



INVESTIGATION OF INDICATORS FOR GREENING MEASURES: PERMANENT GRASSLAND AND SEMI- NATURAL AREA

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ABOUT THE FLINT PROJECT

FLINT will provide an updated data-infrastructure needed by the agro-food sector and policy makers to provide up to date information on farm level indicators on sustainability and other new relevant issues. Better decision making will be facilitated by taking into account the sustainability performance of farms on a wide range of relevant topics, such as (1) market stabilization; (2) income support; (3) environmental sustainability; (4) climate change adaptation and mitigation; (5) innovation; and (6) resource efficiency. The approach will explicitly consider the heterogeneity of the farming sector in the EU and its member states. Together with the farming and agro-food sector the feasibility of these indicators will be determined.

FLINT will take into account the increasing needs for sustainability information by national and international retail and agro-food sectors. The FLINT approach is supported by the Sustainable Agriculture Initiative Platform and the Sustainability Consortium in which the agro-food sector actively participates. FLINT will establish a pilot network of at least 1000 farms (representative of farm diversity at EU level, including the different administrative environments in the different MS) that is well suited for the gathering of these data.

The lessons learned and recommendations from the empirical research conducted in 9 purposefully chosen MS will be used for estimating and discussing effects in all 28 MS. This will be very useful if the European Commission should decide to upgrade the pilot network to an operational EU-wide system.

PROJECT CONSORTIUM:

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2	AKI - Agrargazdasagi Kutato Intezet	Hungary
3	LUKE Finland	Finland
4	IERiGZ-PIB - Instytut Ekonomiki Rolnictwa i Gospodarki Zywnosciowej-Panstwowy Instytut Badawcy	Poland
5	INTIA - Instituto Navarro De Tecnologias e Infraestructuras Agrolimentarias	Spain
6	ZALF - Leibniz Centre for Agricultural Landscape Research	Germany
7	Teagasc - The Agriculture and Food Development Authority of Ireland	Ireland
8	Demeter - Hellenic Agricultural Organization	Greece
9	INRA - Institut National de la Recherche Agronomique	France
10	CROP-R BV	Netherlands
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EXECUTIVE SUMMARY

'Greening' measures were introduced as part of the 2013 Common Agricultural Policy (CAP) reforms with the aim of promoting environmentally beneficial farming practices. In particular, permanent grassland must be maintained, in the expectation that it will provide carbon sequestration and benefit local biodiversity. However, there is currently little relevant data beyond the area of farmland that is currently managed as permanent pasture, despite important differences in the the different types of permanent grassland. This case study presents a simple summary of novel indicators developed to address this information gap. These include the proportion of permanent grassland that is managed intensively or extensively ($>$ or $<$ 50 kg N/ha per year respectively), the proportion of permanent grassland that is both managed extensively and with designated nature protection, and the area covered by semi-natural habitats. The results show considerable variation in how permanent grassland is managed between countries and between systems. These data would allow for several useful lines of enquiry in the future, but some limitations are noted, including concerns with data collection in this pilot study.

1 INTRODUCTION

As part of new Common Agricultural (CAP) greening requirements, a number of area-based payments have been implemented to provide environmental and climate related benefits. In particular, permanent grassland has been identified as an important feature for farms to maintain or develop. It is considered important because of the ability of permanent grasslands to capture organic matter in the soil and reduce losses of greenhouse gases from farmland in addition to the contribution of semi-natural grasslands to biodiversity conservation.

Debates on CAP reform have centred on the validity of the assumption of the equivalent environmental (greening) contribution by, for example, species-rich, extensively managed grasslands on the one hand, and 5-10 year old intensively managed grass monocultures on the other. However, there is relatively little information on the composition of these different states of permanent grassland, and the different benefits that are associated with them. Given the policy relevance of this topic, FLINT collected data on novel measures of what proportion of a farm is composed of permanent grassland that is intensively managed and/or extensively managed with wild plant species (with and without nature conservation).

As noted above, an important obstacle in doing this analysis up to now has been the lack of data. The analysis here relies on the data collected via the FLINT project. These are farm-level data for a sample of farmers of the Farm Accountancy Data Network (FADN) in several European Union (EU) countries (The Netherlands, Hungary, Finland, Poland, Spain, Ireland, Greece, France and Germany). The data include accountancy data from FADN (here after: 'FADN data'), as well as additional data on economic, environmental and social sustainability of farms. These additional data, the 'FLINT data', were collected via face-to-face survey or merging of existing data, depending on the country. The FADN and FLINT data relate to accountancy year 2015, except for France and Germany for which it is 2014.

2 METHODOLOGY AND DATA

2.1 Methodology

The indicators developed to explore the impacts of CAP greening on the type and extent of permanent grasslands, are based on relevant land use areas. The specific land use definitions are a combination of FADN and FLINT categories and are described in the data selection below.

The CAP greening measures require only the presence of permanent grassland, without any assessment of its type or quality, and hence whether it is likely to provide the anticipated environmental benefits. The FLINT data provide additional detail on the type of permanent grassland on a farm, which can be used to begin to assess this. In FLINT, permanent grassland is recorded as being either intensively or extensively managed, depending on whether it receives more or less than 50 kg per hectare per annum of nitrogen (N) fertiliser, respectively. The first permanent grassland indicator designed in FLINT (E.1.1) shows what proportion of permanent grassland on a farm is managed intensively, with a counterpart indicator (E.1.2) showing the proportion of permanent grassland that is managed extensively. Extensively managed permanent grassland is further divided, depending on whether or not it has any form of nature protection, and is used for a third indicator (E.1.3) to highlight the proportion of permanent grassland that is both managed extensively and with designated nature protection. Specific calculations and data inputs are described below.

The indicators described above are only relevant for farms with any form of permanent grassland, due to the prominence of this land use in current CAP greening rules. However, the biodiversity benefit provided by permanent grassland is debated, and might ignore other semi-natural areas (EFA [Ecological Focus Area] landscape features, areas of native woodlands, areas of ponds and lakes, other areas of semi-natural vegetation and other areas with designated nature protection). Comparing the extent of semi-natural areas across different countries and farm systems with the permanent grassland (indicator E.3.1) can reveal where biodiversity benefits may be exaggerated or underestimated by focussing on permanent grassland alone and thus feed into the debate on the relative environmental benefits of permanent grassland and the types of agricultural land use to prioritise through policy tools.

The indicators and notable land use areas are shown using simple summary statistics to represent mean values per country and per farm system.

2.2 Data

Relevant data are from both FADN and FLINT. The FLINT data are novel questions which could not generally be imputed from FADN. Below are the variables selected for analysis, with the respective codes in FADN and FLINT.

FADN

I_A_30100_TA - Pasture and meadow, excluding rough grazings: Total area

I_A_30200_TA - Rough grazings: Total area

I_A_30300_TA - Permanent grassland no longer used for production purposes and eligible for the payment of subsidies: Total area

FLINT

Z5_GR_1010_A - Permanent grassland that receives less than 50 kg N/ha per year and it is dominated by native species without any form of nature protection

Z5_GR_1020_A - Permanent grassland that receives less than 50 kg N/ha per year with any form of nature protection

Z5_GR_1050_A - EFA-Landscape features

Z5_GR_1130_A - Area of native woodlands

Z5_GR_1140_A - Area of ponds and lakes

Z5_GR_1150_A - Other areas of semi-natural vegetation without any form of nature protection

Z5_GR_1160_A - Other areas that is designated for any form of nature protection

Indicator calculations are as follows, each requires a combination of FADN + FLINT data:

Indicator E.1.1, Share of permanent grassland under intensive management = $((I_A_30100_TA + I_A_30200_TA + I_A_30300_TA) - (Z5_GR_1010_A + Z5_GR_1020_A)) / (I_A_30100_TA + I_A_30200_TA + I_A_30300_TA) * 100$

Indicator E.1.2, Share of permanent grassland that is extensively managed with semi-natural vegetation = $(Z5_GR_1010_A + Z5_GR_1020_A) / (I_A_30100_TA + I_A_30200_TA + I_A_30300_TA) * 100$

Indicator E.1.3, Share of permanent grassland that is extensively managed with semi-natural vegetation under nature protection = $Z5_GR_1020_A / (I_A_30100_TA + I_A_30200_TA + I_A_30300_TA) * 100$

Indicator E.3.1, Semi-natural habitat area as a proportion of permanent grassland area = $100 * (Z5_GR_1010_A + Z5_GR_1020_A + Z5_GR_1050_A + Z5_GR_1130_A + Z5_GR_1140_A + Z5_GR_1150_A + Z5_GR_1160) / (I_A_30100_TA + I_A_30200_TA + I_A_30300_TA)$

3 RESULTS

3.1 Permanent grassland

The permanent grassland indicators are only relevant for farms with permanent grassland, so farms without permanent grassland were excluded. The proportion of farms with permanent grassland differed greatly between countries, reflecting different agricultural production between regions, in addition to different sampling from the farm population (Table 1). It was primarily specialist grazing livestock farms which had permanent grassland, but there was variation among the types of farms (using broad FADN categories) with permanent grassland, as shown in Fig. 1.

Table 1. Overview of FLINT sample farms containing permanent grassland

Country	No. farms with permanent grass	Total no. farms in FLINT sample	Percentage of FLINT sample with permanent grass
Germany	42	52	81%
Netherlands	83	155	54%
Ireland	65	65	100%
Greece	34	124	27%
Spain	68	128	53%
Finland	38	50	76%
Hungary	57	102	56%
Poland	73	146	50%
France	114	265	43%

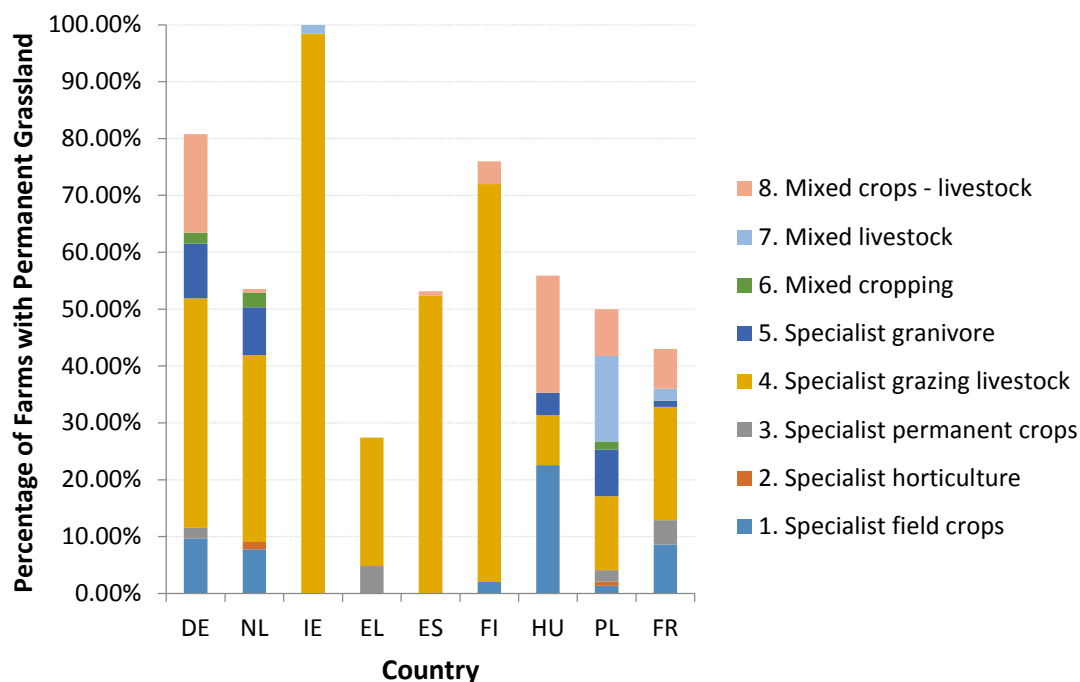


Figure 1. Percentage of farms from the FLINT sample containing permanent grassland, including distribution across different farm types

For a proportion of the farms, data recording was a concern, as the area of permanent grassland exceeded the apparent area of total grassland on the farm. These farms were excluded from this analysis, resulting in the following sample sizes for each country: Germany (DE) – 30, Netherlands (NL) – 59, Ireland (IE) – 64, Greece (EL) – 10, Spain (ES) – 28, Finland (FI) – 36, Hungary (HU) – 47, Poland (PL) – 61, France (FR) – 43.

3.2 Permanent grassland – Results by country

The proportion of permanent grassland which was managed intensively ($>50 \text{ kg ha}^{-1}$ per annum of N fertiliser, indicator E.1.1) varied significantly between countries, according to the dominant types of agriculture in the farms surveyed (Fig. 2). In Ireland, most of the sample was intensive grazing livestock farms, compared with, for example, Hungary, where many arable farms contained areas of permanent grassland, but livestock production was not a major farm output, and they were not highly stocked or intensively managed. The second permanent grassland indicator, E.1.2 (Fig. 3), shows the counterpart to this as the proportion of permanent grassland managed extensively ($<50 \text{ kg ha}^{-1}$ per annum of N fertiliser).

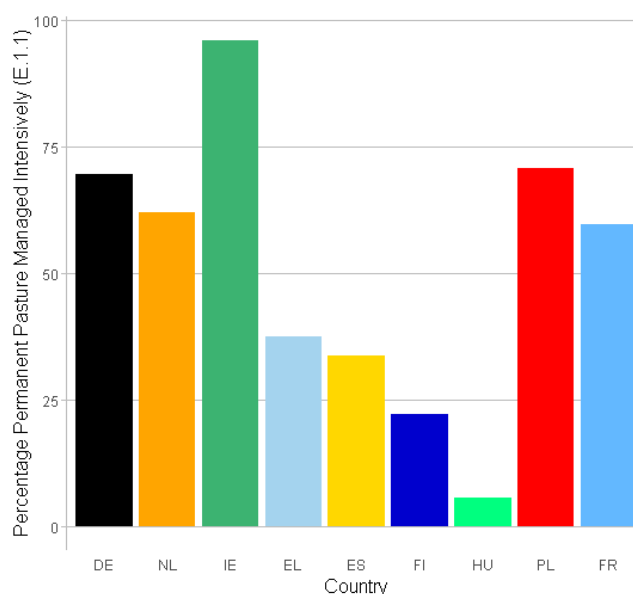


Figure 2. Percentage of permanent grassland managed intensively ($>50 \text{ kg ha}^{-1}$ per annum of nitrogen fertiliser), mean values for all farms with permanent grassland, categorised by country

The proportion of permanent grassland which was managed intensively ($>50 \text{ kg ha}^{-1}$ per annum of N fertiliser, indicator E.1.1) varied significantly between countries, according to the dominant types of agriculture in the farms surveyed (Fig. 2). In Ireland, most of the sample consisted of intensive grazing livestock farms, compared with, for example, Hungary, where many arable farms contained areas of permanent grassland, but livestock production was not a major farm output, and they were not highly stocked or intensively managed. The second permanent grassland indicator, E.1.2 (Fig. 3a), shows the counterpart to this, namely the proportion of permanent grassland managed extensively ($<50 \text{ kg ha}^{-1}$ per annum of N fertiliser).

The final permanent grassland based indicator, E.1.3, is the proportion of permanent grassland managed extensively which also has some form of nature protection (Fig. 3b). The values for this indicator were quite low for most countries, with only Hungary showing a significant proportion of grassland with designated natural habitat protection. It is likely that these values reflect the choice of farms and selection strategy for the sample. This result could be explored further in future work, with member state specific nature designations likely driving these differences, either in terms of the habitats which are covered by legislation, and/or the economic incentives for farmers to maintain or create these habitats.

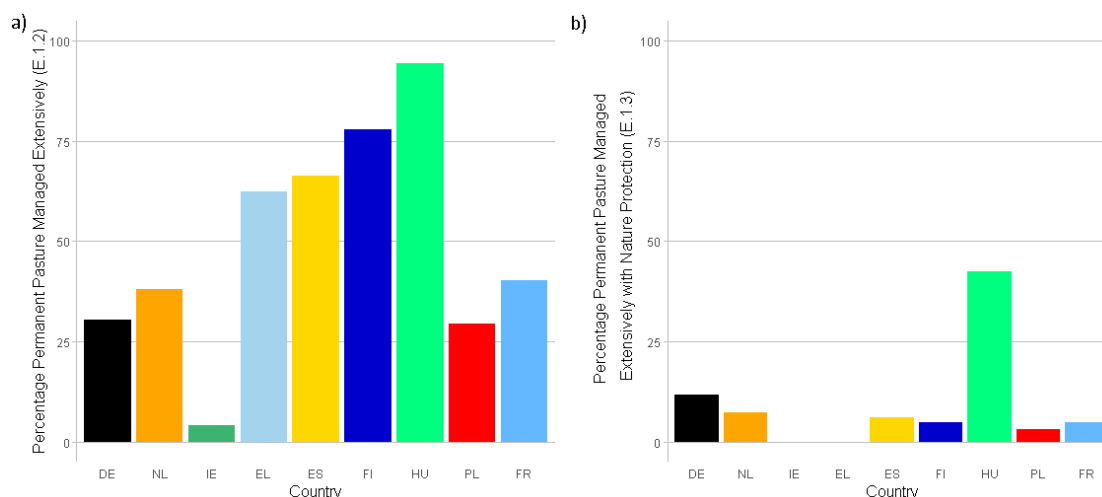


Figure 3. a) Percentage of total permanent grassland managed extensively (<50 kg ha⁻¹ per annum of nitrogen fertiliser) and b) percentage of permanent grassland managed extensively and with designated nature protection. Both show mean values for all farms with permanent grassland, categorised by country.

3.3 Permanent grassland – Results by farm type

Specific farm types can differ markedly between countries, with some only rarely present in a small number of countries. In this case study, we quantified the distribution of permanent grassland across the eight broad FADN categories pooled across countries.

The proportion of permanent pasture managed extensively differs considerably between systems (Fig. 4 & 5). The mixed livestock and specialist grazing livestock systems show the highest percentages of permanent grassland managed intensively (Fig. 4). In these systems, livestock production is prioritised, so it is expected that grasslands are fertilised to maximise meat or milk production. In comparison, a much greater proportion of permanent grassland was managed extensively in the specialist crops and specialist horticulture systems (Fig. 5a), and it may be that in these systems crop production is prioritised so that grassland is managed without needing to maximise its outputs, or even managed very lightly, maintaining the areas specifically to meet CAP requirements. The other systems fall in between these extremes, depending on the form of secondary grassland-based enterprises in which farms engage.

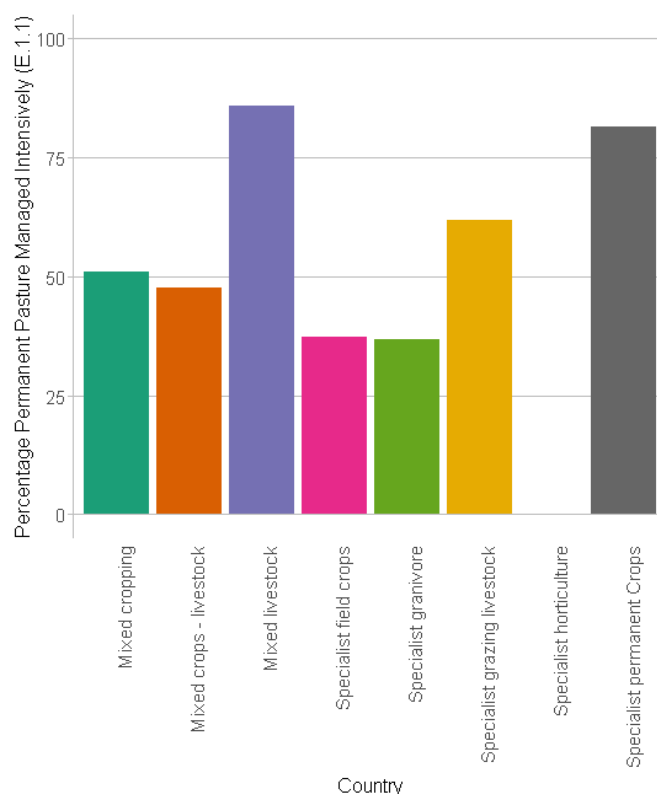


Figure 4. Percentage of permanent grassland managed intensively (>50 kg ha⁻¹ per annum of nitrogen fertiliser), mean values for all farms with permanent grassland, categorised by farm type

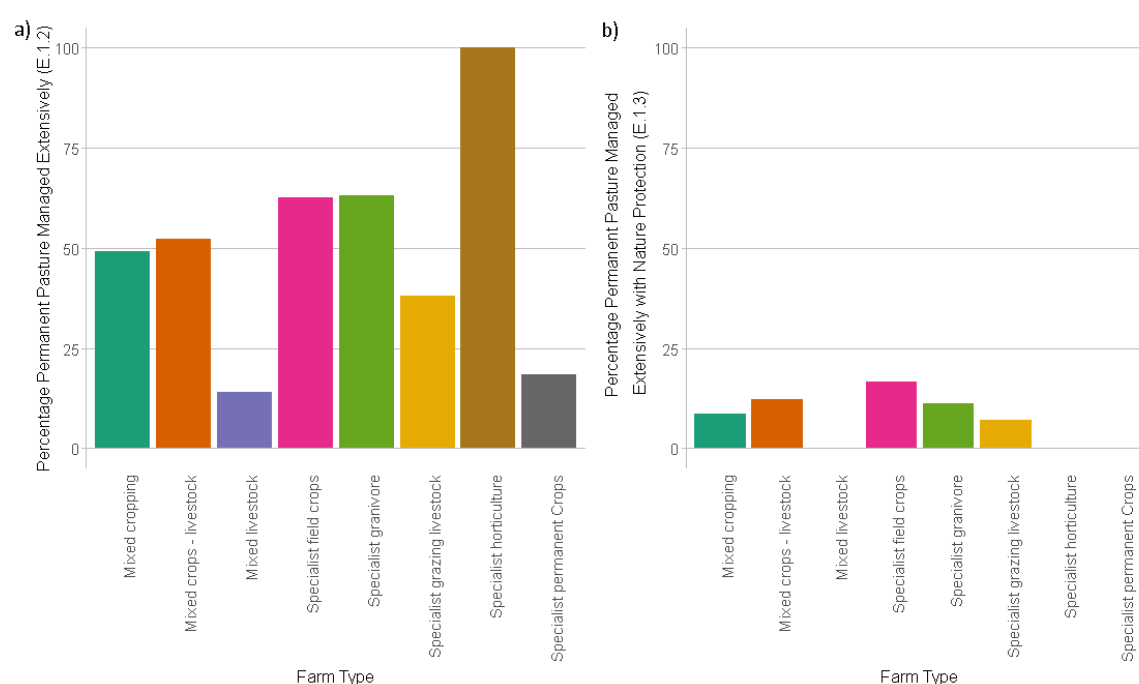


Figure 5. a) Percentage of total permanent grassland managed extensively (<50 kg ha⁻¹ per annum of nitrogen fertiliser) and b) percentage of permanent grassland managed extensively and with designated nature protection. Both show mean values for all farms with permanent grassland, categorised by system

3.4 Semi-natural habitat area

Permanent grassland is not necessarily representative of biodiversity benefits provided by farms, especially when it is intensively managed. The area of a farm covered by any semi-natural habitat may be more representative of agricultural contributions to the area and quality of habitats for biodiversity protection. The indicator E.3.1 compared the total semi-natural habitat area (including extensively managed permanent grassland) to the area of permanent grassland, to highlight where the focus on grassland as an element of greening payments may be more or less indicative of overall land use of benefit to biodiversity.

As the measure is scaled per area permanent grassland, in common with the indicators above only those farms with valid permanent grassland areas were analysed. In addition, one farm had a recorded semi-natural landscape feature area of over 90,000 hectares, which was deemed unfeasible, representing input or unit error, and removed from analysis.

As shown in Fig. 6, the area of semi-natural area as a percentage of permanent grassland area differs significantly by country within the FLINT sample, depending on the types of agriculture found there. A number of different dynamics are captured in this metric. The ratios are above 100% for France, Spain, Hungary and Germany, where a number of farms have very large areas of non-grassland semi-natural habitat, particularly landscape features and woodlands. Where semi-natural habitat areas are primarily grassland based, there are still considerable differences between countries. For example, a high proportion of Finnish farm areas were defined as semi-natural habitat areas, as these systems are generally grazing livestock at low stocking rates and are managed extensively. In Ireland, the sample was exclusively composed of livestock grazing systems, but these were relatively more intensive and so there was very little extensive grassland management or other semi-natural land use. In the remaining countries, the results reflect a combination of extensively managed livestock based systems, and more intensive farm types but with significant non-agricultural areas.

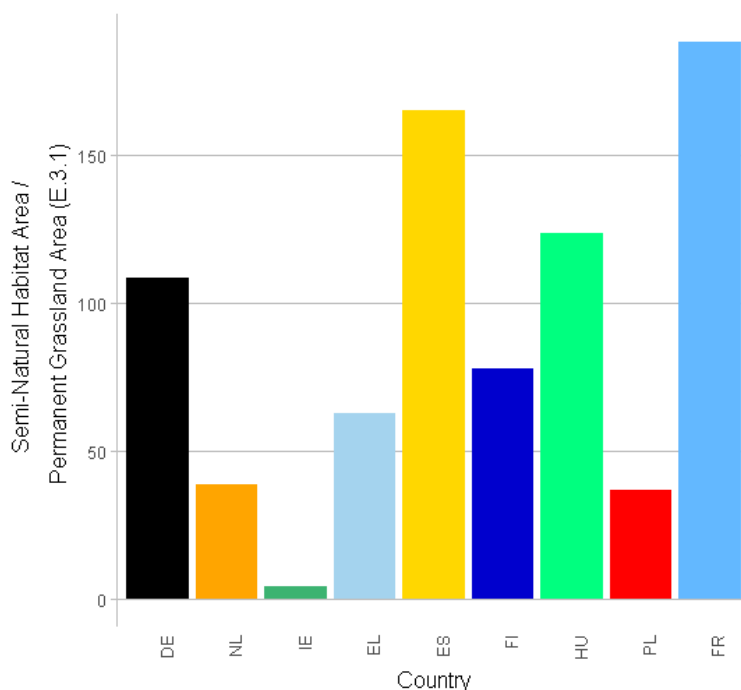


Figure 6. Area of semi-natural habitat as a percentage of permanent grassland area of FLINT sample farms, mean values for all farms, categorised by country

This balance of different land uses is also shown in the results across systems (Fig. 7). Specialist field crop, specialist granivore and specialist permanent crop farms all exceed 100% of semi-natural area as a percentage of permanent grassland area, as many of these farms have only small areas of permanent grassland, and/or large non-agricultural land uses, in particular native woodlands and landscape features. The other farm types within the sample tended to have smaller non-agricultural land use areas contributing to semi-natural habitats, and the results reflect a complex mixture of to what extent their permanent grassland is managed extensively or intensively, and a diversity of different land uses.

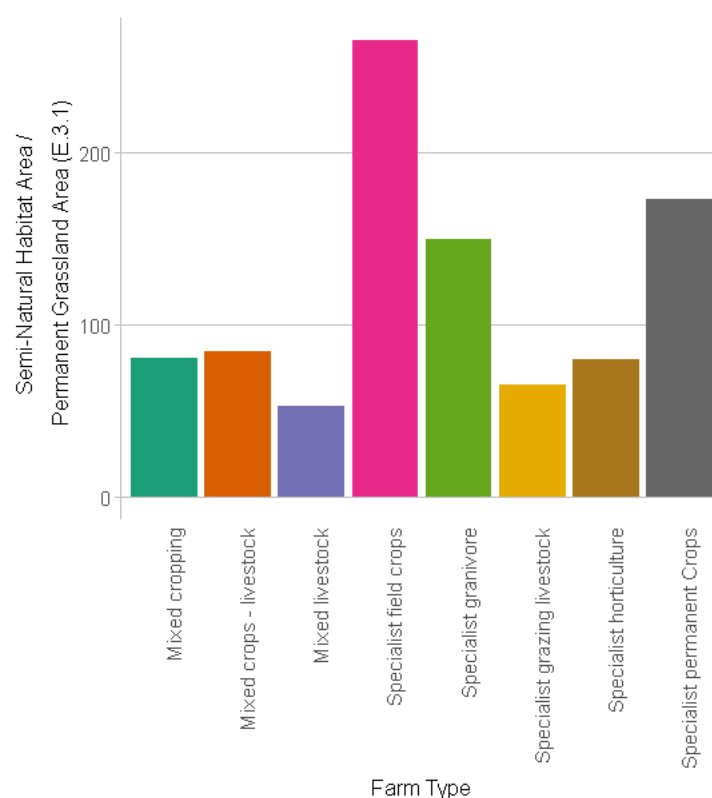


Figure 7. Area of semi-natural habitat as a percentage of permanent grassland area FLINT sample farms, mean values for all farms, categorised by farm system

4 CONCLUSION

Despite its importance, ‘permanent grassland’ is a very broad definition in the current CAP (including the greening measures). Thus, the relevant FLINT indicators and data presented here provide useful insight into improved data collection on the quality and the potential of ‘permanent grassland’. Keeping track of these additional metrics will enable one to see not only how the CAP influences agricultural land use, but also how likely it is that permanent grassland will be maintained, and how likely it is to provide the intended carbon sequestration and biodiversity benefits. Expanded data collection of the topics covered here would also enable more robust statistical analyses, comparing more detailed farm systems and comparing similar systems across countries. In particular, a more detailed exploration of the variation in these measures between individual farms would be enabled if a wider pool of comparable farms were available.

The analyses presented here highlight a number of issues to be resolved in the future. For the permanent grassland and semi-natural habitat areas, a number of farms had to be excluded as proportional areas exceeded 100%. Some non-agricultural land uses contributing to semi-natural habitat areas were also implausibly high, and in future data collection it must be ensured that these areas are being recorded with the same units as the rest of the survey. In addition, account should be taken of the specific details of how countries are recording the management of commonage grassland and ensuring that grasslands and or other semi-natural habitats are not double counted. This is an example of an indicator that relies on data that are not accounting-based or estimated from financial receipts; thus, experience will reduce the occurrence of errors over time.

Our results highlight some of the limitations of the greening measures and the indicator selection. For example, Fig. 5a shows that 100% of the permanent grassland on specialist horticulture farms is managed extensively; however, this does not take into account that the area of this permanent grassland may be very small. The proportion of extensive permanent grassland indicator remains useful, as it reflects the current area-based CAP greening requirements individual farms must meet. However, to more reliably assess policy impacts, it would be useful to include further area-based measures in the future. For example, expressing both the area of intensive and extensive permanent grassland as a proportion of the whole farm area would be a more useful indicator in the future.

Expressing the wider semi-natural areas as a proportion of permanent grassland can highlight some of the difficulties in placing such prominence on permanent grassland in direct support schemes, as it is clear from Fig. 6 & 7 that many farm systems contribute to biodiversity primarily through non-grassland land uses. However, this indicator does not give a clear measure of how much farms are contributing to local biodiversity, as the scaling between different land use types obscures the overall extent of different land uses. Expressing the semi-natural area as a proportion of the whole farm area may be more useful as an indicator in the future.

Further to the points made above, these indicators reveal some of the wider difficulties in reducing complex environmental issues into simple indicators to be applied across a wide variety of farm types and locations. Although the derived metrics are useful and their alignment allows for valuable comparisons across disparate systems, more specific questions could also be addressed using the land-use data contributing to them. For example, different countries/regions could prioritise certain semi-natural areas of maximum importance for local biodiversity.