

Biodiversity in the Farmed Landscape:  
 Conclusions and Outcomes of the Completed Ag-Biota Project  
 (available at: [http://www.epa.ie/downloads/pubs/research/biodiversity/name\\_25860\\_en.html](http://www.epa.ie/downloads/pubs/research/biodiversity/name_25860_en.html))

## Biodiversity in Mainstream Farming

# Ag-Biota

Gordon Purvis,  
 UCD School of Agriculture, Food Science & Veterinary Medicine




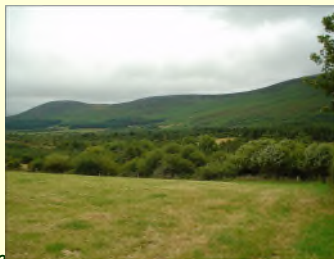
## Current Status of Agricultural Land and Future Projections



- Land area devoted to agricultural production:  
 EU c50%  
 Ireland >60%
- Global human population increase to 9 billion by 2050
- Projected global loss of  $10^9$  ha of natural ecosystems



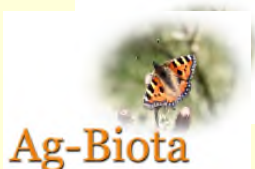
## Changing Status of Land Use Across Europe

- Sweden - 80% loss of semi-natural grassland
- Netherlands - 2.1% of farm area is 'semi-natural'
- France - 2-12% of farm area semi-natural
- Poland - 1-4% farm area semi-natural
- Rep. Ireland<sup>1</sup> - 35% increase in arable land (incl. silage),  
31% increase in artificial surfaces  
23% increase in afforested land
- N. Ireland - 33% increase in area of improved grassland  
12% increase in coniferous forestry

<sup>1</sup> Corine land class changes 1990-2000; plus various other sources


## Ag-Biota






### Monitoring, Functional Significance and Management for the Maintenance and Economic Utilisation of Biodiversity in the Farmed Landscape

- Funding Agency: EPA/ERTDI (National Development Plan)
- Project Type: Capability Development
- Duration: 5 years (Dec '01 - Dec '06... Final Report Mar. 2007)

## Participants in Ag-Biota




**Ag-Biota**

|   |  |
|---|--|
| <p><b>Academic Groups</b></p>   | <p><b>Teagasc Centres</b></p>    |
| <p><b>UCD:</b> Gordon Purvis<br/>Tom Bolger<br/>Jim Curry<br/>Mary Kelly-Quinn<br/>Olaf Schmidt<br/>John Whelan<br/>John Connolly</p> <p><b>Univ. Limerick:</b> John Breen</p>                    | <p><b>Johnstown Castle:</b> Noel Culleton<br/>Rogier Schulte<br/>John Finn</p> <p><b>Oak Park:</b> Tom Kennedy</p> <p><b>Grange:</b> participating site</p> <p><b>Solohead:</b> participating site</p> |

External Consultants: Prof. Michael Usher, Univ. Stirling, Scotland  
Prof. Jim McAdam, QUB/NI Dept. Ag.

## Overall objectives of Ag-Biota



**Ag-Biota**


To develop national expertise in biodiversity research  
*within the context of modern agriculture*


Specifically:

- Action 1: To develop methods for assessment of farmland biodiversity  
*Aim: selection of bio-indicators & initiate monitoring of farming impact*
- Action 2: To assess experimentally the impact of alternative husbandry systems
- Action 3: To study the ecology & agronomic significance of farmland populations
- Action 4: To test ideas about role of biodiversity and functional redundancy


## Identification of Bio-indicators

At field level: grassland arthropods, especially parasitoid wasps







At farm level: bumblebees



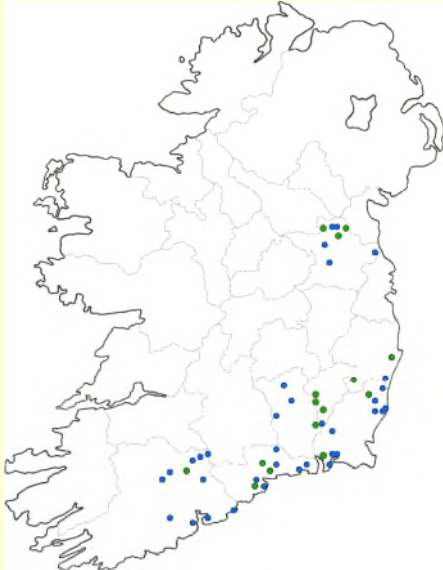
At farm/landscape level: birds




At landscape level: aquatic invertebrates



## Initiation of Monitoring: Study Sites



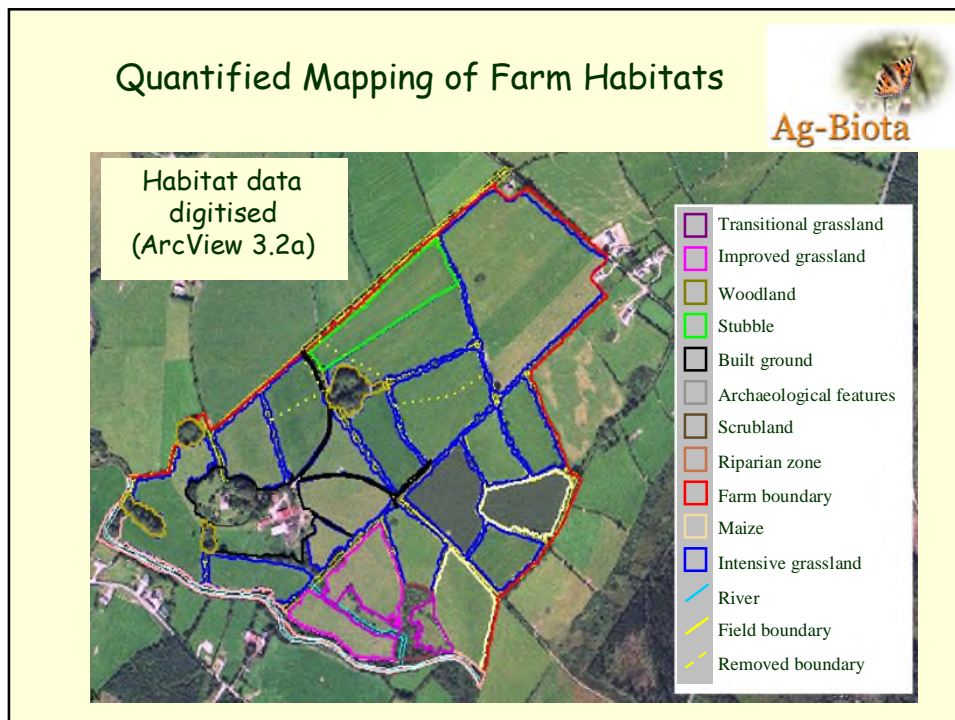


50 commercial grassland farms located in the South East


Selected using National Farm Survey (Teagasc) database

Stratified by livestock type & county:

- 35 dairy farms
- 15 non-dairy farms
-



### Field Boundaries: Methods



- Ecological status of field boundaries assessed using the [Field Boundary Evaluation and Grading System \(FBEGS\) Index](#) (Collier & Feehan, 2003)
- An aggregated index to quantify:
  - **BOUNDARY STRUCTURE** (physical dimensions & no. standard trees)
  - **ASSOCIATED FEATURES** (banks, ditches & field margin management)
  - **BOUNDARY CONNECTIVITY** (to other boundaries & non-cropped habitats)
  - **BOTANICAL DIVERSITY** (nos. native & non-native spp.)
  - **OVERALL BOUNDARY TYPE** (hedgerow, wall types, orientation)

### Additional Farm Husbandry Statistics



- Farm typology: based on livestock type
- REPS participation
- Stocking rate (LU ha<sup>-1</sup>)
- Total farm nitrogen inputs (kg N ha<sup>-1</sup> yr<sup>-1</sup>)
- Total farm phosphorus inputs (kg P ha<sup>-1</sup> yr<sup>-1</sup>)
- Total farm inorganic potassium inputs (kg K ha<sup>-1</sup> yr<sup>-1</sup>)

### Results: Summary Habitat Statistics

Total Area Surveyed = 2,577ha



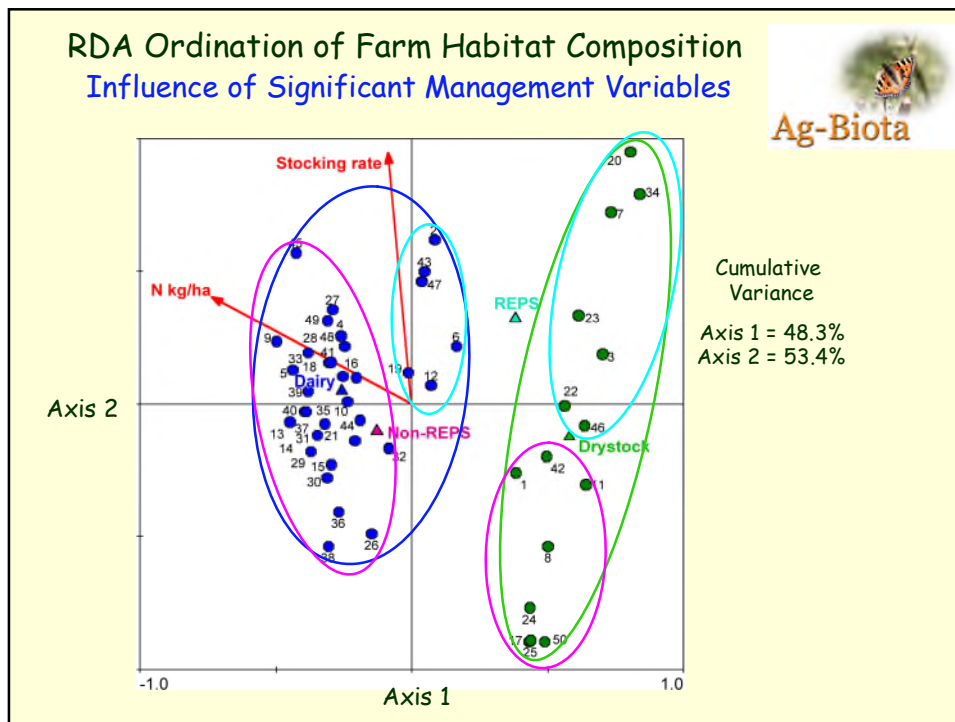
| Mean Farm Areas                | Area (ha) | s.e.   | % of farm area |
|--------------------------------|-----------|--------|----------------|
| Total farm size                | 51.54     | ± 2.95 | -              |
| Agriculturally productive area | 41.96     | ± 2.63 | ~81%           |
| Semi-natural habitats          | 7.83      | ± 0.69 | ~15%           |
| (Field boundaries)             | 4.70      | ± 0.32 | ~9%            |
| Built ground                   | 1.68      | ± 0.12 | ~3%            |

Lengths of field boundaries:

Total length = 268.88km (~11.4 km per km<sup>2</sup>)

Lost boundaries<sup>1</sup> = ~44km (~1.8 km per km<sup>2</sup> = ~16%)

<sup>1</sup> Estimated by comparison with early 20th Century maps available for 36/50 farms

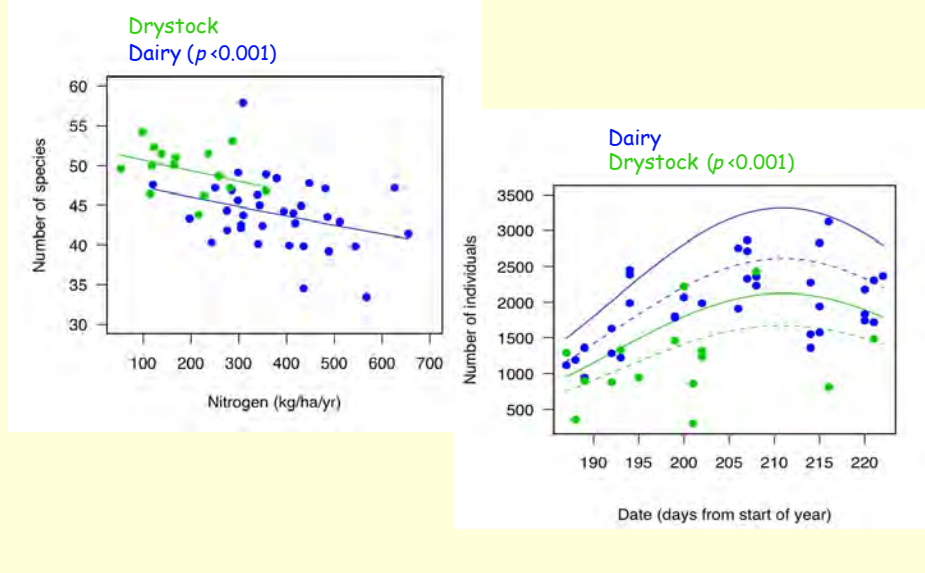


### Grassland Arthropods: Study Methods

- Aggregated Vortis suction sample (2.4m<sup>2</sup>) from one pasture per farm
- GLMs used to quantify farm management effects on catches



### Results: Models for Arthropods

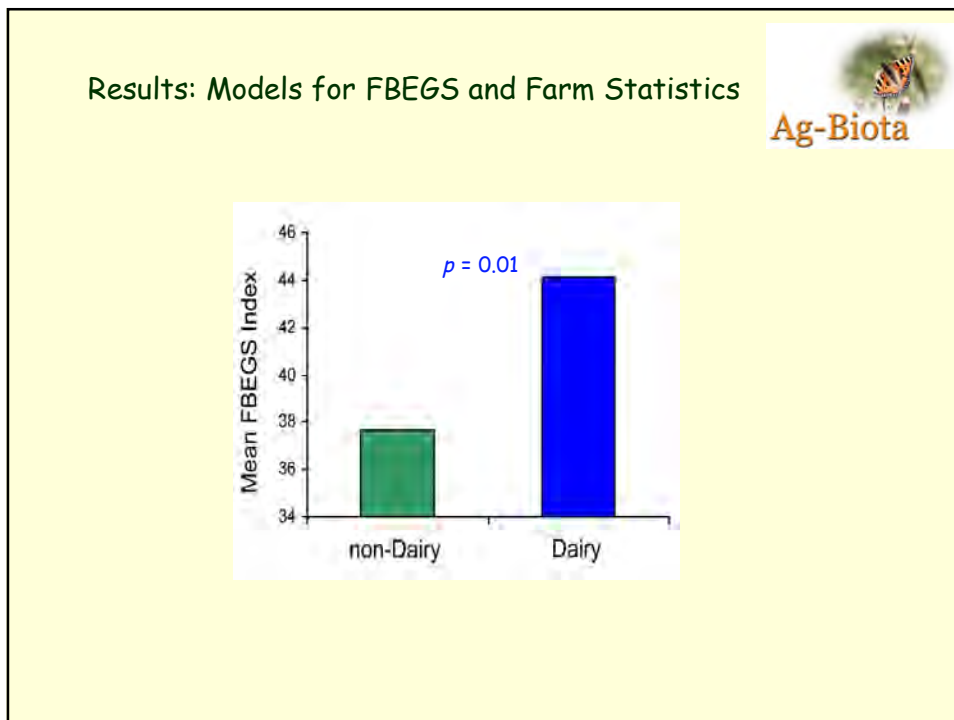
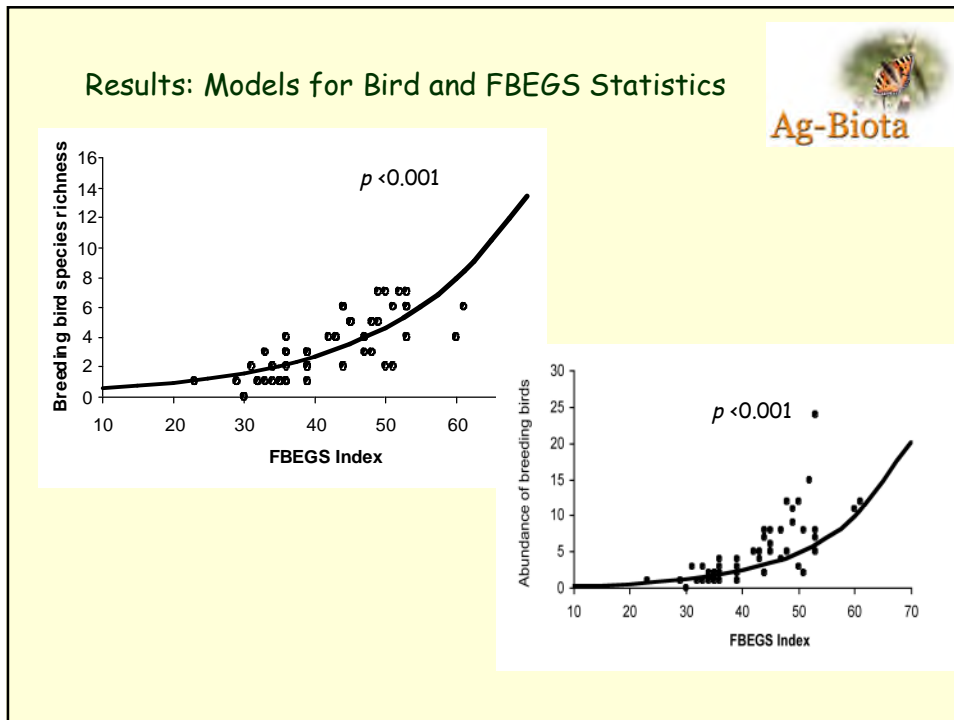


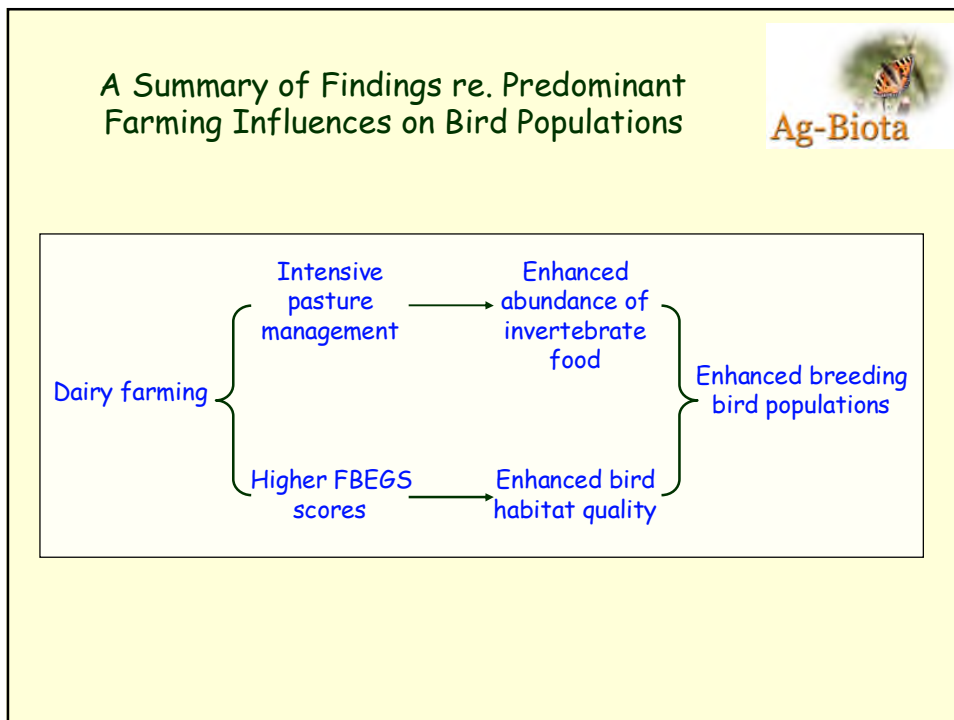
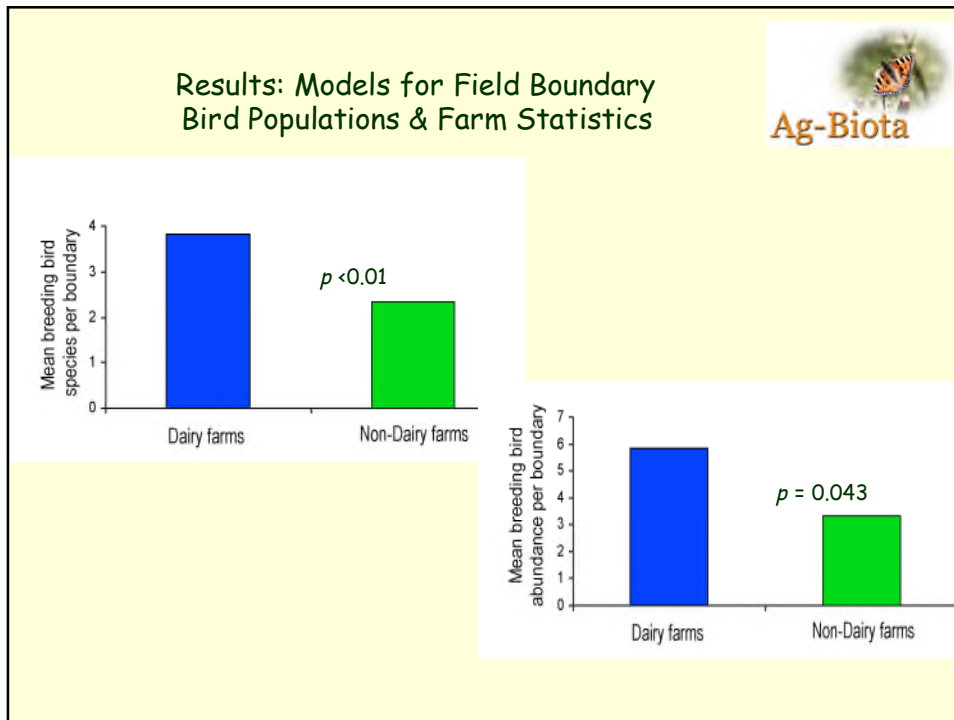
### Birds: Study methods

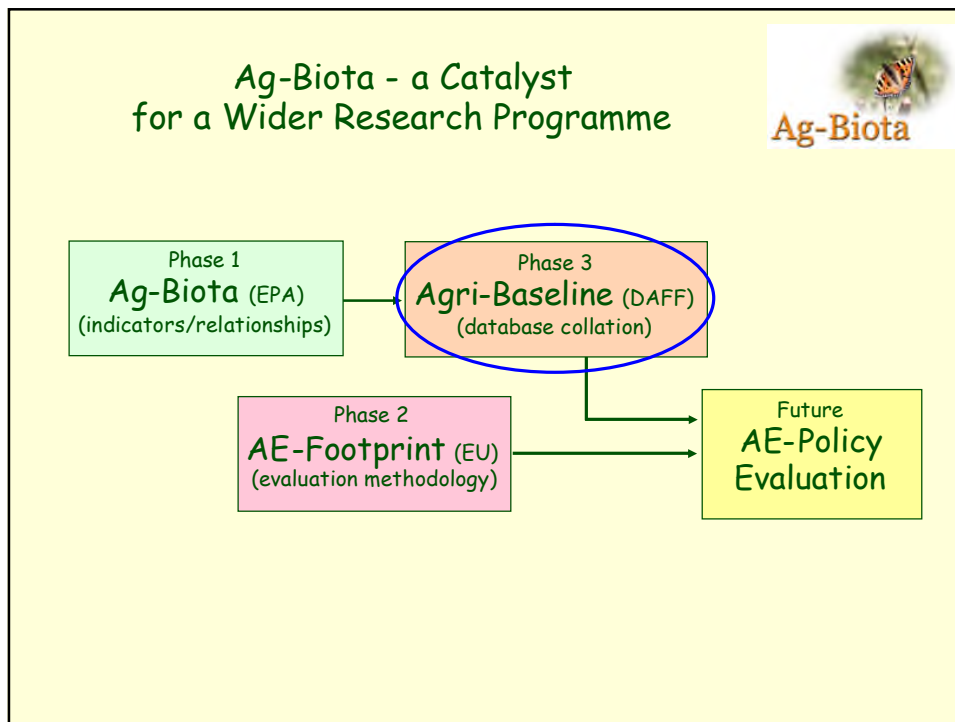


- One field boundary chosen at random per farm site
- Bird surveys conducted winter (2005/6) and breeding season (2006)
- GLMs used to assess relationships between:

Farm management, FBEGS, and Bird population statistics







## Agri-Baseline

Creating an Environmental Baseline for  
the Evaluation of Irish Agri-environmental Policy








THE DEPARTMENT OF  
**AGRICULTURE & FOOD**  
AN ROINN TALMHAÍOCHTA AGUS BIA

Research Stimulus Fund Programme 2006

### Agri-Baseline - Objectives



- Development of an agri-environmental monitoring baseline with data collection for a larger, stratified sample of farms
- So, establishing a basis for ongoing evaluation

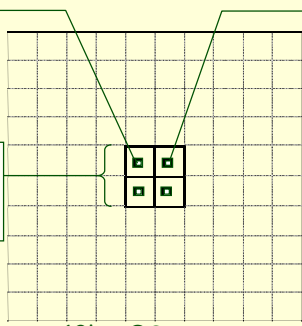
The basic monitoring unit is a 10km square on the OS grid:

*Field level:*

- Botanical diversity
- Soil nutrient status
- Parasitoid diversity

*Farm level:*

- Habitat mapping
- Bird diversity
- Bumblebee diversity



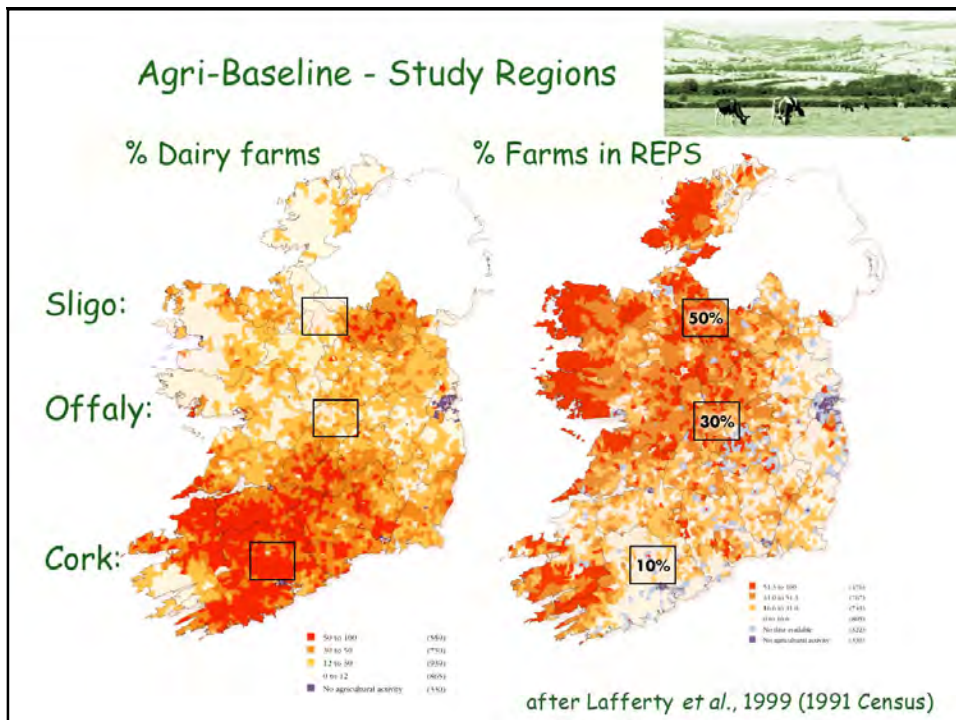
10km OS square

*Landscape level:*  
(x4 central 1km squares)

- Habitat quantification

*Landscape level:*  
(full 10 km square)

- REPS participation
- Aquatic bio-indicators

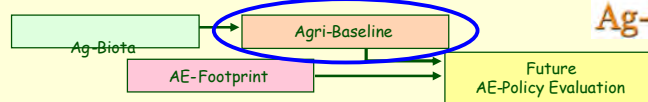


### Agri-Baseline - Scope of Monitoring

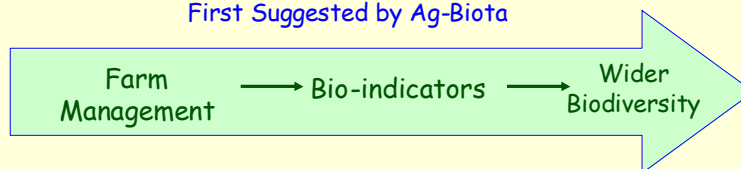


| Region   | 10km OS squares | Farms |
|----------|-----------------|-------|
| Sligo    | 10              | 40    |
| Offaly   | 10              | 40    |
| Cork     | 10              | 40    |
| $\Sigma$ | 30              | 120   |

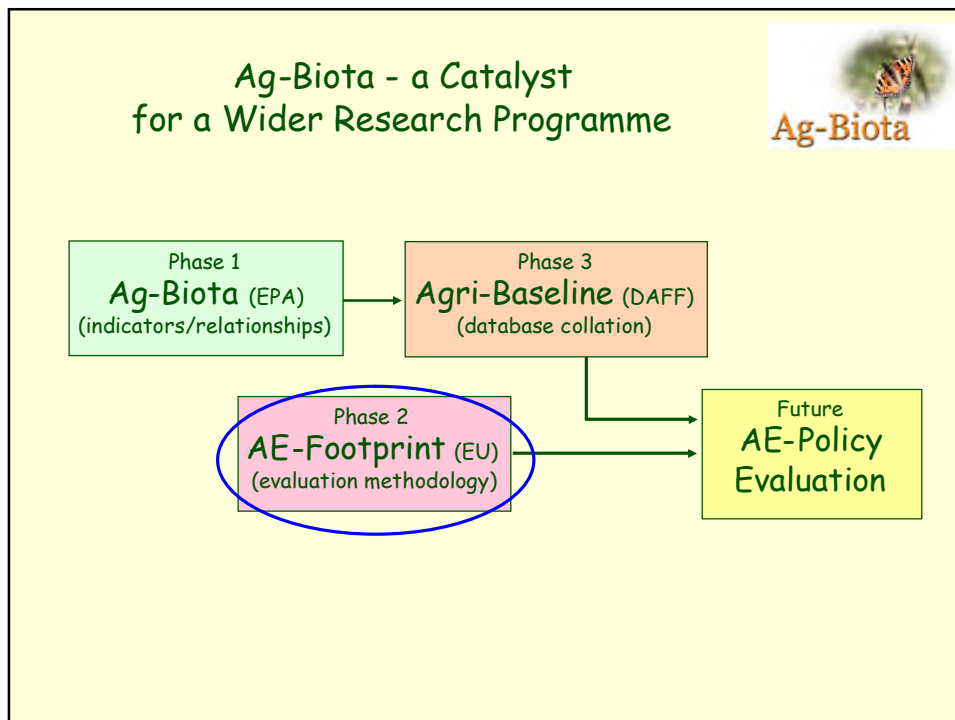
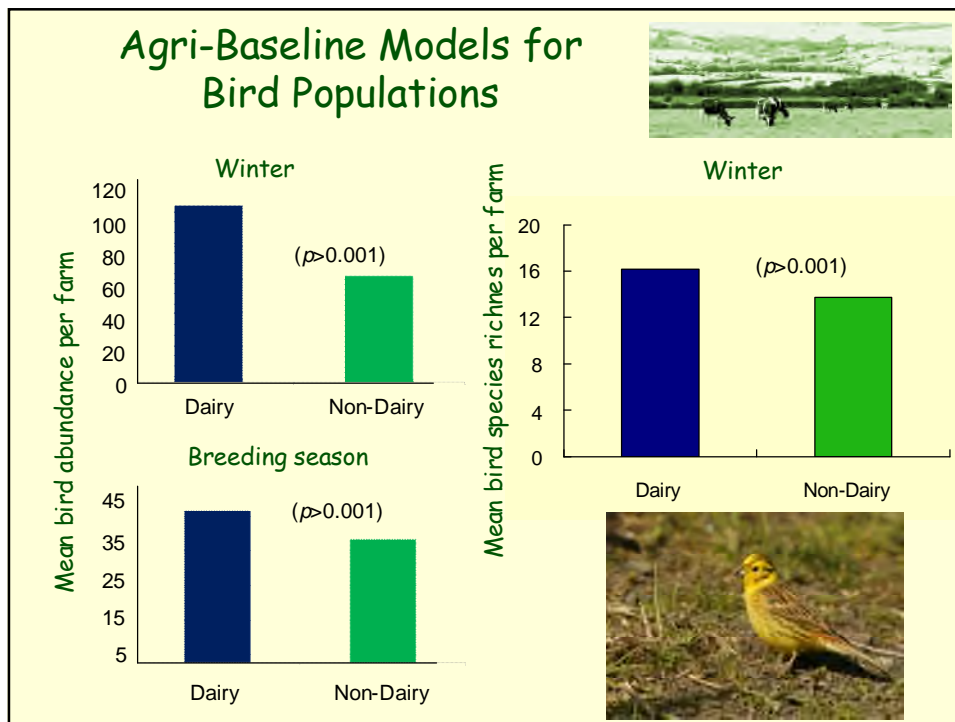
### Strategic Evaluation of AE-Policy




Agri-Baseline: Will Validate Relationships First Suggested by Ag-Biota



positive feedback through policy development





AE-Footprint

## AE-Footprint Development of an AE-Policy Evaluation Methodology

UCD DUBLIN  
Teagasc  
SIXTH FRAMEWORK PROGRAMME  
PRIORITY 6.4  
[POLICY ORIENTED RESEARCH]



AE-Footprint

### European Commission (FP6) Call


To develop a *harmonised methodology* for assessment of the effectiveness of EU agri-environmental schemes

Challenge: the method must:

- Have a *universally applicable structure*
- Use a *harmonised process*
- But must *be customisable to any local context*

## The Universal AFI Structure:

A survey of 244 EU schemes showed that any AE context can be described using a **weighted matrix** nesting Management Targets within major EU AE-Issues



*AE Issues (protection of)*

|                                   |                              | Natural Resources | Biodiversity | Landscape |
|-----------------------------------|------------------------------|-------------------|--------------|-----------|
| <i>Targeted Management Domain</i> | Crop & Animal Husbandry      | NR x CAH          | B x CAH      | L x CAH   |
|                                   | Physical Farm Infrastructure | NR x PFI          | B x PFI      | L x PFI   |
|                                   | Natural & Cultural Heritage  | NR x NCH          | B x NCH      | L x NCH   |

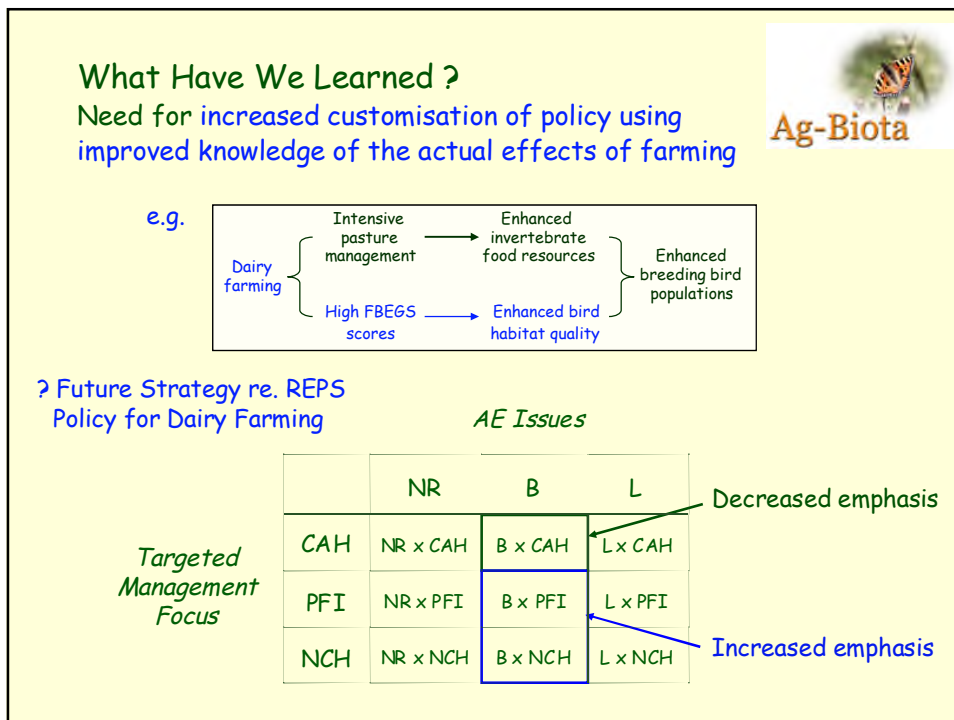
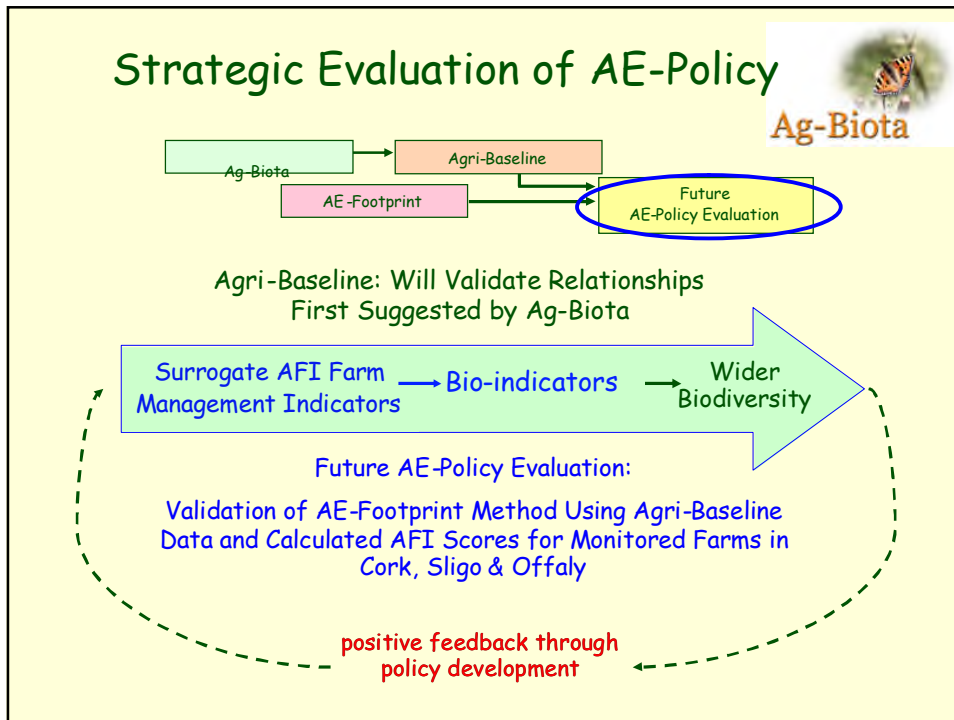
Creates an Assessment Criteria Matrix (ACM) for any Agri-Environment with 9-universal dimensions

AE-Footprint

## More Information About AE-Footprint

Published in *Environmental Science & Policy*, available at:  
[doi:10.1016/j.envsci.2009.01.005](https://doi.org/10.1016/j.envsci.2009.01.005)





## Acknowledgements



***Ag-Biota***

Annette Anderson, Jan-Robert Baars, Tom Bolger, John Breen, John Connolly, Noel Culleton, Jim Curry, Paul Doherty, Michael Doyle, Ilse Geizendorffer, Alvin Helden, Brigitte Henatsch, Mary Kelly-Quinn, Tom Kennedy, Laura Kirwan, Jim McAdam, John McDonald, Barry McMahon, Dirk Miksche, Veronica Santorum, Crona Sheehan, Olaf Schmidt, Rogier Schulte, Michael Usher, John Whelan.

***AE-Footprint***

Geertrui Louwagie, Greg Northey

***Agri-Baseline***

Annette Anderson, John Breen, Alvin Helden, Mary Kelly-Quinn, Barry McMahon, Dirk Miksche, Veronica Santorum, Helen Sheridan

***Teagasc***

Liam Connolly, Anne Kinsella

***Environmental Protection Agency***

Brian Donlan, Helen Walsh, Alice Wemaere, Regina McGarrigle (Mayo Editorial)

***DAFF***

Richard Howell, Frank Macken

***And the farmers who helped and encouraged us***