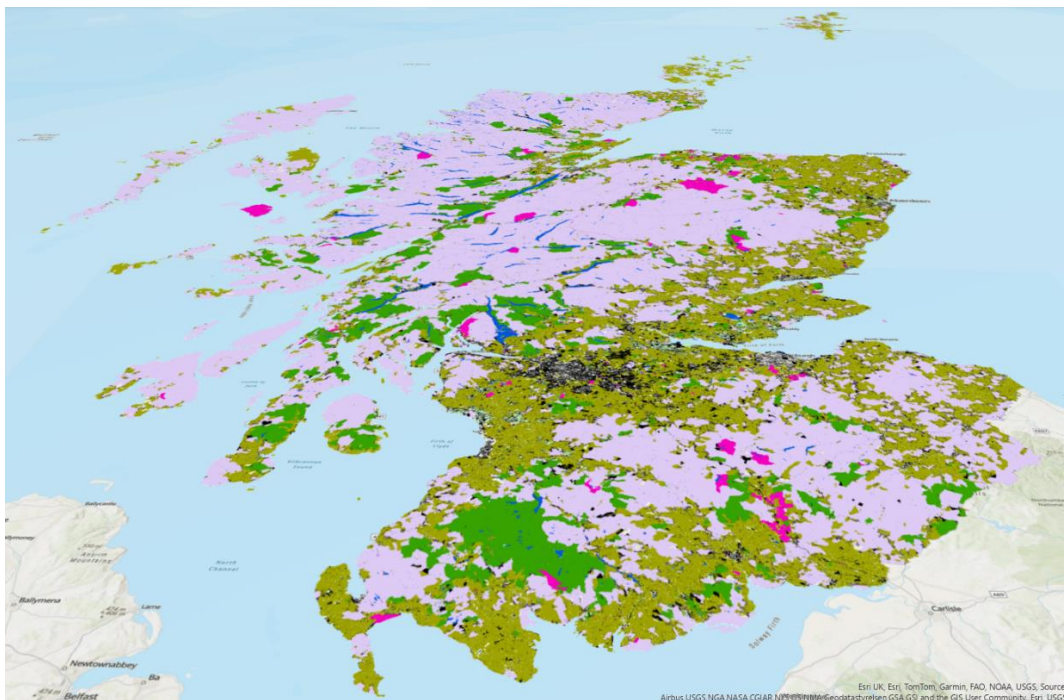# Review of land ownership data in Scotland

Deliverable D1.1 for Scotland's Land Reform Futures project (JHI-E3-1)

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Context

The Scottish Government Rural and Environment Science and Analytical Services (RESAS) division funds the [Strategic Research Programme 2022 to 2027](#) to advance the evidence base in the development of rural affairs, food and environment policies. One of the themes (Theme E) of the Strategic Research Programme 2022 to 2027 is on **Rural Futures**. This theme has three research topics: rural communities, rural economy, and land reform. There are two projects within each topic, led by the James Hutton Institute (JHI) and Scotland's Rural College (SRUC). This publication is one of a series of publications from this theme.

Within the land reform topic, the two projects are:

1) [Scotland's Land Reform Futures](#)
2) Impacts of Land-Based Financial Support Mechanisms on Land Values, Landownership Diversification and Land Use Outcomes

This document is a report on accessing and integrating land ownership data in Scotland, based on a review of existing land ownership data, its availability, accessibility, and shareability. The review was a desk-based study with a small number of meetings with data providers. It identifies relevant data from several sources including Scottish Government Agriculture datasets, Forest and Land Scotland, Registers of Scotland, Local Authorities, from the private sector and other sources. The datasets differ in terms of scope, coverage, granularity, frequency of update, and cost of access. This document summarises the characteristics of the datasets and the challenges for making land ownership data more transparent.

This report is part of the research in the Scotland's Land Reform Futures project, which was tasked with assessing how to make land ownership data across Scotland more transparent and accessible, potentially via a digital mapping platform. The findings and recommendations from this review align with other recent reports published by organisations such as the [David Hume Institute](#) and [Future Economy Scotland](#). This document provides a more detailed overview of the challenges of data access and integration than introduced in these recent reports. This review also contributes to work ongoing by the [Scottish Land Commission](#).

The review provides a detailed overview of the issues and opportunities associated with landownership data availability, accessibility, and shareability in Scotland, with implications for future land reform policy implementation.

Previous publications from the Scotland's Land Reform Futures project are:

1) ['Understanding community access to land data'](#)
2) ['Alternative Land Tenure Models: International Case Studies and Lessons for Scotland'](#)

Acknowledgments

Front cover note

The image on the front cover illustrates that a mix of land ownership information is available from several different sources. There is overlap between the categories, but for the purposes of this illustration, in order of preference:

- blue areas represent inland water bodies (shown for cartographic purposes only);
- light purple is the area currently covered by Who Owns Scotland;
- pink broadly covers land owned by the state or state agencies including the Ministry of Defence, NatureScot, Scottish Crown Estate, Scottish Water, and Transport Scotland;
- green areas are part of the National Forest Estate;
- the pistachio colour shows the remaining extent of field boundaries registered in the Rural Payments and Inspections Division Land Parcel Information System;
- finally black areas are those from which information may be derived from the Land Register.

The intention of the image is simply to give a flavour of the spatial extent of some of data sources explored in the work undertaken.

Contents

List of Abbreviations

Abbreviation	Meaning
AD|ARC	Administrative Data | Agricultural Research Collection
BRN	Business Reference Number
BRIA	Business and Regulatory Impact Assessment
CAP	Common Agricultural Policy
CPH	County Parish Holding
DPIA	Data Processing Impact Assessment
DSA	Data Sharing Agreement
EU	European Union
GDPR	General Data Protection Regulation
IACS	Integrated Administration and Control System
IS	Improvement Service
JAC	June Agricultural Census
LDT	Limited Duration Tenancy
LPIS	Land Parcel Identification System
MLDT	Modern Limited Duration Tenancy
NDPB	Non-Departmental Public Body
NFI	National Forest Inventory
OGL	Open Government Licence
PSGA	Public Sector Geospatial Agreement
RCI	Register of Persons Holding a Controlled Interest in Land
RCIL	Register of Community Interests in Land
RESAS	Rural and Environment Science and Analytical Services
RoACBL	Register of Applications by Community Bodies to Buy Land
RoS	Registers of Scotland
RPID	Rural Payments and Inspections Division
SAF	Single Application Form
ScotLIS	Scotland's Land Information System
SEWEB	Scotland's Environment Website
SG	Scottish Government
SLDT	Short Limited Duration Tenancy
SRDP	Scottish Rural Development Programme
SRUC	Scotland's Rural College
Sub	Subscription
UK	United Kingdom
UPRN	Unique Property Reference Number
VDL	Scottish Vacant and Derelict Land Survey
WOS	Who Owns Scotland

Highlights

What were we trying to find out?

This research examines the current sources of rural land ownership data in Scotland, how comprehensive the coverage of Scotland is, data accessibility and potential uses, either singly or together.

What did we do?

The sources of land ownership data for Scotland were reviewed using online documentation and via meetings with key data owners.

What did we learn?

The analysis indicates that there is only one source of land ownership data (Who Owns Scotland) in which both the areas of land and the individuals or companies that own them are connected and that is available for a cost that would make it usable for communities or public-good research. The dataset is though incomplete (5.3M ha of 7.7M ha) and has less coverage in the lowland areas of Scotland. Otherwise, there are many other data sets that have ownership-related data or data from which ownership could be interpreted using one or usually more datasets combined. Accessing and bringing these datasets together is a challenging task (both technically and in terms of cost) and one that currently would still leave large areas of Scotland with limited information.

Given that there are other tenure rights in addition to legal ownership, it is important that data on other forms of tenure (especially of rural land) is collected and accessible, capturing the varied relationships between people and the use of rural land. Long and short-term rentals, partnerships, seasonal rentals, and crofting all have significant implications for land use and other issues (such as rural community sustainability and access to land for new entrants.). Since 2021 no single, comprehensive, source of data for all tenures has been collected and no data is available to differentiate owner use from renter use of land.

What do we think should happen next?

Scottish Government recognises the potential benefits of bringing together administrative datasets collected for differing purposes. A Trusted Research Environment has already been created that links population and agricultural census, education, and health data in a secure environment for use by research and public policy teams. The recommendation from this research is to build on the existing Trusted Research Environment and to use them as a place where existing land ownership data sources can be brought together, studied, and then used as a basis for supporting policy making by government and to inform community-led initiatives. The benefits of this approach would include ensuring all data sources are available in one place; are more easily linked together; and there is improved access to data by reducing cost while carefully managing the data so that issues of confidentiality are respected. We recognise that there are resource considerations

for a Trusted Research Environment-based approach to enhancing land ownership data. However, by first better exploiting existing datasets, additional costs could be minimised. While data transfers will take staff time and other resources, these, likely limited costs, may be borne by users of the data (for example via project or research capacity funding).

To address the lack of data on other forms of tenure, a second recommendation is that tenure data should again be collected (e.g. through existing agricultural data collection processes) and if possible, it should be mapped so that the tenure data can be better linked with environmental and land use systems data to better inform policy making and evaluation.

Executive Summary

This document reports on a review of existing land ownership data, its accessibility, availability, and shareability. The review was part of the [Scotland's Land Reform Futures](#) project tasked with assessing how to make land ownership data across Scotland more transparent and accessible, potentially via a digital mapping platform. The review was a desk-based study with a small number of meetings with data providers. It identifies relevant data from several sources including Scottish Government Agriculture datasets, Forest and Land Scotland, Registers of Scotland, Local Authorities, from the private sector and other sources. The datasets differ in terms of scope, coverage, granularity, frequency of update, and cost of access. The report summarises the characteristics of the datasets and the challenges for making land ownership data more transparent.

From this review the Hutton team have concluded that the only readily usable source of land ownership data with both land parcels and owners attributed is [Who Owns Scotland](#), the outcome of a private citizen's initiative. Otherwise, land ownership relevant data is fragmented with data collected across multiple organisations with different remits. This leads to partial coverage: spatially, temporally, and thematically. This limits the attribution of tenure to individual land parcels and the identification and classification of active land managers and final beneficiaries of land. Such fragmentation is inherently limiting for transparency as, at best, it implies the need to integrate these sources, a substantially challenging task from a technical and institutional perspective. Existing partial data sets could, though, be better leveraged, to yield a more comprehensive coverage and a more nuanced classification of land ownership/tenure in Scotland. This would enable analysts and researchers to deliver, to both policy makers and rural communities, outputs that better inform both the development of policy options and the monitoring of their impacts. The analysis could be timelier, more efficiently conducted and with less uncertainty, especially in establishing spatial and cause and effect relationships. The barriers to such an initiative are more institutional than technical, and include:

1. Accessibility – Few datasets are open access, with paid subscription or per-record access, regardless of use and strict data sharing agreements.
2. Shareability – Is typically heavily curtailed even for derived outputs.

There is also no single organisation funded and tasked with leading and undertaking such integration nor one that also has the remit of making such data freely and transparently available. To deal with these issues and to enhance both the quality and transparency of land ownership data in Scotland the Hutton team make two recommendations.

Before stating the recommendations, the authors note the following. The recommendations are not endorsed by anyone in government and are those of the Hutton team alone. This review was limited to technical issues (data quality, integration and sharing) and the Hutton team are aware that these recommendations could have as yet unquantified cost and regulatory impact

burdens for government and stakeholders. The Hutton team have, therefore, tried to make recommendations with the greatest potential for rapid and meaningful improvements to the quality and accessibility of land ownership data with the lowest cost and stakeholder burdens.

> **Recommendation 1** – Scottish Government to commission a cross-government data integration exercise to collate and integrate all relevant land ownership data, to be held in a trusted research environment[1], for without payment use by researchers, analysts, policy teams and stakeholders. This exercise would also assess how far existing datasets can meet the need for land ownership or tenure data and to define a route map for filling in any missing data gaps.

The benefits of Recommendation 1 are first in creating new integrated datasets that can be used to better inform the development and evaluation of land-related policies (particularly for rural land). These policies would include, but are not limited to agriculture, environment, climate, and land reform all of which are active areas of policy development. Second, these datasets could, with appropriate controls, be used to support communities seeking better information on the land ownership (and thus land rights and responsibilities) where access and interpretation support has been challenging[2]. The recommendation would provide a locus within government in which partnerships between officials, analysts and researchers could be developed. Both technical and institutional issues may thus be resolved to expedite progress on enhancing land ownership data and its integration with other administrative and research-based data.

The cost of implementing Recommendation 1 would be minimised by: reusing existing data and focusing on better integrating that data; using existing Trusted Research Environment facilities and their expertise in the technical and legal aspects of data linking (e.g. in the GDPR) and using the expertise within the Main Research Providers of the 2022-27 RESAS funded Strategic Research Programme to undertake development and testing of data integration and presentation approaches. Cost minimisation is further elaborated on in Section 6.

While the focus of the review was land ownership, the review team noted that for many policy and stakeholder questions ownership information is necessary, but not sufficient. Other forms of tenure and use (e.g., tenancy, crofting, and seasonal use) imply the need to make sure that any land ownership dataset can be easily integrated with other Scottish Government datasets such as the Integrated Administration and Control System (IACS) and June Agricultural Census (JAC). While such integration is technically feasible, since 2021 land data tenure has no longer been collected by Scottish Government. This leads to the second recommendation.

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[1] See the AD|ARC initiative – linking Agriculture, Census, Education and Health data.

[2] This was a key finding in the related research report 'Understanding community access to land data'.

> **Recommendation 2** – Scottish Government to commit to collect and update land agricultural land tenure data, preferably annually, at land parcel level, and using a tenure typology as granular as that used up to 2021 in the June Agricultural Census.

Collecting spatial tenure data would make it more compatible with other spatial datasets. This would give the data greater utility for policy development, by better supporting analysis of how tenure may affect policy outcomes (e.g. via Business and Regulatory Impact Assessments prior to implementation). The data would also facilitate the monitoring and evaluation of how land reform legislation is changing the mix of tenure present across Scotland.

This recommendation goes beyond previous practice, in seeking spatial (mapped) tenure data. To reduce anticipated costs, spatial tenure data collection could be limited to only those businesses that are already part of the Single Application Form process, where land parcel boundaries are already captured or maintained as part of processing agricultural support payments. Costs and impacts could be limited by adopting a phased approach to establishing the baseline of tenure data over several years with the tenure data then maintained via modifications to an existing administrative process (the Land Maintenance Form). The technical feasibility and stakeholder acceptability of a spatial, SAF-based, approach has been demonstrated by the Welsh Government where tenure at field level is included in the Wales SAF[3]. Tenure could thus become part of the SAF data captured, but the Hutton team acknowledge that this is a non-trivial task and would need careful consideration of how best it could be implemented.

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[3] Details of tenure data collected can be seen in the Welsh SAF Guidance.

1 Introduction

1.1 Background

This review is part of the [Scotland's Land Reform Futures](#) project (JHI-E3-1) within the Scottish Government Strategic Research Programme 2022-27. The project specification, from Scottish Government, highlighted the importance of increasing the transparency of land ownership in Scotland, both for policy makers and stakeholders. For policy makers the need was to have improved sources of information to evaluate the outcomes of land reform and related policies but also to be able to use such data to better assess the impacts of policy proposals where land tenure may shape policy outcomes (for example on tenanted or croft land). For stakeholders there was evidence that challenges in accessing and using land ownership and related data may inhibit communities who seek to change land ownership as part of enhancing sustainable land management in their areas[4]. In response to this specification the James Hutton Institute has conducted a review of current land ownership dataset availability, accessibility, and shareability. The review, reported here, identified where there may be opportunities for data integration that could improve the coverage and transparency of land ownership data across Scotland. The review also assessed options for, and barriers to, making such integrated data available via a digital platform.

The review was a desk-based study with a small number of meetings with data providers. The review builds on work carried out by members of the Hutton [Land Systems Research](#) team since 2008 to integrate spatial land data from across rural Scotland in support of national-level policy development[5]. This includes a suite of administrative and research-based, biophysical, environmental, and socio-economic data. The land ownership review extended the range of potentially relevant datasets known to the research team and contacts with the organisations responsible for their collection and dissemination.

1.2 Methods and sources

The Hutton team reviewed existing and in development land ownership datasets, both where ownership or other forms of tenure is explicit and where ownership could be inferred by combining two or more datasets. The review was a desk-based study of published sources supplemented by meetings and correspondence with teams responsible for the data, particularly to be more certain on development timelines and to clarify roles and responsibilities. Most of the review was undertaken between June 2022 and March 2023, with further work to add detail to some datasets updated for this report as late as January 2024. The detailed descriptions of each of the datasets considered by the team are reported in Section 3 *Land Ownership Relevant Datasets*.

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[4] McKee, A. and Marshall, A. (2023). Understanding community access to land data. Scotland's Land Reform Futures project, James Hutton Institute. March 2023. Available [online](#).
[5] See the web page of the Hutton [Land Systems Research](#) team.

1.3 Structure of the report

The analysis is presented as follows. First is a summary of Key Findings (Section 2), followed by details of Land Ownership Relevant Datasets (Section 3), then discussions of common Issues Across Datasets (Section 4) and Policy Considerations (Section 5), and finally Recommendations (Section 6).

The Key Findings and Recommendations sections can be read standalone with the rest of the document elaborating the underlying evidence used by the Hutton team.

2 Key Findings

This section provides a high-level summary of the review findings with links to the key recommendations that are collated in Section 6 Recommendations.

The assessment of the reviewed land ownership relevant data sources (n=18) against criteria (n=10) is summarised in Table 1, with the cells colour-coded based on completeness and/or functionality. Those that are fully complete or functional are in green, those partially complete are in orange, and those where there are currently serious limitations for the uses being considered here are in red, with grey meaning there is uncertainty on the appropriate grading (at the date of the report).

The criteria assessed for each dataset were chosen by the Hutton team to address the following questions:

- Does a single, comprehensive, dataset exist that can provide land ownership data in a form and cost of data use that means it can be used for policy analysis or community use?
- Alternatively, can datasets be accessed and integrated to derive land ownership data on a reliable basis within anticipatable resource limits?
- What use limitations are there for researchers and other stakeholders?

These questions reflect the overall goal of the Scotland's Land Reform Futures project of making land ownership data more transparent across Scotland.

Before addressing the specific criteria, what the table highlights overall (partly just by the numbers of rows present) is that there are many relevant datasets, each of which address specific aspects of land ownership. There is though no single comprehensive ownership data source at present and the timeline by when such a data set could exist is not clearly defined. Such fragmentation is inherently limiting for transparency as it implies the need to integrate these sources and even were this successful then the resulting datasets would still have limitations (considering the specific criteria below). There is also no single organisation funded and tasked with undertaking such integration nor one that also has the remit of making such data freely and transparently available. A way to address these issues is presented as **Recommendation 1** in Section 6.

As presented in Table 1 below**, Coverage** assesses whether data exists for all land across Scotland (**National**), and the degree to which datasets that are intentionally partial (e.g., crofting or forestry) are themselves complete (**Goal**). The conclusion for Coverage is that no digital dataset assessed, as of 2024, covers all land in Scotland. Where it could be determined, the degree of Goal-based coverage is usually high, with incomplete coverages all being the subject of ongoing data collection or digitisation. The most extensive data set for rural land linked to beneficiaries is the Integrated Administration and Control System (IACS) and Land Parcel Identification System (LPIS). This could serve as the core for any future data integration effort undertaken in advance of completion of a fully accessible cadastre for Scotland with identified owners (again see **Recommendation 1**).

Table 1: Summary of datasets and characteristics

Category	Dataset	Coverage National	Coverage Goal	Ownership Granularity	Mapped	Tenure	Historic (from)	Updated	Access	Cost	Share-ability
Agriculture	Integrated Administration and Control System (IACS) & Land Parcel Identification System (LPIS)	6.5M ha		Business User	Parcel	Part	2000	Annual	DSA		No
Agriculture	June Agricultural Census (JAC)	6.2M ha		Holding	LPIS/No	To 2021	1991	Annual	DSA		No
Agriculture	Croft Lands	13k ha		Business User	Parcel	Part	2000	Annual	DSA		No
Forestry	National Forest Ownership	0.6M ha		Public Estate*	Parcel	Part	No	Annual	Open	None	Yes
Forestry	National Forest Inventory	1.5M ha		Public and Private*	Parcel	No	2010	Annual	Open	None	Yes
Registers of Scotland	Land Register	4.2M ha	Part	Title	Parcel	No	1981	Yes	Record	High	No
Registers of Scotland	Register of Persons Holding a Controlled Interest in Land	Being Built	Being Built	Individuals and NNP	via Land Register	Owners/ Tenants	2022	Yes	Record	None	No
Registers of Scotland	Register of Community Interests in Land					Part	2004	Rolling	Record	None	No
Registers of Scotland	Register of Applications by Community Bodies to Buy Land			Individuals and NNP	No	No	2018	Rolling	Record	None	No
Registers of Scotland	Crofting Register			Individuals	Title	Part	2012	Rolling	Record	None	No
Private	Who Owns Scotland	5.24M ha	Part	Individuals	Holding	Owner only	2001	Rolling since 2022	Sub	Low	No
Other	Crown Estate Scotland				Parcel	Owned			No	None	No
Other	Community Ownership in Scotland	200k ha						Annually		None	No
Other	Public Lands	750k ha		Public	Parcel	Part	No	No	DSA	None	No
Other	Crofting Commission Open Data	20.5k crofts		Individuals	via Land Register	Yes			Open	None	Yes
Other	Vacant & Derelict Land	32 LA 10k ha		Private/Public	Parcel	No		Annual	Open	None	Yes
Other	Local Authority Owner	9/32 LA 26k ha	Part	LA	Title	No	No	As Needed	DSA or Sub	None	No
Other	Community Asset Transfer		95 public bodies	Site	Point locations	Part		Annual	DSA	None	No

Key to the Table	Complete or Functional	Partial	Serious limitations for the uses being considered in the report	Uncertainty on the appropriate grading	DSA – data sharing agreement	LA - Local Authority
NNP – non-natural person		Sub – subscription (paid)		*The public versus private forestry may be inferred by combining data from the two forestry datasets		

Ownership Granularity is the spatial unit at which ownership can be assessed. Ideally individual land parcels would be fully attributable to ownership entities. The only data set with both digital mapping and identification of ownership entities beyond public sector owners is Who Owns Scotland (WOS). The granularity of WOS though is above land parcels (being based on manipulations of land title polygons based on owning entities). For agriculture and forestry data, land parcels can be linked to businesses, holdings, or public sector entities (those using the land) but tenure is uncertain (see below). For Registers of Scotland data, the land title is the spatial unit and linking to owners is a manual only process. For other datasets, parcels are identified but only for public sector owners.

Mapped defines whether the dataset is fully spatial i.e., it has geographically defined boundaries that can be integrated with other spatial data. Mapped also notes whether a dataset depends on another for mapping, and the smallest spatial entities that can be distinguished. No single mapped dataset has both identifiable ownership entities and land parcel level mapping, meaning the need for spatial data integration across the datasets listed remains, yet any resulting dataset will remain limited by both coverage and ownership granularity.

Tenure means whether it is possible to see more than ownership details. This is significant as land use and land reform policy making needs to consider all tenure types – e.g., how long-term heritable tenancies or seasonal land rentals can shape the ability of land managers to engage with land use policy objectives such as tree planting and peatland restoration. This data can be inferred from the scope of some datasets e.g., for crofting, but only one tenure data source existed, which was the June Agricultural Census (JAC). The JAC defined the extents of 11 tenure types per holding for all agricultural holdings (6.2M ha with 5.1 M ha that can be linked to IACS/LPIS mapping). The JAC tenure data ceased to be collected after 2021. The JAC data had incomplete coverage, was not parcel specific and was assessed as unreliable by the SG Census team yet was the only source of such data. Restarting and enhancing the collection of tenure data is essential, see discussion in Section 4 and **Recommendation 2** in Section 6.

Historic gives the periods for which digital records are readily accessible. **Updated** notes the frequency of updates, either as time step, or incremental (as rolling); it also highlights whether the datasets are being collected as of March 2023. All datasets are being actively updated, at least annually, therefore most can provide 'look back' capabilities. The key exception is the tenure data within JAC as noted above.

Access defines the ease with which the data can be viewed or used in analysis. The models for access are Open, controlled via Data Sharing Agreement (DSA), Subscription and Charge per Record. The conclusion here is that there are no open access datasets with mapped ownership linked to individual entities in this domain. Datasets on the extent of afforested land are the only instances of open access but have limited ownership information beyond distinguishing publicly owned forestry. Data sharing agreements are common, some with light conditions while others, where there are privacy issues, can have significant limits on purpose,

identification and sharing (see below). Subscription (Sub) and Charge per Record (Record) can be more restrictive than data sharing agreements (see Cost) but are not inherently limiting.

Cost gives the relative expense of national coverage (where available). Many of the datasets can have low/no cost but only if the access conditions on data sharing can be met. For example, WOS has a low-cost subscription that is not a significant barrier to use. In contrast the data of Registers of Scotland has charges based on a cost recovery model from property transactions. This model seems to preclude Registers of Scotland from providing access to pan-Scotland data, using an additional cost model, even for research commissioned by Scottish Government or for not-for-profit, civil society, organisations.

Shareability defines whether it is thought likely that the dataset having been accessed could then be shared freely with third parties, even in modified form. Except for open access data, the access and cost factors combine to mean that none of the sources are known to be shareable.

In pursuing more transparency of land ownership and related data, the overview presented in Table 1 indicates that there is the need to recognise that data on land ownership and related phenomena are currently partial and fragmented, and that there are serious technical, institutional, and financial barriers to data integration. While the completion of mapped coverage for ownership datasets would be welcome, it is not clear that even compete coverage will deliver a dataset that is functionally usable for pan-Scotland analyses to support policy development or evaluation. WOS provides a model for the functionality that an open ownership dataset could give yet its value would be enhanced further were it to be integrated with other spatial data on land user's structures (farm/estate/croft) from IACS and the form(s) of tenure from JAC or IACS. Consideration should thus be given by Scottish Government to the creation of a Trusted Research Environment- based collection of land ownership and related datasets that better integrate available data and makes it freely accessible. This approach would be a step forward in terms of functionality and transparency while not compromising privacy.

3 Land Ownership Relevant Datasets

This section provides a more detailed description of the potential data sources and the features that underpinned the assessment summarised in the Key Findings section above. The section provides quantitative data wherever it was available but in many cases the public-facing metadata is relatively limited. For some datasets the Hutton team have more detailed knowledge through working with Rural and Environment Science and Analytical Services (RESAS) and Rural Payments and Inspections Division (RPID) on agricultural datasets. The section considers land ownership relevant data from the following sources:

- Scottish Government agriculture datasets

- Forestry data (from both Scottish and UK sources)

- Registers of Scotland

- Private Sector – Who Owns Scotland

- Other sources – other Scottish Government and agency sources, local authorities, Crown Estate etc.

3.1 Scottish Government Agriculture Datasets

3.1.1 Integrated Administration and Control System and Land Parcel Identification System

One of the key datasets the Hutton team has worked with over the last 15 years is the Integrated Administration and Control System (IACS) and Land Parcel Identification System (LPIS) data obtained from RPID. Together these databases contain spatial and non-spatial data for every agricultural business in Scotland that submits a Single Application Form (SAF) for various agricultural support and related schemes. Among the data from these sources[6] are details regarding mapped business extents, business structure, land use, seasonal rentals, and scheme payments. In terms of coverage the mapped area held in LPIS extends to some 6.49 million hectares[7] or approximately 82% of Scotland's land area.

3.1.2 Scottish Government June Agricultural Census (JAC)

Separate to the IACS/LPIS datasets is the June Agricultural Census (JAC) collected each year for all Main Holdings (those that are above an area or number of livestock threshold and are registered as Agricultural Holdings)[8]. The JAC provides, among other characteristics, details regarding farm type, tenure (until 2021, see Section 4.1 for more detail), and labour. This data, collected annually, is

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[6] Held by Hutton under a data sharing agreement with RESAS and RPID, for use in agreed research and policy led projects.

[7] Total area of LPIS polygons from latest cut taken 12th June 2023

[8] See the June Agricultural Census - Methodology Report, note that other agricultural holdings are classed as Minor Holdings and make a Census return once every three years.

held not per field but at both holding and business level. Coverage here is approximately 5.77million hectares[9]. The JAC is a non-spatial dataset meaning there is no land-parcel mapping associated. Also, the population is slightly different between IACS/LPIS and JAC so there are some entities that only appear in one or the other dataset. For records which are common to both JAC and IACS/LPIS, however, these can be linked via county-parish-holding (CPH) code or business reference number (BRN).

While the Hutton research team have in the past focussed on *usership* – i.e., which entities are using the land and for what purposes – the key aspect of the Scotland's Land Reform Future's project is *ownership.* Where a holding or business is entirely owner-occupied the picture is relatively straightforward – linking all land to an ownership entity. In cases where there is tenure of a different kind – particularly where land may be under long term tenancy arrangements (e.g., 91 Act Tenancy) – the JAC data held cannot provide any detail on land ownership. Where there are a mix of tenures present (owned plus tenanted is common) then it is also not possible to be explicit about which land parcels are held under which tenure.

There also remains the question of those holdings in JAC which do not submit a SAF (i.e., those that do not make any application for farm support payments or interact with RPID for other reasons). In these circumstances it is not possible to link to spatial data held in IACS/LPIS. By comparing the populations of IACS/LPIS and JAC it is known that there are some 4,000+ of these holdings. Each has a CPH code so this could be used to establish to which of the 891 Agricultural Parishes[10] these holdings are registered. Holdings will in some (and perhaps even in many) cases map onto ownership but where there is no link to IACS/LPIS there is no businesses level definition indicating if the holding is part of a larger multi-holding business (with a single identifiable beneficiary a requirement of the IACS/LPIS system).

3.1.3 Crofting & Common Grazings Data

Data received from RPID by the Hutton team[11] also contains details of the extents and users of common grazings, grazings shares, and the associated croft. These are typically entities that receive subsidies as part of the agricultural support, and related, payments schemes through IACS and are mapped in the LPIS systems. This spatial data allows for some common grazings to be mapped, typically those that are actively managed. Other data on crofting areas and common grazings comes from a mix of sources with various levels of accessibility, see Sections 3.3.5 Crofting Register and 3.5.4 Crofting Commission*.*

3.1.4 SG Agriculture Data Access

While SG Agriculture data (IACS, LPIS and JAC) is accessible to the Hutton research team, this involves stringent data sharing conditions that define which data is to be shared, how it is to be stored and managed, and how it may be

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[9] Total of the Item-12 area from 2021 June Agricultural Census table
[10] See the Agricultural Parishes map meta data.
[11] Covered by the same data sharing agreement noted above.

processed. Indeed, those conditions mean that some data collected is not shared with Hutton (e.g., direct identifiers such as names of businesses, names of individuals) and in terms of processing Hutton are required to strip and replace any indirect identifiers (BRN or CPH) from the datasets used by analysts or published.

Precedent does exist in other EU member states for at least some of the spatial data collected by paying agencies to be made available publicly. For example, Finland release their LPIS data, including declared crop codes, and make it available under CC BY 4.0 licencing [12]. This includes a series of direct download links to field-level data with field identifiers[13], and a web-viewer[14]. Similarly, France has also published some of their data collected under CAP through their "Register Parcellaire Graphique[15]. An anonymised version contains field-level crop information[16]. While neither of these include ownership data, the ability of other member states to share agricultural field boundaries does mean that there may, in theory, be potential to use the data in similar fashion in an online platform in Scotland. To some extent field boundaries and field cover are already present in existing applications[17]. That said, our understanding is that geospatial LPIS boundaries are maintained by RPID under Ordnance Survey Licence conditions which mean they cannot be shared openly. This would include any public-facing platform.

3.2 Forestry Data

Forestry covers around 19%[18] of Scotland's land area and there are several freely accessible data sources which allow one to determine forestry and woodland coverage and, to some degree, to which landholdings they belong. Many of these are available through the Forestry Commission open data site[19] and the Scottish Forestry open data portal[20] which both provide free user access under the terms and conditions of the Open Government Licence 3.0[21]. Scottish Forestry have produced an online Scottish Forestry Map Viewer which includes many different map layers including areas benefiting from Forestry Grant Scheme funding, felling permissions and plans, and legacy grant applications[22].

3.2.1 National Forest Estate Ownership

For publicly-owned forestry the main dataset is the National Forest Estate Ownership Scotland 2019 dataset[23]. This is a product of the Land Transaction layer

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[12] Terms of the Creative Commons CC BY 4.0 Deed.

[13] The Finish Food Authority land and agricultural datasets.

[14] Showcase of map layers published by Finnish Organizations.

[15] Metadata for the Registre Parcellaire Graphique for France.

[16] See page 4 of Guide to Registre Parcellaire Graphique (for France)

[17] See the 2019 Scottish Crop Map by Scottish Government.

[18] Forestry Facts & Figures (2022), page 3.

[19] Forestry Commission open data site.

[20] Scottish Forestry open data portal.

[21] Text of Open Government License 3.0

[22] Scottish Forestry map viewer.

[23] National Forest Estate Ownership Scotland dataset for 2019.

within ForesterWeb which is used for maintaining estate transactions in Scotland by Forest Research on behalf of Forestry and Land Scotland. It contains 1,972 records of mapped data with detail on the extent, title name, the acquisition type (Feu, Freehold, or Leasehold)[24], and the date of acquisition contained in the associated attribute table.

3.2.2 National Forest Inventory

In terms of private sector forestry coverage reference may be made to the National Forest Inventory (NFI)[25]. This includes all forest and woodland area over 0.5ha. While this dataset does not contain details of ownership, by comparing with the National Forest Estate mapping it is possible to infer the area and location of private forestry. For a subset of NFI coverage, those woodlands which have been established through current or past subsidy schemes form part of the IACS payment system. Their extent, and their ownership – at least to the owner's holding – can be established through this route.

3.3 Registers of Scotland Data

Registers of Scotland (RoS) maintain twenty-one public registers relating to land and property ownership in Scotland[26]. The Land Register, the Register of Sasines, the Register of Persons Holding a Controlled Interest in Land (RCI), the Register of Community Interests in Land (RCIL), the Register of Applications by Community Bodies to Buy Land (RoACBL) and the Crofting Register all contain information on land ownership. Data accessibility is, however, currently limited, costly, or both; this is described further in the following sections.

3.3.1 Land Register

The Land Registration etc. (Scotland) Act 2012[27] required RoS to continue make information on the Land Register publicly available. To better meet this requirement an interface known as ScotLIS[28] (Scotland's Land Information System) was created. For each area of land transacted, the boundary is captured spatially and an ID unique to the polygon is applied (known as the Title Number). Data available via ScotLIS contains detail from the title sheet including a description of the property, the owners/tenants of the property, any charges over the property and any burdens affecting the property. Title sheets and plans can be provided for a fee.

All the mapped ownership parcels are also available as open access via the RoS Cadastral Parcels Download Service. In this service the Title Numbers have been replaced with identifiers known as Inspire IDs. Cadastral parcels made available via

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[24] Acquisition types are those which were in place at the time land was acquired. Since then, Feu has ceased to exist following the Abolition of Feudal Tenure etc. (Scotland) Act 2000.
[25] For example National Forest Inventory Woodland GB 2020.
[26] List of the twenty-one public registers maintained by Registers of Scotland.
[27] Text of the Land Registration etc (Scotland) Act 2012.
[28] Help and Guidance page for Scotland's Land Information System (ScotLIS).

the download service can be linked to Land Register data via the Inspire ID – this is currently a charged service offered by RoS.

In terms of shareability, although the polygons of titles are available as Open Data (through the RoS Inspire Download Service[29]), and ScotLIS may be searched for free, any download of information or title is subject to a charge per title basis paying for the provision of the service. Clearly these issues would make the possibility of any further sharing of RoS ownership data on any other public platform problematic.

A further limitation of the Land Register data is that only land which has been transacted since 1981[30] is included and digitally mapped. Older titles from the Register of Sasines, whilst available through ScotLIS, are available only as scanned data and are not digitally mapped. Some of the deeds recorded in Sasines may contain plans however these need to be ordered to view. This aspect was partially addressed by RoS through the release of a further dataset in May 2023[31],[32]. This dataset is known as 'Unlocking Sasines'[33] in which indicative ownership extents are delineated for titles which exist in Sasines. These are provided with potential sheet search numbers together with a classifier to reflect the degree of confidence in the extent provided. This dataset is a work in progress to which indicative ownership boundaries will continue to be added over time. To confirm the extents, a title search would be required, and search sheets would be chargeable via ScotLIS[34].

A face-to-face meeting between the Hutton research team and representatives of RoS took place in November 2022 to discuss what data the Land Register holds and what could potentially be made available to the research team. The research team continued to liaise with RoS staff following this meeting.

It had been hoped that a version of Land Register data could be made available that included owner identifiers linked to the spatial data already available on the RoS website. However, the publicly-available spatial data has no linkage to any person or corporate entity. The advice from RoS was that making such a linked dataset would be non-trivial since they do not hold any data that would allow them to easily apply any type of ID to the owners and that RoS were also "not authorised as a register" to do so[35]. For the first part there are clearly significant challenges in defining the ownership entities and these will not be addressed by the new Register of Persons Holding a Controlled Interest in Land (RCI) as this covers only those

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[29] Webpage for the RoS Inspire Download Service.

[30] Note that transitioning to the Land Register took place on a county-by-county basis. This started in 1981 with Renfrew and was completed in 2003 when the final 6 counties transitioned.

[31] Registers of Scotland podcast – RoS year in Review 2022 – Interview with Jennifer Henderson, Keeper of Registers of Scotland (Spotify link).

[32] insideROS - The Registers of Scotland blog, May 30, 2023, Unlocking Sasines helps deliver the benefits of a completed land register, Nikki Duke, Head of Land Register Completion.

[33] Unlocking Sasines webpage.

[34] Unlocking Sasines overview webinar, 28th September 2023

[35] Keith Matthews – personal communication (RoS Land and Property Team Manager, 14/12/22).

with an interest in the property that don't appear on the Land Register (see section 3.3.2). It is also worth noting that identification data has been provided for sub-sets of Land Register related data (land transactions – see Section 3.3.6) so there is perhaps the need to further clarify the circumstances in which such owner identification data can be made available.

Comprehensive national scale cadastral mapping of ownership will require the linking of Land Register and RCI and a data sharing approach that means the data can be accessed as a complete coverage rather than per title. This needs to be made available at a cost that is compatible with use for public policy making, public-good research and by other stakeholder communities.

3.3.2 Register of Persons Holding a Controlled Interest in Land (RCI)

The Register of Persons Holding a Controlled Interest in Land (RCI) has been established as part of the Land Reform Act Scotland (2016)[36]. It became operational in 2022 and requires landowners and tenants of land recorded in the Land Register to register in this new Register if there are persons or entities that have control over how the owner or tenant uses the land where this information is not publicly transparent elsewhere to make details of their controlling interests publicly available. The Register is in its infancy and volumes of registrations are increasing, with the deadline for registrations before penalties are applied extended to 1st April 2024[37].

The RCI is free to search via the online service[38]. Where the owner or tenant's land is in the Land Register the land is encoded via title number with recorded person details (where recorded person may be a company) and any associates named and identified with their own reference numbers. Because the Title ID exists in the same format as the Title ID in the Land Register the two *could* be linked (although they are not currently). If this were to be done the RCI could also made searchable through a map interface enabling greater accessibility. Because the scope of the RCI includes owners or tenants (for more than 20 years) of land and property in Scotland, this may make information available which is currently locked in the Register of Sasines.

As a result, the RCI could in time become an essential piece of the jigsaw to tie people or other corporate entities to land and to understand the patterns of concentration of ownership in Scotland.

3.3.3 Register of Community Interests in Land

The Register of Community Interests in Land (RCIL)[39] contains notices of interest by specific groups or individuals that will allow them to purchase the land if the owner ever decides to sell it. This includes community bodies (as part of the Land

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[36] Text of the Land Reform Act Scotland (2016).

[37] FAQ for Register of Persons Holding a Controlled Interest in Land – deadline change.

[38] Register of Persons Holding a Controlled Interest in Land – online search.

[39] Register of Community Interests in Land – webpage.

Reform (Scotland) Act 2003[40]) and agricultural tenants (as part of the Agricultural Holdings (Scotland) Act 2003[41]). The RCIL Community Bodies (RCIL CB) register[42] covers the former of these two elements and is now publicly available. For RCIL Agricultural Tenants (RCIL AT) register[43], RoS customer services can undertake a search on request.

The key part to note here is that agricultural tenants can only register a notice of interest if they hold an agricultural tenancy in the terms of the Agricultural Holdings (Scotland) Act 1991[44]. So, the RCIL AT register may be a route to identify areas under tenancy – at least as far as those who have registered an interest to buy.

3.3.4 Register of Applications by Community Bodies to Buy Land

The Register of Applications by Community Bodies to Buy Land (RoACBL)[45] contains the applications made by community bodies to buy abandoned, neglected, or detrimental land and applications made by community bodies to buy land to further sustainable development.

The register consists of two parts:

1) Register of information and documents relating to applications for the right to buy abandoned, neglected, or detrimental land. This was launched on 27th June 2018 and relates to Part 3A of the Land Reform (Scotland) Act 2003.
2) Register of applications for the right to buy for sustainable development. This went live on 26th April 2020 and relates to Part 5 of the Land Reform (Scotland) Act 2016.

RoS maintain a website where applications may be viewed[46] (noting that decisions on registration remain with Scottish Ministers). This takes the form of a list of community bodies, the name of the landowner, some address details, and their status. At the date of the last check there were 6 entries currently visible on the register relating to 4 applications. Applications which are declined remain on the RoACBL for a period of 6 months.

3.3.5 Crofting Register

Finally, RoS maintain the Crofting Register[47] which was established following the Crofting Reform (Scotland) Act 2010[48]. This requires the establishment and maintenance of a free to search public register of crofts, common grazings, and land held runrig. The register contains information on boundaries, the crofter,

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[40] Text of Land Reform (Scotland) Act 2003.

[41] Text of the Agricultural Holdings (Scotland) Act 2003.

[42] RCIL Community Bodies (RCIL CB) register – webpage.

[43] RCIL Agricultural Tenants (RCIL AT) register - webpage.

[44] Text of the Agricultural Holdings (Scotland) Act 1991.

[45] Register of Applications by Community Bodies to Buy Land (RoACBL) – webpage.

[46] Applications by Community Bodies to Buy Land - webpage.

[47] Crofting Register – webpage.

[48] Text of Crofting Reform (Scotland) Act 2010.

owner-occupier crofter, and/or the landlord of the registered croft. While the Crofting Commission is responsible for crofting regulation in Scotland, Registers of Scotland are responsible for registration of crofts. The Crofting Register is map-based and shows the defined extents of land and property, information on the tenant or owner-occupier on the land, and information on the landlord or landowner.

3.3.6 Other research use of Registers of Scotland data

The Hutton research team work closely with researchers at Scotland's Rural College (SRUC) in the Scotland's Land Reform Futures project. Within the SRUC-led project in the 'Rural Futures' theme, the focus is primarily on tracking land transaction details and building a picture of who is selling and buying land. The dataset used by SRUC has owner identifiers for sellers and buyers but mapping the transactions is challenging, requiring complex spatial and database queries to elaborate a fully spatial dataset that minimises the impact of any spatial data quality issues within the RoS data.

3.3.7 Registers of Scotland – Bulk data provision

Registers of Scotland offer a number of data matching services which includes bulk data provision[49]. Bulk data is currently provided to a variety of users including other statutory bodies who may also be given ownership details if that is a requirement of their statutory task.

3.4 Private Sector Data

3.4.1 Who Owns Scotland

At the time of writing of the project proposal the Who Owns Scotland (WOS) dataset compiled and produced by Andy Wightman had lain dormant for 8 years. Since the Scotland's Land Reform Futures project started in April 2022, Andy Wightman has returned to this work and is in the process of refreshing and extending the coverage to include all major landholdings greater than 100 ha by early 2024[50]. Much of the data contained in it is derived from land ownership records held by the Registers of Scotland in either the Register of Sasines or the Land Register. The records are searched by Wightman who builds a spatial database from the details returned.

The Hutton team has secured access to this dataset via an ongoing business subscription and 4-yr data licence and receive monthly updates to the coverage as it becomes available. In December 2023 coverage extended to over 5.36million hectares with more than 99% of records now less than a year old[51].

The major benefit of this dataset is it provides land holding boundaries for much of upland Scotland as well as named individuals, companies, or other entities responsible for ownership. When combined with the IACS, LPIS and JAC data this

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[49] RoS guidance for bulk data provision.
[50] FAQ for Who Owns Scotland.
[51] News for Who Owns Scotland.

could potentially establish ownership structures above the level provided in the latter datasets for most of upland Scotland.

In terms of data sharing, Andy Wightman enables access to his database on a subscription basis with conditions attached. Clearly as he derives income from this work it would not be possible to re-share this data in any public-facing data sharing platform. This does, however, raise questions of why a dataset with profound implications for public policy, research and other land ownership stakeholders is being recreated from RoS and other sources data, entity-by-entity, by a private citizen. This seems to be incompatible with the ambitions of the Research Data Scotland: Strategy – Unlocking data, Improving Lives[52] or other data integration for public policy initiatives such as the AD|ARC initiative[53].

3.4.2 David Hume Institute and Built Environment Forum Scotland report

A report written by Andy Wightman, commissioned jointly by the David Hume Institute and Built Environment Forum Scotland, was published in February 2023 entitled "ScotLIS 3 – a critical tool for Scotland", and discusses the establishment of a national land information system[54]. It touches on many of the aspects of the review but includes more of the timeline of events in previous efforts to establish such a system. It arrives at many of the same conclusions presented here, particularly regarding the many different data sources, differing access levels, and mix of current governance structures currently in place.

3.5 Other potential sources

3.5.1 Crown Estate Scotland

Crown Estate Scotland manages property – including buildings, land, coastline, and seabed – on behalf of the Scottish people. Spatial data describing their assets and property are available through their Crown Estate Scotland Spatial Hub under an Open Government Licence version 3. Assets are a mix of those which are owned outright or managed on behalf of others. While most are offshore, land-based assets include rural estates, buildings, fishing rights, and mineral rights. Spatial data for these is made available via web maps and web mapping applications which allow their extents to be viewed, however those relating to assets that Crown Estate own outright are not currently available for download. In total 52 items are made available through the data hub with 38 of these classed as datasets.

3.5.2 Community Ownership in Scotland

The Scottish Government produces an annual publication providing summary statistics for community ownership in Scotland[55]. This is compiled from data provided by a range of organisations. Most assets in community ownership are land

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[52] Unlocking data, improving lives, Research Data Scotland: Strategy.

[53] Administrative Data | Agricultural Research Collection: Enhancing the prosperity and wellbeing of farm households.

[54] Andy Wightman (2023) ScotLIS 3 – a critical tool for Scotland. Scotland's land information service: what is it and why it matters. Jointly commissioned by Built Environment Forum Scotland and The David Hume Institute. Published online., 13 pp.

[55] Community land ownership in Scotland statistics – webpage.

and buildings covering a total area of over 200k hectares. By area most of this is in the Western Isles with over 150k hectares of community owned land. Summary statistics for a variety of classifications are currently published alongside the report. While individual data is not currently available, the user guide[56] which accompanies the 2022 publication states, *"An appropriately anonymised dataset containing information for individual assets in Excel format will be made available following the release of the Community Ownership in Scotland 2022 publication (published 3rd October 2023). The timescale for this is yet to be determined. When it is published it will be available from the Community Ownership in Scotland collection page."* This may mean that the base data used to produce the publication may become available in time.

3.5.3 Public Land Dataset

During the review, the research team were made aware of a new dataset compiled by Scottish Government covering land in public ownership. This was a collaborative effort between Scottish Government, NatureScot, and Forest and Land Scotland intended for use in an assessment of natural capital in these areas. In addition to land owned and managed by the NatureScot and Forest and Land Scotland, the Public Land Dataset includes land held by the Ministry of Defence, Crown Estate Scotland, and Scottish Water. While some of the area covered is already in the public domain (e.g. that held by Forest and Land Scotland, NatureScot, and Crown Estate), others in the list were not previously available. In total the dataset covers around 750k hectares.

3.5.4 Crofting Commission

The Crofting Commission is a Non-Departmental Public Body (NDPB) which is primarily responsible for the regulation of crofting[57]. It maintains lists of parishes, common grazings, holdings (in this case crofts), and individuals in their Register of Crofts[58]. These lists are made available as text (*.csv) files from their open data site[59]. The combined data is also made available through the Register of Crofts Online[60]. Detail in the Register of Crofts includes tenancy arrangements together with details of landlords (owners) where appropriate. Boundary data is not included as this is held by Registers of Scotland (see 3.3.5) however for certain elements (e.g., common grazings) direct links are provided from the Register of Crofts Online to the Crofting Register.

3.5.5 Improvement Service - Spatial Hub

Scottish Local Authorities and Scottish National Parks contribute data to the Spatial Hub[61] portal which is an initiative from the Improvement Service[62]. Certain other external organisations also contribute data (e.g. Scottish Gas Network and

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[56] User Guide for Community Ownership in Scotland data 2022.

[57] About the Crofting Commission – webpage.

[58] Register of Crofts – webpage.

[59] Crofting Commission Open Data – website.

[60] Register of Crofts – online search tools.

[61] Scottish Local Government Spatial Data Hub – website.

[62] Improvement Service – organization for local government improvement in Scotland.

Greenspace Scotland). This online resource was launched in 2016 and currently contains 293 datasets. Data is provided to the Improvement Service by each local authority which is then combined and standardised to build national datasets. Among the datasets included in the list are a number which contain land ownership relevant information. Details of a selection of these including vacant and derelict land, local authority land ownership, community asset transfers, and data access are described below. A deeper search may yield further datasets which may also have value in inferring ownership characteristics.

3.5.5.1 Vacant and Derelict Land Survey

The Scottish Vacant and Derelict Land Survey[63] is a national data collection undertaken to establish the extent and state of vacant and derelict land in Scotland. Among the attributes collected are the most recent owner of the site and any known past owners of the site. While the combined national dataset produced by the Improvement Service is not publicly available, some individual local authority data is made available by local authorities under an Open Government Licence[64]. The combined dataset contains data from all 32 local authorities and distinguishes between types of owners into 28 categories (where known). Also included is an assessment of the likely ability to develop the site.

3.5.5.2 (Local Authority) Land Ownership – Scotland

The Land Ownership – Scotland dataset[65] attempts to identify the extent of land owned by local authorities. Since many of these areas have not changed ownership in the last 40 years, they do not appear on the current Land Register. This dataset provides an indicative extent of land owned by local authorities by collating data supplied by each local authority. It is designed as an aid to assist interested parties in identifying where to start their enquiries. To date 9 of 32 local authorities have supplied data. This is available to Public Sector Geospatial Agreement (PSGA) members and licenced partners only. Level of detail is variable. Of those local authorities that do submit data, some provide only spatial data with little attribution (e.g. Aberdeen City) while others (e.g. North Ayrshire) contain a description of the site, the area held in the title for the site, and a disclaimer containing details of how the data was captured.

3.5.5.3 Community Asset Transfer Register – Scotland

As part of the Community Empowerment Scotland Act 2015[66], new rights were introduced for community bodies to make requests to local authorities, Scottish Ministers, and a wide-ranging list of public bodies (collectively referred to as 'Relevant Authorities'), for any land they feel they could make better use of. The full list of relevant authorities includes 32 local authorities, 14 regional health boards, 8 special health boards, 16 further education colleges (which are incorporated colleges), 7 regional transport partnerships, 13 individually named relevant authorities on the Schedule, and 5 grouped under the control of Scottish Ministers.

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[63] Vacant and derelict land, from Improvement Service – website.

[64] For example, North Ayrshire.

[65] Local Authority – Land Ownership from Improvement Service.

[66] Text of Community Empowerment Scotland Act 2015.

Relevant authorities are required to create, maintain, and publish a register of the land they own or lease to help communities identify suitable property for potential asset transfer[67]. A guidance document[68] has been prepared to assist relevant authorities in meeting this requirement.

Under Parts 5, 8, and 9 of the Act, local authorities are required to create and maintain a register of land or other property held for the common good and provide detail on allotment provision and allocation. A combined local authority dataset, referred to as the Community Asset Transfer Register[69], is curated by the Improvement Service. At the time of writing, 23 of 32 local authorities had submitted data with variations in the level of detail provided. This data is available as a point dataset with each point geographically referenced. Depending on the individual local authority there may be detail on tenancy arrangements. Some also provide a Unique Point Reference Number (UPRN) which would be linkable to Ordnance Survey data. This combined local authority dataset is available to Public Sector Geospatial Agreement (PSGA) members and licenced partners only.

Other relevant authorities publish their asset lists via their websites. Examples of known lists include Highlands and Islands Enterprise[70] and Scottish Enterprise[71]. Where available these are usually in the form of excel tables or *.pdf files rather than spatial data. The degree to which asset registers may be available across all 95 relevant authorities has not been fully explored.

3.5.5.4 Improvement Service Access
In terms of data access, anyone can access details about which datasets are collected and published. Some of the data listed are available under an Open Government Licence (OGL). These tend to include those datasets provided by councils themselves. However, most datasets, especially the combined datasets generated by the Improvement Service, are usable only by Public Sector Geospatial Agreement[72] (PSGA) members and other licenced partners via an authentication key[73].

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[67] Community Empowerment (Scotland) Act: summary

[68] Asset Transfer under the Community Empowerment (Scotland) Act 2015. Guidance for Relevant Authorities.

[69] Community Asset Transfer Register – Scotland – website.

[70] Highlands and Islands Enterprise asset register.

[71] Scottish Enterprise asset register.

[72] Public Sector Geospatial Agreement – website.

[73] Authentication keys are assigned per institution through membership of the Public Sector Geospatial Agreement (PSGA).

4 Discussion – issues across datasets

There are a series of common issues which have relevance across several of the datasets described in Section 3. These issues include:

1. The need to look beyond ownership towards a more nuanced understanding of the layers of land tenure that shape land rights and responsibilities and thus land use decision making. Transparency of ownership remains a huge challenge, but resolving this issue alone is not sufficient to address all land reform and land use issues, for example the need to assess business and regulatory impacts of land reform measures on tenanted land.
2. Even if a land ownership dataset were created, questions remain regarding how the dataset could be made freely accessible to all, e.g. through existing data portals.
3. Whether existing data governance structures and responsibilities can support greater accessibility to land ownership data.

4.1 Beyond ownership – other forms of tenure.

In addition to details regarding labour, farm type, and other characteristics, the June Agricultural Census (referenced previously) also contains information on land tenure. This includes areas recorded under different tenancy agreements at the holding level, including:

- Rented Croft
- Small Landholders Act Tenancy
- 91 Act Tenancy
- 91 Act Limited Partnership
- Short Limited Duration Tenancy (SLDT)
- Limited Duration Tenancy (LDT)
- Modern Limited Duration Tenancy (MLDT)

Critically, knowledge of tenure type enables a more nuanced picture of land management to be built below the level of ownership. It is vital to consider the decision space within which land managers operate and tenure is a vital component of this.

The most detailed and comprehensive data (geographically and thematically) on tenure was collected through the annual June Agricultural Census until 2021. As part of the Agricultural Statistics Transformation Programme (2021-24) there was a decision to reduce the "core" questions asked each year to free up resources to more flexibly undertake "modules" of new topics and/or more in depth data collection as needed. As part of this review, the existing tenure data was judged as not sufficiently reliable, in particular because it relied too heavily on imputing values

from previous year returns (in some cases from many years previous). This implied the need to re-baseline the data – that is to undertake a data gathering exercise across all holdings to generate a single date dataset with acceptable reliability that could then be updated only when circumstances change. Such an exercise was judged as being beyond the resources available to the June Census team alone and therefore discussions of other options were opened within government. These included adding tenure questions to the SAF, which would potentially enhance the quality of the data by linking to spatial data (see example from Wales SAF Guidance). Such a substantial change to the operation of SAF, was viewed by RPID as being beyond the incremental change threshold and may be more appropriate to be considered as part of any revisions to the SAF to support the post 2025 reformed agricultural payments. This does not resolve the issue of how best to collect tenure data for non-SAF holdings, and indeed non-agricultural land holdings beyond the scope of the JAC. It may also be worth considering whether after establishing a new baseline dataset tenure data could be updated as part of other SG data processes for example the Land and Business Change form, that underpins data collection for some aspects of LPIS.

The importance of the collection of tenure data for researchers and other stakeholders beyond government has been raised in several settings with RPID and RESAS[74] and is the subject of ongoing discussion between RESAS and SG policy teams. If a long-term solution to the collection of tenure data proves challenging to implement before 2025 then it would be highly desirable to use one of the 2025 JAC modules to provide an updated tenure dataset as an interim solution.

4.2 Making land data accessible – portal examples

As previously mentioned, there are several portals which provide access to spatial data usually hosted by individual organisations. Examples covered to this point include Registers of Scotland, Who Owns Scotland, the Forestry Commission Open Data Site, and Scottish Forestry Open Data portal. There are several other data portals which collate and provide links to external data.

Scotland's environment website (SEWEB)[75] hosts two land information search applications which can be queried for specific purposes – The Land Information Search – Agri-environment and Forestry Application[76], and the Land Information Search – Control of Major Accidents and Hazards application[77]. The first assists applicants for Scottish Rural Development Programme funding and/or forestry felling licences by searching more than 60 data sources from 4 public sector organisations for information which may need to be considered when applying for grants or licences. The second is intended to identify "*any possible sensitive receptors with respect to identified credible major accident scenarios and Source-*

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[74] RESAS Agriculture Analysis Technical Advisory Group Meeting (31st August 2022)

[75] SEWEB Land information search – website.

[76] Land Information Search – Agri-environment and Forestry Application – website.

[77] Land Information Search – Control of Major Accidents and Hazards Application – website.

Pathway-Receptor linkages"[62]. This includes over 20 datasets containing environmental data.

Both land information search tools demonstrate the ability to build a relatively straightforward interface with links to data sources served from other organisations. It is likely that a solution like this could be the goal of efforts to improve transparency of land ownership. Relevant data could be owned, and managed, by the hosting organisation with links provided via a data portal such as this. It would be preferable were this to be created through an "add-on" development of an existing platform rather than adding another portal to the landscape. For example, this could be achieved through a re-imagined Land Register as others have previously suggested[54].

4.3 Governance

Throughout the review questions of data governance arose, regarding who makes decisions on the data collected and shared, who leads delivery and who has the resources to build entities like a data portal. Many of these datasets are collected and maintained by public bodies or government agencies in accordance with the relevant Acts of Parliament that established them. These organisations are tasked with establishing and maintaining these datasets, but not necessarily integrating them with other datasets. They are collected using different tools and adhere to different data standards. Others are collected and maintained by private individuals. The questions regarding who would build a comprehensive land ownership information system, who would maintain it, and the governance framework that would underpin such a system are not easily addressed and raise policy issues and questions, which are discussed in the next section.

5 Discussion - policy considerations

A series of policy-relevant considerations arise from this review. In some cases, these are framed as questions for policy makers, but where possible the Hutton team have made a limited number of recommendations (see Section 6). These policy considerations may be grouped into themes of accessibility, shareability, and technical feasibility.

5.1 Accessibility

For many of the datasets searched and referenced above there remain fundamental limitations on data accessibility. Very few of the datasets explored are available on a fully open basis. Many, such as most of those made available by the Improvement Service, are accessible only to restricted groups e.g., Public Sector Geospatial Agreement (PSGA) or, due to the business model, only available on a chargeable basis even to the research community e.g., that from Registers of Scotland. Others are only available under an even more restrictive basis (e.g. IACS/LPIS/JAC) with specific data sharing agreements (DSA) in place.

5.2 Shareability

Many of the datasets relating to land ownership while potentially accessible to policy analysts or researchers are challenging to make available to third parties or the public. Either those that collect and maintain this information derive an income stream for making their data available, or the access model is intended for individual queries rather than a pan-Scotland analysis. While the research team may have better access to many of these data sources than the public, the fact that this data is not open-access means any attempt to share any data in a public-facing website or other capacity would fall foul of existing conditions of use. Furthermore, the fact that these datasets are not public also means that community groups are also limited in their capacity to access land data that may be critical to community development or the development of community land-based activities.

5.3 Technical Feasibility

Looking across the datasets and desire for transparency it is possible to consider the technical feasibility of making land ownership data more transparent. In terms of computer infrastructures, it is possible to create a sophisticated web-based map-viewer capable of displaying a series of datasets from a single organisation or from multiple organisations. Good examples covered, referred to earlier, include the Land Information Search tools from SEWEB and the Scottish Forestry Map Viewer. A new platform concentrating on land ownership could, in theory, be built using similar technology. However, perhaps the transparency objective could be better achieved by developing an existing source – such as a reimagined ScotLIS – in which many of the data management and data governance issues are already considered, rather than creating a new platform.

6 Recommendations

6.1 The need for recommendations

This review has highlighted the technical (and some institutional) limitations of the land ownership related data in Scotland. These limitations are serious enough that that they have impeded the ability of SG analysts and Hutton researchers to integrate data and undertake policy supporting work in a rigorous, timely and efficient manner, and limit the transparency and usability of ownership data for other stakeholders (including community bodies).

To respond to these limitations there are potentially complex technical, data governance, privacy and financing issues that need to be addressed, only some of which the Hutton team are familiar with. In preparing this review it was noted that there are several cross-cutting policy areas that are interested in the outcomes, but that no individual policy area has the resources required to implement the recommendations presented here. This has been interpreted by the review team as indicating that the issues with land ownership data are recognised within government and that a pan-government approach to the issue might be desirable – see Recommendation 1 (below).

6.2 Caveats to the recommendations

Before elaborating the Hutton team's recommendations, it is important to state that these recommendations are not endorsed by anyone in government and are those of the Hutton team alone, but that they have been informed by limited interactions with SG analysts and officials. Beyond this, the key caveat is that the scope of this review was limited to technical issues (i.e. data quality, integration and sharing) and the Hutton team are thus mindful that in making any recommendations there are unquantified cost and regulatory impact burdens for government and stakeholders. The recommendations have not been subjected to a formal cost-benefit analysis, but the Hutton team have tried to make recommendations with the greatest potential for analysts to make rapid and meaningful improvements to the quality and accessibility of land ownership data with the lowest cost and stakeholder burdens. The rationale for the burden minimisation is presented after each recommendation.

6.3 Recommendation 1

> **Recommendation 1** – Scottish Government to commission a cross-government data integration exercise to collate and integrate all relevant data, to be held in a Trusted Research Environment, for without payment use by researchers, analysts, policy teams and stakeholders. This exercise would also assess in detail how far existing datasets can meet the need for land ownership/tenure data and to define a route map for filling in any missing data.

6.3.1 Cost minimisation for Recommendation 1

The cost of implementing Recommendation 1 could be minimised by:

1. Reusing existing data and focusing on better integrating data, in line with the aims and principles of the [Scotland-wide Data Linkage Framework for Statistics and Research](#)[78]. In this case the key data sets are those of RoS and RPID (IACS-LPIS) and there is existing provision for bulk data transfers from both for research and analytical use. The likely small additional costs incurred by the data owners could be shared between the users of the data.

2. Using existing Trusted Research Environment facilities (i.e. locations where linked data can be accessed by researchers and analysts in a controlled environment) and their expertise in the technical and legal aspects of data linking (e.g. regarding the GDPR). Recommendation 1 is in effect an extension of the existing (and funded) [AD|ARC initiative](#) – linking [Agriculture, Census, Education and Health data](#).

3. Using expertise within the Main Research Providers of the 2022-27 RESAS-funded Strategic Research Programme to undertake development and testing of data integration and presentation approaches. This would align with existing RESAS commissioned projects (JHI-C3-1, JHI-E3-1, and SRUC-C3-1). The additional costs of Recommendation 1 would thus be those associated with project oversight and providing those inputs required to make the integrated data most useful for policy and stakeholder use. Such costs have typically, in other projects in which the Hutton team have participated, been seen as good investments of SG staff time, given the creation of new analytical capacity or timely analytical outputs.

6.3.2 Benefits of Recommendation 1

The benefits of Recommendation 1 are first in creating new integrated datasets that can be used to better inform the development and evaluation of land related policies (particularly for rural land). These policies would include, but are not limited to agriculture, environment, climate, and land reform, all of which are active areas of policy development. Second, these datasets could, with appropriate controls, be used to support communities seeking better information on land ownership (and thus land rights and responsibilities) where access and interpretation support has been challenging. The recommendation would provide a locus within government in which partnerships between officials, analysts and researchers could be developed and in which both technical and institutional issues can be resolved to expedite progress on enhancing land ownership data and its integration with other administrative and research-based data.

6.4 Recommendation 2

The second recommendation is necessary in our view, because land ownership data provides only a partial view of how agricultural and other rural land is held in Scotland. Data on the full range of land tenures is needed to support policy making, monitor changes in the mix of tenures, especially the presence and prevalence of novel models of land holding, and ultimately to empower communities through providing transparency on who makes which decisions on land use in their areas.

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[78] Including: "Scientifically sound, ethically robust research and statistics that inform decision makers of what problems exist and what works in tackling them" leading to "Improved policy and delivery of services".

> **Recommendation 2** – Scottish Government to commit to collect and update agricultural land tenure data, preferably annually, at land parcel level, and using a tenure typology as granular as that used up to 2021 in the June Agricultural Census.

6.4.1 Cost minimisation for Recommendation 2

Recommendation 2 does have resource implications and it is likely that those would have to be borne across RESAS and RPID. As noted in the discussion of June Agricultural Census data there is a potential option to include tenure as a module in a future JAC. Resources could therefore be mobilised to collect tenure data if it was seen as having sufficient priority. Doing so would provide a new baseline for the tenure dataset and perhaps also the opportunity to move to a system in which, between dates when tenure questions are answered in a JAC module, any change in tenure would be reported via another means, for example, using the RPID Land Maintenance Form process as a model. This would minimise the numbers of stakeholders having to respond each year while keeping the ability to have annual snapshots of land tenure to match with other administrative datasets and to maintain a time series for longitudinal analysis.

Where the recommendation goes beyond previous practice is in seeking spatial (mapped) tenure data. To reduce the costs of such data collection, this would have to be limited to only those businesses that are already part of the Single Application Form process where land parcel boundaries are already captured or maintained as part of processing agricultural support payments. Tenure could become part of the data captured, but the Hutton team acknowledge that this is a non-trivial task and would need careful consideration of how best to implement. Potential ways to limit costs and impacts could be to adopt a phased approach to establishing the baseline values over several years with the data maintained as noted above via the Land Maintenance Form. The technical feasibility and stakeholder acceptability of a spatial, SAF based, approach has been demonstrated by the Welsh Government where tenure at field level is included[79].

6.4.2 Benefits of Recommendation 2

This dataset would greatly enhance the capacity of analysts and researchers to facilitate the monitoring and evaluation of how Land Reform legislation is influencing the mix of tenures present across Scotland. Collecting spatial tenure data would make it more compatible with other spatial datasets – particularly the mapping of environmental phenomena such as habitats and land use. By being more precise about the overlap of tenure(s) with other phenomena, (e.g. the condition of peatlands or changes in biodiversity), the data becomes more valuable since it can then underpin more robust interpretations of cause and effect. This would give the data greater utility for policy development, by better supporting analysis of how tenure may affect policy outcomes (e.g. via Business and Regulatory Impact Assessments prior to implementation).

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[79] Details of tenure data collected can be seen in the Welsh SAF Guidance.

6.5 Follow up research

While the recommendations have focused on actions that can be taken by others, mainly within Scottish Government, the research team have in parallel to completing the review, been undertaking analysis that has made use of WOS, IACS and June Agricultural Census data independently, and more recently for Scottish Government in a more integrated way. These studies - an example of which is presented in Appendix 1 - Analysis Example - have confirmed many of the limitations highlighted this report, but also that when land datasets are combined there can be considerable added value derived. Early findings emphasise the need for care in how "land holdings" are defined with complex and sometimes uncertain relationships between RoS titles, WOS estates and farms, IACS beneficiary-based businesses, Agricultural Census holdings and land parcels (fields). Better quantifying the relationships across the scales and definitions will be undertaken in follow-up research within the Scotland's Land Reform Futures project.

Appendix 1 - Analysis Example

Concentration of Land Ownership

This report describes a desk-based review supplemented by interactions with some of the key dataset owners. In parallel with this review, the Hutton team has undertaken data integration and analysis with existing datasets to try to address policy-relevant questions. Such experimentation is useful in highlighting technical and data quality issues and how these may be overcome. The analyses also highlight where there are remaining opportunities for improvement via data integration that may be undertaken within the Scotland's Land Reform Futures project. This Appendix provides an illustration of the kinds of analysis that are sought by policy makers, the limitations on the answers that can be delivered, and why that means the issues highlighted in the main text need to be addressed as a matter of urgency.

This section presents a brief example of the kinds of policy-led analysis that can be undertaken, using as an example the outputs that formed part of the Hutton submission to the SG consultation on the Land Reform Bill proposal ('Land Reform in a Net Zero Nation')[80]. The analysis focused firstly on defining large scale landholdings (using area (ha) thresholds) and secondly, concentration of ownership criteria (percentages of an area in the hands of one entity).

The first map (Figure 1) highlights IACS businesses greater than 3,000 ha and greater than 1000 ha. The map is a good representation of large-scale land holdings because IACS aggregates multiple holdings into businesses with a single beneficiary. The map is incomplete, however, as there are ~1.4M ha of land beyond IACS and within that area there are known to be large scale holdings (from WOS or RoS mapping). Further, the IACS based mapping aggregates are based on usership not ownership so will include large, tenanted businesses but will not attribute them to an owner. The map in Figure 1 will also miss large land holdings when these are broken up into multiple tenanted entities (for example on Crown Estate Scotland land). In this example, seasonal land (with less than year-long lets) is assigned to the user not the owner, potentially meaning that some owning entities are not included. Some, but not all, of these limitations could be addressed via data integration, particularly with information from WOS, the Public Land mapping and tenure data from June Agricultural Census. Analysis is also likely to be more challenging and less reliable for lower threshold area values (for example the amendment that proposed >500 ha).

The second map (Figure 2) illustrates areas of Scotland which based on the IACS data there is a concentration of ownership. The map uses Agricultural Parishes as these are a well understood breakdown that is not regularly subjected to change (as would be the case of Census Datazones or parliamentary wards) and can thus serve as basis for historical comparisons or future monitoring of change in

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[80] Response from James Hutton Institute to Land Reform in a Net Zero Nation consultation.

landownership concentration. For each parish the largest business was identified – considering only the land within the parish[81]. The percentage of the area of the parish held by the largest business was then calculated and is presented in the second map below. For the illustration a threshold of 20% was set, but the sensitivity of outcomes to the threshold for a single business would need to be tested as would or other ways of defining concentration. For example, the percentage threshold for a set of the biggest businesses (i.e., the percentage threshold for the largest n businesses where n>1).

This 'concentration mapping' is of interest because while it partly conforms to the area identified by size thresholds it also identifies areas in the lowlands, where although businesses are smaller, there are still significant concentration effects. It is likely that the decisions of such businesses would have great influence on the communities within these areas. Such sensitivity might mean that land management plans for such businesses may be appropriate, not least as larger numbers of people are affected in accessible rather than remote rural areas.
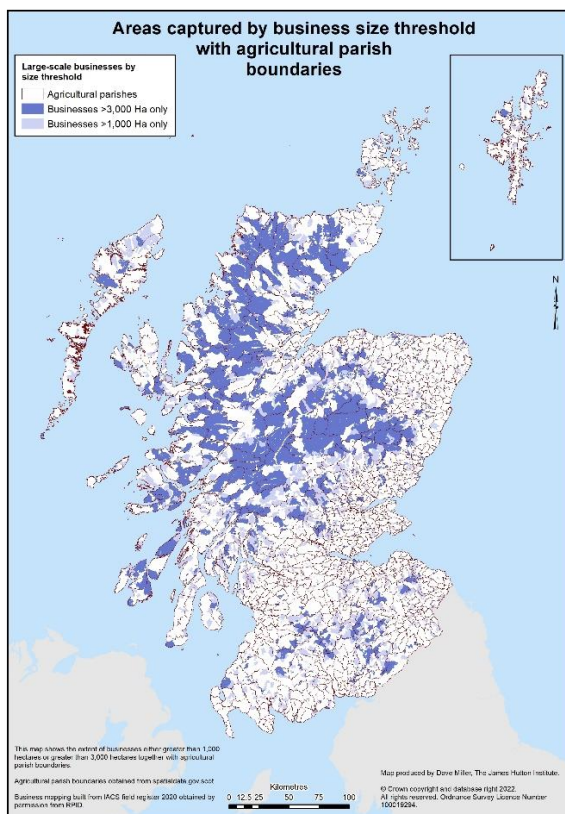

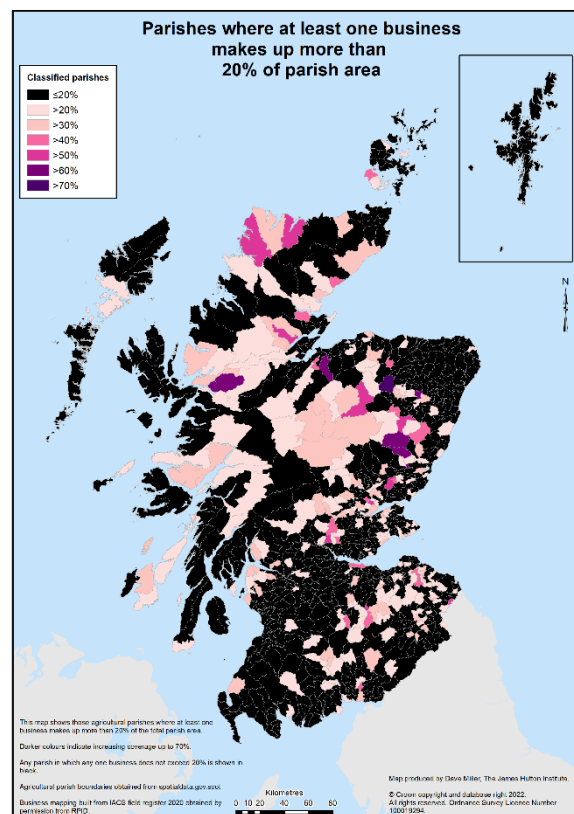**Figure 1 - Large landholdings by size thresholds 3,000 ha and 1,000 ha**

Figure 2 - Concentration of land use by IACS businesses per Agricultural Parish

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[81] Note that large businesses may be split over multiple parishes and thus not pass a concentration threshold, but this is an inherent limitation of having a fixed frame within which concentration is being measured (e.g. the Agricultural Parishes).

Contact and feedback
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