

Hotspots of farm business diversification in Scotland

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On-farm wind turbine in Aberdeenshire

Purpose of document

This note forms an output of Research Deliverable 2.4.2 ‘How Rural Economies Can Adapt to Key External Drivers’, undertaken as part of the RESAS Strategic Research Programme (2016-2021). This work has helped to “...identify indicators of innovation and diversification”¹. This note presents an analysis of questionnaire and public datasets to identify areas in Scotland where there is evidence of high levels of farm diversification activity (‘farm diversification hotspots’). The note describes the uptake of non-farming enterprises and income diversification in Scotland, focusing in particular on renewable energy projects and agri-tourism development.

Key findings

- Levels of diversification are high in the rural areas north of central Scotland: Argyll, Stirling, Perth and Kinross, Fife, and Angus.
- Lanarkshire and Aberdeenshire have a high concentration of on-farm renewable energy schemes, in particular onshore wind projects.
- Different types of renewable energy technology tend to cluster together. In addition to onshore wind schemes (found frequently in central and eastern Scotland), hydro developments are concentrated in mountainous regions and near the west coast, and solar projects have been developed in the sunnier east (e.g. Fife, Angus).
- Evidence suggests that farm diversification into agri-tourism has taken place in accessible scenic regions and in areas close to population centres. Across the west coast and Inner Hebrides, a very high proportion of farmers plan to invest in agri-tourism.

¹ Cited from the final tender document for Theme 2 of the Strategic Research Programme 2016-2021.

Introduction and context

The last five years have seen several challenges facing the agriculture sector in Scotland. Farming income in the UK has fallen from nearly £5.5 billion in 2013 to very slightly over £4 billion in 2015, with a 24% drop between 2014 and 2015 (DEFRA, 2016: 1, 5). In Scotland, farm income has shown a similar trend from 2013 onwards, declining by 15% from 2014 to 2015 (SGDEF, RESAS, 2016: 17-8). Across Europe, farmers are facing a range of economic and political difficulties, on top of typical uncertainties associated with agricultural incomes (Augère-Granier, 2016). Diversification represents an important adjustment strategy for farms (Ilbery, 1991); generating income is a central aim in diversification (Ilbery, 1991; Barbieri and Mahoney, 2009). In 2016, ‘other gainful activities’ were found on a quarter (25.6%) of holdings in Scotland, an increase from the figure in 2013 (21.4%) (Scottish Government, 2016a: 22).

Given this context of a challenging and increasingly uncertain environment for Scottish farming, and evidence of increasing diversification, this research note aims to improve the understanding of how diversification varies spatially across Scotland, in particular identifying areas where there is evidence of high levels of farm diversification activity.

In Europe, farm diversification is defined as “...the creation of any gainful activities, that do not comprise any farm work but are directly related to the holding i.e. use its resources or products, and have an economic impact on the holding”. It is subtly different from pluriactivity, which describes the involvement of farmers in other gainful activities (cited and adapted from European Commission Directorate General for Agriculture and Rural Development, 2008: 5). Diversification can take many forms: Table 1 shows a typology of diversification activities from the academic literature of the early 1990s, and a list used within recent EU farm structure surveys. The methods used to assess farm diversification in Scotland within this note are detailed in the sections below.

Table 1: Definitions of farm diversification activities.

“A typology of farm diversification options” (adapted from Ilbery, 1991: 210)	“Other gainful activities of the holding (directly related to the holding)” (cited/adapted from farm structure survey characteristics) ²
<ul style="list-style-type: none"> • Tourism (accommodation, recreation) • Marketing, processing of farm produce • Leasing land and/or buildings • Production of ‘unconventional’ crop and animal produce • Farm woodland • Agricultural contracting 	<ul style="list-style-type: none"> • Provision of health, social or educational services • Tourism, accommodation and other leisure activities • Handicrafts • Processing of farm products • Production of renewable energy • Wood processing (e.g. sawing) • Aquaculture • Contractual work (using production means of the holding): agricultural (for other holdings) or non-agricultural • Forestry • (Other)

² Annex III “List of farm structure survey characteristics for 2016” of Regulation (EC) 1166/2008 of the European Parliament and of the Council of 19 November 2008 on farm structure surveys and the survey on agricultural production methods and repealing Council Regulation (EEC) No 571/88. Available at <http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02008R1166-20140718&from=EN> (Accessed 16th February 2017)

Non-farming enterprises operated on farms, and diversified income

To assess potential ‘hotspots’ of farm diversification, we firstly used data from the CAP Intentions Survey (CAPIS), a spatially representative telephone survey of Scottish farms which took place in 2013 (for a more detailed description of this survey, see Sutherland et al. (2016: 14)). This survey collected detailed information, including the characteristics of farms and farmers, non-farming enterprises in operation, details of income and past and intended future changes to farms. The CAPIS achieved 2,416 responses.

The agricultural parish data included in the CAPIS dataset was used to link each respondent to larger geographical areas. Statistics on diversification levels were calculated for 18 adapted NUTS3 regions³, to take into account the number of responses received (median number of respondents in a region: 132.5). Some NUTS3 areas were combined together, while Aberdeenshire and Dumfries and Galloway were split into three and two units, respectively, due to the higher number of farmers who were surveyed in these areas.

Responses within the survey were used to identify indicators of diversification and innovation, including a) if the respondent operated a non-farming enterprise on their farm, and b) if the respondent estimated that they received at least 25% of their income from non-farming activities on the farm. For these two indicators, the percentage of survey respondents within each region that met the criteria was calculated, and this was then compared with figures for all respondents in Scotland. These comparisons are shown on Figures 1 and 2.

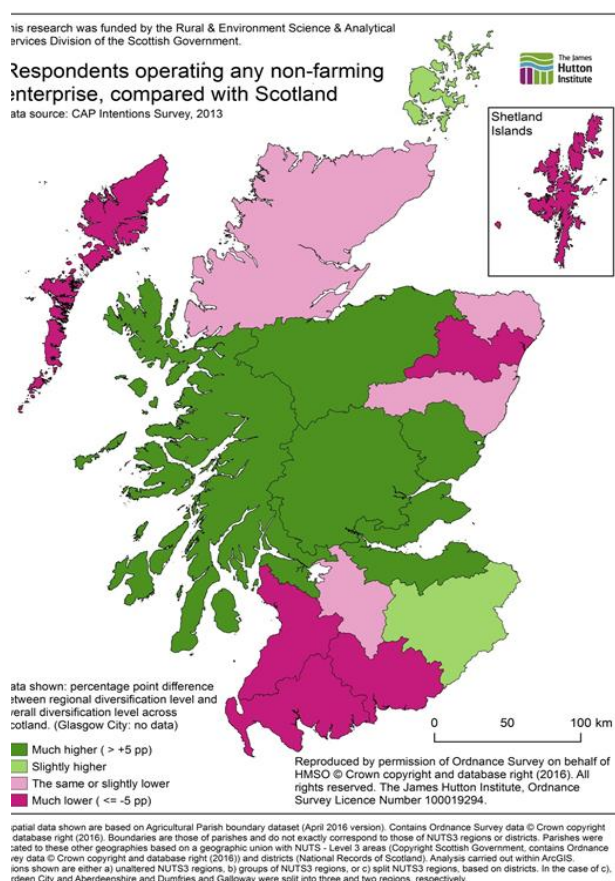


Figure 1

Firstly, 28.0% of all respondents operated a non-farm enterprise: this compares well with the proportion of Scottish holdings reporting ‘other gainful activities’ (ca. a quarter in 2016: Scottish Government (2016a: 22)). Regions where the respective figure was much higher than this are shaded dark green on Figure 1: these include Angus and Dundee City (44.3%), Perth and Kinross and Stirling (41.6%) and ‘Forth’ (40.3%). More remote areas: parts of Aberdeenshire, the south west of Scotland, Western Isles and Shetland have a much lower uptake of these enterprises than Scotland as a whole (Figure 1): the lowest figure was found in Western Isles/Eilean Siar (14.7%).

³ 'Nomenclature des Unités territoriales statistiques', there are 23 such areas in Scotland. Source: <https://data.gov.uk/dataset/nomenclature-of-units-for-territorial-statistics-nuts-level-3> (Accessed 16th February 2017).

Using the second indicator, 18.3% of survey respondents across Scotland had a 'diversified income' with at least a quarter of holding income from non-farming activities. The regional view (Figure 2) shows that Perth and Kinross and Stirling (27.5%), Inverness and Nairn and Moray, Badenoch and Strathspey (27.3%) and the 'west coast' of Lochaber, Skye and Lochalsh, Arran and Cumbrae and Argyll and Bute (24.9%) had more evidence of income diversification. Additionally, the figure for Angus and Dundee City (22.9%) was the fourth-highest in Scotland.

Based on this regional analysis, relatively high diversification was found in the southern Highlands: in particular Perth and Kinross and Stirling and in Angus and Dundee City, and in other regions to their north and west. This survey dataset provided a useful overview which was sourced directly from farmers; however, there was a need to supplement it with analysis of other data in order to provide a more fine-grained picture of potential 'hotspots'.

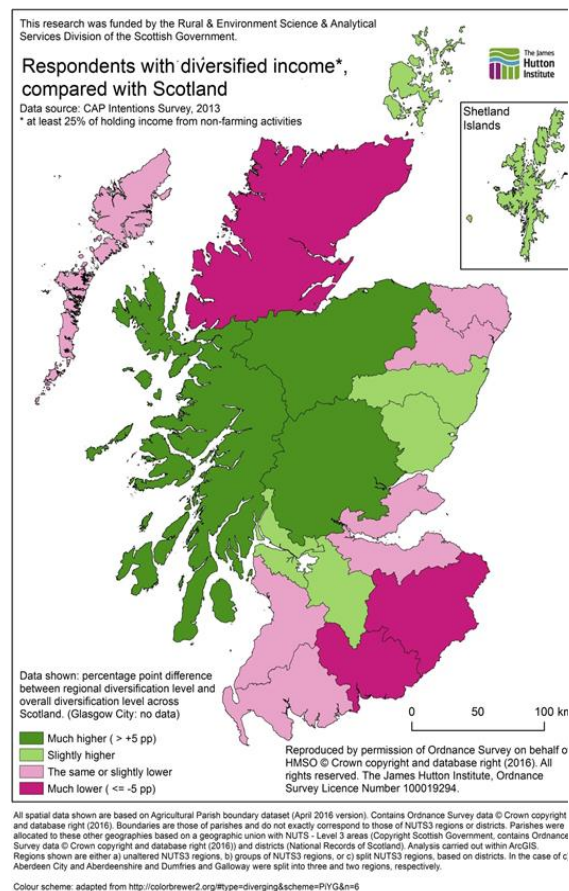


Figure 2



Products being sold at a Smallholder Festival

To identify specific hotspots, two large datasets were used to identify the locations of a) renewable energy projects which were based on farms, and b) companies which may represent farm diversification into agri-tourism. Renewable energy schemes form an example of both farm diversification and technological innovation. Around one in ten Scottish holdings were involved in

renewable energy generation in 2013 (Scottish Government, 2013: 6); however, the target in Scotland for a 66% emission reduction by 2032 (compared with 1990) (Scottish Government, 2017), the relatively large contribution of ‘agriculture and related land use’ to existing greenhouse gas emissions (10.7 out of 46.7 MtCO₂e in 2014) (figures: Scottish Government, 2016b: 33), and recent changes to policy schemes supporting renewable energy in the UK⁴ suggest that farm-based renewable energy schemes are a key area of interest. Additionally, the “...capacity of agritourism to generate private economic benefits for farmers has been established in a range of international contexts” (Flanigan et al., 2015: 129), and tourism is the most common type of ‘other gainful activity’ found on Scottish holdings (Scottish Government, 2016a: 22).

Farm-based renewable energy schemes

To assess the locations of farm-based renewable energy schemes, data from the Renewable Energy Planning Database (Department for Business, Energy & Industrial Strategy) was sourced. This dataset is updated monthly and shows projects within the planning system with a capacity of at least 1MW⁵. The December 2016 version of this dataset was downloaded, and a slightly older version (from October 2014) was used to provide information on projects with a smaller capacity (10kw and above). From these data tables, projects which were within Scotland and were “operational”, “under construction” or “awaiting construction” (at the time of dataset publication) were identified and extracted⁶. These were combined into one dataset of 1,089 projects. To identify those projects which were likely to be associated with farms, dataset information on the applicant, site name and address was combined and searched for the terms “farm”, “mains” or “croft”⁷. Projects where the information contained one of these terms, but which did not contain the term “windfarm”⁸ were identified (n = 249). These were mapped using location data (co-ordinates) included within the datasets⁹. Figure 3 shows the locations of these projects as points (coloured by technology type), agricultural parish boundaries are also shown and are shaded based on the number of renewable projects (of all technology types) within them. It is important to note that this is not a full dataset of all schemes (in particular, those smaller than 10kw are not included), but is useful at showing likely “hotspots” of farm diversification into renewable energy, and the spatial distribution of different technologies.

Of the 249 likely farm-based renewable energy schemes, nearly two thirds (157, or 63.1%) were onshore wind projects. Hydro (40), solar (29) and dedicated biomass (16) comprised almost all of the remaining projects. The mapping shows that the wind projects are particularly concentrated in Lanarkshire and central Scotland, the east coast and the north east. Farm diversification into renewable energy can be assessed in terms of overall and technology-specific diversification. ‘Hotspots’ of farm diversification into renewable energy are:

- Lanarkshire, which is dominated by wind-based schemes. Lesmahagow (labelled ‘Les.’ on Figure 3) parish has nine projects, Shotts (‘Sh.’) has five and Carnwath (‘Car.’) has four.
- The north east, covering northern Aberdeenshire and the coast to the south of Aberdeen City. Wind projects are well-established in this region, with a scattering of solar projects to

⁴ See <https://www.iea.org/policiesandmeasures/renewableenergy/?country=United%20Kingdom> (Accessed 16th February 2017)

⁵ See <https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract> (Accessed 16th February 2017)

⁶ For the October 2014 data, in addition to the criteria mentioned here, only projects with an installed capacity smaller than 1MW were extracted: the rationale being that the larger projects should appear in the more recent (December 2016) dataset.

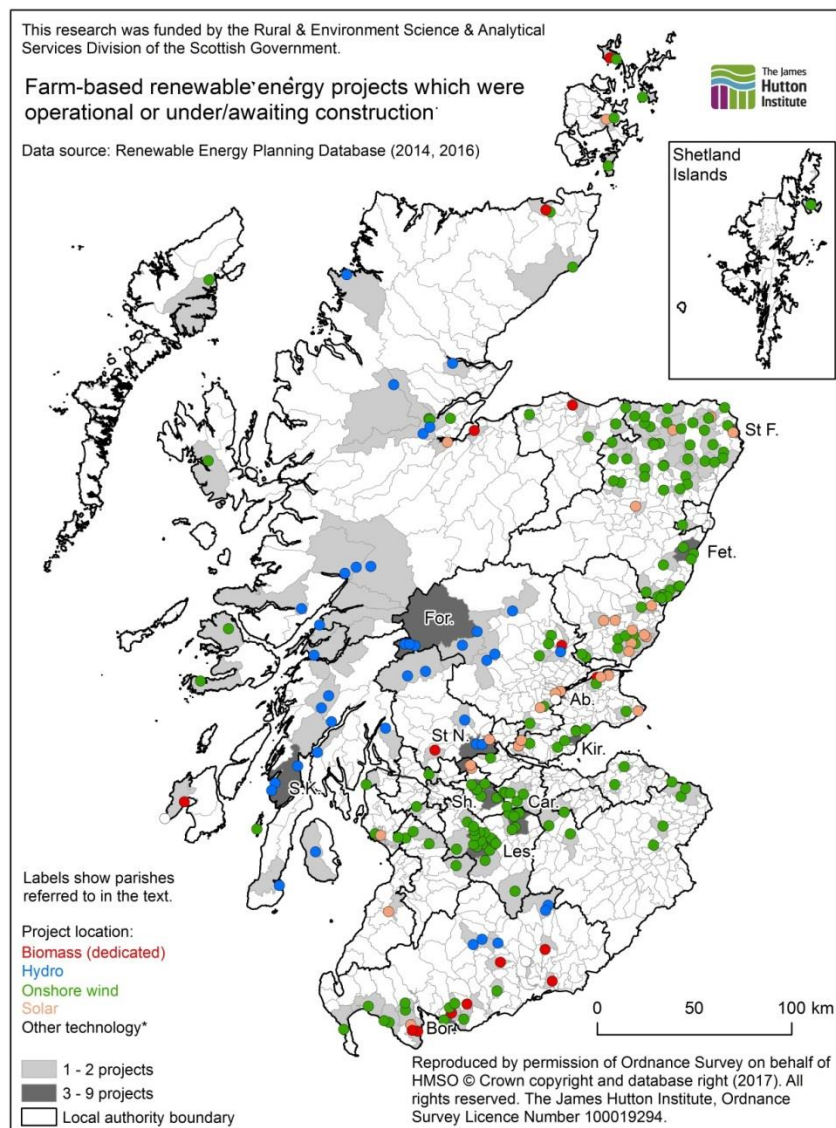
⁷ Capitalised and all-uppercase versions of these words were also used in the search

⁸ Capitalised, all-uppercase, and one- and two-word versions were also used in the search

⁹ one of these sets of co-ordinates was ‘corrected’ after checking using a web search

the north and west of Aberdeen. Several parishes have multiple projects within them: St Fergus ('St F.') and Fetteresso ('Fet.') have three each.

- The east coast, including south east Angus, southern Perth and Kinross and coastal areas of Fife, has a high number of farm-based solar projects, as well as onshore wind schemes. Particularly high numbers of projects are found in Kirkcaldy and Dysart ('Kir.') and Abernethy ('Ab.') parishes (four).
- The upland areas to the north of the central belt, including parts of Stirling and Perth and Kinross, and the west coast of Argyll, are dominated by hydro schemes. South Knapdale ('S.K.'), Fortingall ('For.'), and St Ninians ('St N.') parishes all have three projects. In addition, smaller numbers of hydro projects are found in parts of southern Scotland and to the north and west of Inverness.
- The far south of Dumfries and Galloway has a mixture of wind projects and also a number of dedicated biomass schemes. Borgue ('Bor.') parish has three schemes.



* Anaerobic digestion, EFW incineration, landfill gas or wave projects

Spatial data: Agricultural Parish boundary dataset (April 2016 version). Contains Ordnance Survey data © Crown copyright and database right (2016). Also showing local authority boundaries for Scotland: derived from Ordnance Survey Survey Boundary-Line(TM) data. Locations of renewable energy projects and technology information derived from Department for Business, Energy and Industrial Strategy Renewable Energy Planning Database: December 2016 (download: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/583147/2016_12_December_-_Public_Database_-_Dec_2016.xlsx) and October 2014 version of database (supplied on request). Data: © Crown Copyright. Contains public sector information licensed under the Open Government Licence v3.0.

Figure 3

To support this analysis, the CAPIS questions on intentions to change renewable energy production on holdings, and past changes to production were analysed. On a regional basis (Table 2), several areas located in or around the ‘hotspots’ noted above (Angus and Dundee City, Forth, Lanarkshire, Lochaber, Skye and Lochalsh, Arran and Cumbrae and Argyll and Bute and Wigtown and Stewartry) had a high proportion of farmers who intended to increase renewable energy production in the near future, at the time of the survey. However, regions in the north east of Scotland (Banff and Buchan, Gordon, Kincardine and Deeside and Aberdeen City) had somewhat lower values. Although the CAPIS sample size within these regions is relatively low, it provides some support for the ‘hotspots’ identified from the planning data.

Table 2: The proportion of survey respondents within the regions shown who intended to increase/had increased renewable energy production. Source: CAPIS (2013)

	Renewable energy production	
	intended to increase (by 2020) % (rank)	increased (since 2005) % (rank)
Clyde	42.9 (1)	26.1 (6)
Angus and Dundee City	42.4 (2)	21.3 (10)
Scottish Borders	38.8 (3)	29.8 (4)
Forth	38.8 (4)	34.3 (2)
Lanarkshire	37.7 (5)	21.5 (9)
Lochaber, Skye and Lochalsh, Arran & Cumbrae and Argyll & Bute	37.4 (6)	18.1 (14)
Wigtown and Stewartry	37 (7)	31.9 (3)
Inverness and Nairn and Moray, Badenoch and Strathspey	33.3 (8)	26.7 (5)
Ayrshire (mainland)	31.4 (9)	16.4 (15)
Banff and Buchan	31.2 (10)	25.5 (7)
Perth and Kinross and Stirling	27.1 (11)	23.4 (8)
Nithsdale and Annandale and Eskdale	25.8 (12)	20.3 (13)
Gordon	25.8 (13)	20.6 (12)
Kincardine and Deeside and Aberdeen City	25 (14)	10.9 (16)
Caithness and Sutherland and Ross and Cromarty	23.9 (15)	20.9 (11)
Shetland Islands	20.9 (16)	9.8 (17)
Eilean Siar (Western Isles)	18.6 (17)	9.7 (18)
Orkney Islands	14.9 (18)	39.1 (1)

Agri-tourism

Companies House produces the ‘Free Company Data Product’: a publicly-accessible database of registered companies in the UK which is updated every month¹⁰ and includes information on the registered office address and industry sector(s) which companies are associated with. Due to the comprehensive coverage provided by this dataset (it contained over 3.9 million records in January 2017) and information on addresses (including postcodes, which can be used as a location indicator), it was used to identify companies which were likely a) to be associated with farms and b) be involved in activities which may represent agri-tourism. A method used in other research with the Companies House data (see Copus et al., 2016) was adapted, to identify companies which were:

¹⁰ http://download.companieshouse.gov.uk/en_output.html (Accessed 16th February 2017)

- within Scotland (had a Scottish postcode¹¹) and not dormant/non-trading
- were likely to be located on farms, based on company name and address¹² or industry classification¹³
- were involved in activities which may represent agri-tourism: retail (all types), accommodation and food service, or arts, entertainment and recreation¹⁴

Following this analysis, 467 companies were identified: the names, addresses and industry classifications of these companies were then reviewed as a form of 'quality control'. A subset of 205 cases was then mapped based on postcode¹⁵ (Figure 4). This is very unlikely to represent all farms which have diversified into agri-tourism, and a limitation of the data is that means is not possible to confirm whether or not the different activities were taking place on the farm itself. However, the size of the dataset and its national coverage mean that it was useful for recognising 'hotspots'.

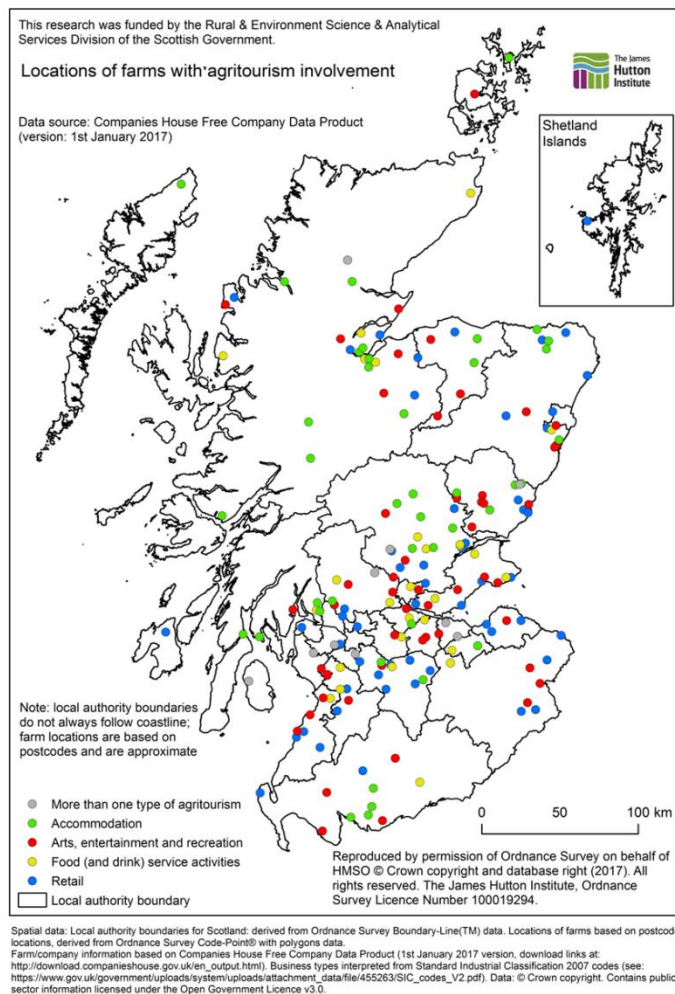


Figure 4

Of the 205 (likely) farms associated with (likely) agri-tourism, 65 were involved in retail, 59 in arts, entertainment and recreation, 48 in accommodation and 43 with food service. Ten farms were associated with two of these types. The spatial distribution (Figure 4) shows that agri-tourism associated with accommodation provision appeared to be more geographically widespread than other types, with evidence in Argyll and Bute, Highland (especially around Inverness), Perth and Kinross and Angus and southern Dumfries and Galloway. These areas can be described as accessible tourist areas. The central belt and Fife, Angus, Ayrshire, the Lothians and south east Borders had a concentration of agri-tourism activity: especially in retail, arts and entertainment and recreation and food services. These types of agri-tourism were also found across the north east (especially close to Aberdeen) and the area around Inverness in Highland, and appeared to be more concentrated around large settlements than accommodation activities.

¹¹ Scottish postcodes identified from Ordnance Survey Code-Point® with polygons and Boundary-Line™ data

¹² if "FARM", "CROFT" or "MAINS" was included in the company name or address

¹³ if the company had a Standard Industrial Classification (2007) code associated with agricultural activities – represented by some of the codes within Section A "Agriculture, Forestry and Fishing" (see

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/455263/SIC_codes_V2.pdf

(Accessed 16th February 2017))

¹⁴ based on Standard Industrial Classification (2007) codes

¹⁵ locations as points derived from Ordnance Survey Code-Point® with polygons, a small number of postcodes were 'corrected' following a web search

The regional CAPIS survey data analysis (Table 3) found that nearly three out of ten survey respondents in the ‘west coast’ region from Skye to Argyll/Arran intended to increase the level of investment in tourism and other recreation by 2020, and nearly a quarter had increased this investment since 2005. The former was by some margin the highest percentage figure of any region, the latter was the highest figure for past increases in investment. Levels of past and future investment in tourism and other recreation also appeared to be relatively high in the Scottish Borders, Perth and Kinross and Stirling, Kincardine and Deeside and Aberdeen City and Inverness and Nairn and Moray, Badenoch and Strathspey: areas which correspond to parts of Scotland identified from the mapping. While there was a lower degree of agreement between the two analyses for other regions, the CAPIS data does support some of the ‘hotspots’ of agri-tourism development identified from the company information.

Table 3: The proportion of survey respondents within the regions shown who intended to increase/had increased the level of investment in tourism and other recreation.

Source: CAPIS (2013)

	Investment in tourism and other recreation	
	intended to increase (by 2020) % (rank)	increased (since 2005) % (rank)
Lochaber, Skye and Lochalsh, Arran & Cumbrae and Argyll & Bute	28.9 (1)	24.1 (1)
Eilean Siar (Western Isles)	19 (2)	11.4 (7)
Scottish Borders	17.8 (3)	13 (4)
Perth and Kinross and Stirling	17.6 (4)	18.3 (2)
Shetland Islands	16.4 (5)	7.8 (14)
Kincardine and Deeside and Aberdeen City	14 (6)	13 (5)
Inverness and Nairn and Moray, Badenoch and Strathspey	13.7 (7)	12 (6)
Nithsdale and Annandale and Eskdale	12 (8)	8.6 (12)
Forth	11.7 (9)	7.9 (13)
Clyde	11.4 (10)	14.3 (3)
Ayrshire (mainland)	10.7 (11)	6.5 (16)
Orkney Islands	10.1 (12)	9.8 (10)
Caithness and Sutherland and Ross and Cromarty	9.8 (13)	9.9 (9)
Wigtown and Stewartry	7.9 (14)	6.7 (15)
Angus and Dundee City	7.3 (15)	10 (8)
Banff and Buchan	6.9 (16)	5.1 (18)
Gordon	6.8 (17)	6.4 (17)
Lanarkshire	4.5 (18)	9.1 (11)

Discussion and policy implications

Identifying spatial patterns of farm diversification in Scotland is not straightforward. This work has combined a region-based analysis of a survey of Scottish farmers with insights from the analysis of large, country-wide datasets, to present a detailed picture considering overall diversification and specific activity types (renewable energy and agri-tourism). The datasets used have different strengths and weaknesses: the CAPIS contains information which was sourced directly from farmers, but at the regional level the numbers of farmers surveyed are fairly small. The planning and companies datasets are very large and contain ‘fine grained’ location information; however,

identifying farms and diversification associated with farms from these datasets involves assumptions and inevitable inaccuracy. However, it has been possible to identify areas of Scotland where farm diversification (and innovation) is likely to be particularly common.

Considering both overall diversification (uptake of any type of non-farming enterprise, and diversified income), and more specific uptake of renewable energy and agri-tourism, diversification levels are high in rural areas to the north of the central belt: Argyll, Stirling, Perth and Kinross, Fife and Angus. Outside of these regions, Aberdeenshire and Lanarkshire have a large number of renewable energy schemes, and uptake of both renewable energy and agri-tourism appears to be high around Inverness and in southern Dumfries and Galloway. There is also evidence of strong agri-tourism involvement on the west coast, and in areas close to large towns and cities.

Some of these ‘hotspots’ have geographical advantages which favour the development of farm diversification. Across the EU, farm diversification appears more frequently in areas near cities, or in scenic and attractive regions (European Commission Directorate General for Agriculture and Rural Development, 2008; report summarised by Augère-Granier, 2016): in Scotland, the areas north of the central belt, and several areas where agri-tourism is in evidence, would fit within these categories. The potential for farm tourism in scenic ‘marginal fringes’ and diversification in ‘urban fringes’ was similarly noted in the early 1990s (Ilbery, 1991: 211). Research in Scotland has also identified the importance of farm location: noting that “Proximity to sources of population (towns, cities) is an important consideration for providers in terms of generating demand in the form of local day-trippers. Attractive scenery and proximity to other tourism attractions and facilities is important in terms of generating demand for agritourism accommodation products” (Flanigan et al., 2015: 137). In addition, Angus and Fife have physical advantages which favour the development of renewable energy projects: Eastern Scotland records strong winds, and coastal areas of the region have the longest sunshine duration in Scotland¹⁶. The concentration of hydro renewable energy schemes in Perth and Kinross and Stirling is favoured by the mountainous nature of these areas.

The areas where diversification uptake appears to be strong thus appear to be those which are capitalising on the geophysical locations of the farms, i.e. those which are accessible to people, attractive scenery, existing tourism, or climate. These can be thought of as examples of ‘pull factors’ (described by Edmond and Crabtree, 1994: 77. A key policy implication is to consider areas without these attributes, where ‘push factors’ such as low farming incomes are driving decisions to diversify or generate non-agricultural incomes. In earlier work on agritourism (RESAS 2011-2016), Flanigan et al. note (for agri-tourism) that “...pull drivers appeared to be more influential in the context of lowland farming and in accessible rural areas, and push factors were more significant in remote and disadvantaged rural areas” (p. 133). An important question is the extent to which policy support for farm diversification can support diversification in regions where the natural landscape is less conducive to these activities.

Acknowledgements

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Data analysis for this work used ArcGIS (ESRI, 2013) and R (R Core Team, 2016), including the ‘foreign’ package (R Core Team, 2015)

¹⁶ See <http://www.metoffice.gov.uk/climate/uk/regional-climates/es> (Accessed 16th February 2017)

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