	32	21	15	18	8	3	1
Medium	5	6	6	10	8	8	5
Low	2	9	4	4	13	20	17

Figure 6 is a boxplot that reveals the proportion of total revenue that came from different income streams for the 39 estates with driven grouse days. The box represents the lower and upper quartiles whilst the lower line represents the 10th percentile value and the upper line the 90th percentile value. The * represents outliers whilst the median is represented by the line within the box and the mean (average) by the ⊗ symbol. The data, again, shows that these estates with driven grouse moors, on average, have a wide range of earned income streams. The relative importance of different income streams on some estates is apparent from the outliers with, for example individual estates having significant reliance on timber, renewable, agricultural tenants and holiday lets income streams. On average 29% of estate income came from sporting activities although it is being skewed by some larger figures (the median is only 20%), with a very large spread – with some estates almost entirely reliant on sport for revenues. In-hand agriculture is the next most important source of estate income (23% on average, with median of 22%).

Figure 6 Boxplot showing % of total revenue derived from different activities on estates with driven grouse moors (average 2011 – 2013).



As many sporting estates will not generate income from sporting activities undertaken by friends and family income figures can sometimes give a spurious picture of estate activity. Therefore, Figure 7 shows the boxplot of the relative contributions of different cost centres to overall expenditure on estates with driven grouse. On these estates sporting activities were the largest cost to the business (including management, staffing, running costs and repairs and investments), accounting for over

40% of estate costs on average (median 33%). The wide interquartile range (the size of the box) for sporting does however show that the reliance on income from sport varies significantly between estates.

Figure 7 Boxplot showing % of total expenditure attributed to different activities on estates with driven grouse moors (average 2011 – 2013).

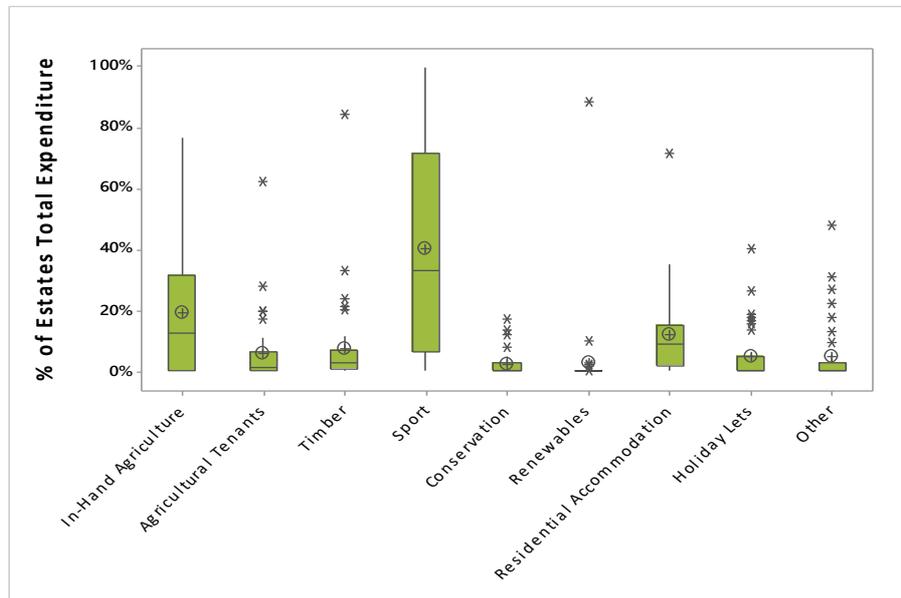
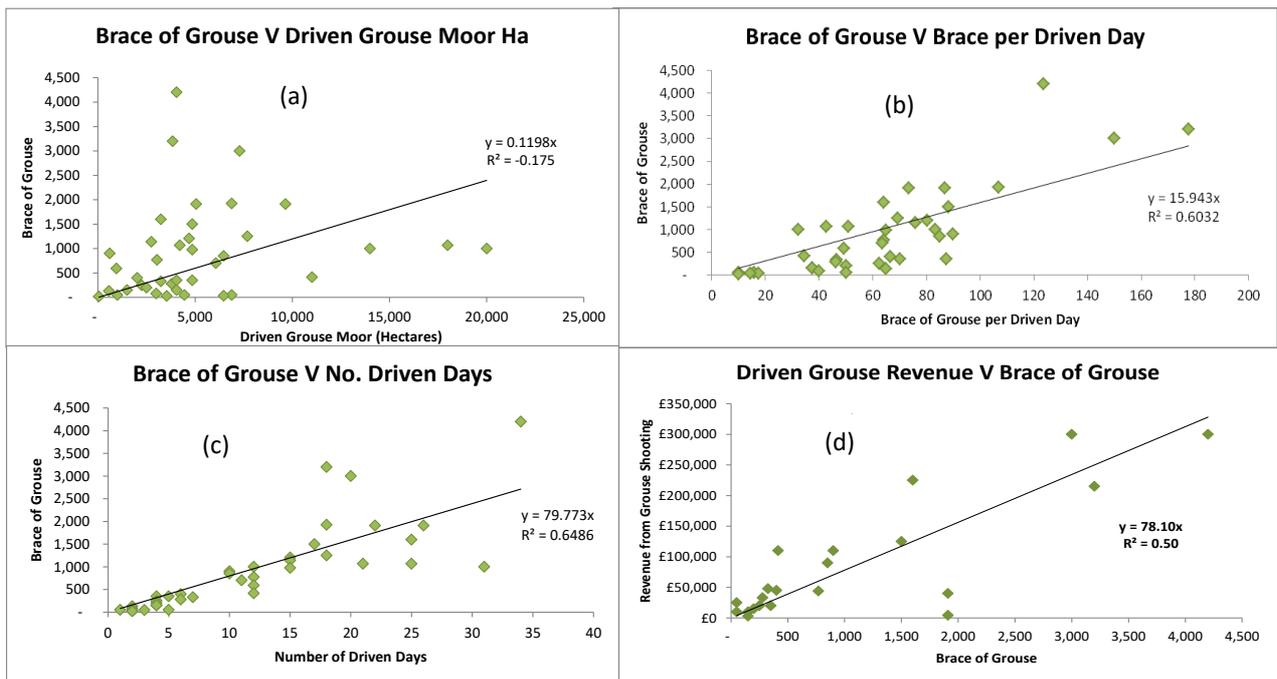


Figure 8 provides a series of graphs that highlight a number of factors that may determine the number of grouse shot on estates. Figure 8(a) shows that whilst there appears to be a some relationship with the area of driven grouse moor the relationship is weak ($R^2 -0.175$) as (similarly to the Angus Glens and Monadhliath study) the estates with largest area of grouse moor have relatively smaller bags compared to some of the mid-sized grouse moors (3,000 to 7,000 hectares) where there appears to have been higher shooting intensity in 2011-2013. Figure 8(b) shows that there was a relatively strong relationship ($R^2 0.60$) between the number of brace shot per driven day and the average brace shot in 2011-2013. This suggests the estates with more successful driven days were more likely to shoot the largest bags over the season, perhaps indicative of greater focus on the grouse moor management. Figure 8(c) shows a relatively strong relationship ($R^2 0.64$) between the number of driven days and the total annual bag of grouse,²⁸ perhaps as one would expect (although the estate with the largest bag shot less per day than the second and third most intensive grouse estates). Figure 8(c) shows that between the number of grouse shot was a reasonable determinant of revenues derived from grouse shooting ($R^2 0.5$) with the model predicting that each brace shot brings £78 estate revenue (the model explains 50% of the variance). The figure also reveals a couple of significant outliers that reported very low commercial incomes despite having bags of around 1,900 (perhaps indicative of more traditional family grouse estates where commercial activity were not a key driver) with some other outlier estates generating significantly higher revenues per brace of grouse.

The data is now more than 5 years out of date and it is apparent that further commercialisation of grouse has occurred in this period. It would therefore be helpful to fill the evidence void to better understand some of these figures, using more up-to-date research (e.g. how many paying guests per year, estimates of grouse intensity on the ground, etc.).

²⁸ 64% of the variation is accounted by the model equation: Total Brace = 80 brace per driven day

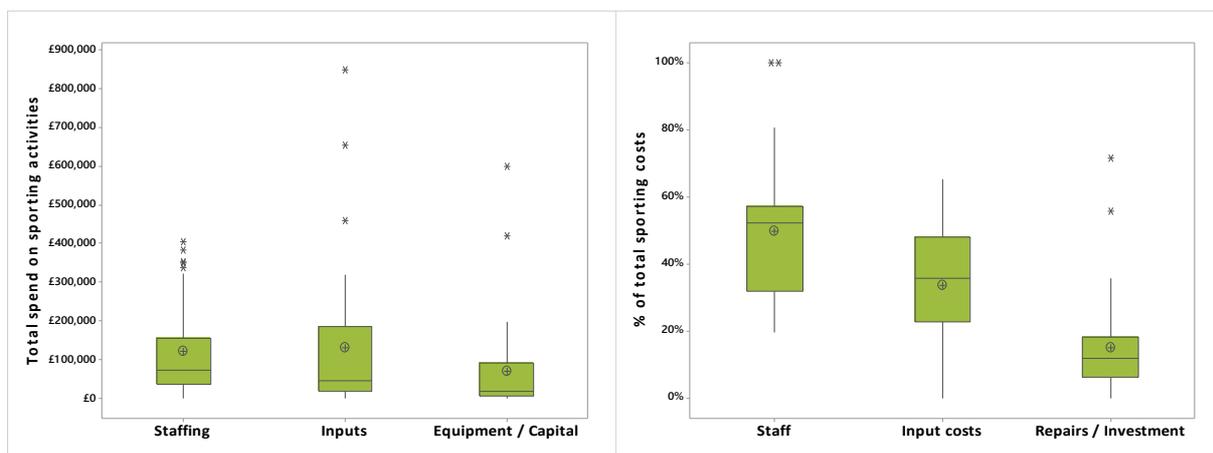
Figure 8 Relationships between brace of grouse shot and area, number of driven days and driven grouse revenue



Over the entire sample of driven grouse estates on average £310,000 was spent on sporting activities per year (2011-2013), although this is somewhat skewed upward with a median of £110,000. Figure 9 shows the spread of estate expenditure on staff, inputs and capital / investments for 2011-13. On average staff costs accounted for half of all sporting costs (average £134,000; median £75,000), with inputs or other running costs taking up about 35% (average £133,000; median £46,000) and capital / reinvestment costs accounting for about 15% (average £71,000; median £20,000). The figures show how running and capital costs are heavily skewed by a small number of estates that may have had specific on-going capital projects / investments.

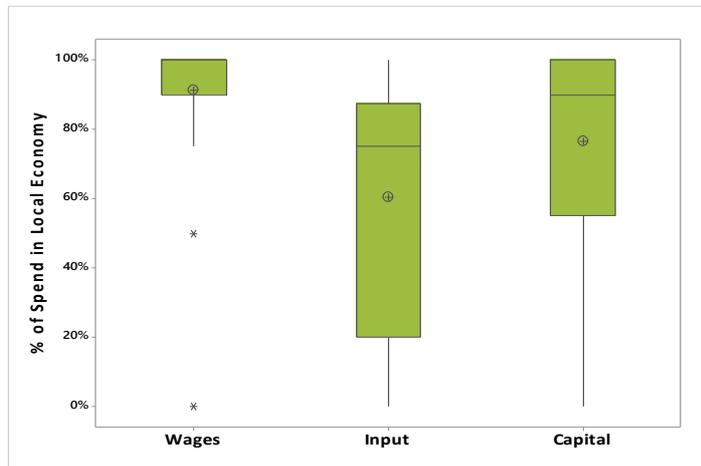
These figures compared to those reported for the Langholm Moor Demonstration Project (LMDP, 2014), where (despite not engaging in commercial shooting) driven grouse were valued at £140 per brace (a potential yield of £140,000 for the pilot projects target of 1,000 driven brace per year), whilst keeping costs for the year came to £227,000 excluding capital expenditure on improvements to roads and fences during the pilot (equating to a notional £87 loss per brace if the moor was commercially operating).

Figure 9 Boxplot of breakdown of sporting costs on estates with driven grouse moors (2011 – 2013).



There is limited evidence in the literature of locality of spend and therefore Figure 10 shows where these estates with driven grouse were claiming to spend their money attributed to the sporting activities. Overall more than 70% on average (median 81%) was spent in local economies (equating to over £7.5 million from 32 estates). Over 90% of the staff costs were paid locally (with some leakage to non-resident factors / land agents) with 60% of running costs and 75% of capital / reinvestment costs also spent within local communities.

Figure 10 Driven grouse estates sporting expenditure - locality of spend (average 2011-2013)



8 Alternative land uses on grouse moors

Langholm Moor Demonstration Project - LMDP (2014) reported that in the 1990s the Joint Raptor Study²⁹ highlighted that hen harrier populations can reach levels that “render red grouse shooting unviable.” In 1997, the keepers on the formerly well-known 12,000 hectare grouse moor in the South of Scotland were made redundant as commercial driven grouse became unviable, meaning habitat and predator control activities also ceased. The LMDP was established in 2008 with the objective “to establish Langholm Moor as a driven grouse moor [and] to meet the nature conservation objectives for the SPA and SSSI.” As part of the project 5 keepers were reintroduced with the aim of recovering the moor (with a target of 1,000 brace of driven grouse) within the legal framework, particularly the conflict between raptors and grouse. The report summarised that “We have not yet found the win-win solution for both raptors and red grouse...the quality of keeping and legal predator control is good, as is grouse health, but grouse mortality all year round is high and deaths of 78% of adult grouse have been attributed to raptor predation.”

After 7 years, it was concluded (LMDP, 2014) that grouse numbers had “not recovered sufficiently for shooting”, and indeed have declined since 2014 to levels similar to those in 2008 estimated during 2017 as keeping activities were wound down in and halted in April 2016³⁰. It was concluded that the target of 1,000 brace of grouse was unachievable, hence cessation of keeping activities. During the project it was reported that heather habitats were improved, raptor numbers remained in good conservation status, but wader populations remained lower than expected. It is against this backdrop that alternative land uses for grouse moors are discussed further in this section.

Rural land-use and land management is not cheap and normally requires a mix of market returns and public funds to have effective social and economic contributions. Most private land owners benefit, to varying degrees, from public support for farming, the environment, renewables and forestry / woodlands. Indeed, Rayment (2017) identifies that the cost of meeting environmental land

²⁹ https://www.gwct.org.uk/media/249268/Hen_harriers_and_the_Joint_Raptor_Study_2005.pdf

³⁰ <http://www.langholmproject.com/news.html>

management priorities in the UK alone are £2.2 billion annually, with 21% of that in Scotland (Table 10).

Table 10 Summary of annual costs of meeting environmental land management priorities, based on current costs (£m)

	England	Northern Ireland	Scotland	Wales	UK
Priority habitats	471	32	252	120	876
Boundary features	255	46	65	35	402
Historic environment	41	3	40	7	92
Arable land	403	14	40	5	461
Grassland	164	80	56	32	331
Organic	17	0.5	3	5	26
Total	1,352	176	456	205	2,188

Source (Rayment, 2017)

Whilst not an alternative land-use *per se*, a means of encouraging changes to existing practices that are detrimental to natural capital, biodiversity and ecosystem services could be through tighter environmental monitoring of the sector through an accreditation scheme, such as Wildlife Estates Scotland (WES) that was launched in 2010 with the aims to³¹:

- Promote best practice in game and wildlife management.
- Build information on species and their habitats, wildlife management, conservation projects and integration with other land uses to monitor continuous improvement.
- Use information to engage public and private stakeholders in encouraging best practice management for further maintenance of Scotland's biodiversity.

WES accreditation is based on independent assessment related to:

- Commitment to best practice
- Adoption of game and wildlife management plans that underpin best practice
- Maintaining species and habitats records
- Conservation and collaborative work
- Integration with other land management activities (such as farming, forestry and tourism)
- Social, economic and cultural aspects (such as employment, community engagement and communications)

This initiative appears to be a step in the right direction in gaining public trust of activities within the sporting estate sector, however SNH (2018) reported: "Approximately 38 farms and estates have achieved accreditation under the initiative but the rate of progress is slower than anticipated." Currently there are now 65 accredited estates and farms, covering 1.25 million acres³². It would appear that some of the approaches advocated by this initiative have merit and some effort to reinvigorate and increase membership would have benefits for estates and for society.

Biophysical and regulatory constraints limit the alternative uses that driven grouse moors could be used for. It should be noted that many of the activities are not mutually exclusive, and actually many of these activities currently occur on or on the periphery of existing driven grouse moors. In particular, it should be noted that many grouse moors already employ shepherds to maintain sheep flocks, which are often not breeding flocks, rather being used to provide habitat management and control tick numbers (known as tick mops). In principle the alternative land uses appear limited to:

- Conservation/NGOs

³¹ <http://www.wildlife-estates.co.uk/>

³² Pers Comm. Tim Baynes, Scottish Moorland Group. September 2018.

- Extensive sheep production
- Afforestation
- On-shore wind energy
- Rewilding and Tourism

As this review process finalised the Revive campaign group published “Back to life: Visions for Alternative Futures for Scotland’s Grouse Moors” (Common Weal and Lateral North, 2018). This is a useful addition to the debate, although there is a lack of consideration over the practicalities of some of the alternatives suggested in the discourse³³ (e.g. landscape, species and habitat protection; inadequate infrastructure; land-use planning regulations; biophysical challenges) or the reliance on public expenditure to provide positive returns.

8.1 Conservation / NGOs

Werritty et al. (2015) highlight that Scotland’s moorland areas are largely controlled by 20 landowners including: “four government departments/agencies (including SNH, with the Forestry Commission Scotland owning most), three NGOs and community groups, and thirteen private estates.” Mc Morran et al. (2013) reported that land owned and managed by environmental NGOs in Scotland extended to over 207,000 hectares (accounting for a disproportionately high amount of designated land managed for natural heritage values).

Mc Morran et al. (2013) reported that employment directly related to site management accounted for 55% of environmental NGO employment (Royal Society for the Protection of Birds, National Trust for Scotland, John Muir Trust, Woodland Trust Scotland and the Scottish Wildlife Trust). They estimated direct site employment accounted for 736 FTEs with total direct expenditure on land management of over £37 million, equivalent to £181 per hectare with “considerable” indirect impacts of NGO landownership through visitor attractions (annual visitor spend was estimated to be a minimum of £26 million).

- Molly et al. (2011) estimated that in 2009 the RSPB farms and reserves network directly contributed £21.7 million of local spend, with 867 FTEs with an additional 1,005 FTEs and £65.9 million spend by over 2 million visitors. The RSPB’s annual report³⁴ reveals that managing their nature reserves cost £36.5 million in 2017. In 2014 RSPB managed over 150,000 hectares at 214 reserves³⁵ with 72,000 hectares located in 77 nature reserves in Scotland³⁶. In 2017 the RSPB received a total of £4.5 million in CAP payments.³⁷
- SNH annual accounts³⁸ reveal that they manage 30 National Nature Reserves extending 43,000 hectares that attracted 610,000 visitors in 2016. In 2016-17 their managed sites had operating costs of £1.5 million
- The Scottish Wildlife Trust annual report³⁹ reveals that their “reserve management” costs for the 120 reserves that they manage (covering more than 20,000 hectares) were around £1 million in 2017⁴⁰.

³³ For example – see *Part 3: Use of GIS/remote sensing to identify areas of grouse moors, and to assess potential for alternative land uses* of this report for a discussion on some of the practical limitations to alternative land uses.

³⁴ <https://www.rspb.org.uk/globalassets/downloads/about-us/rspb-annual-accounts-2017.pdf>

³⁵ http://ww2.rspb.org.uk/Images/rspbreserves2012_tcm9-326414.pdf

³⁶ <https://www.rspb.org.uk/about-the-rspb/at-home-and-abroad/scotland/peopleandnatureinscotland/#VPLDTefc5y9ydQHw.99>

³⁷ £676,652 in Scotland, £3,403,664 in England and £446,456 in Wales. <http://cap-payments.defra.gov.uk/Default.aspx>

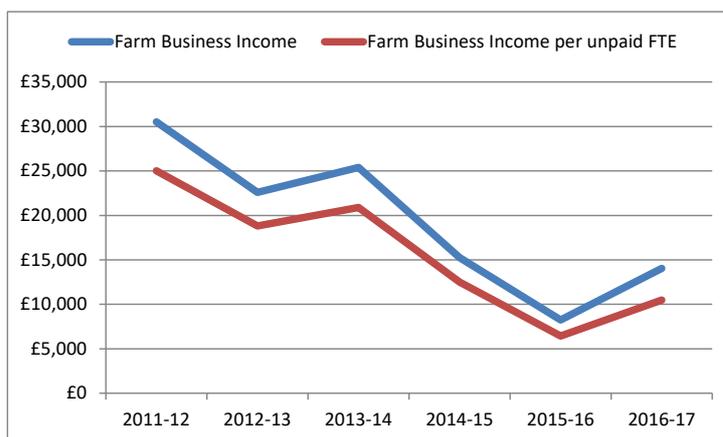
³⁸ <https://www.nature.scot/sites/default/files/2017-12/Publication%202017%20-%20SNH%20Annual%20Report%20and%20Accounts%202016-17.pdf>

8.2 Agriculture

All of Scotland's grouse moors are currently designated a Less Favoured Areas under EU regulations indicating that farming activity is considerably constrained due to natural handicaps (elevation, weather, soil quality, etc.). As previously highlighted, many driven grouse estates already carry sheep flocks, either as part of farming enterprises or as a means of tick control. The quality of the grouse moor land is generally very poor in agricultural terms, comprising mainly rough grazing. The current quality of the grazing is likely enhanced from regular muirburn that grouse moor management entails and would likely deteriorate over time without active heather management. Indeed, many hill farms no longer fully utilise or manage their high hill ground as a response to lower stocking densities, driven largely by changes to the CAP support regime in 2005 (Thomson et al. 2011).

The economics of hill farming are challenging, trying to earn a living from extensive sheep production where market returns are inadequate to cover costs, with the sector reliant on direct CAP support payments (basic payment scheme, greening support and coupled support for beef cattle and extensive hill sheep). Figure 11 shows how the average farm business income (a proxy for net farm profit) has fallen since 2011, with the return to unpaid family labour and capital invested in the business being less than £15,000 (inclusive of CAP support) in 2016-17.

Figure 11 Farm Business Income for specialist Less Favoured Area sheep farms



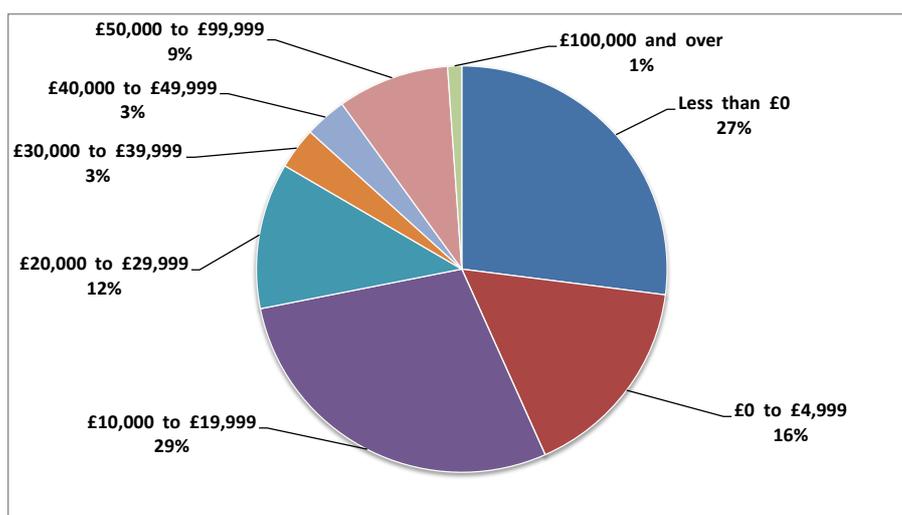
Source: derived from Scottish Government (2018)

The average income figures can be somewhat deceptive, as there is a significant variation in the economic performance of sheep farms across Scotland, sometime due to biophysical constraints, sometimes due to management choices, and often a combination of both. Figure 12 highlights how in 2016/17 despite CAP support payments 27% of sheep farms made losses with a further 16% earning less than £5,000 to pay for their unpaid family labour and provide a return on their investment.

³⁹ <https://scottishwildlifetrust.org.uk/wp-content/uploads/2017/07/Annual-Accounts-2016-17.pdf>

⁴⁰ <https://scottishwildlifetrust.org.uk/our-work/our-wildlife-reserves/>

Figure 12 Distribution of specialist LFA sheep farms according to farm business income performance: 2016-17



Source: derived from Scottish Government (2018)

As a proxy for an agricultural alternatives to driven grouse moors, the Scottish Government’s (2017) published average specialist sheep farm data (see Table 11) provide useful overview of the direct socio-economic contribution that this alternative could provide. It should be noted that these figures overestimate the productivity and returns that would be capable on land comprised of grouse moor.⁴¹ The stocking density of 0.9 sheep per hectare would not be recommended for fragile moorland areas, with most farms in these areas stocking at less than half a sheep per hectare.

Table 11 Socio-economic characteristics of an average specialist sheep farm in Scotland’s Less Favoured Area (2016/17)

Farm Characteristics	Average	
Land	Average size of farm	754 ha
	Area of cereals	1 ha
	Area of grass	85 ha
	Area of Rough Grazing	668 ha
Livestock and workforce	Number of ewes	602
	Number of suckler cows	9
	Number of other cattle	11
	Number of unpaid workers (FTE)	1.3
Farm economics	Average output	£45,371
	Average inputs	£73,621
	CAP Support Payments	£38,965
	Diversification Margin	£3,332
	Farm Business Income (FBI)	£14,048
	FBI per unpaid labour (FTE)	£10,483
Off-farm work	Off farm income (OFI)	£16,237
	OFI per unpaid labour (FTE)	£12,117

Table 11 shows that the “average” sheep farm can provide work for 1.3 full-time equivalents on 668 hectares, with 600 breeding ewes and 9 suckler cows. Without public support payments the agricultural component of the business would make losses of £28,000, but the £58 per hectare in

⁴¹ Pers. Comm. Kev Bevan, Farm Business Survey manager, SAC Consulting. September 2018

CAP support payments is enough to make this average farm return about £10,500 per unpaid FTE worker. It should be noted that many farmers and /or spouses also work off-farm to make ends meet and on average in 2016/17 they brought in £12,000 per unpaid FTE on top of what the farm earned. The sheep sector, with high reliance on CAP support and lamb exports to the EU, is particularly exposed to the challenges that Brexit may bring – although opportunities may exist through any future payment for ecosystem services / payments by results schemes.

8.3 Renewable Energy

Werritty et al. (2015) highlighted for renewable energy *“the main impacts on moorland habitats are from direct land take for tracks, crane hard standings, turbine bases, control buildings and borrow pits and changes in drainage. There are also indirect impacts associated with these operations – most notably cable trenches and pipelines. These impacts result in habitat loss and habitat change through altered hydrology which in turn, can lead to changes in how a wide range of animal species use these areas. Additional impacts can arise through the improved access provided by these developments, enabling sporting and recreational activities in areas which were previously inaccessible and/or unattractive.”*

Biggar Economics (2012) suggested that whilst there is an assumption that a significant proportion of on-shore wind energy development impacts occur in other countries (e.g. Denmark and Germany where there are established turbine manufacturing industries) *“this assumption does not however reflect the experience of many local economies throughout the UK over the last few years.”*

BVG Associates (2017) estimated the impacts of 8 Scottish Power wind farms commissioned in 2016 and 2017 with combined capacity of 474 MW. Overall they estimated that 16% of the £1.6 billion investment will be spent locally (in south west Scotland) with 35% in the rest of Scotland, 15% in the rest of the UK and 45% overseas. They estimate that the development will lead to £1.2 billion Gross Value Added (GVA) over its lifetime (with £297 million additional GVA locally), create 31,118 UK FTE years (7,768 locally) and lead to £59 million community benefit funding over the 24 year lifespan of the project.

PWC (2015) report that Clyde wind farm extension will mean that there are 206 turbines spread over 47km² (4 turbines per km²) with installed capacity of 500 megawatts (increased from 152 turbines and 206MW). They estimate that each turbine generates £2.2 million GVA and generates 50 person years over the lifetime of the development (£90,000 GVA and 2 FTEs per year based on assumed 24 years total development, operational and decommissioning stages).

8.4 Tourism and Rewilding

Whilst tourism often benefits from managed moorland (whether that management is for deer, grouse, woodlands or farming), it rarely contributes to the maintenance costs of Scotland’s rich landscape which people come from around the globe to visit. Grouse moors have been used as recreation areas in Scotland for decades, mainly for walking, but also to access mountains, and more recently for mountain biking. Nothing much has changed since GFA-RACE and Macaulay (2003) wrote: *“Direct income is almost impossible to secure, although estates with nearby facilities such as a shop, café, or other paying visitor attraction may be able to derive revenue, directly or indirectly, through such outlets. Attention therefore focuses on the costs imposed (e.g. disturbance by dogs, or to shooting and farming operations) and on the implicit value to be ascribed to such access (which may then be used to justify tax reductions and/or direct payments).”*

Werritty et al. (2015) describe rewilding as: *“a broad label which is understood in various ways and is commonly expressed in terms which include large scale habitat ‘restoration’, ‘encouraging natural processes’ and ‘minimum intervention”*. Werritty et al. (2015) then explain that the rewilding term has *“been applied to diverse projects in Scotland ranging from Carrifran and Glen Feshie to Alladale, and including the management of various upland estates owned by JMT, NTS and RSPB, such as Quinag, Mar Lodge and Abernethy respectively. Re-wilding could indeed be taken to encompass*

management approaches adopted by SNH at sites such as Beinn Eighe and Creag Meagaidh. A decrease in grazing pressure is a key objective in many such schemes, and in the Scottish uplands 'minimum intervention' is commonly taken to include reduction of deer densities, through fencing and/or intensive culling, and a reduction in the intensity of muirburn."

Little is known of the socio-economic costs and benefits from rewilding. However, searching the public CAP payments data it is apparent that, like grouse estates, private estates engaged in rewilding in Scotland receive significant levels of support (with one rewilding estate getting an average of £205,000 direct support and £170,000 rural development support in 2016 and 2017). Trees for Life's annual report reveals that amongst £1 million expenditure in 2017 they spent: £240,000 rewilding the 10,000 Dundreggan Estate; £243,000 on forest restoration projects across the Highlands; £208,000 propagating trees. £500,000 was supported through grant aid and trusts, £110,000 through companies and about £230,000 each by members and donations; products and; other sources such as gift aid.

8.5 Afforestation

CJC Consulting (2015) estimated that Scotland's forestry sector directly employs 12,143 FTEs with a further 7,400 indirectly employed across Scotland with total GVA contribution of £950 million (including public funding). There is no breakdown of the contribution of hill woodland areas. Indeed GFA-RACE and Macaulay (2003) suggested that *"the financial viability of afforestation of moorland and moorland fringe areas, even with existing public financial support, is doubtful. The pressure of greater environmental constraints has increased this position, and therefore this option has not been revisited in any depth."* Whilst the economics of forestry and woodlands have improved significantly since 2003 the hard fact remains that there is limited scope to plant grouse moors due to regulations and poor quality of land. There are limited published details of the costs and returns of planting moorland areas.

Confor (2018) highlighted how planting of 424ha conifers and 53ha broadleaves on a hill farm in the Borders will employ 2.5 people over its lifetime, the same as the farm would have. The report stresses that the *"forest provides continuous employment in management and deer control, but a much larger workforce at planting and harvest times...The forest brought economic vitality not just in the work involved in fencing, ploughing, planting and establishing the forest, but also in wide range of other developments such as house and workshop renovation"*

Bell (2014) estimated for 20,000 hectares in Eskdalemuir that the normalised costs of a 40 year rotation in the area would lead to timber output of £495 per hectare, costs of £346 per hectare (£149 per hectare surplus before grants) with grants of £16 per hectare. This was estimated to have compared with sheep farming that may have been expected to have returned £154 per hectare of output, £176 per hectare of costs (£22 loss per hectare before support) with £94 per hectare in support payments.

Native woodland planting or natural regeneration costs money and needs active management annually. Costs can include surface cultivation or grubbing up, weeding and protection of young trees from wild deer / sheep / hares browsing by culling, fencing and guards.

8.6 Alternative land-use summary

Recognising that the socio-economic impacts of alternative land use are not comparing like with like, and there are biophysical, landscape, or designations restrictions of replicating them across all Scottish moors, Table 12 provides an indicative summary of the socio-economic impacts of potential alternative uses of moorland. It should be noted that each of these land uses is dependent to varying degrees on the public purse, with for example renewable energy, farming and forestry being heavily supported by the Government, whereas conservation / NGO land management often receives Government support as well as private membership support. Care must be taken when interpreting these figures as each alternative cannot simply be introduced across all moorland areas due to

environmental, landscape, biophysical, economic, and labour constraints.⁴² The extents of coverage of each area in Scotland are deliberately not provided here due to land use not being mutually exclusive, and the extent of each alternative’s coverage on moorland area being difficult to estimate.

Table 12 Indicative comparisons of annual expenditure per hectare and hectare required per FTE job

Land Use	Spend per Hectare	Hectares per Job	Source / assumption
Driven Grouse:			
• <i>Angus Glens</i>	£120 / ha	875 ha / FTE	<i>McMorran et al. (2015) – only driven grouse</i>
• <i>Monadhliath</i>	£51/ha	1,038 ha /FTE	
NGOs`	£181/ha	277 ha /FTE	<i>‘McMorran et al. (2013)</i>
RSPB*	£144/ha	173 ha / FTE	<i>*RSPB (various) based on running costs</i>
Sheep Farming	£98/ha	580 ha / FTE	<i>Scottish Government (2018)</i>
Largescale Wind	£2,240/ha local investment costs £7,150/ha Scottish investment costs £517/ha community benefit	15 ha /local FTE 5 ha / UK FTE	<i>BVG Associates (2017) - impacts annualised over 24 year lifetime</i>
Forestry	£346/ha	422 ha / FTE	<i>Bell (2014) - annualised costs of a 40 year rotation</i>

Whilst grouse moor estates may receive some CAP support this will generally be for agricultural activities on the land, or for agri-environmental / woodland plantations (i.e. defined outcomes). These figures should be treated with caution should only be considered indicative. The figures do not include the cost to the public purse, nor does they include socio-economic impacts of additional expenditure associated with an activity (e.g. by visitors to conservation sites, or paying grouse shooting guests), or from the cumulative socio-economic impacts resulting from that activity upstream and downstream (e.g. from the value added activities in downstream sectors associated with forestry and agriculture (e.g. hauliers, markets, processors, manufacturers and retailers).

9 Conclusions and Evidence Gaps

This short report provides an overview of the existing data relating to the socio-economic impacts of Scotland’s grouse moors, focusing on driven grouse moors where possible. The role of driven grouse moors on local, often fragile, communities can be significant through direct wage expenditure, supply chains and the hospitality sector. However, there is a limited research base from which to draw-on and provide a robust evidence base with which to make policy decisions, or help understand how these estates interact with the wider rural business base, the communities in which they are based, nor the wider users of the Scottish countryside – recreational users and tourists.

To date there have been limited studies that specifically examine the driven grouse sector, with many of the studies now dated, therefore failing to account for recent increases in intensity of driven grouse moor management approaches. Further, many of the studies fail to differentiate between walked-up grouse and more intensive driven grouse, and are often reporting from a relatively small sample of estates within a small geographic area (meaning it is difficult to generalise findings beyond the area of study – although this is partly due to the variability in emphasis on driven grouse in different parts of Scotland).

⁴² see Part 3: Use of GIS/remote sensing to identify areas of grouse moors, and to assess potential for alternative land uses of this report for a discussion on some of the practical limitations to alternative land uses.

To some extent the evidence gaps relate to the challenges of disaggregating estate data, specifically: staff effort on different tasks; the split of running and investment costs between different cost centres; etc. Part of the challenge in disaggregating data is that estate activities (sheep, deer, walked-up grouse, driven grouse, wind energy, tourism, conservation, etc.) are often not mutually exclusive – that is, they can all be done on the same piece of ground and managed by the same staff members.

The narrow evidence base and inconsistency in data collection approaches mean that evidence on socio-economic impacts is open to criticism. Some of the methodological criticisms are not unique to grouse studies and indeed often apply to sectoral economic impact study approaches. The main criticism of the evidence base reviewed in this study are that the surveys that assess the socio-economic impacts suffer from:

- Self-selection (participation) bias;
- Self-reporting (that can be selective);
- Challenges in splitting data on: walked-up V driven grouse; and, commercial V private days and bags;
- Unverified (often estimates) of incomes, expenditures and staff time associated with grouse moor management and shooting activities;
- Lack of consistency in format of data provision;
- Missing data that could improve data insights;
- Challenges in grossing up to a regional / national level due to incomplete knowledge of the number of estates involved in grouse shooting, or the intensity of grouse management activities;
- Lack of clarity on the multipliers used to assess indirect and induced impacts, or of economic leakage from local, regional and national economies.
- Lack of data on participants in the sport.

Despite these limitations, the existing evidence base does provide some context relating to the social and economic contributions of grouse moor management. However, the evidence on the socio economic impacts of grouse moor management can be improved.

The specific gaps in the evidence base, methodological approaches and scope of studies that are highlighted here warrant further study and more systematic approaches to data collection (whether that is through independent research or from within-sector approaches). The majority of the information gaps would benefit from socio-economic data collected over a longer period of time than the studies reviewed here, to allow the assessment of trends.

Future Research Options

To address the identified knowledge gaps we suggest that future research could include:

1. Comprehensive longitudinal study of multipliers at local and regional scales to determine the extent and impact of economic connections between grouse shooting estates and surrounding businesses and wider communities (including the local and regional economic impacts of shooting participants) over time.
2. Comparison of the employment and wider economic impacts of grouse moor management at different shooting intensities, including driven, walked up and grouse shooting over pointers to compare long-term impacts of the different types.
3. Comparison of the relative socio-economic impacts of let grouse days and long-term grouse leasing with private (non-commercial) grouse shooting and estate-run commercial grouse shooting - both currently and in terms of future potential roles.

4. Assessment of the impact of grouse moor management and wider sporting management on land values and the impact of trophy (capital) values on landowner and land manager approaches to moorland management.
5. Evaluation of community perceptions of grouse shooting, including in relation to community well-being, demography, conflicts, etc.
6. An evaluation of the socio-economic impacts of alternative land uses for moorland, in particular of rewilding approaches to land management – where there is a paucity of evidence of the social and economic impacts of this evolving land management approach.
7. Independent research to engage with gamekeepers on motivations, behaviours and support needs. There is limited evidence on why certain management methods are utilised in the management of game on sporting estates, or attitudes to biodiversity and conservation. This important group of land managers are understudied and developing a greater understanding of their drivers, concerns and motivations would likely be beneficial.

We also believe that there is scope for a more systematic approach to data collection: by estates; industry representatives; and academics. In particular, data collected by the Scottish Moorland Groups would benefit from:

- Improved, and more consistent, data submission formats.
- Collection of additional data to enable disaggregation of socio-economic data by grouse moor extent, scale, intensity, etc.
- Expansion of the study to all grouse estates in Scotland.
- Independent review of the data validity and aggregation methods.
- Improve the understanding of the locations of where direct wage and other expenditure occurs and subsequent multiplier effects it may give rise to (e.g. using a Local Multiplier⁴³ study approach).

A final opportunity identified is to collect publically available data on grouse shooting, through land agents, in particular from the details of the extent of grouse moor and annual bags that are detailed in sales particulars as estates come onto the land market. In addition, it would be useful to work with land agents to identify the management approaches taken in these estates (e.g. owners, on-site factors, management agents) to assess if there are differences in approaches taken to managing grouse moors, their relative profitability and socio-economic impacts.

⁴³ <https://www.lm3online.com/>

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Appendix A. Sources of information

There are a wide array of socio-economic topics that studies have focused on, so to simplify the task and make the review process a socio-economic factors template (matrix) was developed, establishing the assessment criteria for the exiting evidence. The assessment framework is detailed in Table 13 with the key review topics summarised as:

- Study Methods;
- Study Scope;
- Direct (estate) impacts;
- Indirect (wider socio-economic) impacts.

Table 13 Socio Economic Factors Evidence Base

Description		
Background Details		Title
		Lead author
		Organisation /institute affiliation(s)
		Year published
		Commissioning body
		Year(s) data relates to
		Hypertext link
		Type of evidence: Report / Scientific Paper / News& Other online media / policy or parliament
Methodology	Participants	Numbers/type/self-selecting or not
	Overview	Description
	Critique	Positives and negatives - robustness of data
	Links to other reports	i.e. if it uses same data and/or responds to or refutes another study
Scope of Study	Sector	e.g. estates / moorland / game / shooting / grouse
	Geography	spatial coverage of study
	Focus	Was grouse a specific focus / can it be disaggregated/ driven moors
Direct Impacts (numbers / £)	Workforce	Permanent / part-time / casual (e.g. beaters) /
	Capital Investment	Investment into butts, roads, housing, infrastructure, machinery, guns, tweeds, etc.
	Running costs	Annual costs: muirburn, advertising, management, agents, ammo, accommodation, estate hospitality, etc.
	Income	Direct shooter income / sporting lease / game sales / accommodation
	GVA	Impact on Economy
	Land Value	Capital value based on grouse bag
Indirect Impacts	Economy	Hotels/pubs/restaurants, cafes, shops, Machinery suppliers, garages, Plant hire (tracks, etc.), Game dealers, Vets
		Transport (international / national) / flights / helicopters
		Land agents - factoring fees / estate sales commission
		Locality of spend?
	Society	Population, schools, services
		Community links to moorland management
		Estate / Community engagement
		Wider well-being - use of moors etc. for tourism and recreation
	GVA	multipliers, leakage from economy (i.e. locality of spend - local / regional / National)
	Cultural	Skills / Heritage
Other considerations	e.g. Perceptions of moorlands / muirburn, etc.	
Overall Assessment	Strengths	
	Weaknesses	
	Gaps	

Main research sources relating to socio-economics of driven grouse

NGC = National Gamebag Census

Type of data	Dataset	Lead author	Commissioned by	Title/focus	Peer-reviewed?	Year published	Data Year(s)	Grouse-specific?	Geographical scope
Primary	Survey responses from 92 grouse moors	Dunlop, S., Fraser of Allander Institute	GWCT	Economic study of grouse moors	No	2010	2009	Yes	UK
Primary	Quantitative survey with 27 representatives of grouse shooting interests and 17 of conservation interests	Marshall, K.	NERC and SEERAD	Examining the perceptions of different stakeholder groups in relation to conflicts around driven grouse shooting and hen harrier conservation	Yes	2007	Unclear	Yes	Scotland (North Scotland, NE Scotland and S Scotland)
Primary	Surveys of local communities (266 responses) and 16 grouse estates, 37 stakeholder and business interviews	Mc Morran, R.	Scottish Land and Estates/ Regional Moorland Groups	Community perceptions and socio-economic impacts of moorland management and grouse shooting	No	2015	2014/2015	Yes	Scotland (Angus Glens and Monadhliath)
Primary	Interviews with 26 head gamekeepers and/or estate owners	Newey, S.	European Commission (HUNT project)	Impact of management on avian communities	Yes	2016	2010	No	Scottish uplands
Primary	Large-scale survey of sport shooting participants (16,234 responses), 16 case studies	PACEC	UK Shooting and Countryside Organisations	The value of shooting: economic, environmental and social benefits.	No	2014	2013	No	UK
Primary	280 survey responses from shooting participants and 63 interviews with shooting providers	PACEC	Exmoor National Park Authority	Role of game shooting in Exmoor	No	2012	2012	No	England (Exmoor)
Primary	228 postal survey respondents	Hanley, N.	European Commission	Economic values of species management	Yes	2010	Pre-2010	No	Scotland

				options in human-wildlife conflicts (hen harriers in Scotland)					
Primary	Interviews with 24 stakeholders involved in management of 33 estates in Highlands	Irvine, J.	Scottish Government	Economic impacts of sport shooting in the Highlands	No	2011	2006-2011	No	Scotland
Primary	Survey responses from 113 community members, 18 interviews with local businesses and stakeholders, estates survey (nine estates)	Mc Morran, R.	Scottish Countryside Alliance	Red grouse and the Tomintoul and Strathdon communities	No	2009	2008	Yes	Scotland (Tomintoul and Strathdon)
Primary	Long-term data on established field site	Ludwig, S.	GWCT	Long-term trends in abundance and breeding success of red grouse and hen harriers in relation to changing management of a grouse moor	Yes	2017	1992-2015	Yes	Scotland (Langholm)
Primary	Survey of grouse moor owners	Scott Wilson Resource Consultants and SAC	Borders Foundation for Rural Sustainability	Inventory of grouse shooting activities in the Scottish Borders	No	2002	1999	Yes	Scotland (Lammermuirs and central Southern uplands)
Primary	Survey of 218 estates (documentary analysis, postal questionnaire, case studies, focus groups, interviews)	MacMillan, D.	ESRC	Sporting estates and recreational land use in the Highlands and Islands of Scotland	No	2002	Unknown	No	Scotland (Highlands and Islands)
Primary	Case studies	Moorland Forum	Moorland Forum	Upland Solutions	No	2011	2010	No	Scotland (Tomatin, Inverness-shire and

									Muirkirk, East Ayrshire)
Primary	Interviews and participant observation	Norton, A.	Unknown	Hunting and Country Life	No	2001	Multiple years	No	England (Exmoor)
Secondary	Upland breeding bird survey and NGC	Warren, P.	GWCT	Changes in upland bird numbers and distribution in the Berwyn SPA ('The Berwyn Report')	No	2012	1983-85, 2002	Yes	N. Wales
Secondary	NGC	Robertson, G.	GWCT	Using harvesting data to study temporal and regional variation in red grouse abundance	Yes	2017	1890-1920, 1920-1950, 1950-1980, 1980-2010	Yes	UK
Secondary	Discourse analysis of 324 news articles from organisations' websites	Hodgson, I.	Macaulay Development Trust and University of Aberdeen	Organisational discourses of conflict regarding raptors and grouse moor management	Yes	2018	Pre-2018	Yes	Scotland
Secondary	NGC data and income and costs averages on basis of GWCT upland advisory team knowledge	Sotherton, N.	GWCT	Hen harriers and red grouse: economic aspects of red grouse shooting and the implications for moorland conservation	Yes	2009	NGC data up to 2002, 2008 other data	Yes	UK (with some data specific to Scotland)
Review	Range of sources post-1970 to 2000s	BASC	BASC	Overview of grouse shooting in the UK	No	2015	Multiple years	Yes	UK
Review	Range of sources; visits to two English moors	Animal Aid	Animal Aid	Calling the shots: the power and privilege of the grouse shooting elite	No	2013	Multiple years	Yes	UK
Review	Academic sources, petition responses,	Bennett, O.	House of Commons	Research briefing paper and debate	No	2016	Multiple years	Yes	UK

	media articles			pack on grouse shooting					
Review	PACEC (2006) and McGilvray (1995)	Anon	Unknown	Moorland management for driven grouse shooting (summary briefing)	No	2006	Pre-2006	Yes	UK
Review	Range of sources	Park, K.	BASC, GCT, GCSRT, Heather Trust, RSPB, SACS, Scottish Executive, SGA, SNH, SRPBA, SRSG	Impacts of birds of prey on gamebirds in the UK	Yes	2008	Multiple years	No	UK
Review	Fraser of Allander (2001) and McGilvray (1995)	Martínez, J.	EU Framework V Programme	Socio-economic aspects of gamebird hunting, hunting bags and gamebird populations in European countries	No	2002	Multiple years	No	Europe (specifically UK, France, Spain, Finland, Portugal)
Review	Range of sources	Not specified	Ethical Consumer Research Association	Campaign against intensification of England's grouse shooting estates	No	2014/2017	Multiple years	Yes	England
Review	Range of sources and Leicestershire farm case study	Tapper, S.	GWCT	Singing fields – why gamekeeping helps the countryside	No	2007	Multiple years	No	UK (drawing on experience from Leicestershire)
Review	Range of sources and interview to source data	Aigas Associates	EU LIFE Peatlands Project	Land Use Review (comparing alternative land uses for peatlands)	No	2002	2000/2001	No	Scotland (North)
Review	Literature on economic, social and environmental	Midgley, A.	Scottish Enterprise	Primary land-based business study	No	2008	Multiple years	No	Scotland

	contribution of land-based businesses								
Review	Range of sources	Wightman, A.	League Against Cruel Sports	The intensification of grouse moor management in Scotland	No	2015	Multiple years	Yes	Scotland
Review	Range of sources, written and oral evidence submissions.	Werritty, A.	SNH	Review of sustainable moorland management (report to SNH Scientific Advisory Committee)	No	2015	Multiple years	No	Scotland
Review	Range of sources	Thompson, P.	RSPB	Resolving the conflict between driven-grouse shooting and conservation of hen harriers	Yes	2009	Multiple years	Yes	UK
Review	Range of sources	Bicknell, J.	RSPB	Impacts of gamebird release in the UK	No	2010	Multiple years	No	UK
Review	Range of source, particularly McGilvray et al. (1990)	Wightman, A.	Unknown	Sporting estates and recreational land use in the Highlands and Islands of Scotland	Yes	2000	1990s	No	Scotland
Review	Range of sources	Thirgood, S.	Unknown	Hen harriers and red grouse: science, politics and human-wildlife conflict	Yes	2008	Multiple years	Yes	UK