Biodiversity in the Farmed Landscape: Building a Knowledge base to Inform Agri-environmental Policy

Biodiversity Monitoring and Policy Support in Northern Ireland

Ag-Biota

www.ucd.ie/agbiota/index.htm

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Queens University, Belfast and DARD
Northern Ireland

Fact and Figures

- Population 1.7 million
- Farms 29,818
- Farm size 35.50 ha
- Farm Tenure
  - 48% owned
  - 45% owned and rented
  - 7% solely rented

Land use

- 1.35 million ha (excluding water)
- 1.1m ha (80%) Agriculture
- 82,000 ha (7%) Forestry
- 174,000 (13%) Other areas
- 70% Less Favoured Area (LFA)
Farming background

• Livestock production from grassland

• Approximately 2.7m sheep and 1.7m cattle graze 78% of the land area

• Of this area, 54% is improved grassland
  36% is unimproved and semi-natural
  5.5% is in arable production
## Northern Ireland Agriculture (1)

### Industry Sizes (2000)

<table>
<thead>
<tr>
<th></th>
<th>NI</th>
<th>UK</th>
<th>ROI</th>
<th>EU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area (m ha)</td>
<td>1.1</td>
<td>17.0</td>
<td>4.4</td>
<td>128.7</td>
</tr>
<tr>
<td>Total farms (‘000)</td>
<td>29</td>
<td>240</td>
<td>144</td>
<td>6,989</td>
</tr>
<tr>
<td>Av. Farm size (ha)</td>
<td>35.5</td>
<td>66.6</td>
<td>29.3</td>
<td>18.4</td>
</tr>
<tr>
<td>Beef cows/farm</td>
<td>19</td>
<td>27</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Total sheep/farm</td>
<td>253</td>
<td>510</td>
<td>182</td>
<td>138</td>
</tr>
</tbody>
</table>
## Northern Ireland Agriculture (2)

<table>
<thead>
<tr>
<th>Agriculture as % of National Totals (2000)</th>
<th>NI</th>
<th>UK</th>
<th>ROI</th>
<th>EU</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross added value</strong></td>
<td>2.6</td>
<td>0.8</td>
<td>3.9</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td>5.0</td>
<td>1.6</td>
<td>8.5</td>
<td>4.7</td>
</tr>
<tr>
<td><strong>Land Use</strong></td>
<td>78.2</td>
<td>70.0</td>
<td>62.9</td>
<td>40.3</td>
</tr>
<tr>
<td><strong>LFA</strong></td>
<td>69.9</td>
<td>44.5</td>
<td>66.8</td>
<td>54.3</td>
</tr>
</tbody>
</table>
Agriculture and the Environment

**Intensification:**
- loss of habitat
- loss of biodiversity

**Pollution:**
- slurry
- silage effluent
Loss of Biodiversity

- 97% of species rich hay meadows
- Corncrake
- Irish hare
- Wetland birds eg Lapwing
- Red grouse
Agricultural Improvements

• Agricultural improvements have been largely to blame for losses in biodiversity

• Measures taken to counteract this decline…
Agri-Environment Measures

EU Regulations

797/85 member states **could** introduce measures

2078/92 member states **should** introduce measures

1257/99 member states **must** introduce measures

• Now a compulsory element of Rural Development Plans
• Encourages producers to farm in a responsible and environmentally friendly way
• Management of the countryside
• Reduced inputs of pesticides and fertilisers
Implementation of Agri-Environment Measures

EU Regulations

797/85  2 pilot areas
2078/92  5 areas covering 20% of Northern Ireland (ESA)
1257/99 additional scheme throughout other 80% (CMS)
Environmentally Sensitive Areas Scheme

- Original scheme launched in early 1990s
- ESA scheme co-funded with EU
- 5 designated ESAs in Northern Ireland (20% of land)
- Currently 4,500 participant farmers
- Annually worth £5m

“The ESA scheme is designed to help conserve areas of the countryside which are highly valued for their scenic beauty, wildlife habitats or distinctive heritage features”
ESA- Operation

• Whole farm
• Farm visit and 5 year conservation plan drawn up by DARD officer
• ESA agreement issued (10 year participation)
• Monitoring  - Claims inspections, spot checks, penalties
  - Scientific monitoring
Environmentally Sensitive Areas

- 65% of eligible land under agreement
- 4500 participants

Habitats positively managed
• 27,000 ha heather moorland
• 1,200 ha hay meadow
• 1,100 ha wet pasture
• 640 ancient monuments
Monitoring Agri-environment (AE) schemes

- EU requirement (regulation 2078/92)
- AE schemes must be seen to deliver value for money
- Aim - Determine the impact of AE schemes on environmental quality
- Document & assess change in: -
  - 1. biodiversity
  - 2. the rural landscape
- The feedback from monitoring to be used to refine management prescriptions
Agri-environment monitoring unit

In Northern Ireland agri-environment monitoring is commissioned by DARD and carried out independently and transparently by Queen’s University Belfast.
Habitats monitored

185 sites monitored

• Grasslands
  – Wet
  – Limestone
  – Unimproved
  – Hay meadows

• Heather moorland

• Woodland
Strategy

- Baseline
- Re-survey (3 – 10 years)
- Compare participant and non-participant ESA farms
- Habitat based
Indicators of change

• Vegetation:
  – Key element in agro-ecosystems

• Insects:
  – 70% of all species are invertebrates
  – Ground beetles & spiders sensitive to change
Plant indicators

- Plant strategy theory (Grime et al. 1988) defines plant species in terms of:
  - **Ruderals** (R): annual weeds
  - **Competitors** (C): fast-growing species that live under the threat of competitive exclusion
  - **Stress-tolerators** (S): found where an environmental factor is limiting productivity

Many stress-tolerator species are vulnerable to intensive agricultural practices, such as fertiliser application and drainage

- The frequency and composition of indicator species with known ecological requirements and C-S-R plant strategies, can indicate the effect of management practices
Invertebrate indicators

- Ground beetles and spiders
  - Indicate change in habitat quality and biodiversity
    - Management intensity
    - Disturbance
    - Environmental impacts
- Habitat specialists reduce with management intensity
Methods

Position of quadrats and pitfall traps

Vegetation quadrats  Pitfall traps
## Scope of Monitoring

<table>
<thead>
<tr>
<th></th>
<th>Estimated total number of species in Ireland</th>
<th>Total species recorded in ESA monitoring</th>
<th>% species recorded in ESA monitoring</th>
<th>Fermanagh Hay meadow diversity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher plants</td>
<td>1330</td>
<td>400</td>
<td>30</td>
<td>39 (per transect)</td>
</tr>
<tr>
<td>Ground beetles</td>
<td>212</td>
<td>165</td>
<td>78</td>
<td>12 (per transect)</td>
</tr>
<tr>
<td>Spiders</td>
<td>368</td>
<td>184</td>
<td>50</td>
<td>18 (per transect)</td>
</tr>
</tbody>
</table>
Data Analysis

• Biodiversity indicators
  – Habitat type
  – Number of plant / invertebrate species
### Mean number of Plant and Invertebrate species in N. Ireland ESAs

<table>
<thead>
<tr>
<th>ESA</th>
<th>Mean number of Plant species per site</th>
<th>Mean number of Ground Beetle species per site</th>
<th>Mean number of Spider species per site</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Fermanagh &amp; Erne Lakeland</td>
<td>28</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Antrim Coast, Glens</td>
<td>26</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td><strong>Rathlin Island</strong></td>
<td><strong>37</strong></td>
<td><strong>19</strong></td>
<td><strong>24</strong></td>
</tr>
<tr>
<td>Mournes &amp; Slieve Croob</td>
<td>21</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Slieve Gullion</td>
<td>30</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Sperrins</td>
<td>28</td>
<td>13</td>
<td>14</td>
</tr>
</tbody>
</table>
Rathlin biodiversity

- Plant indicator species
  - *Calluna vulgaris* - Significant increase in cover
  - *Sphagnum* - ‘building block’ of peat. Indicator of healthy peatland
  - *Other indicator species:*
    - *Drosera rotundifolia, Vaccinium myrtillus, Carex sp., Erica sp., Listera ovata, Dactylorhiza maculata*
Rathlin biodiversity

• Ground beetle indicator species
  – *Cymindis vaporariorum*
  – Increase in frequency on participant farms

• Distribution is restricted with regard to preferred ground conditions. In particular well-drained peat under *Calluna*
West Fermanagh & Erne Lakeland ESA
Fermanagh hay meadows (1)

- Participant farms- increase in traditional hay meadow species
  - characteristic of low intensity management

![Euphrasia officinale agg.](image1)

![Rhinanthus minor](image2)
Fermanagh hay meadows (2)

- The declining species *Carabus clatrat*us, identified as habitat quality indicator, increased in frequency on ESA participant farms.

- Changes in spider species composition indicate that a typical hay meadow community is being maintained on ESA participant farms.

- A decrease in invertebrate biodiversity was recorded on farms not participating in the ESA scheme.
## Change in number of plant stress-tolerator species

<table>
<thead>
<tr>
<th>Habitat</th>
<th>ESA participant</th>
<th>Non-participant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hay meadow</td>
<td>↑*</td>
<td>↓</td>
</tr>
<tr>
<td>Wet grassland</td>
<td>↑</td>
<td>↔</td>
</tr>
<tr>
<td>Limestone grassland</td>
<td>↔</td>
<td>↓</td>
</tr>
<tr>
<td>Unimproved grassland</td>
<td>↔</td>
<td>↔</td>
</tr>
<tr>
<td>Heathland</td>
<td>↑</td>
<td>↓*</td>
</tr>
<tr>
<td>Woodland</td>
<td>↔</td>
<td>↔</td>
</tr>
</tbody>
</table>
CMS Structure

**Tier 1**
- nutrient management plan
- stocking rate restriction
Payment for non-farmed habitat
- ceiling of £1,500 per farm business

**Tier 2**
- wetland, moorland, upland breeding wader sites, traditional hay meadows, species-rich grasslands

**Tier 3 – Optional Habitats**
- Arable fields managed for wildlife
- Chough option

‘Vision’ enhancement funding available
Conclusion

• Monitoring meets EU requirements and sets benchmarks
• ESA scheme maintains or enhances species diversity
• Monitoring results used to refine management prescriptions
• Data is inputted to central biological recording system at Ulster Museum (CEDaR)
• Results provide scientific evidence that Agri-environment schemes are delivering their objectives
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