

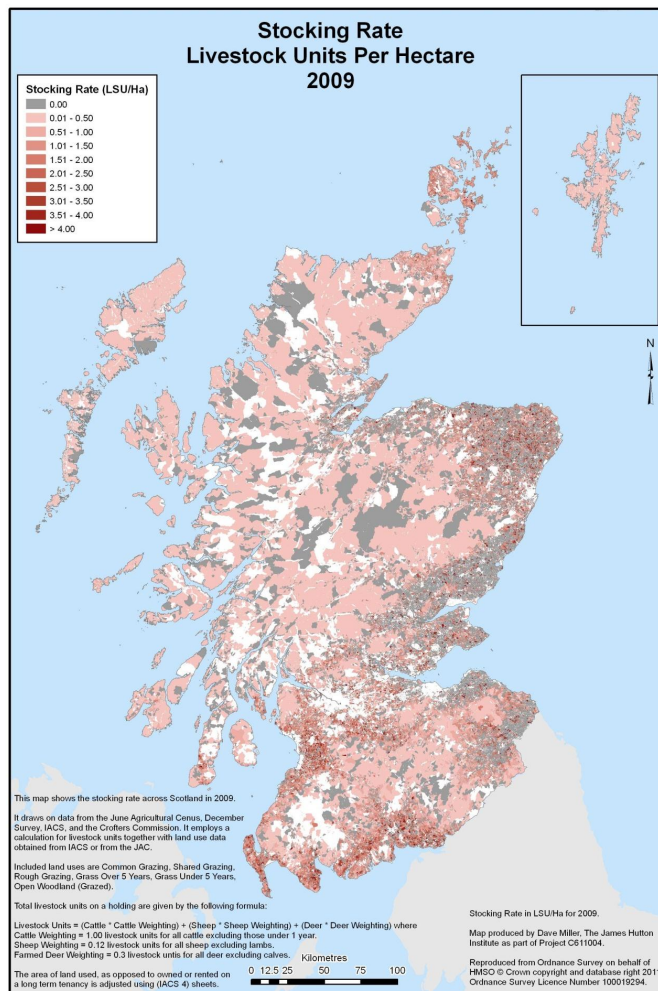
Stocking Rates of Land Capability for Agriculture Classes

Estimating the stocking rate characteristics of groupings of Macaulay Land Capability for Agriculture classes in the regions of Scotland

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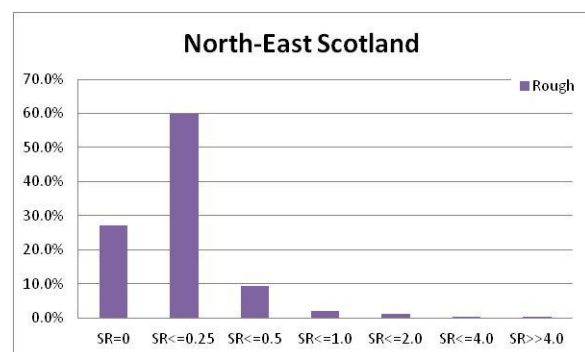
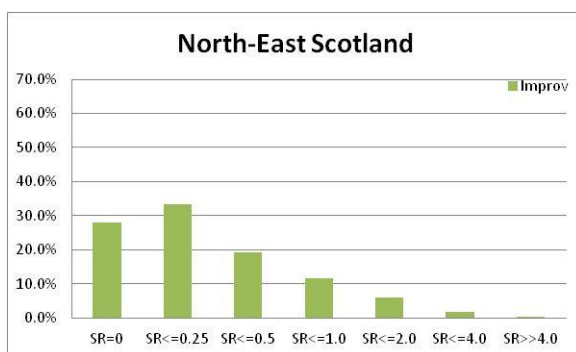
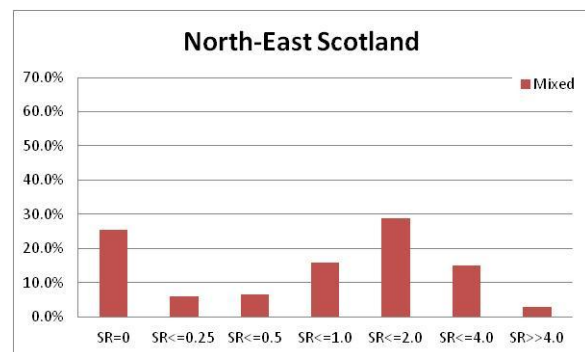
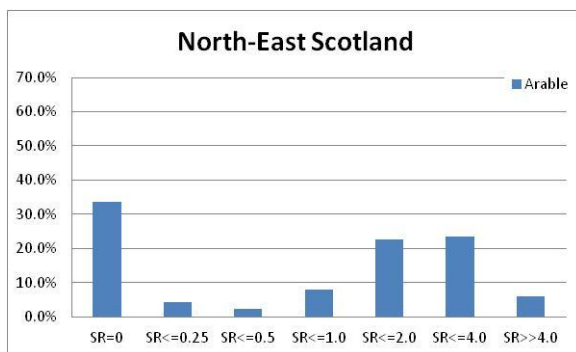
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Executive Summary

This document presents an analysis of the stocking rates, (SR, numbers of livestock units (LSU) per unit of area), associated with groupings of the Macaulay Land Capability for agriculture (LCA) classes for the Agricultural Regions (AgRegions) of Scotland. This analysis was sought to improve the evidence base used by RESAS to assist with, amongst other projects, the deliberations of the Woodland Expansion Advisory Group set up by Scottish Government in 2011.

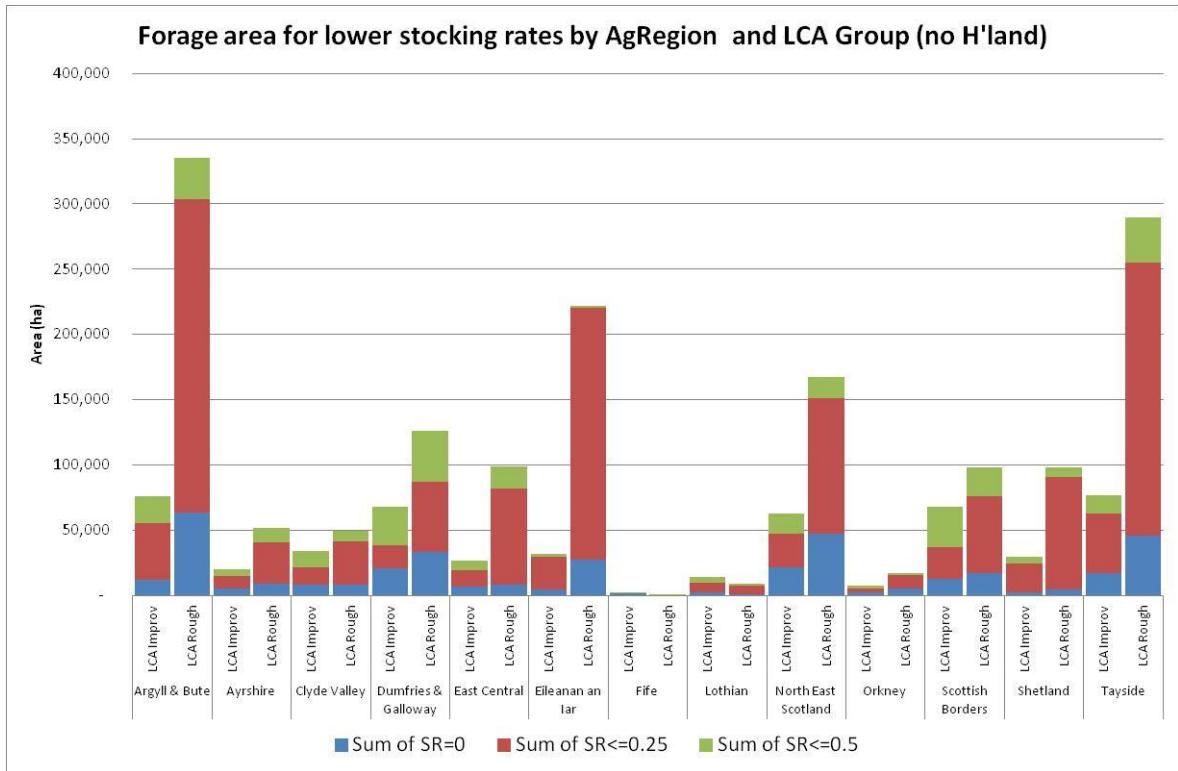
The analysis combines potential for use as summarised by LCA with actual use as summarised by the SR's. These SR values are derived at field or holding level from Integrated Administration and Control System (IACS) and June Agricultural Census data (see Section 2 of the main report for details of data and methods). Recognising from previous analysis the spatial heterogeneity in SRs (see mapping in the main body of the report) the analysis preserves and quantifies the range and distribution of SR values associated with the combinations of AgRegion and LCA. This allows an appreciation of the uncertainty inherent in assessing the consequences for livestock numbers of any change in the woodland area for combinations of LCA and AgRegion. The figure below illustrates the information available at regional level using North-east Scotland as the example. Each graph shows the proportions of the forage area stocked at each SR rate for a grouping of LCA classes. Average values for the LCA-AgRegion combinations while informative, cannot alone adequately characterise the range of possible consequences. The supporting tabular data for all regions and LCA classes is presented in Section 6.3 of the main report.



Accepting the caveat above, it is possible to generate robust area weighted averages for SR that provide an overview of the likely consequences for livestock numbers of changes to woodland areas on the combinations of LCA and AgRegion. The table below presents the cross-tabulation of average SR values for LCA and AgRegion. The table is colour coded to highlight combinations where SR is below 1.0 (in shades of purple) and above 1.0 in shades of green. As expected, SR declines across the LCA groups, from those classes with the highest potential (Arable) to the lowest (Rough). The key outcome, however, is in demonstrating value of regionalisation, since for the same LCA class there is a considerable range of SR values reflecting the other factors that determine SR beyond those biophysical characteristics expressed in LCA. A key caveat here is that treating Highland region as a single unit may be inadvisable since it is disproportionately large compared with the other AgRegions.

| Weighted Average SR (Isu/ha) | LCA Group | | | | | |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | Region | Arable | Mixed | Improv | Rough | Other |
| Argyll & Bute | 1.76 | 0.68 | 0.29 | 0.14 | 0.23 | 0.21 |
| Ayrshire | 1.49 | 1.28 | 0.61 | 0.37 | 0.80 | 0.87 |
| Clyde Valley | 1.24 | 1.07 | 0.50 | 0.24 | 0.80 | 0.71 |
| Dumfries & Galloway | 1.95 | 1.41 | 0.77 | 0.34 | 0.97 | 0.86 |
| East Central | 1.60 | 0.80 | 0.32 | 0.16 | 0.63 | 0.38 |
| Eileanan an Iar | | 0.18 | 0.14 | 0.09 | 0.08 | 0.09 |
| Fife | 1.23 | 1.20 | 1.22 | 0.97 | 0.75 | 1.19 |
| Highland | 0.80 | 0.54 | 0.14 | 0.08 | 0.10 | 0.13 |
| Lothian | 0.96 | 0.91 | 0.53 | 0.32 | 0.54 | 0.74 |
| North East Scotland | 1.70 | 1.20 | 0.37 | 0.14 | 0.59 | 0.76 |
| Orkney | | 1.11 | 0.84 | 0.34 | 0.72 | 0.84 |
| Scottish Borders | 1.06 | 0.85 | 0.51 | 0.22 | 0.54 | 0.56 |
| Shetland | | 0.25 | 0.22 | 0.17 | 0.21 | 0.18 |
| Tayside | 1.38 | 0.80 | 0.28 | 0.14 | 0.50 | 0.37 |
| No Region | 1.29 | 0.83 | 0.18 | 0.33 | 0.24 | 0.27 |
| All Regions | 1.29 | 1.03 | 0.38 | 0.14 | 0.34 | 0.40 |

The outputs from the analysis can also be summarised to provide indications of the areas of forage associated with SR values. This could be effective in highlighting where there may be opportunities for additional woodland on land with lower SR values. In this regard it is important to see that in nearly all regions there are substantial areas with SR's below 0.5 Isu/ha. The figure below illustrates these areas for the LCA Improved and Rough groupings. For clarity the figure omits Highland AgRegion since this has ~1.5m ha of LCA Rough with SR less than 0.5 Isu/ha. While Highland thus has by far the largest area other regions also have the potential to contribute to achieving increased areas of woodland.



A number of caveats and potential improvements to the analysis have become apparent during the course of the research (see Section 4 in the main report). None of these is sufficiently serious so as to undermine the validity of the results presented but some would merit further analysis. Further research is also required to determine how best to combine the SR values with other spatial datasets to allow assessment of within region patterns.

1. INTRODUCTION

This document presents an analysis of the stocking rates, (numbers of livestock units (LSU) per unit of area), associated with groupings of the Macaulay Land Capability for agriculture (LCA) classes for the Agricultural Regions (AgRegions) of Scotland. This analysis was sought to improve the evidence base used by RESAS to assist with, amongst other projects, the deliberations of the Woodland Expansion Advisory Group set up by Scottish Government in 2011.

The data sources, methods and assumptions inherent in the analysis are set out and results are presented, both as high level summaries (average stocking rates (SRs) per class) and more detailed distributional data. The document also highlights the issues that need to be considered when interpreting and using the high level results.

2. METHODS AND MATERIALS

The overall approach taken to the analysis is set out in outline in Figure 1. This can be summarised as four data integration and analytical steps:

- Define and map the potentially grazed forage area and attribute users;
- Derive stocking rates for the potentially grazed forage area;
- Derive the LCA mix for the potentially grazed forage area;
- Summarise the stocking rates present by groups of LCA class and administrative regions.

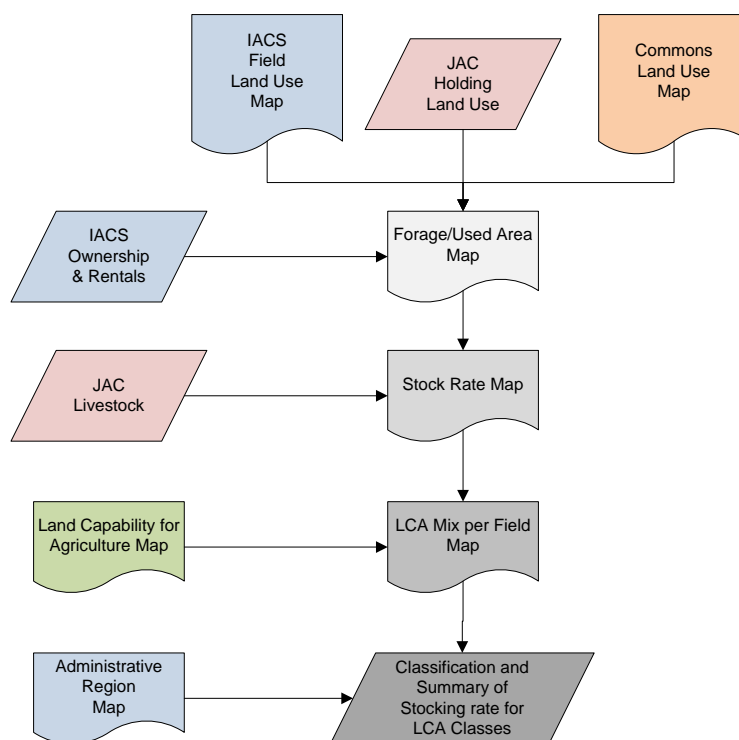


Figure 1

2.1. Datasets

2.1.1. Land Use and Land Users

Land use data is required to define the area of land potentially being used for forage. The land use data needs to be spatially explicit (mapped) so that the mix of LCA classes per field can later be derived by means of geographical information system (GIS) overlay.

The main land use dataset used was from the Integrated Administration and Control System (IACS) Single Application Form (SAF), with Permanent and Seasonal sheet data linked to GIS maps of land parcel boundaries (for May 2009). This is supplemented by data from the 2009 June Agricultural Census (JAC), the Shareholder Tenant (SHT) dataset in IACS, mapping of common grazings from Crofters Commission (March 2009) and common grazings identified in the IACS MP2 Address List (June 2009). 2009 data was used as this was immediately available and had been subjected to quality control previously. The area extents of the datasets are set out in Table 1. The table also lists those land uses included in the forage area with all others included in non-forage (mainly cropping and woodland).

Table 1: Coverage and forage land uses

| Type | Area (ha) | Forage Land Uses |
|--------------------|-----------|----------------------|
| All land | 7,897,506 | Common Grazing |
| Mapped cover | 6,306,084 | Rough Grazing |
| Non mapped | 1,591,422 | Grass Over 5 Years |
| | | Grass Under 5 Years |
| Field - forage | 4,346,598 | Open Woodland Grazed |
| Field – non-forage | 814,938 | |
| Holding | 579,544 | |
| Common | 565,004 | |

The forage area was defined at fieldⁱ level for all of the IACS-SAF area where land use data was present (~5.1M ha). Where mapping of land parcels was present but no 2009 land use was data available from SAF then land use was derived from JAC (~0.6M ha). The JAC land use data is not spatially explicit, that is the overall mix of land uses in a holding is known but the land uses of specific fields are not defined. For common grazings that do not appear in the IACS-SAF dataset (none are included in JAC) then a supplementary mapped dataset from the Crofters Commission was used with the assumption that all the common grazing area was made up of rough grazing land use (~0.6M ha). The three sources of data were stored in three map layers (Field, Holding and Commons) with rules used within the GIS to decide which had priority in setting values for a

ⁱ Field in this case refers to any land parcel defined in the GIS, clearly the nature of these varies from well defined lowland agricultural fields to unenclosed lands where fields relate to tenure.

particular field. Field, Commonsⁱⁱ and Holding was the order based on the level of detail provided by each dataset. Figure 2 shows the mapped forage area (from the three sources), the non-forage and the unmapped area.

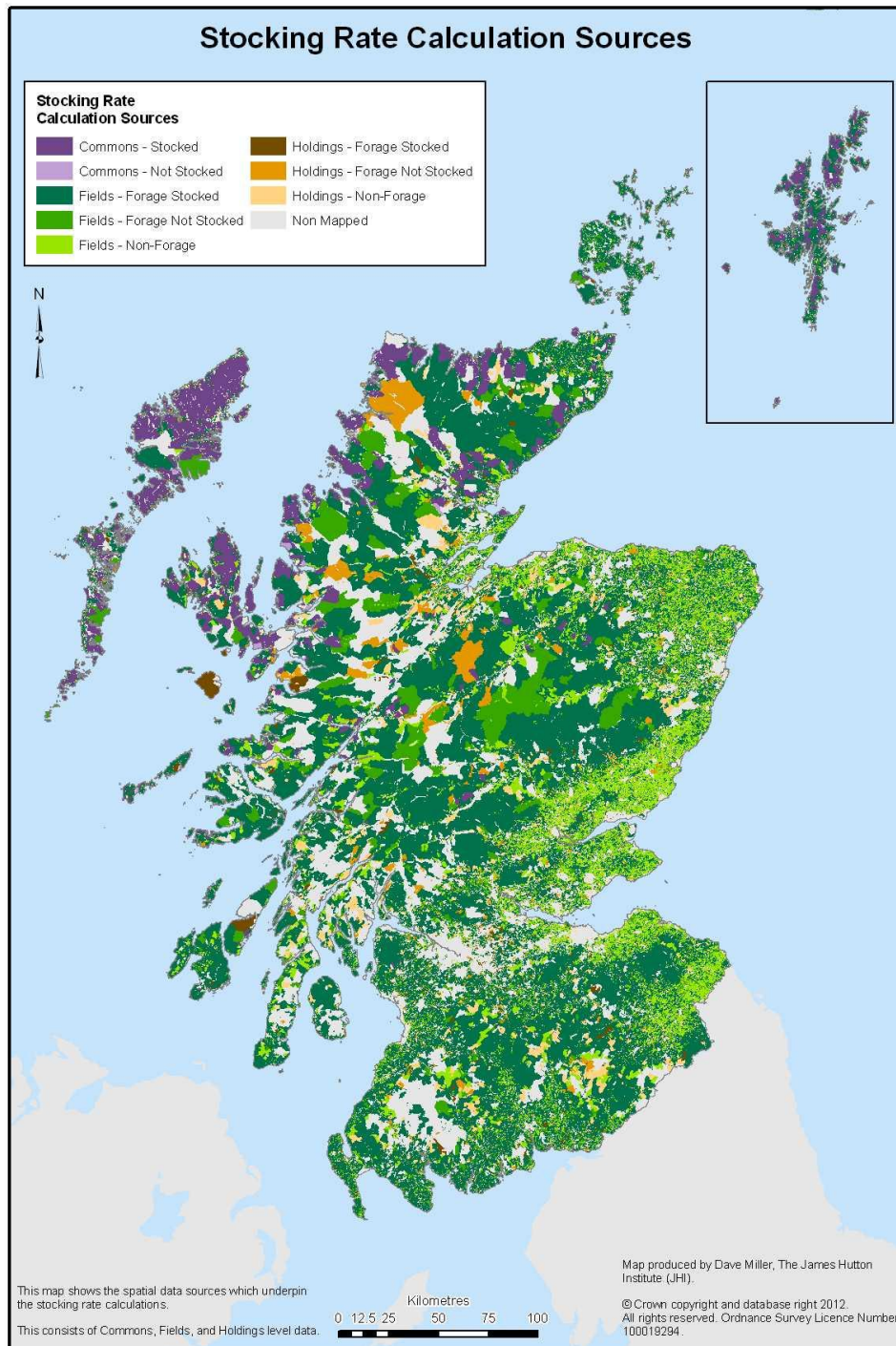


Figure 2

ⁱⁱ The commons layer is a composite of IACS GIS mapping of fields and Crofters Commission mapping of complete commons.

Note that since the primary purpose of the IACS-SAF dataset is the administration of agriculture related payments and policies the coverage is biased in favour of agricultural land used. In particular forestry is under-represented. This bias has no effect on the estimation of the SRs for the LCA groupings but it does mean that interpretation of associated areas or percentage of region figures does need to bear this in mind.

Since SR depends on the area of land being used by a holding rather than the area owned it is necessary to account for rentals of land. This was done using the IACS-SAF seasonal rentals sheet data (~700 thousand ha of mainly forage land). The attribution of rental use is known in 96% of cases for forage land and 90% of cropland. For JAC holdings, information on which specific parcel(s) are rented and the identity of the renter are not available so the assumption is made that all owned land is used. Where there is more than one holding using a single land parcel (commons and in some rentals) then the analysis tracks the shares for each holding and uses these as part of the SR calculations.

2.1.2. Livestock Numbers

Livestock numbers and types are derived per holding from the JAC and December Survey (DS) both in 2009. The higher of these values is used so the SR's are the higher recorded value. Given the fluctuations in livestock numbers in response to differing management regimens there is clearly the need for some caution in the use of these livestock numbers. Whilst June would typically see the highest rates of stocking, it is possible that neither of the June nor December dates reflects the maximum stocking. Conversely it may be that the recorded values reflect a peak value for livestock numbers not typical for the holding at other times. Within the land use dataset there are also significant areas of "forage" recorded within holdings who own no stock (at June or December). In this case the land may be being used for other purposes, used informally or used seasonally for only short periods of time, for example of finishing. Livestock may also not be captured by JAC or DS if they are always kept on seasonal lets and the keeper/owner has no other permanent land (rented or owned). In these latter cases the stocking rate may be underestimated. Accepting these caveats the JAC and DS livestock numbers are, however, the most reliable and comprehensive available source for this information at presentⁱⁱⁱ

ⁱⁱⁱ Options for using the British Cattle Movement Service dataset for statistical purposes are being explored SG.

2.1.3. Land Capability for Agriculture Classification

The Macaulay LCA classification was first published in 1982. The classification ranks land on the basis of its potential productivity and cropping flexibility determined by the extent to which its physical characteristics (soil, climate and relief) impose long-term restrictions on its agricultural use. There are seven classes, Class 1 offering the highest potential flexibility of agricultural use and Class 7 land being of very limited agricultural value (see Figure 3). Classes 1-4 comprise land suited to arable cropping, with decreasing opportunities for arable crops from Class 1 to Class 4. Class 4 land is land suited primarily for grassland with only short arable breaks. Class 5 land is capable of use as improved grassland with very limited opportunities for the occasional pioneer crop. Class 6 land is capable only of use as rough grazing with no realistic potential for improvement. Classes 3 and 4 are subdivided into two divisions and Classes 5 and 6 into three divisions (again see Figure 3). These classes and subdivisions can usefully be grouped as follows. Land capable of supporting Arable Agriculture – classes 1 to 3.1. Land Capable of supporting Mixed Agriculture – classes 3.2 to 4.2. Land capable of supporting Improved Grassland – classes 5.1 to 5.3. Land capable of supporting only Rough Grazing- classes 6.1 to 7. These are the LCA class groupings for which stocking rates have been derived. A further LCA grouping is also present – LCA Other. This grouping includes built-up areas, inland water, and islets too small to be included in the mapping of the LCA. Differences in the dates and scales of mapping mean that in some cases areas of forage occur on land mapped as LCA Other. To ensure consistency of regional totals and so as not to exclude areas of forage and livestock, LCA Other has also been included in the tabular outputs.

The map in Figure 3 shows the 1:250,000 scale LCA dataset. It should be noted that a “hybrid” dataset combining 1:250,000 scale mapping and 1:50,000 scale mapping was used in this analysis. The 1:50,000 scale mapping provides a finer resolution of conditions in those regions with more intensive management regimens.

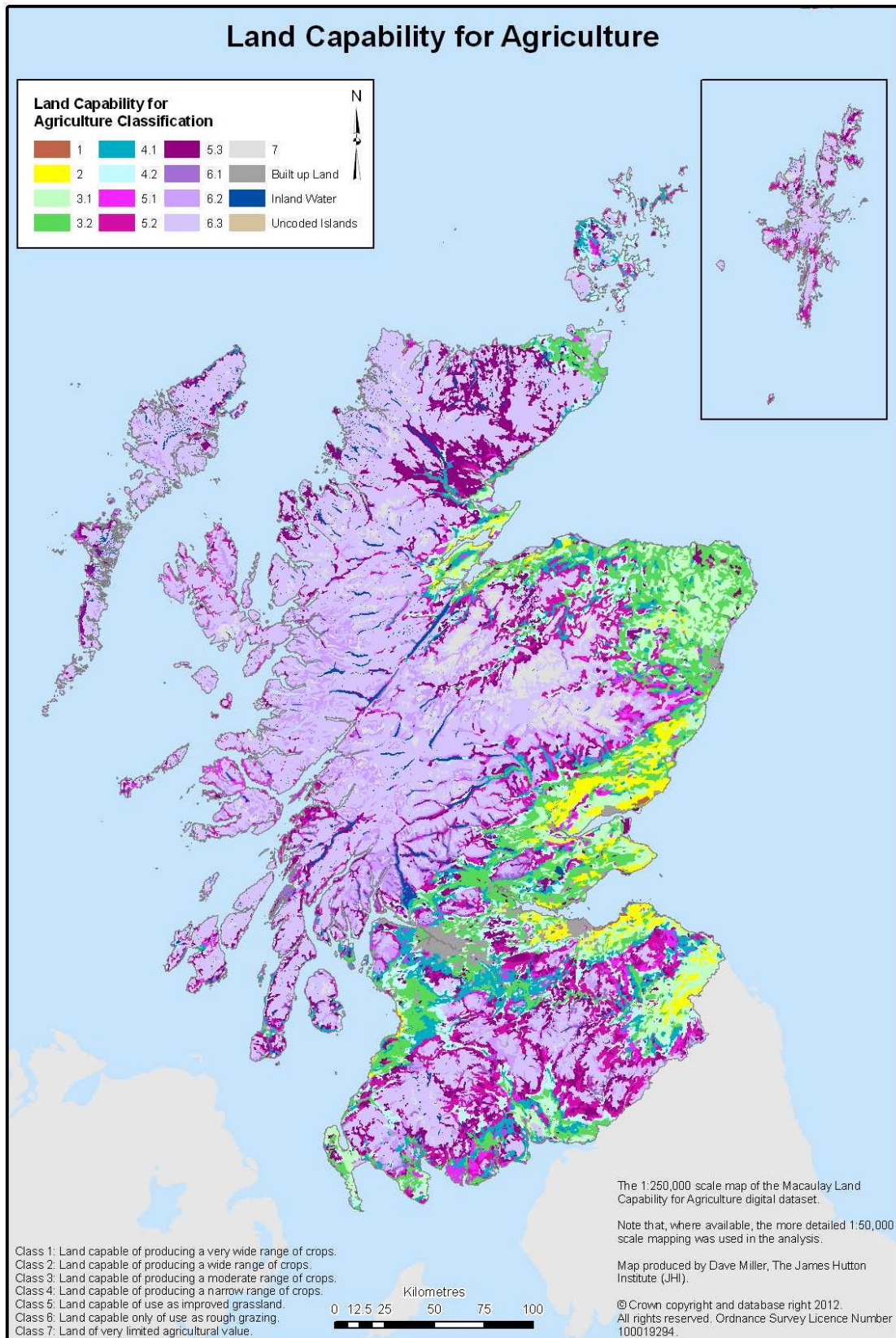


Figure 3

2.2. Analyses

2.2.1. Forage area per holding

The total area for each holding is calculated as owned area plus any share of commons area plus rented-in area minus rented out area. Common grazings with no known shareholders are treated as individual holdings. To enforce data integrity the IACS field data claims, and in particular the seasonal rental claims, are adjusted using an improved version of the multi-step process described in previous work. Despite this in some cases the rented-in area does not match the rented-out area therefore some uncertainty is introduced.

The forage area per holding is defined based on land use using the same assumptions as have been used for the research in support of the Pack Inquiry and in defining the potential new recipients of SFP for SG. The principal exclusions are cropped land and forestry. For a full list of exclusions see the Pack Inquiry report^{iv}.

2.2.2. Stocking rates

Stocking rate is simply the ratio of livestock numbers (expressed as standard livestock units) to available forage area. The livestock units were derived as follows

Livestock Units = (Cattle * Cattle Weighting) + (Sheep * Sheep Weighting) + (Deer * Deer Weighting)
where:

Cattle weighting = 1.00 livestock units for all cattle excluding those under 1 year,

Sheep Weighting = 0.12 livestock units for all sheep excluding lambs,

Farmed Deer Weighting = 0.3 livestock units for all deer excluding calves.

These are standard weightings for cow-calf, sheep-lamb, and deer-calf combinations and are adequate for the purposes of this analysis. Previous analysis has shown the greater sensitivity of SR results to the parameterisation of the sheep weighting.

This calculation provides an average stocking rate for the land used by the holding. All forage land parcels used by the holding are assigned this value. Where significantly different enterprises exist within a holding, e.g. dairy cattle and hill sheep, then the holding average is characteristic of the

^{iv} <http://www.scotland.gov.uk/Publications/2010/11/01153620/0>

holding as a whole, but of neither livestock system in particular, nor would it be representative of particular land parcels. Since no land management information is available indicating which stock use particular land parcels any differentiation within holdings would depend on making further assumptions.

Where there are multiple users of a single land parcel the stocking rate for the parcel is derived as the ratio of the sum of the livestock units from each share^v to the area of all shares.

Where no field mapping is present it is possible to derive stocking rates for holdings using JAC data but it is not possible to derive an LCA mix. Such holdings cannot therefore be included in the LCA-SR analysis.

Figure 4 shows a national level map of SRs. Note that the grey areas with zero SR contain both non-forage land uses and land with forage land use but no stock present. The latter include areas of “improved” grasslands^{vi} (49,824 Ha of grass under five years and 92,533 Ha of grass over five years). These are likely being maintained for agricultural purposes but since there are no livestock associated with the holding in JAC or DS they have a zero SR. Also note the heterogeneity of SRs within small areas and the concentration of higher SRs in particular regions (for example Northeast Scotland and Dumfries and Galloway) though pockets of higher SRs appear in most regions.

^v LSU on the share = SR of the holding using the land *area of share

^{vi} IACS land uses temporary and permanent grasslands (TGRS and PGRS).

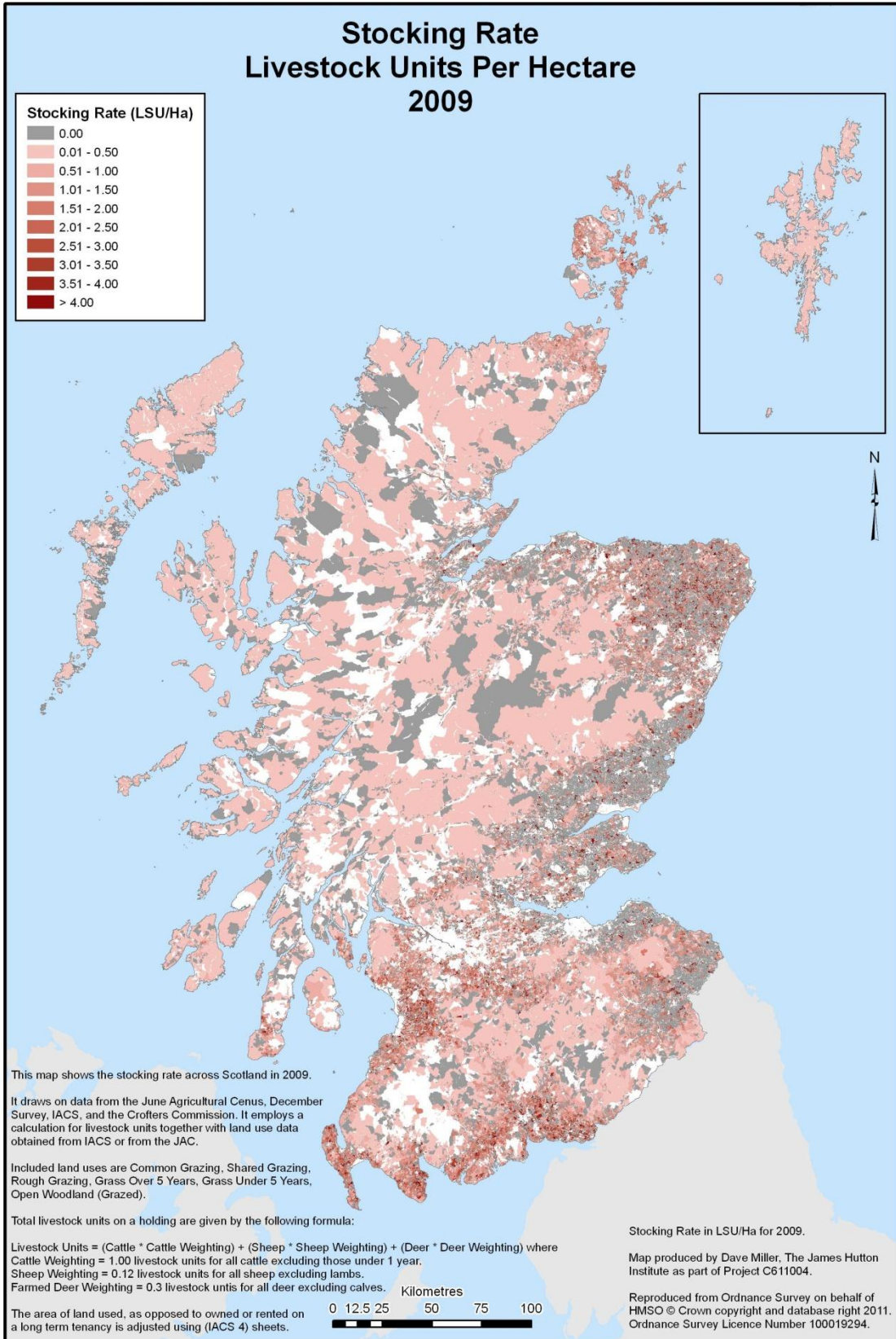


Figure 4

2.2.3. LCA mix per field

The LCA mix for those land parcels identified in the IACS-SAF GIS mapping is derived by overlaying^{vii} the stocking rate maps (Field-Commons-Holding) with the LCA in a GIS. The output of this operation is a map with individual records as follows

| ID | Source | | | Area | Stocking Rate | LCA Code | LCA Group |
|--------|--------|---------|---------|------|---------------|----------|-----------|
| | Field | Holding | Commons | | | | |
| number | flag | flag | flag | ha | LSU/ha | number | category |

Source identifies the dataset from which land use and stocking rate data have come, area and stocking rate values are self-explanatory, the LCA code is a look up to the LCA classes, subdivisions or classes where LCA has not been determined (e.g. built up areas), LCA group is the higher level grouping set out previously.

An individual record will be for a whole field unless the field has more than one LCA class in which case more than one record will be generated.

2.2.4. Regional identifiers

Given the objective of summarising the SR for groups of LCA classes at regional level it was necessary to add regional identifiers to the land parcels. Whilst this could have been done for those holdings in JAC from the existing regional classification within the JAC dataset, it was decided in this case to use a further GIS overlay with a map of the NUTS4 regions. This was done so that in all cases the land parcels (or parts thereof) were allocated to the correct region. In the JAC dataset the holding is allocated to the correct region based on the location of the steading but not all of the land parcels would be correctly allocated to regions in large holdings or holdings that straddle regional boundaries. In any case this would have been required for those mapped elements not within the JAC. NUTS4 was chosen as the smallest standardised regional division as higher level aggregations can be built from this, i.e. NUTS3 and 2 and AgRegions used in this analysis.

This overlay operation adds a regional identifier to all the records falling within a single region and generates two or more new records when a regional boundary is straddled. Figure 5 shows the AgRegions map used as the basis for regional summaries in the analysis.

^{vii} The specific overlay was a union.

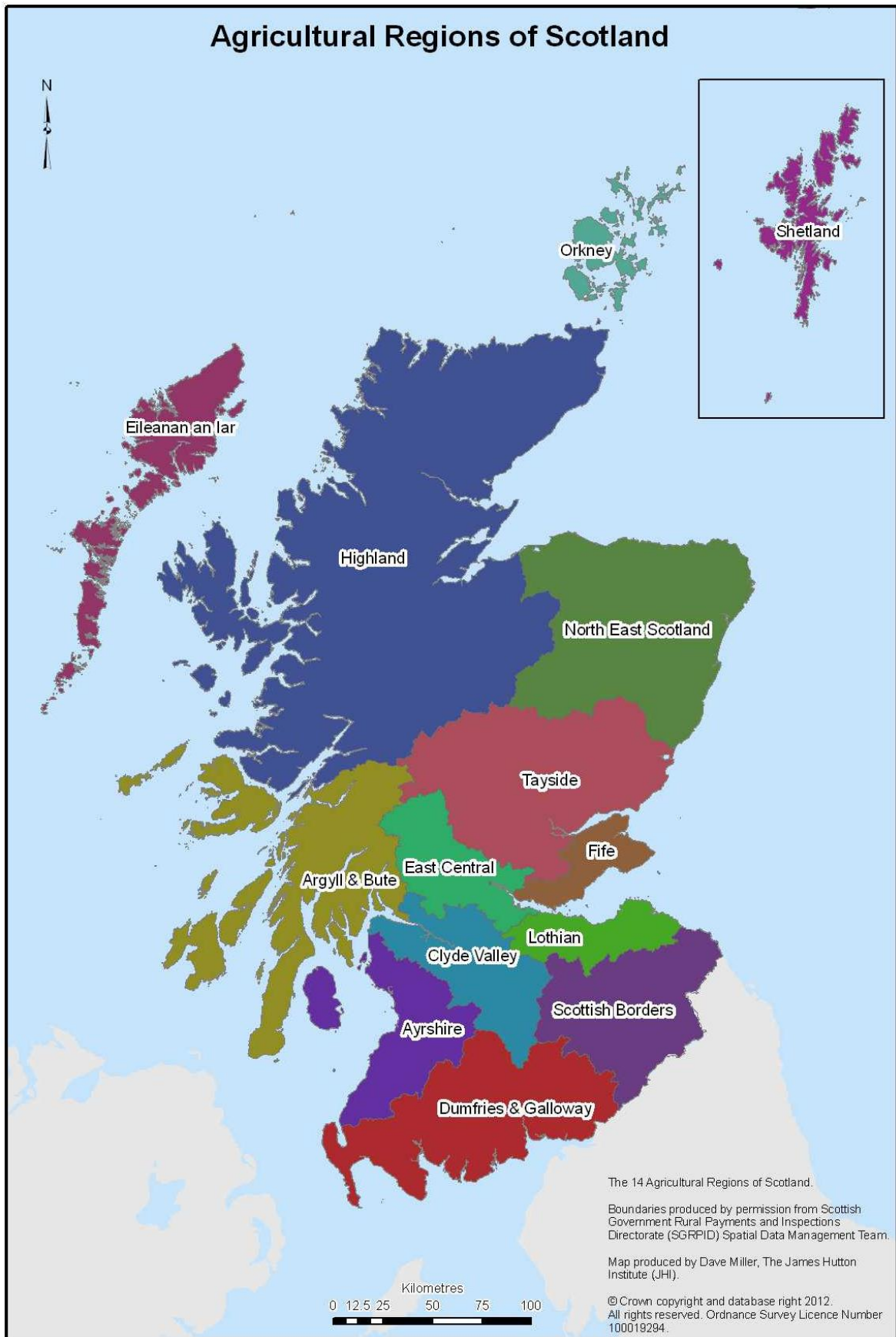


Figure 5

2.2.5. Deriving a tabular dataset

To support summarising and presenting the dataset, the records generated in the GIS were imported in an ORACLE database for further processing. Within the database the individual records are classified based on stocking rate to generate a dataset that supports presenting distributions of stocking rate values for combinations of LCA classes and/or regions. This “binning” process used the following threshold values.

Table 2: SR classification thresholds

| Threshold (LSU/ha) | Rationale |
|--------------------|--|
| 0 | Forage land that is not stocked with cattle, sheep or deer. For higher LCA classes (6+) much of this will be land designated as rough grazing but used for other purposes such as hunting. For lower LCA classes this land may be grass breaks or headlands or grass used seasonally but for which no owned livestock records are available. If non-forage land were included in estimations of average SR for LCA classes then such fields would also have zero SR (e.g. cropland and woodland). |
| 0.25 | ~2 sheep per ha |
| 0.5 | ~4 sheep per ha |
| 1.0 | 1 cow-calf unit per ha |
| 2.0 | 2 cow-calf units per ha |
| 4.0 | 4 cow-calf units per ha |
| More than 4.0 | Within this class there are legitimate SR values, for example where businesses have housed livestock, there are however also a small number of holdings with SRs over ten and while these may reflect housed livestock using bought in feed they may also reflect remaining problems in the attribution of seasonal forage land to users. |

These bin values double the stocking rate for each class from 0.25 lsu/ha onwards. This structure was chosen since it provides finer differentiation in the lower stocking rates (the areas of greater interest to the WEAG) while still limiting the number of categories such that the tabular and graphical presentations remain clearly interpretable.

3. RESULTS

3.1. Area Weighted Average Stocking Rates

To provide a summary SR value for each AgRegion and LCA combinations, an area weighted average of SRs has been calculated. This calculation has maintained the SR bins for as long as possible within the calculation so as to make explicit the range and distribution of SR values associated with the LCA classes. This can be significant even within a single region (see Figure 6 for a graphical example for Northeast Scotland). The area of the forage and the average SR for each AgRegion-LCA combination is tabulated for each of the SR bins in Section 6.3. This would allow for the inclusion of uncertainty in assessing the consequences for livestock numbers for any increase in woodland area, defining the largest or smallest numbers of livestock that may be displaced.



Figure 6

Table 3 presents the area weighted average stocking rates for each of the LCA groupings cross tabulated by AgRegion. The colours highlight where SRs are less than 1.0 lsu/ha in deepening shades of purple and above 1.0 lsu/ha in shades of green. The consistent trend is for higher stocking rates on the better quality land but with a wide range of variability between regions for the same LCA group. This variability emphasises that it is necessary to assess the relationship between SR and LCA at regional scale if the implications for any change in land use are to be assessed.

Table 3: Area weighted average stocking densities for forage land

| Weighted Average SR (Isu/ha) Region | LCA Group | | | | | |
|--|-------------|-------------|-------------|-------------|-------------|-------------|
| | Arable | Mixed | Improv | Rough | Other | All LCA |
| Argyll & Bute | 1.76 | 0.68 | 0.29 | 0.14 | 0.23 | 0.21 |
| Ayrshire | 1.49 | 1.28 | 0.61 | 0.37 | 0.80 | 0.87 |
| Clyde Valley | 1.24 | 1.07 | 0.50 | 0.24 | 0.80 | 0.71 |
| Dumfries & Galloway | 1.95 | 1.41 | 0.77 | 0.34 | 0.97 | 0.86 |
| East Central | 1.60 | 0.80 | 0.32 | 0.16 | 0.63 | 0.38 |
| Eileanan an Iar | | 0.18 | 0.14 | 0.09 | 0.08 | 0.09 |
| Fife | 1.23 | 1.20 | 1.22 | 0.97 | 0.75 | 1.19 |
| Highland | 0.80 | 0.54 | 0.14 | 0.08 | 0.10 | 0.13 |
| Lothian | 0.96 | 0.91 | 0.53 | 0.32 | 0.54 | 0.74 |
| North East Scotland | 1.70 | 1.20 | 0.37 | 0.14 | 0.59 | 0.76 |
| Orkney | | 1.11 | 0.84 | 0.34 | 0.72 | 0.84 |
| Scottish Borders | 1.06 | 0.85 | 0.51 | 0.22 | 0.54 | 0.56 |
| Shetland | | 0.25 | 0.22 | 0.17 | 0.21 | 0.18 |
| Tayside | 1.38 | 0.80 | 0.28 | 0.14 | 0.50 | 0.37 |
| No Region | 1.29 | 0.83 | 0.18 | 0.33 | 0.24 | 0.27 |
| All Regions | 1.29 | 1.03 | 0.38 | 0.14 | 0.34 | 0.40 |

3.2. Stocking Rate Mix per Region

The average SR for the combinations of LCA grouping versus AgRegion depends on the mix of SRs and their associated areas. For example Lothian and Northeast Scotland have similar overall SRs (0.74 and 0.76) but their mix of SRs and LCA are quite distinct. The figures below illustrate the mix of SRs that occur in each region. The first three figures (6 to 8) present the overall mix of SRs present in the region regardless of LCA grouping. Figure 7 presents the forage area for each of the SR bins for each region, with Figure 8 presenting the same data but omitting Highland region for clarity. Figure 9 presents the data as the share of each SR bin of the forage area. These figures serve to highlight where there is apparently unstocked forage land (mid blue) and where there are areas of lower (though likely appropriate) stocking rates (red).

These SR mixes are further broken down by LCA class in Figure 10 and Figure 11 which show the SR mix, in terms of the forage area per SR bin, for each of the LCA groups present (Figure 11 again omits Highland region for clarity). Figure 12 highlights that while in most cases it is only on the LCA Rough land that SRs fall below 0.5 Isu/ha for substantial areas, there are areas of such stocking on better quality land in nearly all regions. The figure also highlights that in all regions there are areas with lower stocking rates where increased areas of woodland would have more limited effects on livestock numbers.

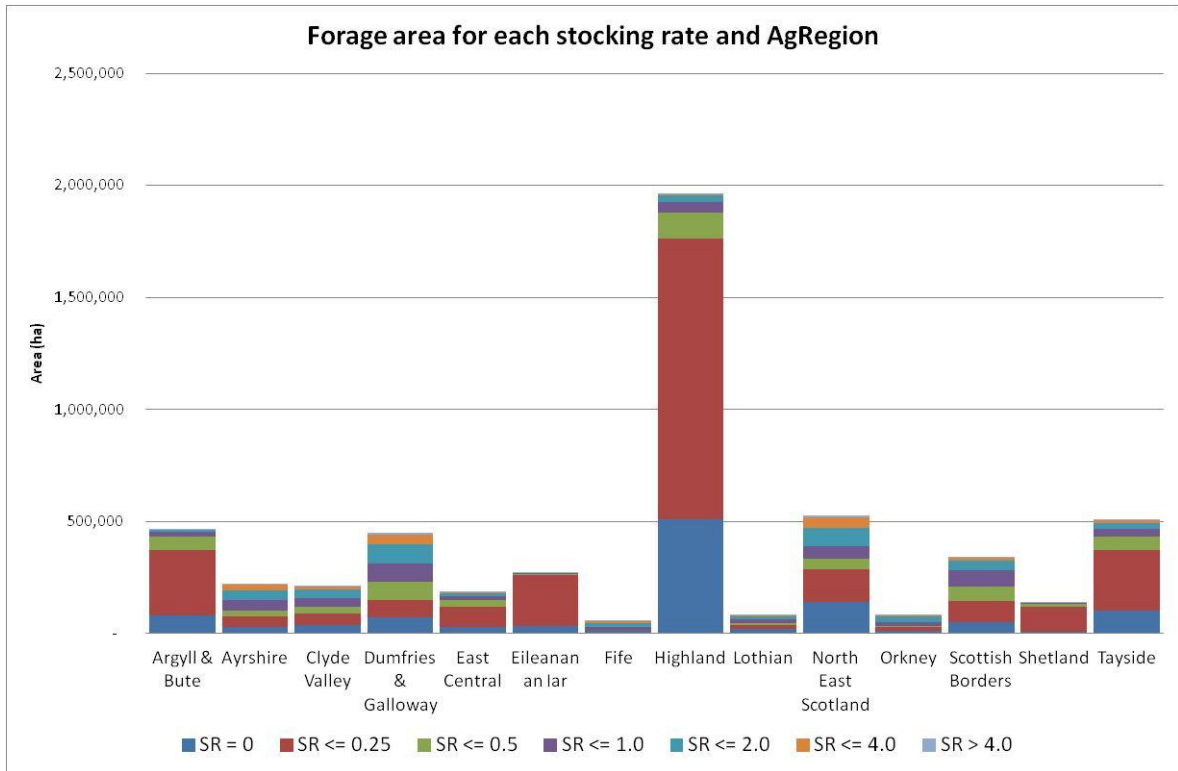


Figure 7

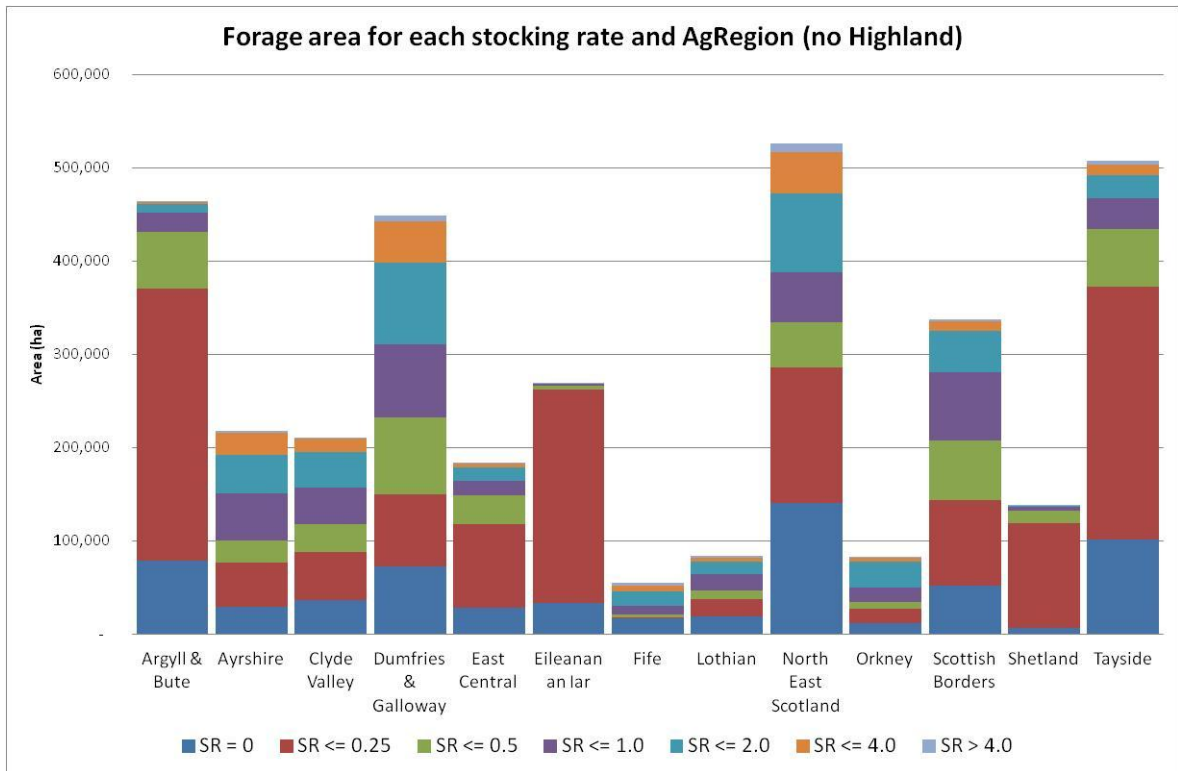


Figure 8

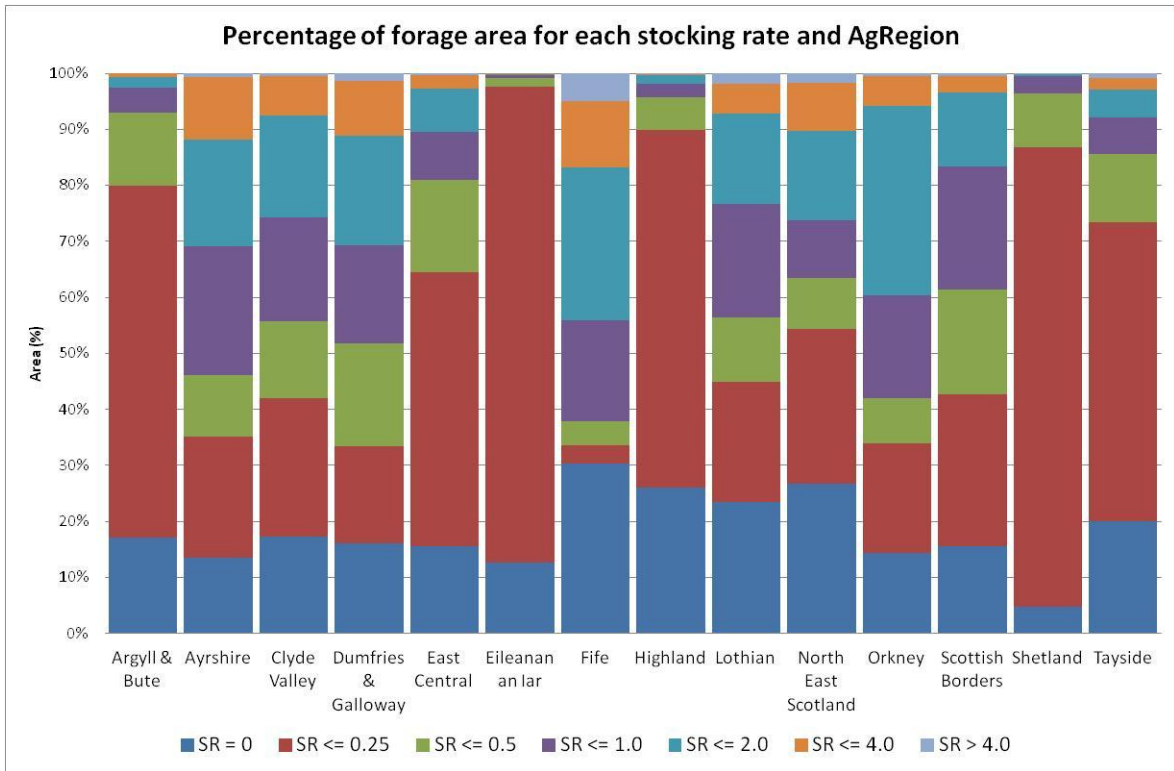


Figure 9

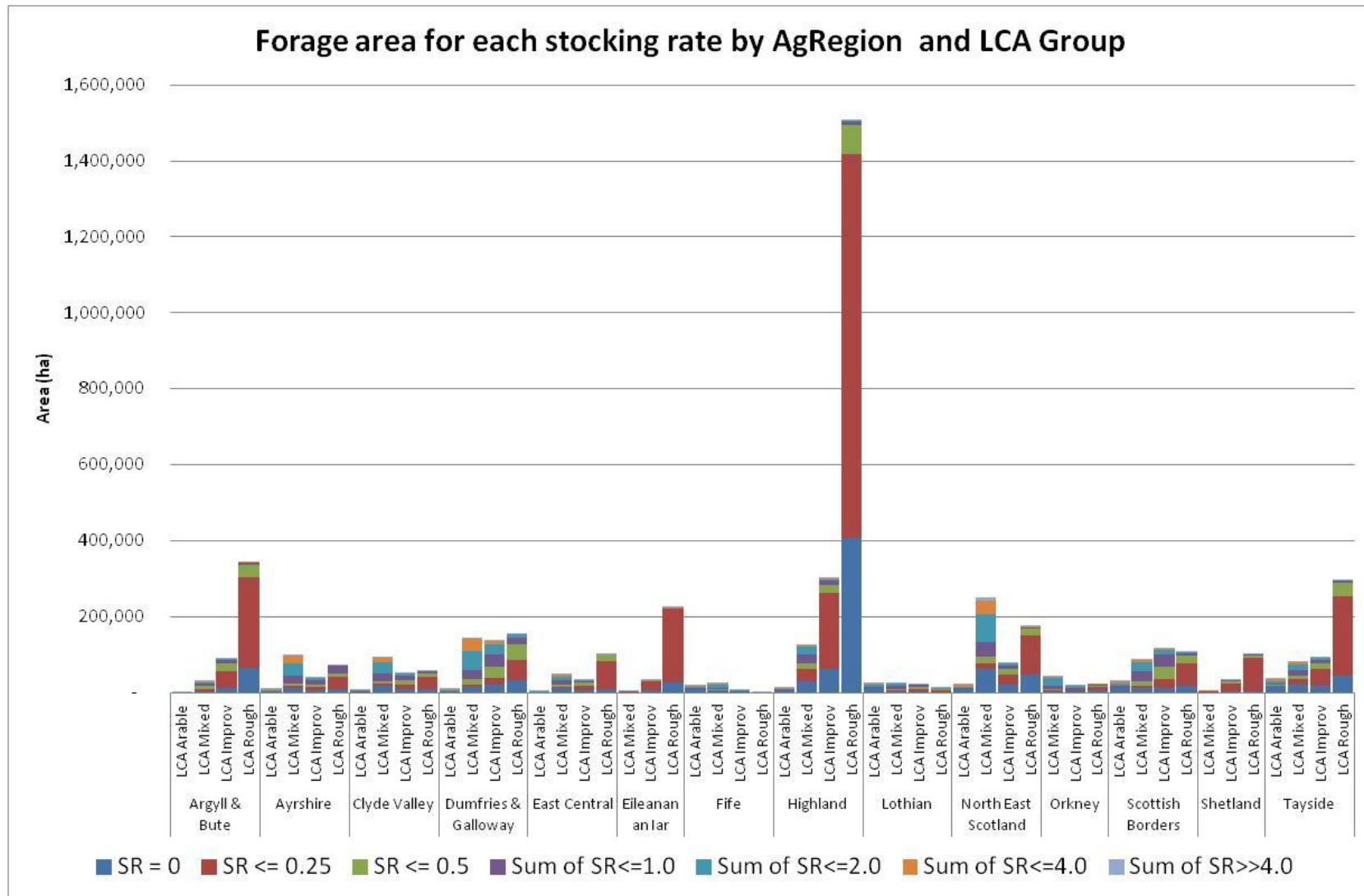


Figure 10

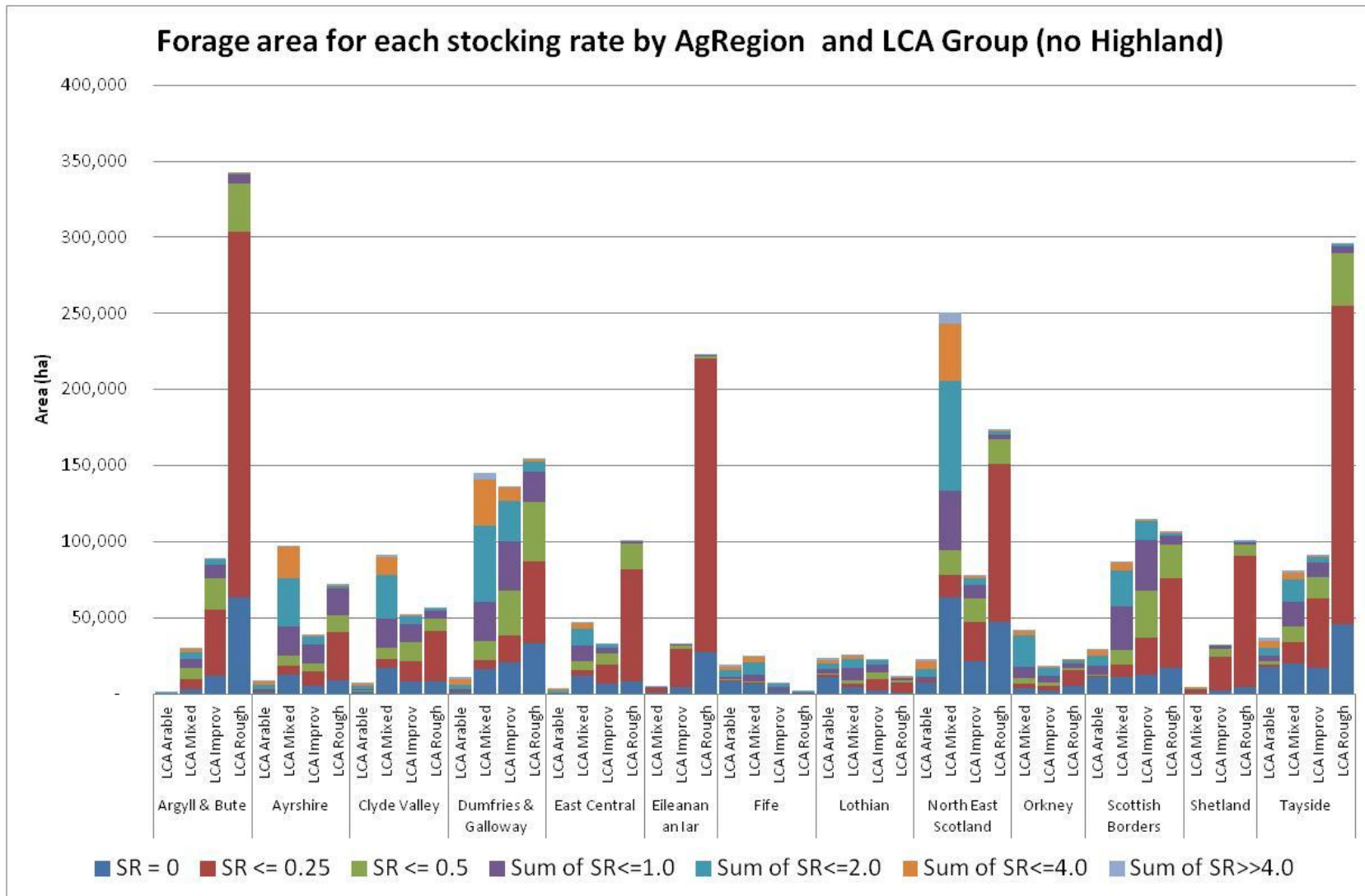


Figure 11

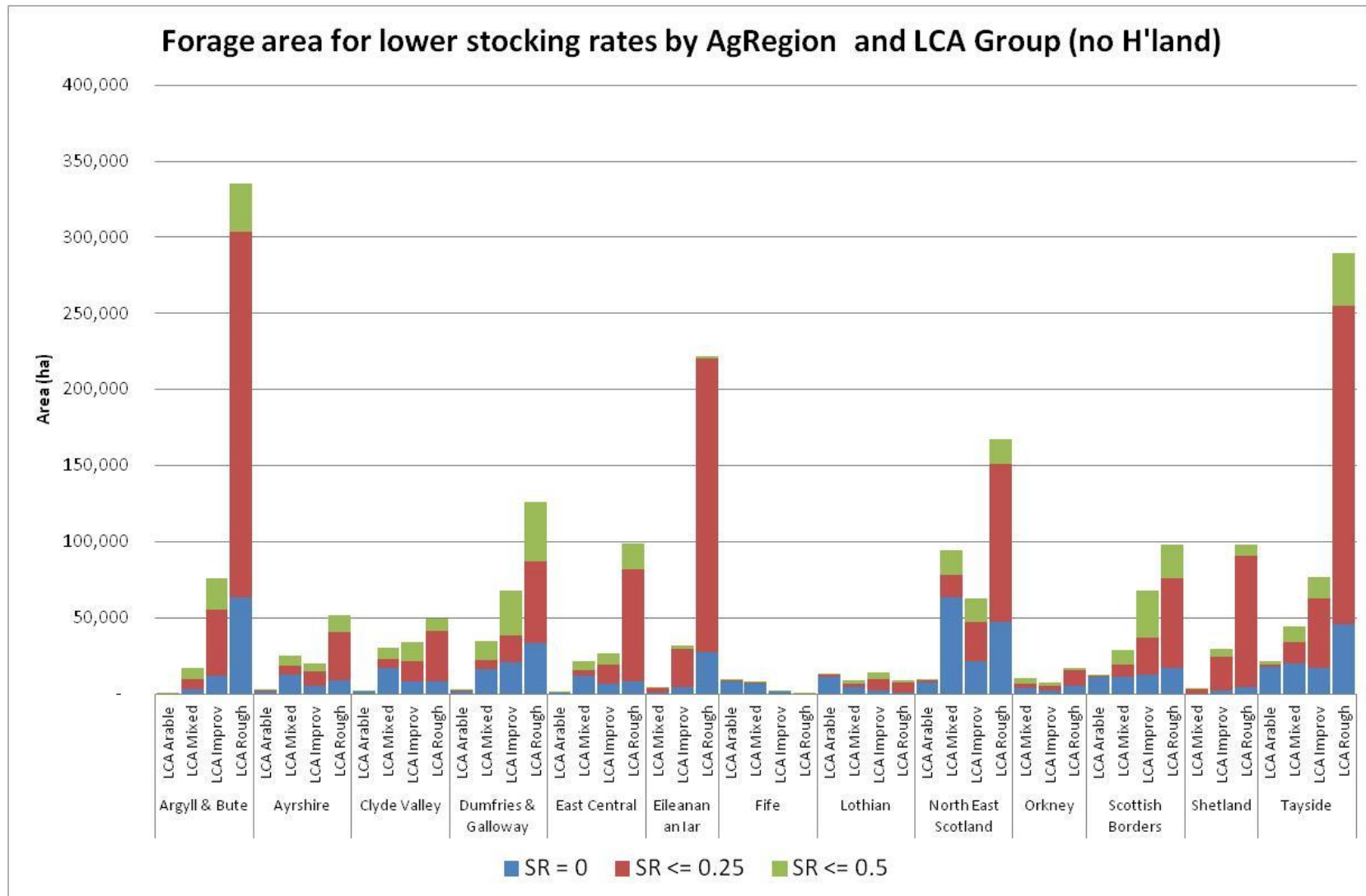


Figure 12

4. CAVEATS TO THE ANALYSIS AND RESULTS

The two main limitations to the estimation of the SR values are:

1. The need to use the non-spatially explicit JAC data as the source of land use (9% of mapped area). While the SR's are calculated correctly based on the JAC data, the SR is mapped across all the fields that make up the holding rather than only those making up the forage area. Note this affects only the representation of the SRs as maps not the tabular data totals. In most cases this "increased" area will not be significant as the affected holdings do not have large areas of cropping or woodland (the main excluded classes).
2. For the Mapped Commons areas (565,004 ha) assumptions have had to be made on the nature of the land use (defaulting to inclusion). In some of these areas the SR may be underestimated by including non-forage areas such as bracken, scrub and bare rock. Given the generally low rates of stocking associated with commons, however, it is unlikely that this has changed the SRs significantly. Use of other datasets may improve the representation of the land use within the mapped commons areas but was beyond the scope of this analysis.
3. The assumption that the holding level SR applies to all forage fields, while acceptable for a national scale analysis and an improvement on the use of parish level SRs, has been noted previously as a limitation. Options exist for differentiating within holdings but this would require further analysis.

In considering the further use of the average stocking rates for the LCA groupings and the Ag Regions the following caveats need to be borne in mind.

1. Consideration should be given to how well the average represents the distribution when it is derived from strongly skewed or bimodal distributions.
2. In interpreting averages it should be borne in mind that the same average can result from markedly different distributions (as illustrated previously) and this may have implications for how the average value should be used in planning or decision making.
3. Since LCA determines the potential of land rather than the actual improvement made or the current intensity of use, this means that there is significant diversity of stocking rates within LCA classes and this diversity is also expressed in spatial heterogeneity. The heterogeneity is seen in strongly contrasting rates of stocking in adjacent holdings with similar mixes of LCA classes, reflecting the many other current and historical socio-economic factors that determine management regimens.
4. The use of any spatial unit (region) as a basis for summary will have an influence on the results. Careful account should be taken of regionalisation effects in any prioritisation or decision making, particularly the need to differentiate within the Highland AgRegion.

5. SUPPORTING ANALYSES

5.1. LCA Mix per Region

To provide context for the SR values the mix of LCA groupings for each AgRegion is presented for the mapped (Figure 13), forage (Figure 14), stocked (Figure 15) and unstocked (Figure 16) areas. The values are cross-tabulated in Section 6 (Supporting Tabular Data). The intention of deriving these figures is to indicate the absolute (ha) and relative (%) magnitude of the areas associated with each of the LCA groupings for each of the regions. The pairs of illustrations have previously been shown to be useful given the diversity in the range of AgRegion sizes. As above using absolute magnitudes alone for issues related to the LCA rough class means that Highland region tends to dominate and obscure the potential of other regions.

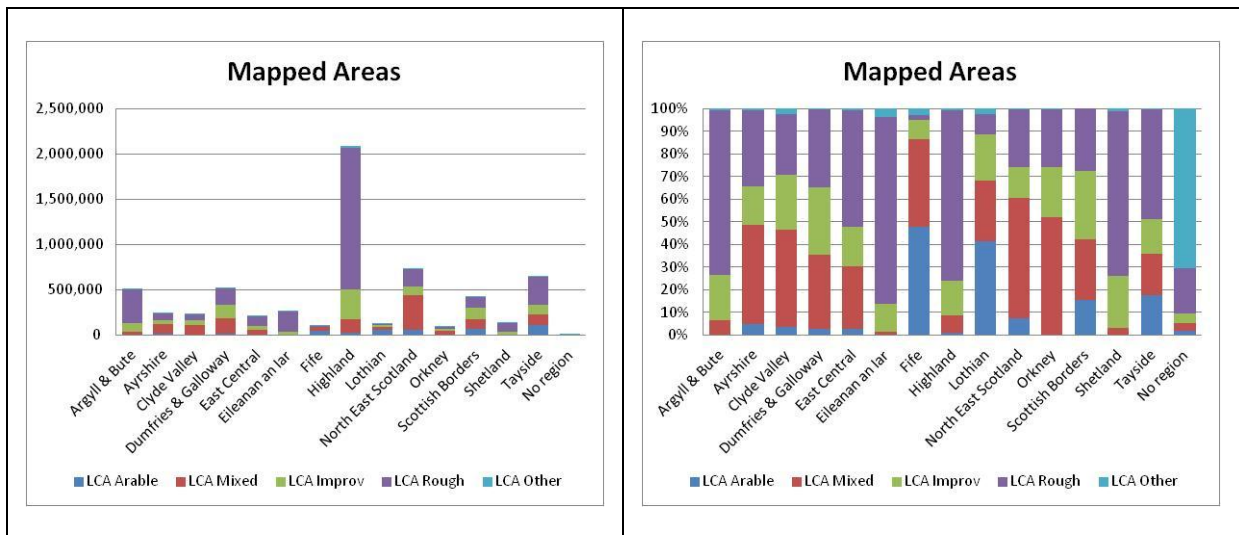


Figure 13

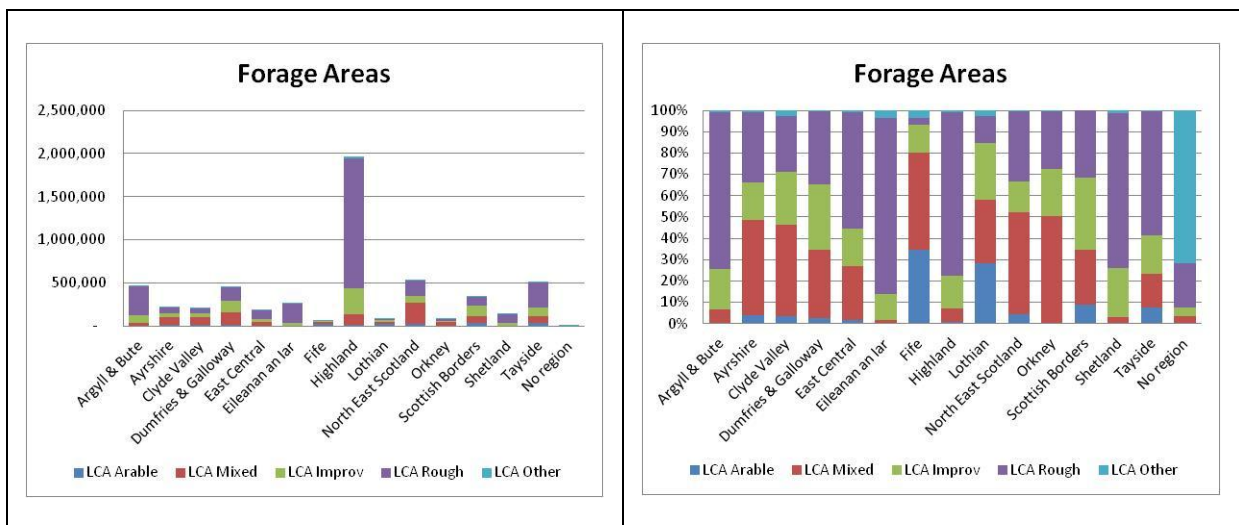


Figure 14

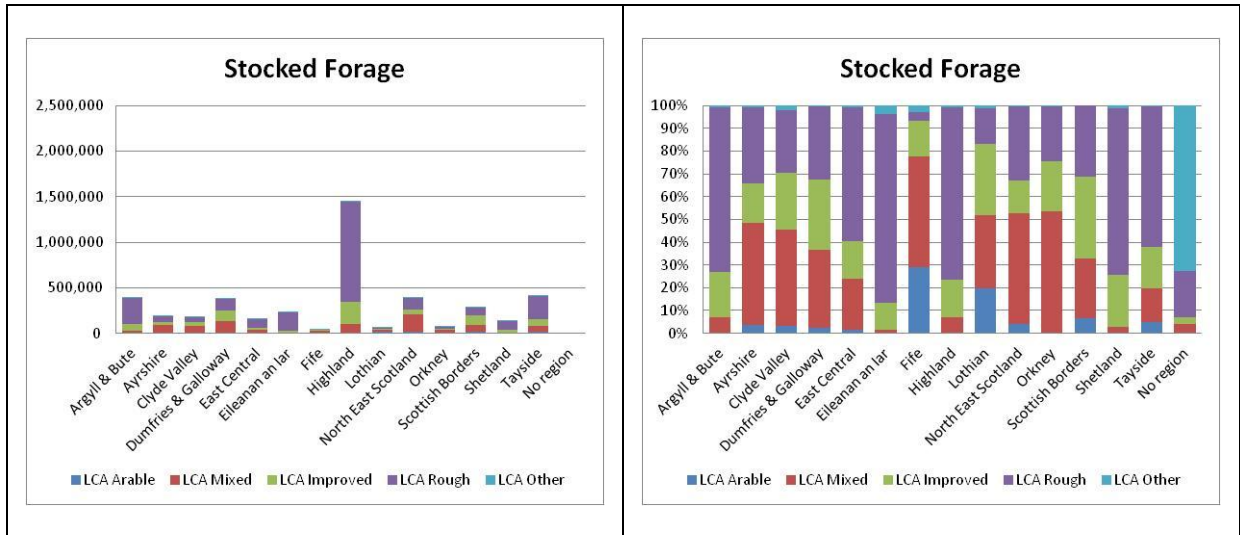


Figure 15

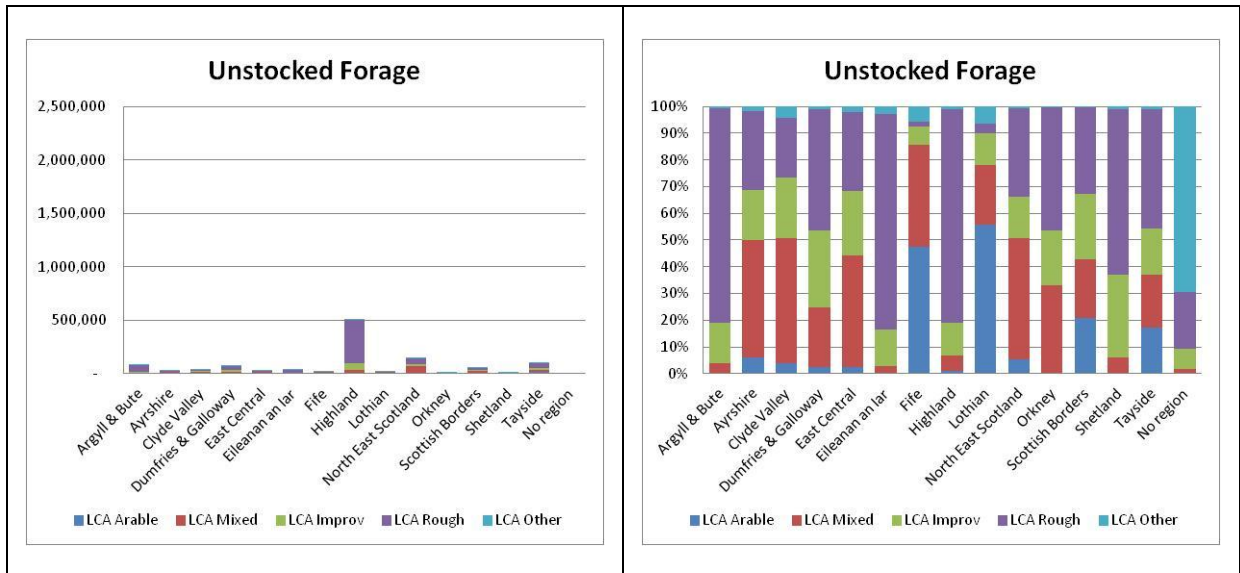


Figure 16

5.2. Forage Area Characteristics

To provide further context for the average SR values it is useful to define the areas associated with the SR values. In this case the geography is provided by AgRegions. Their use is justified since they are standard statistical regions and thus compatible with other data sources and their characteristics are readily comprehensible to stakeholders and decision makers. They are, however of markedly different sizes, ranging from Orkney at 87 thousand hectares to Highland at over 2 million hectares. There are thus 23 Orkney sized regions within Highland and not all (indeed perhaps none) of these regions would share the same characteristics as Highland overall. This makes interregional comparisons of magnitudes and determining the within-region significance of areas more complex. Highland region will tend to stand out or dominate in any area-based comparison of results. Whilst Highland undoubtedly presents the most significant opportunity for additional woodlands (with large areas of lightly stocked land), other regions also have substantial areas with similar characteristics. These may also need to be considered, especially if equity of burden sharing in terms of woodland expansion is seen as a priority. Table 4 presents the forage area (in hectares) for each of the LCA groupings cross-tabulated with AgRegion. The table has been shaded to highlight those regions with large areas of particular LCA groupings (dark green for the 75th percentile of area shading to brown for the 25th percentile).

Table 4: Forage area per AgRegion and LCA Grouping

| Forage Area (ha) Region | LCA Grouping | | | | | All LCA |
|----------------------------|----------------|------------------|------------------|------------------|---------------|------------------|
| | Arable | Mixed | Improved | Rough | Other | |
| Argyll & Bute | 736 | 29,479 | 88,861 | 341,812 | 2,882 | 463,770 |
| Ayrshire | 8,746 | 97,280 | 38,456 | 71,456 | 2,166 | 218,105 |
| Clyde Valley | 6,805 | 91,156 | 51,838 | 56,059 | 5,179 | 211,037 |
| Dumfries & Galloway | 10,819 | 144,866 | 136,635 | 154,391 | 1,978 | 448,688 |
| East Central | 2,878 | 46,614 | 32,681 | 100,176 | 1,497 | 183,845 |
| Eileanan an Iar | | 4,265 | 32,489 | 222,804 | 9,357 | 268,917 |
| Fife | 19,228 | 25,197 | 7,202 | 1,713 | 2,068 | 55,408 |
| Highland | 11,705 | 125,768 | 299,706 | 1,506,579 | 17,883 | 1,961,642 |
| Lothian | 23,606 | 25,306 | 22,318 | 10,791 | 2,140 | 84,161 |
| North East Scotland | 22,819 | 250,689 | 77,757 | 173,206 | 1,621 | 526,092 |
| Orkney | | 41,623 | 18,241 | 22,215 | 431 | 82,509 |
| Scottish Borders | 29,866 | 86,466 | 114,570 | 105,941 | 460 | 337,303 |
| Shetland | | 4,031 | 31,880 | 100,026 | 1,597 | 137,534 |
| Tayside | 37,167 | 81,134 | 91,194 | 295,548 | 2,106 | 507,150 |
| No Region | 19 | 152 | 214 | 1,025 | 3,574 | 4,984 |
| All Regions | 174,394 | 1,054,027 | 1,044,043 | 3,163,744 | 54,940 | 5,491,146 |

Table 5 presents the same data but with the forage area as the percentage of the total mapped agricultural area. This table emphasises the differences between the regions in terms of the share of forage land. Better quality land in the west tends to have larger proportions of forage land use on the best quality land, 75% Dumfries and Galloway versus 41% for Fife.

Table 5: Forage area as % of total agricultural area per AgRegion and LCA Grouping

| Forage % of Agric Region | LCA Grouping | | | | | All LCA |
|-----------------------------|--------------|------------|------------|------------|------------|------------|
| | Arable | Mixed | Improved | Rough | Other | |
| Argyll & Bute | 75% | 90% | 88% | 92% | 93% | 91% |
| Ayrshire | 76% | 92% | 91% | 88% | 94% | 90% |
| Clyde Valley | 84% | 91% | 92% | 90% | 88% | 91% |
| Dumfries & Galloway | 75% | 87% | 89% | 88% | 87% | 87% |
| East Central | 56% | 83% | 92% | 96% | 81% | 90% |
| Eileanan an Iar | | 100% | 100% | 100% | 92% | 99% |
| Fife | 41% | 66% | 87% | 83% | 75% | 56% |
| Highland | 50% | 82% | 92% | 96% | 97% | 94% |
| Lothian | 45% | 74% | 87% | 93% | 71% | 66% |
| North East Scotland | 42% | 65% | 81% | 92% | 81% | 72% |
| Orkney | | 91% | 96% | 100% | 96% | 94% |
| Scottish Borders | 45% | 78% | 90% | 92% | 78% | 80% |
| Shetland | | 99% | 100% | 100% | 100% | 100% |
| Tayside | 33% | 69% | 91% | 95% | 75% | 79% |
| No Region | 20% | 80% | 97% | 96% | 95% | 93% |
| All Regions | 44% | 78% | 90% | 95% | 90% | 87% |

6. SUPPORTING TABULAR DATA

6.1. Areas – mapped, forage, stocked and unstocked

Table 6: Total mapped area (ha) per AgRegion and LCA Grouping

| Mapped Area (ha) Region | LCA Grouping | | | | | All LCA |
|----------------------------|----------------|------------------|------------------|------------------|---------------|------------------|
| | Arable | Mixed | Improved | Rough | Other | |
| Argyll & Bute | 979 | 32,743 | 100,641 | 372,023 | 3,105 | 509,491 |
| Ayrshire | 11,493 | 106,274 | 42,260 | 80,852 | 2,317 | 243,196 |
| Clyde Valley | 8,080 | 100,535 | 56,247 | 62,073 | 5,894 | 232,829 |
| Dumfries & Galloway | 14,417 | 167,063 | 153,970 | 175,557 | 2,272 | 513,280 |
| East Central | 5,142 | 56,305 | 35,578 | 104,413 | 1,857 | 203,297 |
| Eileanan an Iar | | 4,277 | 32,541 | 223,555 | 10,121 | 270,494 |
| Fife | 47,161 | 38,180 | 8,320 | 2,070 | 2,757 | 98,488 |
| Highland | 23,246 | 153,141 | 325,481 | 1,565,704 | 18,519 | 2,086,091 |
| Lothian | 52,413 | 34,222 | 25,664 | 11,660 | 3,011 | 126,970 |
| North East Scotland | 54,949 | 386,289 | 96,510 | 187,602 | 1,996 | 727,346 |
| Orkney | | 45,629 | 19,021 | 22,296 | 448 | 87,394 |
| Scottish Borders | 65,677 | 111,049 | 127,019 | 114,946 | 590 | 419,282 |
| Shetland | | 4,084 | 31,991 | 100,040 | 1,599 | 137,714 |
| Tayside | 112,991 | 117,888 | 99,930 | 311,238 | 2,820 | 644,867 |
| No Region | 95 | 191 | 220 | 1,072 | 3,767 | 5,345 |
| All Regions | 396,645 | 1,357,871 | 1,155,394 | 3,335,101 | 61,073 | 6,306,084 |

Table 7: Total forage area (ha) per Region and LCA Grouping

| Forage Area (ha) Region | LCA Grouping | | | | | All LCA |
|----------------------------|----------------|------------------|------------------|------------------|---------------|------------------|
| | Arable | Mixed | Improved | Rough | Other | |
| Argyll & Bute | 736 | 29,479 | 88,861 | 341,812 | 2,882 | 463,770 |
| Ayrshire | 8,746 | 97,280 | 38,456 | 71,456 | 2,166 | 218,105 |
| Clyde Valley | 6,805 | 91,156 | 51,838 | 56,059 | 5,179 | 211,037 |
| Dumfries & Galloway | 10,819 | 144,866 | 136,635 | 154,391 | 1,978 | 448,688 |
| East Central | 2,878 | 46,614 | 32,681 | 100,176 | 1,497 | 183,845 |
| Eileanan an Iar | | 4,265 | 32,489 | 222,804 | 9,357 | 268,917 |
| Fife | 19,228 | 25,197 | 7,202 | 1,713 | 2,068 | 55,408 |
| Highland | 11,705 | 125,768 | 299,706 | 1,506,579 | 17,883 | 1,961,642 |
| Lothian | 23,606 | 25,306 | 22,318 | 10,791 | 2,140 | 84,161 |
| North East Scotland | 22,819 | 250,689 | 77,757 | 173,206 | 1,621 | 526,092 |
| Orkney | | 41,623 | 18,241 | 22,215 | 431 | 82,509 |
| Scottish Borders | 29,866 | 86,466 | 114,570 | 105,941 | 460 | 337,303 |
| Shetland | | 4,031 | 31,880 | 100,026 | 1,597 | 137,534 |
| Tayside | 37,167 | 81,134 | 91,194 | 295,548 | 2,106 | 507,150 |
| No Region | 19 | 152 | 214 | 1,025 | 3,574 | 4,984 |
| All Regions | 174,394 | 1,054,027 | 1,044,043 | 3,163,744 | 54,940 | 5,491,146 |

Table 8: Total stocked forage area (ha) per AgRegion and LCA Grouping

| Stocked Area (ha) Region | LCA Grouping | | | | | All LCA |
|-----------------------------|----------------|----------------|----------------|------------------|---------------|------------------|
| | Arable | Mixed | Improved | Rough | Other | |
| Argyll & Bute | 687 | 26,438 | 76,757 | 278,126 | 2,421 | 384,430 |
| Ayrshire | 6,974 | 84,386 | 32,943 | 62,812 | 1,686 | 188,801 |
| Clyde Valley | 5,362 | 74,048 | 43,542 | 47,920 | 3,595 | 174,467 |
| Dumfries & Galloway | 9,026 | 128,773 | 115,644 | 121,360 | 1,356 | 376,159 |
| East Central | 2,125 | 34,765 | 25,767 | 91,771 | 919 | 155,347 |
| Eileanan an Iar | | 3,354 | 27,771 | 195,501 | 8,418 | 235,045 |
| Fife | 11,252 | 18,817 | 6,015 | 1,421 | 1,123 | 38,628 |
| Highland | 6,620 | 96,429 | 237,706 | 1,098,907 | 11,797 | 1,451,458 |
| Lothian | 12,558 | 20,928 | 19,979 | 10,055 | 875 | 64,394 |
| North East Scotland | 15,163 | 187,076 | 56,047 | 126,148 | 916 | 385,350 |
| Orkney | | 37,691 | 15,806 | 16,751 | 394 | 70,643 |
| Scottish Borders | 18,924 | 74,988 | 101,790 | 89,066 | 275 | 285,042 |
| Shetland | | 3,618 | 29,832 | 95,897 | 1,519 | 130,867 |
| Tayside | 19,509 | 60,905 | 73,842 | 249,828 | 1,158 | 405,242 |
| No Region | 15 | 133 | 115 | 748 | 2,672 | 3,683 |
| All Regions | 108,214 | 852,349 | 863,556 | 2,486,312 | 39,125 | 4,349,556 |

Table 9 Total unstocked forage area (ha) per AgRegion and LCA Grouping

| Unstocked Area (ha) Region | LCA Grouping | | | | | All LCA |
|-------------------------------|---------------|----------------|----------------|----------------|---------------|------------------|
| | Arable | Mixed | Improved | Rough | Other | |
| Argyll & Bute | 49 | 3,040 | 12,104 | 63,685 | 462 | 79,340 |
| Ayrshire | 1,772 | 12,895 | 5,513 | 8,644 | 480 | 29,304 |
| Clyde Valley | 1,443 | 17,108 | 8,296 | 8,139 | 1,584 | 36,570 |
| Dumfries & Galloway | 1,793 | 16,093 | 20,991 | 33,031 | 621 | 72,529 |
| East Central | 752 | 11,849 | 6,914 | 8,404 | 578 | 28,498 |
| Eileanan an Iar | - | 912 | 4,718 | 27,303 | 939 | 33,872 |
| Fife | 7,976 | 6,380 | 1,187 | 292 | 945 | 16,780 |
| Highland | 5,086 | 29,339 | 62,001 | 407,672 | 6,086 | 510,184 |
| Lothian | 11,048 | 4,378 | 2,339 | 737 | 1,265 | 19,767 |
| North East Scotland | 7,656 | 63,613 | 21,710 | 47,058 | 705 | 140,742 |
| Orkney | - | 3,932 | 2,434 | 5,464 | 36 | 11,867 |
| Scottish Borders | 10,942 | 11,478 | 12,781 | 16,875 | 184 | 52,261 |
| Shetland | - | 413 | 2,048 | 4,128 | 78 | 6,667 |
| Tayside | 17,658 | 20,229 | 17,352 | 45,720 | 949 | 101,908 |
| No Region | 4 | 19 | 99 | 278 | 902 | 1,301 |
| All Regions | 66,180 | 201,678 | 180,486 | 677,431 | 15,815 | 1,141,590 |

6.2. Livestock Numbers

Table 10: Total Livestock Units per AgRegion and LCA Grouping

| Total LSU Region | LCA Grouping | | | | | All LCA |
|---------------------|----------------|------------------|----------------|----------------|---------------|------------------|
| | LCA Arable | LCA Mixed | LCA Improv | LCA Rough | LCA Other | |
| Argyll & Bute | 1,327 | 20,021 | 25,112 | 40,504 | 634 | 87,599 |
| Ayrshire | 13,200 | 124,317 | 22,672 | 23,412 | 1,668 | 185,268 |
| Clyde Valley | 8,493 | 96,576 | 25,072 | 12,233 | 4,211 | 146,585 |
| Dumfries & Galloway | 21,364 | 203,778 | 103,603 | 51,462 | 1,831 | 382,039 |
| East Central | 3,798 | 37,451 | 10,357 | 14,639 | 960 | 67,205 |
| Eileanan an Iar | | 811 | 4,258 | 12,468 | 561 | 18,097 |
| Fife | 23,106 | 29,375 | 8,531 | 1,620 | 1,525 | 64,156 |
| Highland | 9,359 | 66,767 | 35,150 | 91,165 | 1,562 | 204,003 |
| Lothian | 21,927 | 22,941 | 11,481 | 3,221 | 1,190 | 60,761 |
| North East Scotland | 36,996 | 298,451 | 27,808 | 19,692 | 1,006 | 383,954 |
| Orkney | | 45,606 | 15,007 | 7,175 | 313 | 68,101 |
| Scottish Borders | 30,960 | 73,144 | 57,298 | 22,781 | 258 | 184,441 |
| Shetland | | 973 | 6,904 | 15,894 | 334 | 24,105 |
| Tayside | 51,698 | 64,896 | 25,360 | 36,948 | 817 | 179,719 |
| No Region | 24 | 139 | 37 | 330 | 794 | 1,325 |
| All Regions | 222,252 | 1,085,245 | 378,650 | 353,545 | 17,663 | 2,057,357 |

Note that it is not possible to derive the average SRs simply by combining the total LSU and the forage area. The average SR is an area weighted average of the individual SR bins not the overall totals.

6.3. Area Weighted Average Intermediate Tables

Table 11: Distribution of forage areas (ha) per stocking rate, AgRegion, LCA Grouping

| Forage Area (ha) | | LCA Group | | | | | All LCA |
|---------------------|------------|---------------|----------------|----------------|----------------|--------------|----------------|
| Region | Bin Values | Arable | Mixed | Improv | Rough | Other | |
| Argyll & Bute | All SRs | 736 | 29,479 | 88,861 | 341,812 | 2,882 | 463,770 |
| | SR=0 | 49 | 3,040 | 12,104 | 63,685 | 462 | 79,340 |
| | SR<=0.25 | 8 | 6,561 | 43,144 | 240,060 | 1,759 | 291,533 |
| | SR<=0.5 | 44 | 7,064 | 20,889 | 31,806 | 422 | 60,225 |
| | SR<=1.0 | 215 | 6,490 | 8,796 | 5,525 | 141 | 21,167 |
| | SR<=2.0 | 218 | 4,271 | 3,360 | 687 | 65 | 8,601 |
| | SR<=4.0 | 109 | 2,028 | 536 | 48 | 31 | 2,752 |
| | SR>>4.0 | 93 | 25 | 31 | - | 3 | 152 |
| Ayrshire | All SRs | 8,746 | 97,280 | 38,456 | 71,456 | 2,166 | 218,105 |
| | SR=0 | 1,772 | 12,895 | 5,513 | 8,644 | 480 | 29,304 |
| | SR<=0.25 | 346 | 5,679 | 9,142 | 31,841 | 181 | 47,189 |
| | SR<=0.5 | 403 | 6,180 | 5,659 | 11,263 | 461 | 23,967 |
| | SR<=1.0 | 740 | 19,212 | 12,297 | 17,776 | 400 | 50,426 |
| | SR<=2.0 | 2,573 | 32,046 | 4,768 | 1,512 | 391 | 41,291 |
| | SR<=4.0 | 2,602 | 20,210 | 935 | 364 | 238 | 24,350 |
| | SR>>4.0 | 308 | 1,058 | 141 | 56 | 15 | 1,578 |
| Clyde Valley | All SRs | 6,805 | 91,156 | 51,838 | 56,059 | 5,179 | 211,037 |
| | SR=0 | 1,443 | 17,108 | 8,296 | 8,139 | 1,584 | 36,570 |
| | SR<=0.25 | 328 | 5,458 | 12,892 | 32,958 | 308 | 51,944 |
| | SR<=0.5 | 271 | 7,665 | 12,878 | 8,125 | 304 | 29,242 |
| | SR<=1.0 | 959 | 19,514 | 11,326 | 5,710 | 1,618 | 39,127 |
| | SR<=2.0 | 2,357 | 28,757 | 5,256 | 1,013 | 953 | 38,335 |
| | SR<=4.0 | 1,438 | 11,763 | 1,134 | 101 | 354 | 14,789 |
| | SR>>4.0 | 9 | 892 | 56 | 13 | 59 | 1,030 |
| Dumfries & Galloway | All SRs | 10,819 | 144,866 | 136,635 | 154,391 | 1,978 | 448,688 |
| | SR=0 | 1,793 | 16,093 | 20,991 | 33,031 | 621 | 72,529 |
| | SR<=0.25 | 253 | 6,233 | 17,251 | 53,638 | 121 | 77,496 |
| | SR<=0.5 | 210 | 12,715 | 29,791 | 39,492 | 59 | 82,268 |
| | SR<=1.0 | 685 | 25,214 | 32,517 | 19,514 | 456 | 78,386 |
| | SR<=2.0 | 3,273 | 50,263 | 26,467 | 7,165 | 523 | 87,691 |
| | SR<=4.0 | 3,702 | 30,156 | 8,654 | 1,245 | 149 | 43,906 |
| | SR>>4.0 | 904 | 4,191 | 964 | 305 | 48 | 6,413 |
| East Central | All SRs | 2,878 | 46,614 | 32,681 | 100,176 | 1,497 | 183,845 |
| | SR=0 | 752 | 11,849 | 6,914 | 8,404 | 578 | 28,498 |
| | SR<=0.25 | 230 | 3,991 | 12,446 | 73,177 | 156 | 90,001 |
| | SR<=0.5 | 187 | 5,228 | 7,254 | 17,428 | 134 | 30,231 |
| | SR<=1.0 | 399 | 10,444 | 3,896 | 955 | 236 | 15,931 |
| | SR<=2.0 | 607 | 11,226 | 1,855 | 182 | 286 | 14,156 |
| | SR<=4.0 | 543 | 3,426 | 294 | 29 | 100 | 4,393 |
| | SR>>4.0 | 158 | 450 | 21 | 0 | 6 | 635 |
| Eileanan an Iar | All SRs | - | 4,265 | 32,489 | 222,804 | 9,357 | 268,917 |

| | | | | | | | |
|------------------------|----------|---------------|----------------|----------------|------------------|---------------|------------------|
| | SR=0 | 912 | 4,718 | 27,303 | 939 | 33,872 | |
| | SR<=0.25 | 2,679 | 24,796 | 193,063 | 8,306 | 228,845 | |
| | SR<=0.5 | 292 | 2,076 | 1,603 | 59 | 4,030 | |
| | SR<=1.0 | 319 | 577 | 550 | 42 | 1,488 | |
| | SR<=2.0 | 30 | 179 | 140 | 5 | 353 | |
| | SR<=4.0 | 22 | 110 | 116 | 6 | 254 | |
| | SR>>4.0 | 11 | 33 | 29 | 1 | 74 | |
| Fife | All SRs | 19,228 | 25,197 | 7,202 | 1,713 | 2,068 | 55,408 |
| | SR=0 | 7,976 | 6,380 | 1,187 | 292 | 945 | 16,780 |
| | SR<=0.25 | 697 | 965 | 145 | 20 | 27 | 1,854 |
| | SR<=0.5 | 1,009 | 826 | 286 | 59 | 194 | 2,375 |
| | SR<=1.0 | 1,624 | 4,705 | 2,567 | 763 | 298 | 9,958 |
| | SR<=2.0 | 4,286 | 7,811 | 2,211 | 453 | 417 | 15,178 |
| | SR<=4.0 | 2,198 | 3,627 | 418 | 96 | 134 | 6,474 |
| | SR>>4.0 | 1,438 | 883 | 388 | 29 | 51 | 2,790 |
| Highland | All SRs | 11,705 | 125,768 | 299,706 | 1,506,579 | 17,883 | 1,961,642 |
| | SR=0 | 5086 | 29339 | 62001 | 407672 | 6086 | 510,184 |
| | SR<=0.25 | 673 | 31437 | 201890 | 1009235 | 10402 | 1,253,638 |
| | SR<=0.5 | 905 | 15905 | 20467 | 77773 | 683 | 115,733 |
| | SR<=1.0 | 1654 | 25194 | 10603 | 9243 | 328 | 47,021 |
| | SR<=2.0 | 2234 | 19730 | 4225 | 2171 | 334 | 28,693 |
| | SR<=4.0 | 724 | 3576 | 430 | 341 | 43 | 5,114 |
| | SR>>4.0 | 430 | 587 | 91 | 144 | 6 | 1,259 |
| Lothian | All SRs | 23,606 | 25,306 | 22,318 | 10,791 | 2,140 | 84,161 |
| | SR=0 | 11,048 | 4,378 | 2,339 | 737 | 1,265 | 19,767 |
| | SR<=0.25 | 1,745 | 1,966 | 7,568 | 6,647 | 64 | 17,990 |
| | SR<=0.5 | 720 | 2,848 | 4,276 | 1,690 | 145 | 9,678 |
| | SR<=1.0 | 2,412 | 7,887 | 5,299 | 1,264 | 257 | 17,119 |
| | SR<=2.0 | 4,395 | 6,020 | 2,439 | 382 | 258 | 13,494 |
| | SR<=4.0 | 2,197 | 1,934 | 267 | 41 | 119 | 4,558 |
| | SR>>4.0 | 1,090 | 272 | 130 | 31 | 32 | 1,555 |
| North East Scotland | All SRs | 22,819 | 250,689 | 77,757 | 173,206 | 1,621 | 526,092 |
| | SR=0 | 7,656 | 63,613 | 21,710 | 47,058 | 705 | 140,742 |
| | SR<=0.25 | 977 | 14,599 | 25,814 | 103,725 | 377 | 145,491 |
| | SR<=0.5 | 522 | 16,143 | 14,975 | 16,186 | 26 | 47,853 |
| | SR<=1.0 | 1,790 | 39,370 | 9,069 | 3,484 | 105 | 53,818 |
| | SR<=2.0 | 5,166 | 72,104 | 4,574 | 2,114 | 272 | 84,230 |
| | SR<=4.0 | 5,337 | 37,466 | 1,396 | 537 | 114 | 44,850 |
| | SR>>4.0 | 1,371 | 7,393 | 219 | 103 | 22 | 9,108 |
| Orkney | All SRs | - | 41,623 | 18,241 | 22,215 | 431 | 82,509 |
| | SR=0 | | 3,932 | 2,434 | 5,464 | 36 | 11,867 |
| | SR<=0.25 | | 3,012 | 2,768 | 10,152 | 144 | 16,076 |
| | SR<=0.5 | | 3,215 | 1,874 | 1,647 | 27 | 6,764 |
| | SR<=1.0 | | 7,813 | 4,517 | 2,708 | 86 | 15,124 |
| | SR<=2.0 | | 20,248 | 5,567 | 1,883 | 122 | 27,820 |
| | SR<=4.0 | | 3,118 | 910 | 360 | 11 | 4,400 |

| | | | | | | | |
|------------------|----------|----------------|------------------|------------------|------------------|---------------|------------------|
| | SR>>4.0 | | 285 | 171 | - | 3 | 459 |
| Scottish Borders | All SRs | 29,866 | 86,466 | 114,570 | 105,941 | 460 | 337,303 |
| | SR=0 | 10,942 | 11,478 | 12,781 | 16,875 | 184 | 52,261 |
| | SR<=0.25 | 817 | 7,594 | 24,162 | 59,302 | 58 | 91,932 |
| | SR<=0.5 | 1,178 | 9,464 | 30,577 | 21,825 | 61 | 63,105 |
| | SR<=1.0 | 5,394 | 28,843 | 33,349 | 6,056 | 89 | 73,730 |
| | SR<=2.0 | 6,501 | 23,738 | 12,633 | 1,662 | 45 | 44,580 |
| | SR<=4.0 | 3,907 | 5,155 | 1,010 | 216 | 16 | 10,304 |
| | SR>>4.0 | 1,127 | 194 | 58 | 5 | 7 | 1,391 |
| Shetland | All SRs | - | 4,031 | 31,880 | 100,026 | 1,597 | 137,534 |
| | SR=0 | | 413 | 2,048 | 4,128 | 78 | 6,667 |
| | SR<=0.25 | | 2,550 | 22,390 | 86,486 | 1,321 | 112,748 |
| | SR<=0.5 | | 557 | 4,763 | 7,687 | 129 | 13,136 |
| | SR<=1.0 | | 444 | 2,308 | 1,466 | 58 | 4,275 |
| | SR<=2.0 | | 64 | 314 | 166 | 4 | 548 |
| | SR<=4.0 | | 3 | 37 | 20 | 1 | 61 |
| | SR>>4.0 | | - | 20 | 73 | 6 | 99 |
| Tayside | All SRs | 37,167 | 81,134 | 91,194 | 295,548 | 2,106 | 507,150 |
| | SR=0 | 17,658 | 20,229 | 17,352 | 45,720 | 949 | 101,908 |
| | SR<=0.25 | 1,704 | 13,931 | 45,129 | 209,037 | 706 | 270,506 |
| | SR<=0.5 | 2,095 | 10,261 | 14,089 | 35,149 | 146 | 61,740 |
| | SR<=1.0 | 3,431 | 16,222 | 9,378 | 4,128 | 85 | 33,244 |
| | SR<=2.0 | 5,119 | 14,476 | 4,292 | 1,127 | 90 | 25,104 |
| | SR<=4.0 | 4,913 | 4,645 | 803 | 297 | 76 | 10,734 |
| | SR>>4.0 | 2,246 | 1,370 | 152 | 90 | 55 | 3,913 |
| No Region | All SRs | 19 | 152 | 214 | 1,025 | 3,574 | 4,984 |
| | SR=0 | 4 | 19 | 99 | 278 | 902 | 1,301 |
| | SR<=0.25 | 1 | 29 | 80 | 481 | 1933 | 2,523 |
| | SR<=0.5 | 1 | 14 | 10 | 96 | 211 | 332 |
| | SR<=1.0 | 1 | 38 | 16 | 55 | 371 | 481 |
| | SR<=2.0 | 10 | 46 | 7 | 89 | 129 | 281 |
| | SR<=4.0 | 3 | 5 | 2 | 24 | 20 | 53 |
| | SR>>4.0 | 0 | 2 | 0 | 3 | 9 | 15 |
| All Regions | All SRs | 174,394 | 1,054,027 | 1,044,043 | 3,163,744 | 54,940 | 5,491,146 |
| | SR=0* | 66,180 | 201,678 | 180,486 | 677,431 | 15,815 | 1,141,590 |
| | SR<=0.25 | 7,777 | 106,685 | 449,618 | 2,109,822 | 25,862 | 2,699,764 |
| | SR<=0.5 | 7,546 | 98,377 | 169,866 | 271,829 | 3,062 | 550,679 |
| | SR<=1.0 | 19,303 | 211,709 | 146,514 | 79,197 | 4,571 | 461,294 |
| | SR<=2.0 | 36,739 | 290,829 | 78,148 | 20,746 | 3,894 | 430,356 |
| | SR<=4.0 | 27,673 | 127,135 | 16,937 | 3,837 | 1,412 | 176,993 |
| | SR>>4.0 | 9,176 | 17,613 | 2,474 | 882 | 324 | 30,470 |

* note that the zero SR class includes 49,824 Ha of temporary grassland and 92,533 Ha of permanent grassland where no stack were associated with the holding in JAC or DS.

Table 12: Distribution of Average SR values per stocking rate, AgRegion, LCA Grouping

| Average SR per bin | | LCA_CLASS | | | | | |
|---------------------|----------|-----------|-------|--------|-------|-------|---------|
| Region | Bins | Arable | Mixed | Improv | Rough | Other | All LCA |
| Argyll & Bute | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | 0.24 | 0.15 | 0.14 | 0.13 | 0.12 | 0.13 |
| | SR<=0.5 | 0.44 | 0.36 | 0.36 | 0.36 | 0.35 | 0.36 |
| | SR<=1.0 | 0.72 | 0.73 | 0.70 | 0.65 | 0.67 | 0.70 |
| | SR<=2.0 | 1.65 | 1.50 | 1.47 | 1.49 | 1.55 | 1.49 |
| | SR<=4.0 | 2.92 | 2.55 | 2.46 | 2.44 | 2.55 | 2.54 |
| | SR>>4.0 | 4.73 | 5.23 | 8.25 | | 7.79 | 5.77 |
| Ayrshire | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | 0.17 | 0.15 | 0.14 | 0.14 | 0.15 | 0.15 |
| | SR<=0.5 | 0.36 | 0.39 | 0.38 | 0.39 | 0.37 | 0.38 |
| | SR<=1.0 | 0.74 | 0.73 | 0.72 | 0.73 | 0.73 | 0.73 |
| | SR<=2.0 | 1.50 | 1.47 | 1.42 | 1.38 | 1.42 | 1.46 |
| | SR<=4.0 | 2.61 | 2.56 | 2.42 | 2.54 | 2.51 | 2.56 |
| | SR>>4.0 | 5.14 | 7.38 | 15.82 | 28.90 | 5.88 | 8.45 |
| Clyde Valley | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | 0.14 | 0.15 | 0.15 | 0.13 | 0.14 | 0.14 |
| | SR<=0.5 | 0.37 | 0.38 | 0.35 | 0.37 | 0.37 | 0.37 |
| | SR<=1.0 | 0.73 | 0.75 | 0.76 | 0.74 | 0.78 | 0.76 |
| | SR<=2.0 | 1.52 | 1.47 | 1.40 | 1.36 | 1.46 | 1.46 |
| | SR<=4.0 | 2.72 | 2.59 | 2.55 | 2.60 | 2.66 | 2.60 |
| | SR>>4.0 | 10.07 | 6.81 | 9.05 | 4.79 | 6.94 | 7.02 |
| Dumfries & Galloway | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | 0.12 | 0.16 | 0.17 | 0.17 | 0.15 | 0.16 |
| | SR<=0.5 | 0.33 | 0.38 | 0.37 | 0.37 | 0.36 | 0.37 |
| | SR<=1.0 | 0.75 | 0.78 | 0.76 | 0.73 | 0.79 | 0.76 |
| | SR<=2.0 | 1.55 | 1.48 | 1.43 | 1.37 | 1.47 | 1.46 |
| | SR<=4.0 | 2.72 | 2.61 | 2.57 | 2.56 | 2.67 | 2.61 |
| | SR>>4.0 | 5.89 | 6.15 | 6.58 | 6.24 | 7.16 | 6.22 |
| East Central | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | 0.11 | 0.15 | 0.13 | 0.12 | 0.13 | 0.13 |
| | SR<=0.5 | 0.36 | 0.37 | 0.35 | 0.34 | 0.39 | 0.36 |
| | SR<=1.0 | 0.78 | 0.78 | 0.75 | 0.72 | 0.75 | 0.77 |
| | SR<=2.0 | 1.51 | 1.33 | 1.29 | 1.24 | 1.37 | 1.34 |
| | SR<=4.0 | 2.55 | 2.54 | 2.40 | 2.44 | 2.37 | 2.52 |
| | SR>>4.0 | 11.98 | 6.86 | 7.07 | 5.07 | 12.09 | 8.36 |
| Eileanan an Iar | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | | 0.10 | 0.10 | 0.09 | 0.08 | 0.09 |
| | SR<=0.5 | | 0.36 | 0.35 | 0.34 | 0.35 | 0.35 |
| | SR<=1.0 | | 0.73 | 0.68 | 0.69 | 0.68 | 0.69 |
| | SR<=2.0 | | 1.44 | 1.48 | 1.39 | 1.29 | 1.42 |
| | SR<=4.0 | | 2.69 | 2.78 | 2.69 | 2.82 | 2.75 |
| | SR>>4.0 | | 6.00 | 13.32 | 14.44 | 15.93 | 12.80 |

| | | | | | | | |
|---------------------|----------|-------|------|-------|-------|------|------|
| Fife | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | 0.09 | 0.08 | 0.08 | 0.08 | 0.04 | 0.08 |
| | SR<=0.5 | 0.37 | 0.38 | 0.44 | 0.39 | 0.41 | 0.39 |
| | SR<=1.0 | 0.76 | 0.77 | 0.77 | 0.74 | 0.77 | 0.76 |
| | SR<=2.0 | 1.47 | 1.39 | 1.38 | 1.43 | 1.40 | 1.41 |
| | SR<=4.0 | 2.52 | 2.56 | 2.58 | 2.64 | 2.50 | 2.55 |
| Highland | SR>>4.0 | 7.06 | 6.87 | 6.62 | 5.60 | 6.31 | 6.85 |
| | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | 0.12 | 0.11 | 0.10 | 0.09 | 0.07 | 0.10 |
| | SR<=0.5 | 0.37 | 0.37 | 0.36 | 0.35 | 0.35 | 0.36 |
| | SR<=1.0 | 0.77 | 0.75 | 0.72 | 0.72 | 0.72 | 0.74 |
| | SR<=2.0 | 1.47 | 1.34 | 1.29 | 1.36 | 1.35 | 1.35 |
| Lothian | SR<=4.0 | 2.50 | 2.47 | 2.46 | 2.50 | 2.61 | 2.48 |
| | SR>>4.0 | 5.89 | 6.92 | 8.34 | 6.54 | 4.82 | 6.72 |
| | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | 0.12 | 0.15 | 0.14 | 0.15 | 0.13 | 0.14 |
| | SR<=0.5 | 0.35 | 0.37 | 0.37 | 0.38 | 0.37 | 0.37 |
| | SR<=1.0 | 0.76 | 0.77 | 0.76 | 0.80 | 0.78 | 0.77 |
| North East Scotland | SR<=2.0 | 1.41 | 1.36 | 1.35 | 1.29 | 1.39 | 1.37 |
| | SR<=4.0 | 2.77 | 2.62 | 2.56 | 2.64 | 2.61 | 2.67 |
| | SR>>4.0 | 7.51 | 8.28 | 9.42 | 5.81 | 7.27 | 7.84 |
| | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | 0.10 | 0.13 | 0.12 | 0.10 | 0.09 | 0.12 |
| | SR<=0.5 | 0.40 | 0.39 | 0.37 | 0.37 | 0.41 | 0.38 |
| Orkney | SR<=1.0 | 0.78 | 0.77 | 0.76 | 0.77 | 0.78 | 0.77 |
| | SR<=2.0 | 1.54 | 1.44 | 1.43 | 1.44 | 1.44 | 1.45 |
| | SR<=4.0 | 2.78 | 2.65 | 2.67 | 2.59 | 2.63 | 2.67 |
| | SR>>4.0 | 10.40 | 8.05 | 12.33 | 9.25 | 6.32 | 8.68 |
| | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | - | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 |
| Scottish Borders | SR<=0.5 | - | 0.38 | 0.36 | 0.37 | 0.38 | 0.38 |
| | SR<=1.0 | - | 0.79 | 0.80 | 0.76 | 0.76 | 0.79 |
| | SR<=2.0 | - | 1.44 | 1.38 | 1.39 | 1.42 | 1.42 |
| | SR<=4.0 | - | 2.40 | 2.39 | 2.29 | 2.42 | 2.40 |
| | SR>>4.0 | - | 6.53 | 4.91 | - | 4.49 | 5.77 |
| | SR=0 | - | - | - | - | - | - |
| Shetland | SR<=0.25 | 0.09 | 0.14 | 0.15 | 0.14 | 0.14 | 0.15 |
| | SR<=0.5 | 0.39 | 0.38 | 0.37 | 0.37 | 0.37 | 0.37 |
| | SR<=1.0 | 0.77 | 0.76 | 0.73 | 0.72 | 0.74 | 0.75 |
| | SR<=2.0 | 1.44 | 1.34 | 1.27 | 1.23 | 1.37 | 1.33 |
| | SR<=4.0 | 2.66 | 2.57 | 2.43 | 2.56 | 2.53 | 2.58 |
| | SR>>4.0 | 6.49 | 8.42 | 6.59 | 21.69 | 7.16 | 7.14 |
| Shetland | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | - | 0.15 | 0.14 | 0.14 | 0.13 | 0.14 |
| | SR<=0.5 | - | 0.38 | 0.36 | 0.34 | 0.34 | 0.35 |
| | SR<=1.0 | - | 0.71 | 0.68 | 0.67 | 0.68 | 0.68 |

| | | | | | | | |
|-------------|----------|-------|-------|------|-------|-------|-------|
| | SR<=2.0 | | 1.26 | 1.29 | 1.24 | 1.24 | 1.27 |
| | SR<=4.0 | | 2.58 | 2.58 | 2.45 | 3.62 | 2.77 |
| | SR>>4.0 | | | 6.28 | 13.50 | 10.80 | 8.43 |
| Tayside | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | 0.12 | 0.14 | 0.12 | 0.11 | 0.11 | 0.12 |
| | SR<=0.5 | 0.38 | 0.38 | 0.38 | 0.37 | 0.37 | 0.38 |
| | SR<=1.0 | 0.76 | 0.74 | 0.71 | 0.71 | 0.73 | 0.73 |
| | SR<=2.0 | 1.43 | 1.35 | 1.28 | 1.33 | 1.34 | 1.35 |
| | SR<=4.0 | 2.79 | 2.64 | 2.45 | 2.49 | 2.72 | 2.67 |
| | SR>>4.0 | 11.88 | 11.34 | 5.57 | 6.45 | 9.47 | 11.13 |
| No Region | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | 0.11 | 0.11 | 0.11 | 0.10 | 0.11 | 0.11 |
| | SR<=0.5 | 0.34 | 0.36 | 0.35 | 0.34 | 0.35 | 0.35 |
| | SR<=1.0 | 0.77 | 0.75 | 0.69 | 0.73 | 0.71 | 0.72 |
| | SR<=2.0 | 1.52 | 1.43 | 1.40 | 1.39 | 1.36 | 1.40 |
| | SR<=4.0 | 2.37 | 2.66 | 2.52 | 2.55 | 2.59 | 2.58 |
| | SR>>4.0 | 4.89 | 5.46 | 7.70 | 9.23 | 7.56 | 7.00 |
| All Regions | SR=0 | - | - | - | - | - | - |
| | SR<=0.25 | 0.12 | 0.13 | 0.13 | 0.12 | 0.10 | 0.12 |
| | SR<=0.5 | 0.37 | 0.38 | 0.37 | 0.36 | 0.36 | 0.37 |
| | SR<=1.0 | 0.76 | 0.76 | 0.74 | 0.73 | 0.74 | 0.75 |
| | SR<=2.0 | 1.49 | 1.43 | 1.39 | 1.37 | 1.42 | 1.43 |
| | SR<=4.0 | 2.70 | 2.60 | 2.54 | 2.55 | 2.59 | 2.60 |
| | SR>>4.0 | 8.43 | 7.48 | 8.24 | 9.26 | 7.33 | 7.87 |