Hill farming in Scotland: a fragile farming system?

Davy McCracken & Steven Thomson
Head of SRUC’s Hill & Mountain Research Centre
Senior Agricultural Economist
Land Economy, Environment & Society Research Group

davy.mccracken@sruc.ac.uk
steven.thomson@sruc.ac.uk

https://twitter.com/DavyMcCacken

Leading the way in Agriculture and Rural Research, Education and Consulting
General Introduction

- Around 60% of Scottish farmland is rough grazing
- Only 10% is used for cropping
- A fifth of agricultural land is grassland
- Government drive to increase Scotland’s woodland cover from 18% to 25%....farmland has a role to play as trees not allowed to be planted on deep peatlands
Scotland & Rough Grazing

% UAA as RGR
- 0% - 1%
- 2% - 1%
- 2% - 4%
- 5% - 10%
- 11% - 15%
- 16% - 21%
- 22% - 42%
- 43% - 82%

UK = 30%

Data source: GISCO - Eurostat (European Commission)
Administrative boundaries: © EuroGeographics, UN-FAO, Turkstat.
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Created by Steven Thomson, SRUC
Constrained Farming Systems

- Scottish farming is significantly constrained by poor land (85% classed as Less Favoured Area)
- About 54,000 agricultural holdings in Scotland covering 5.7 million ha
- Around 20,000 farm businesses claiming direct CAP support
- Around 19,400 registered crofts (about 13,000 crofters) with about 1,100 common grazings (covering 584,000 Ha)
The importance of CAP

- CAP remains important for the profitability of much of Scottish agriculture, but particularly so in the uplands.

<table>
<thead>
<tr>
<th></th>
<th>LFA Sheep</th>
<th>LFA Cattle</th>
<th>LFA Cattle &amp; Sheep</th>
<th>Cereal</th>
<th>General Cropping</th>
<th>Dairy</th>
<th>Lowland Cattle &amp; Sheep</th>
<th>Mixed</th>
<th>All Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs as % Output</td>
<td>140%</td>
<td>118%</td>
<td>125%</td>
<td>116%</td>
<td>106%</td>
<td>93%</td>
<td>110%</td>
<td>118%</td>
<td>113%</td>
</tr>
<tr>
<td>CAP as % of Output</td>
<td>60%</td>
<td>38%</td>
<td>48%</td>
<td>20%</td>
<td>17%</td>
<td>8%</td>
<td>28%</td>
<td>24%</td>
<td>27%</td>
</tr>
<tr>
<td>CAP as % of FBI</td>
<td>282%</td>
<td>184%</td>
<td>201%</td>
<td>204%</td>
<td>123%</td>
<td>53%</td>
<td>143%</td>
<td>339%</td>
<td>173%</td>
</tr>
</tbody>
</table>
Scottish uplands not just topographical!
Sheep: a changed landscape

• Large reduction in sheep population - particularly in the West Coast
• Some farms/crofts reducing sheep numbers altogether
• Other farms/crofts reducing flock sizes and concentrating on only part of the grazing resource
Beef – a gradual decline

- **Suckler herd well spread across the country**
- **North East has higher concentration of finishing animals**
- **11% decline since 2006**
Financial Performance

- Despite good prices in recent years, hill sheep remain largely unprofitable
- Despite good beef prices suckler cows remain largely unprofitable
Range of agricultural production challenges, e.g.:

- Low productivity
- Poor nutrition
- Pests and Disease
- Climate change
- Predation
- Blackloss

Low lambing percentages in spring and/or Low survival of lambs through to autumn
Range of public goods which hill farming & crofting has a role in providing:

- Protecting carbon stocks in soil & vegetation
- Reducing flood risk
- Increasing woodland cover
- Supporting rural communities
- Maintaining safe access routes for hill walkers
- Maintaining the land for future generations
- Maintaining good quality food production
- Supporting wider Scottish economy
- Maintaining local employment opportunities
- Maintaining landscapes for tourism
- Maintaining cultural heritage
- Preventing and controlling wildfires
- Improving water quality
- Maintaining habitats and wildlife species
Inbye grasslands

- Soil pH and nutrients
- GHG emissions
- Grassland management
- Forage & fodder improvements

Systems approach to Precision Livestock Farming
Innovation = Doing Things Differently
Innovation = Doing Things Differently

Inbye grasslands
- Soil pH and nutrients
- GHG emissions
- Grassland management
- Forage & fodder improvements

Sheep Performance
- Genetic selections
- Blackface and Lleyn

Hill grazing
- Bracken control
- Improving hill parks

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**Flock Performance**
- EID associated kit
- TST worming of lambs
- Comparison of system trade-offs

**Systems approach to Precision Livestock Farming**
Technology

EID readers
Innovation = Doing Things Differently

https://www.youtube.com/watch?v=PJO7-3XSslU
Innovation = Doing Things Differently

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**Auchtertyre flock**
- Restocking
- Blackloss
- Yellowses/Plochteach

**Technology**
- Virtual fencing
- Drones for assessments

**LoRa network**
- Tracking livestock
- Sensors

Systems approach to Precision Livestock Farming
Innovation = Doing Things Differently

Precision Agriculture and the Internet of Things (IoT)

- Minimising costs / maximising production efficiency
- Promoting sustainability
- Livestock welfare
- Economic viability of farms
- Environmental compliance

Low Cost
- Devices and infrastructure
- 5+ year battery life

Low Power
- Agroskin in urban areas, 1km rural

Long Range

Sensors > Gateway > Cloud > Mobile/Laptop

LoRa Alliance Member

SRUC

CENSIS censis.org.uk
Internet of Things

- LoRaWAN?
  - long range/low power communications platform
  - >10 miles range in rural areas
  - ideal for
    - deployment of sensors and devices where small amounts of data are transmitted periodically
    - when a given event occurs.

- LoRa network:
  - established at SRUC Kirkton & Auchtertyre
  - covers most of the 2,200 ha of the upland research farms.
  - First LoRa network covering a remote, rural location in the UK and as such is a unique resource.
Innovation = Doing Things Differently

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Diversification
- Wigwam business
- Peatland Restoration & Environmental management
- Woodland creation

Systems approach to Precision Livestock Farming

Of direct relevance to:
- UK & Ireland
- Europe & International
(1) Ecosystem services stocks and flows – compare and contrast ‘rewilded’ area with continuous grazed upland moorland pastures. With Moredun Research Institute and University of Stirling

(2) Compare and contrast production, economic, animal health, animal welfare, wider sustainability of two new alternative systems – building on previous good practice, optimising use of grazing resource versus maximising outputs

(3) Increasing research collaborations with local (e.g. LLTNP, SNH) and wider European (e.g. Idele, INRA, University & Limerick, Teagasc) and International (e.g. AgResearch, CIRAD)
Scottish Government funded 2016-21: Compare and contrast two alternative sheep systems

Complementary work:

BBSRC Resilience of UK food systems in a global context 2017-2021: Livestock’s role in food system resilience in remote, upland regions

Scottish Government funded 2017: Quantifying the impact of hill sheep farming on the wider economy and social fabric of rural areas

https://www.submission-era-susan.eu/lw_resource/datapool/_items/item_253/susan_cofundedcall_results-list_published.pdf

ERA-NET SusAn funded 2017-2020: SusShep – Sustainable Sheep Production
https://www.submission-era-susan.eu/lw_resource/datapool/_items/item_253/susan_cofundedcall_results-list_published.pdf

H2020 funded SheepNet 2016-2019: SHaring Expertise and Experience towards sheep Productivity through NETworking
https://ec.europa.eu/eip/agriculture/en/content/sheepnet-sharing-expertise-and-experience-towards-sheep-productivity-through-networking
Scottish Government funded 2016-21: Compare and contrast ‘rewilded’ area with continuous grazed upland moorland

Complementary work:

Scottish Government (Seeking funding opportunities): Blackloss in Sheep - Investigating timing of occurrence and potential causes

Innovate UK funded 2016-17: Geolocation tracking of livestock in extensive systems

National Sea Eagle Stakeholders Group 2017 onwards

https://www.sruc.ac.uk/news/article/1718/video_davy_mccracken_joins_national_sea_eagle_stakeholder_group

Scottish Government funded 2017: Working for Waders

http://www.moorlandforum.org.uk/working-for-waders

Scottish Government funded 2015-16: Understanding Predation

http://www.moorlandforum.org.uk/understanding-predation-report-launch

University of Stirling and SRUC funded PhD 2016-2020: A catchment-based approach to determine environmental controls of Cryptosporidium transfer from land to water
Innovation = Doing Things Differently

Engineering & Technology

Knowledge Transfer

Biological Sciences

Systems & ecology

For more detail see: http://www.sruc.ac.uk/news/120252/hill_and_mountain_research_centre
Acknowledgements

Much of the research presented here was funded by the Rural & Environment Science & Analytical Services Division of the Scottish Government through their 2011-2016 and 2016-2021 Strategic Research Programmes.

Additional funders of research from 2016 onwards include:

- The European Commission’s H2020 Research & Innovation Programme
- Defra under the ERA-NET SusAn (Sustainable Animal Production) Programme
- Global Food Security’s ‘Resilience of the UK Food System Programme’, with support from BBSRC, ESRC, NERC and Scottish Government.
1. Fast-track to evidence
2. Commentary on key themes
3. Compendium of resources
4. Insight into changes over time
Agriculture – Time for Change?
- Steven Thomson with
- Andrew Barnes
- Julian Bell
- Gavin Hill
- Robert Logan
- David Keiley

Outcomes from different land ownership models
- Rob McMorrin

What future for woodland and forestry in Scotland?
- Davy McCracken
Sheep

- 28% of Scottish holdings have sheep enterprises
- Scotland has about 21% of the UK’s breeding flock and nearly 5% of EU flock
- Rear over 3 million lambs per year with about ¼ retained for breeding flock
- Scotland slaughters around 1.3 million lambs p.a. in 19 abattoirs
- High concentration: 29% of breeding flock on 4% (514) of the holdings with sheep & 58% on 1,500 holdings (12%)

<table>
<thead>
<tr>
<th>Region</th>
<th>Holdings with Breeding Ewes</th>
<th>Breeding Ewes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Scotland</td>
<td>2,208 17%</td>
<td>874,791 34%</td>
</tr>
<tr>
<td>Highlands &amp; Islands</td>
<td>7,016 55%</td>
<td>834,114 32%</td>
</tr>
<tr>
<td>North Eastern Scotland</td>
<td>1,069 8%</td>
<td>166,022 6%</td>
</tr>
<tr>
<td>South Western Scotland</td>
<td>2,421 19%</td>
<td>729,258 28%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flock Size</th>
<th>Holdings with Breeding Ewes</th>
<th>Breeding Ewes</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 10</td>
<td>1,699 13%</td>
<td>8,657 0.3%</td>
</tr>
<tr>
<td>10-50</td>
<td>4,119 32%</td>
<td>101,746 4%</td>
</tr>
<tr>
<td>50-100</td>
<td>1,679 13%</td>
<td>118,435 5%</td>
</tr>
<tr>
<td>100-250</td>
<td>2,146 17%</td>
<td>346,959 13%</td>
</tr>
<tr>
<td>250-500</td>
<td>1,478 12%</td>
<td>529,576 20%</td>
</tr>
<tr>
<td>500-1,000</td>
<td>1,079 8%</td>
<td>751,410 29%</td>
</tr>
<tr>
<td>Over 1,000</td>
<td>514 4%</td>
<td>747,402 29%</td>
</tr>
</tbody>
</table>

| Scotland   | 12,714                      | 2,604,185     |

Data Extracted from June Agricultural Census
Beef

- Over 28% of Scottish agricultural output from beef at £827m inc. £681m from finished livestock.
- Scotland has 28% of UK breeding herd
- 10,788 holdings with 709,000 beef cows with 11,880 with 1.8 million cattle
- 22 beef abattoirs
- Beef industry dominated small number of breeds
Beef: a lot doing it but highly concentrated

- Highly concentrated
  - 54% cows on 15% holdings with herds > 100 cows
  - 31 holdings have 10% of the male animals >1yr
  - 577 (6%) holdings have 45% of the male cattle > 1yr

<table>
<thead>
<tr>
<th>Holdings</th>
<th>Beef Cows over 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>3,416 33%</td>
</tr>
<tr>
<td>10-50</td>
<td>3,414 33%</td>
</tr>
<tr>
<td>50-100</td>
<td>1,940 19%</td>
</tr>
<tr>
<td>100-200</td>
<td>1,185 11%</td>
</tr>
<tr>
<td>200-500</td>
<td>379 4%</td>
</tr>
<tr>
<td>&gt;500</td>
<td>28 0.3%</td>
</tr>
<tr>
<td>Scotland</td>
<td>10,362</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Holdings</th>
<th>Males &gt; 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>5,151 53%</td>
</tr>
<tr>
<td>10-50</td>
<td>3,194 33%</td>
</tr>
<tr>
<td>50-100</td>
<td>877 9%</td>
</tr>
<tr>
<td>100-200</td>
<td>383 4%</td>
</tr>
<tr>
<td>200-500</td>
<td>163 2%</td>
</tr>
<tr>
<td>&gt;500</td>
<td>31 0.3%</td>
</tr>
<tr>
<td>Scotland</td>
<td>9,799</td>
</tr>
</tbody>
</table>
SheepNet
Sharing Expertise and Experience towards sheep Productivity through Networking

6 EU countries – 80% EU sheep flocks

1. France
   - Idele
   - INRA
   - Efficient Innovation

2. United Kingdom
   - Scotland – SRUC

3. Ireland – Teagasc

4. Spain - NEIKER-Tecnalia

5. Romania - Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" - Timisoara

6. Italy – AGRIS-Sardegna

+ Turkey – TOGEN

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 727895.
Main aims of network

- Produce a reservoir of scientific, technical, practical information & best practices
- Encourage knowledge exchange and interactive participation with the sheep community through national and international workshops.
- Develop simple tools for communication:
  - learning materials, web-based tools, interactive platform, designed to help scientists, farmers and advisors/consultants share knowledge and experience.
SusShep is a 3 year ERA-NET European project (2017-2020), with 4 European partners: Norway, France, Ireland & UK.

Overall aim: to increase the sustainability and profitability of European Sheep Production by addressing key industry focused problems.

Key objectives:
- Provide new genetic tools for farmers to increase longevity of ewes.
- Quantify labour input and carbon hoofprint in contrasting sheep systems.
- Develop more socially acceptable methods of AI, looking at ewe breed effects (for oestrus, cervical mucus, sperm transport).
- Maximise knowledge transfer and uptake of methods by farming community.
Animal Future: Steering animal production systems to a sustainable future

Animal Future is a 3 year ERA-NET European project (2017-2020), with 8 European partners: Austria, France (x2), Germany, Netherlands, Portugal, Spain & UK.

**Overall aim:** to design innovative strategies for assessing and enhancing the sustainability of animal production systems.

**Key objectives:**
- To quantify at farm level the impact & cost-benefit portfolio when adopting innovative practices
- To identify the trade-offs between costs and benefits at regional, national and EU levels
- To develop an evidence-based and easy-to-use tool enabling animal production actors to select the most appropriate innovative practices to achieve sustainable animal production
- To promote sustainable practices amongst animal production actors

SRUC HMRC will conduct **case studies of hill sheep systems** in Scotland to identify innovative opportunities and ways to **address any constraints** to doing that.

SRUC economists will investigate **institutional innovative capacity** at partner MS level.

UK input from SRUC funded by Defra