Agroecological Practices Used in Scottish Farming: Evidence from a Survey of Farming Businesses

Authors

Bethan Thompson, Luiza Toma, Joana Ferreira, Shailesh Shrestha, Andrew Barnes[1]

Summary

The Scottish Government's ambition to address climate and biodiversity emergencies require urgent decisions to be made on replacement agricultural policies, following the UK's withdrawal from the EU. Agroecology is one nature-based farming approach which, if adopted widely in Scotland, may enable farms to contribute to both these climate and biodiversity targets. To know how best to support the adoption of agroecological practices we must first understand the current level of use.

This briefing note outlines the results of a survey of Scottish farmers on agroecological practices. It is part of an EU Horizon 2020 project so compares Scottish adoption with a concurrent sample of EU farmers. It highlights which practices Scottish farmers promote within their farming systems and where there is scope to do more relative to their EU counterparts. This allows us to understand the potential for a transition to a more agroecological system and start to identify barriers and opportunities for adoption of these approaches in Scottish farming.

We find that Scottish livestock farms lag behind their EU counterparts in our sample in terms of overall adoption of agroecological practices. Only in relation to stocking density criteria did Scottish farms outperform their EU counterparts. On the other hand, the overall adoption of agroecological practices on Scottish crop farms is in line with EU counterparts. In fact, their adoption of agroecological tillage, fertilisation, pest and weed management practices is slightly ahead of the EU in our sample. The uptake of integrated weed management practices was particularly high in the Scottish farms surveyed. Areas for improvement include increasing plant diversity and rotation as well as cover cropping.

Overall, we see several opportunities for Scottish livestock farmers to adopt agroecological practices that could help contribute to climate and biodiversity goals if they are properly supported. These are opportunities that appear to have been taken by EU counterparts and could be promising quick wins for Scotland. We also see that Scottish crop farmers have been successful in adopting several agroecological approaches. There is an opportunity here to learn what has driven adoption in this group and how learning can be transferred to the livestock sector.

[1] *Department of Rural Economy, Environment and Society, SRUC, West Mains Road, Edinburgh, UK*

1.0 Introduction

Agroecology has been identified as a promising approach to farming that could support the achievement of our climate and biodiversity goals (European Commission, 2020). A recent review by Carlile and Garnett (2021) illustrated the contested nature of this concept: for some agroecology concerns the ecology of the entire food system (Francis et al. 2003), for others it is a social movement (Méndez et al. 2013), and for others it has a primarily technical application to the farm scale (Wezel et al. 2009). Here we focus on the farm-scale application as we are interested in the actions that farmers can take to move towards a more agroecological farming system.

At the farm scale agroecology is a system that aims to optimise production while minimising external inputs, avoiding the degradation of natural resources and contributing to ecological benefits such as biodiversity (Figueroa-Helland et al. 2018). A wide range of practices can support these aims, with different practices relevant for different locations and aspects of farming. For cropland management this might mean reducing reliance on inorganic fertilisers, pesticides and herbicides and instead using green manures, introducing natural predators, or managing weeds through variety selection. It could also mean limiting tillage and making use of crop rotations and cover crops to support soil health and to control pests and diseases. For livestock management this may mean reducing reliance on inorganic fertilisers for grassland, focussing on permanent pasture grazing over temporary grassland, favouring high forage over low forage diets, as well as good manure management and careful use of antibiotics.

2.0 Method

A survey of Scottish farmers took place as part of the LIFT (Low-Input Farming and Territories) project (LIFT H2020[2]) between January and March 2020. The surveys were conducted by through a combination of telephone and face-to-face interviews. We received 109 valid responses in Scotland across a range of farm types including arable, livestock, permanent crops and mixed crop and livestock farms. In total the survey had 1,335 valid responses from farmers in Austria, Germany, Greece, England, France, Hungary, Ireland, Italy, Poland, Romania, Scotland and Sweden[3].

Farmers were asked about the practices they used, when they adopted these practices and, where relevant, the intensity of adoption (e.g., across what percentage of land) and application (e.g., fertiliser application levels). Farmers were presented with a range of conventional and agroecological practice options[4].

From these responses we developed an indicator to identify three types of farms, namely:

i) farms that only used conventional practices,
ii) farms that used a combination of conventional and agroecological practices, and
iii) farms that only used agroecological practices.

Farms in the sample received a score between 1 (conventional only) and 3 (agroecological only) for each relevant aspect of farm management. To assess the level of adoption the average of the scores for each farm management aspect was aggregated.

This gives us an indication of where farms rank in terms of their agroecological practices. By providing a purely practice-based classification, it will allow for future analysis to link practices with potential public-good outcomes.

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[2] *See: https://www.lift-h2020.eu/*
[3] *A future note will provide a detailed comparison across EU countries and ecological practices.*
[4] *The questionnaire is available here: https://www.lift-h2020.eu/download/1504/*

3.0 Results

3.1 Livestock practices

Figure 1 shows the mean score of Scottish farms for agroecological practice adoption across 6 aspects of livestock farm management. This includes feeding, grass fertilisation, disease management, manure and slurry management, stocking density, and feature management. The mean score achieved by Scottish farms in each category is compared with the mean score for the rest of the EU countries in the sample.

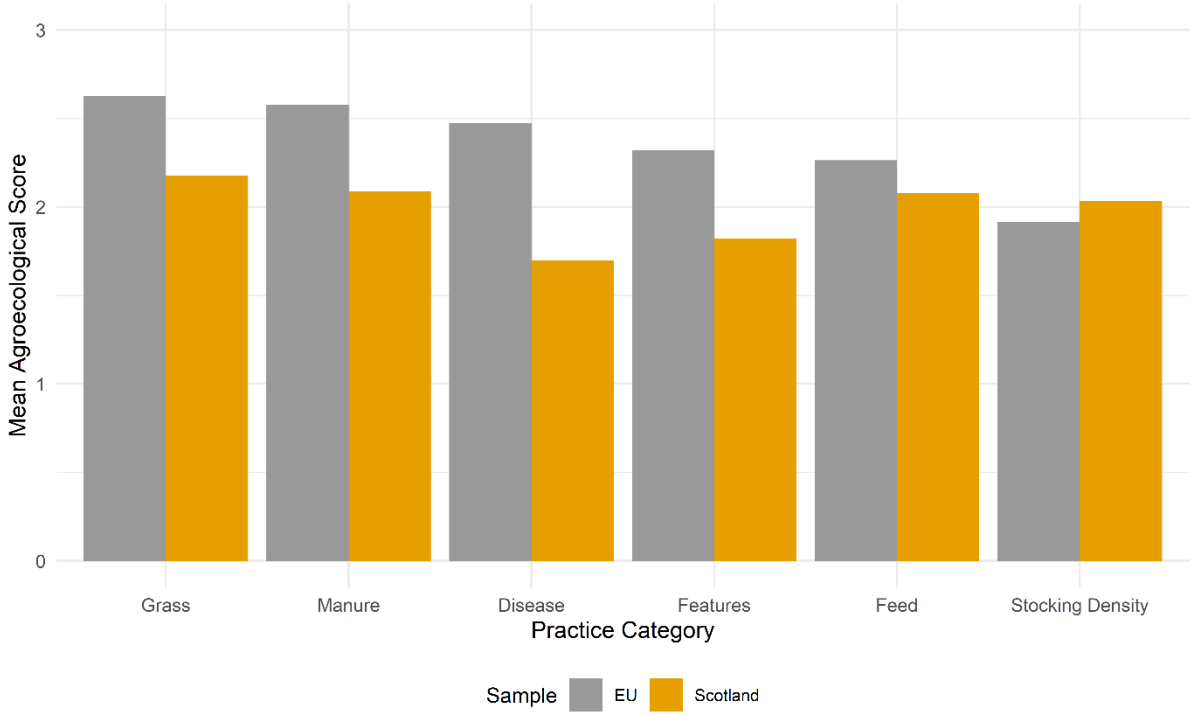

Figure 1: Uptake of agroecological livestock practices in Scotland versus EU

Key points:

- **Grass**: the average agroecological grass management score in Scotland is significantly lower than for EU counterparts, indicating potential scope for reduction in the use of inorganic fertiliser on grassland.
- **Manure**: on average Scottish farmers reported fewer manure management practices than EU counterparts.
- **Disease**: fewer farms in Scotland indicated the use of antibiotics for treatment only (compared to prevention and treatment) relative to EU counterparts. This gap was the largest across management areas.
- **Features**: fewer Scottish farmers reported building or maintaining features such as hedgerows, ponds, or field edges than their EU counterparts.
- **Feed**: fewer farms in Scotland make use of pure forage diets compared to their EU counterparts.
- **Stocking Density**: the stocking density reported by Scottish farmers is on average lower than EU counterparts.

3.2 Crop practices

Figure 2 shows the mean score of Scottish farms for agroecological practice adoption across 7 aspects of crop land management. This includes diversity and rotation, fertilisation, cover cropping, tillage, pest management, weed management, and feature management. As above, the mean score achieved by Scottish farms in each category is compared with the mean score for the rest of the EU countries in the sample.

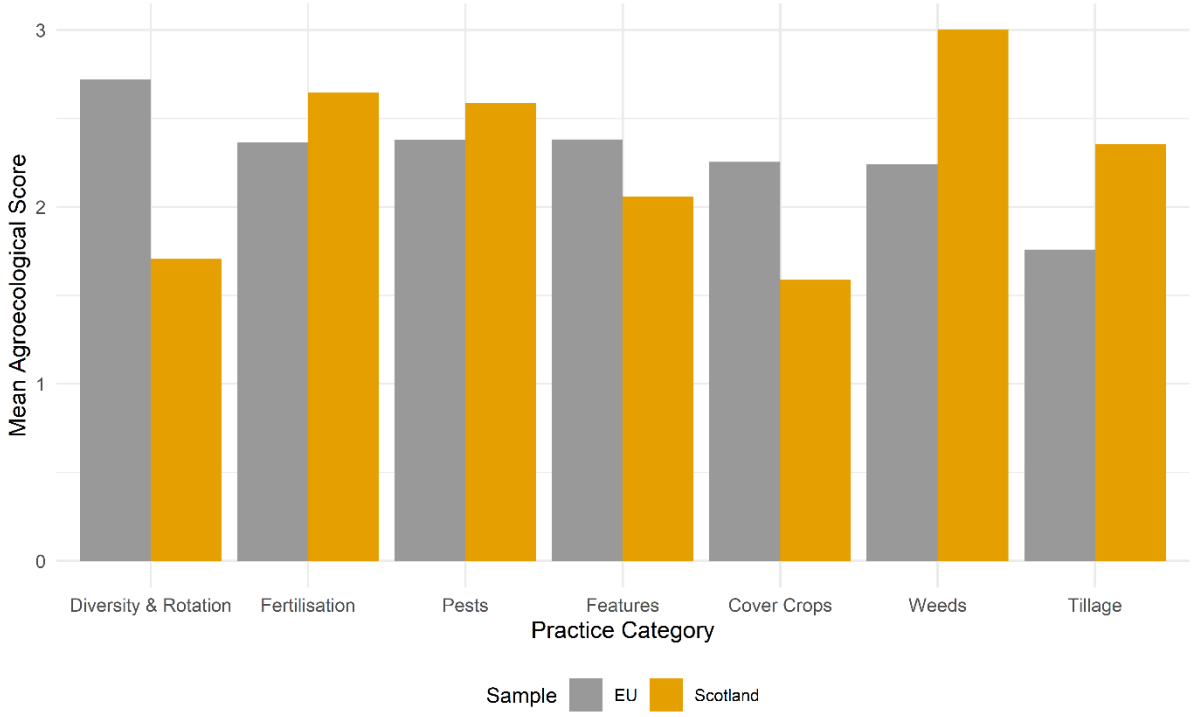

Figure 2: Uptake of agroecological crop practices in Scotland versus EU

Key points:

- **Diversity & Rotation**: significantly fewer Scottish farmers indicated that they were trying to increase plant diversity or increase the number of rotations on their farms compared to EU counterparts.
- **Fertilisation**: more Scottish farmers indicated that they have moved completely away from inorganic fertilisers than their EU counterparts, though the majority indicated use a combination of inorganic and other methods.
- **Pests**: the average agroecological pest management score for Scottish farmers was higher than their EU counterparts, indicating that have adopted more agroecological practices and fewer conventional practices.
- **Features**: fewer Scottish farmers reported that they built or maintained features such as hedgerows, ponds, or field edges compared to their EU counterparts.
- **Cover Crops**: the average score for cover cropping for Scottish farmers was significantly lower than their EU counterparts.
- **Weeds**: all the Scottish farms surveyed reported having adopted some agroecological weed practices and none reported using inorganic herbicides. When the practices are explored in detail it seems that around a third of these farms report using integrated weed management and / or rely on manual weeding, variety selection and machine weeding.
- **Tillage**: the average score for tillage was much higher for Scottish farmers than their EU counterparts.

3.3 Overall scores for farms

Figure 3 shows the distribution of the overall agroecological scores for livestock and crop farms, taken as a whole. The overall score is the mean of scores for each aspect of farm management outlined above. The percentage of the Scottish sample achieving receiving each score is compared to the rest of EU.

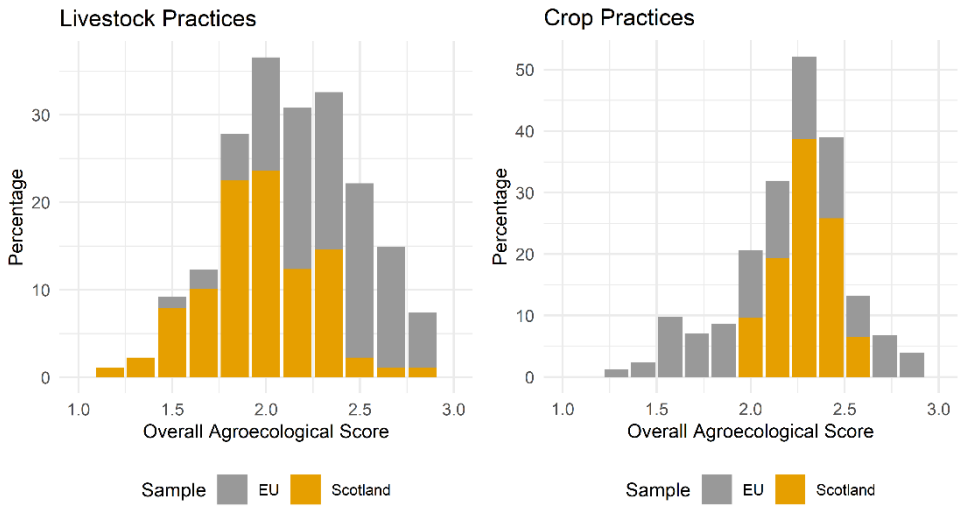

Figure 3: Distribution of Overall Agroecological Scores: Scotland compared to the EU

Key points:

- Scottish livestock farms have lower overall scores than their counterparts in the EU with many farms being in the lower end of the distribution.
- Scottish crop farms have very similar scores to their EU counterparts, with several farms being in the middle to upper end of the distribution.

4.0 Summary

- Relative to the EU farms in our sample, Scottish livestock producers have scope to adopt more agroecological management practices. Only in stocking density did Scottish farms outperform their EU counterparts.
- To be considered more agroecological farms may also need to reduce non-forage elements in livestock diets and improve grassland management. The viability of these options given climatic conditions needs to be evaluated.
- Manure management also offers opportunities to improve. However, for specialist sheep systems with a high proportion of rough grazing, some of the manure management will be less applicable than in less extensive systems.
- Improving livestock disease management and feature management could be quick wins.
- The adoption of agroecological practices on Scottish crop farms is broadly in line with EU counterparts. The uptake of integrated weed management practices is particularly high in the Scottish farms surveyed.
- Areas for improvement include increasing plant diversity and rotation as well as cover cropping.

4.1 Livestock Practices Overview

Practice Category	Country	Mean Score	Practices Represented
Features	EU	2.32	Establishment or maintenance of: hedgerows; bushes; wet areas; tree lines; woodland; isolated trees; field margins; buffer strips; flower strips; terraces; agro forestry; other
	Scotland	1.82	
Feed	EU	2.26	List of feed types (dependent on animal type) then classified as forage /non-forage
	Scotland	2.08	
Grass Fertilisation	EU	2.63	Inorganic; manure; sludge; compost; amendments; green manure; precision application
	Scotland	2.18	
Disease	EU	2.47	Use of antibiotics for treatment and prevention; use of antibiotics for treatment only; health trait selection; physical health measures; alternative remedies; other
	Scotland	1.7	
Manure & Slurry	EU	2.58	Use of covered storage to reduce leaks/reduce GHG emissions; livestock bedding; digester; composting; other
	Scotland	2.09	
Stocking Density	EU	1.91	Ratio of livestock (in livestock units) to grass area
	Scotland	2.03	
Overall	EU	2.17	Mean of scores across livestock practice categories
	Scotland	2.29	

4.2 Crop Practices Overview

Practice Category	Country	Mean Score	Practices Represented
Diversity & Rotation	EU	2.72	Rotation (number of types and rotations); diversification; local varieties; mixed cropping; fallow
	Scotland	1.71	
Features	EU	2.38	Establishment or maintenance of: hedgerows; bushes; wet areas; tree lines; woodland; isolated trees; field margins; buffer strips; flower strips; terraces; agro forestry; other
	Scotland	2.06	
Fertilisation	EU	2.37	Inorganic; manure; sludge; compost; amendments; green manure; leaving crop residues; precision technologies
	Scotland	2.65	
Cover Crops	EU	2.25	Nitrogen-fixing; catch crops; cover crops; other to achieve same effect
	Scotland	1.59	
Tillage	EU	1.76	Till; conservation tillage; no till
	Scotland	2.35	
Pests	EU	2.38	Pesticide use (inorganic/organic); biological controls; tolerant varieties; integrated pest management; precision technologies; other
	Scotland	2.59	
Weeds	EU	2.24	Herbicide use (inorganic/organic); mulches; weeding (machine/manual/thermal); tolerant varieties; integrated weed management; precision application; other
	Scotland	3	
Overall	EU	2.33	Mean of scores across crop practice categories
	Scotland	1.97	

5.0 References

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For further details please contact:

Bethan Thompson SRUC

☎: +44(0)131 535 4385

🖮: bethan.thompson@sruc.ac.uk

or

Andrew Barnes SRUC

☎: +44(0)131 535 4042

🖮: andrew.barnes@sruc.ac.uk