

Trends in Land Use and Natural Capital in Dorset



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TPAL project

- Final project report available from VNP website: <https://valuing-nature.net/sites/default/files/documents/Reports/DorsetNatCapTrendsReport.pdf>

- Let me know if you would like to receive a copy

- email: anewton@bournemouth.ac.uk



Trends in Natural Capital,
Ecosystem Services and Economic
Development in Dorset

Valuing Nature Research Project Report

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Framework

Other Capital Inputs

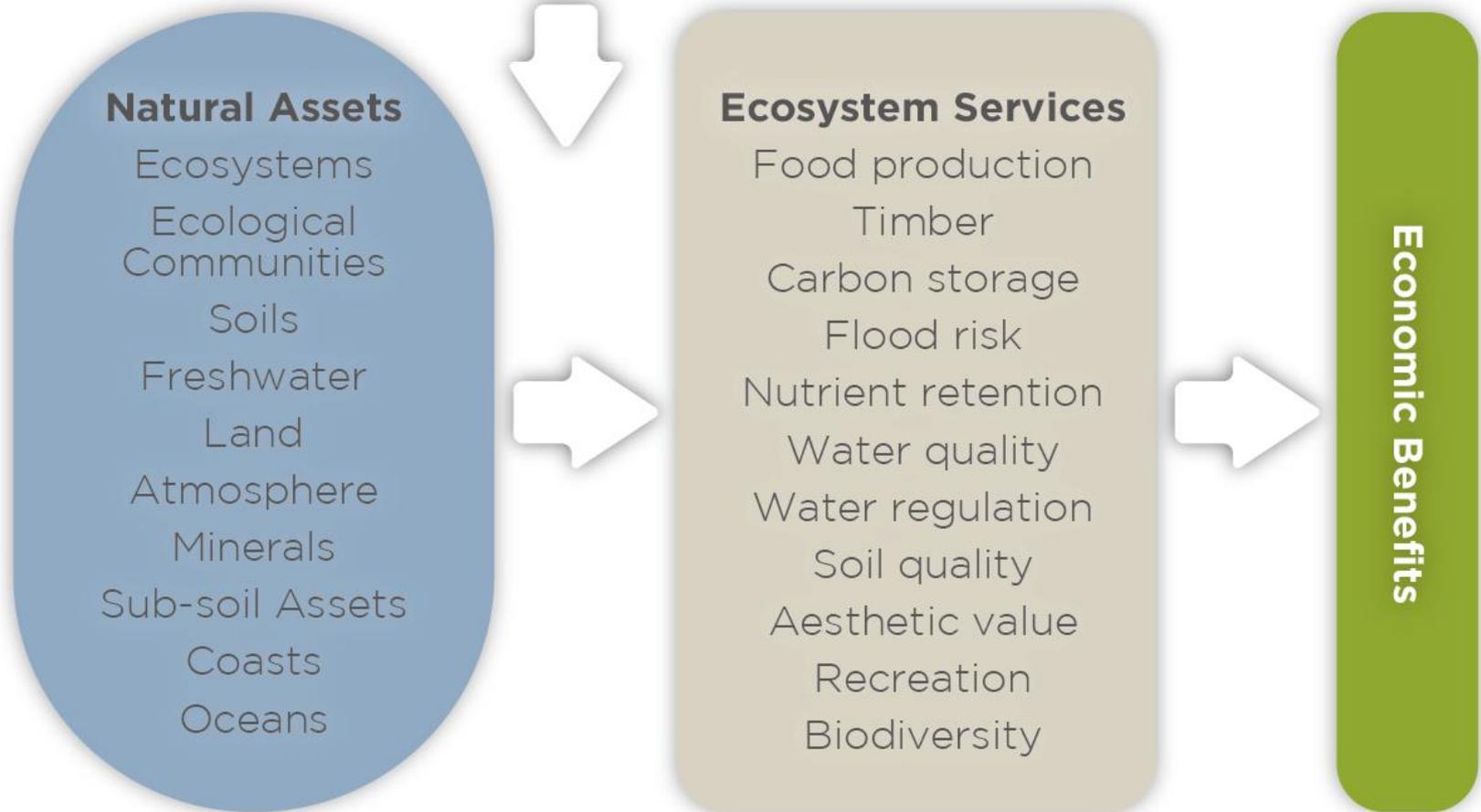
Natural Assets

Ecosystems
Ecological
Communities
Soils
Freshwater
Land
Atmosphere
Minerals
Sub-soil Assets
Coasts
Oceans

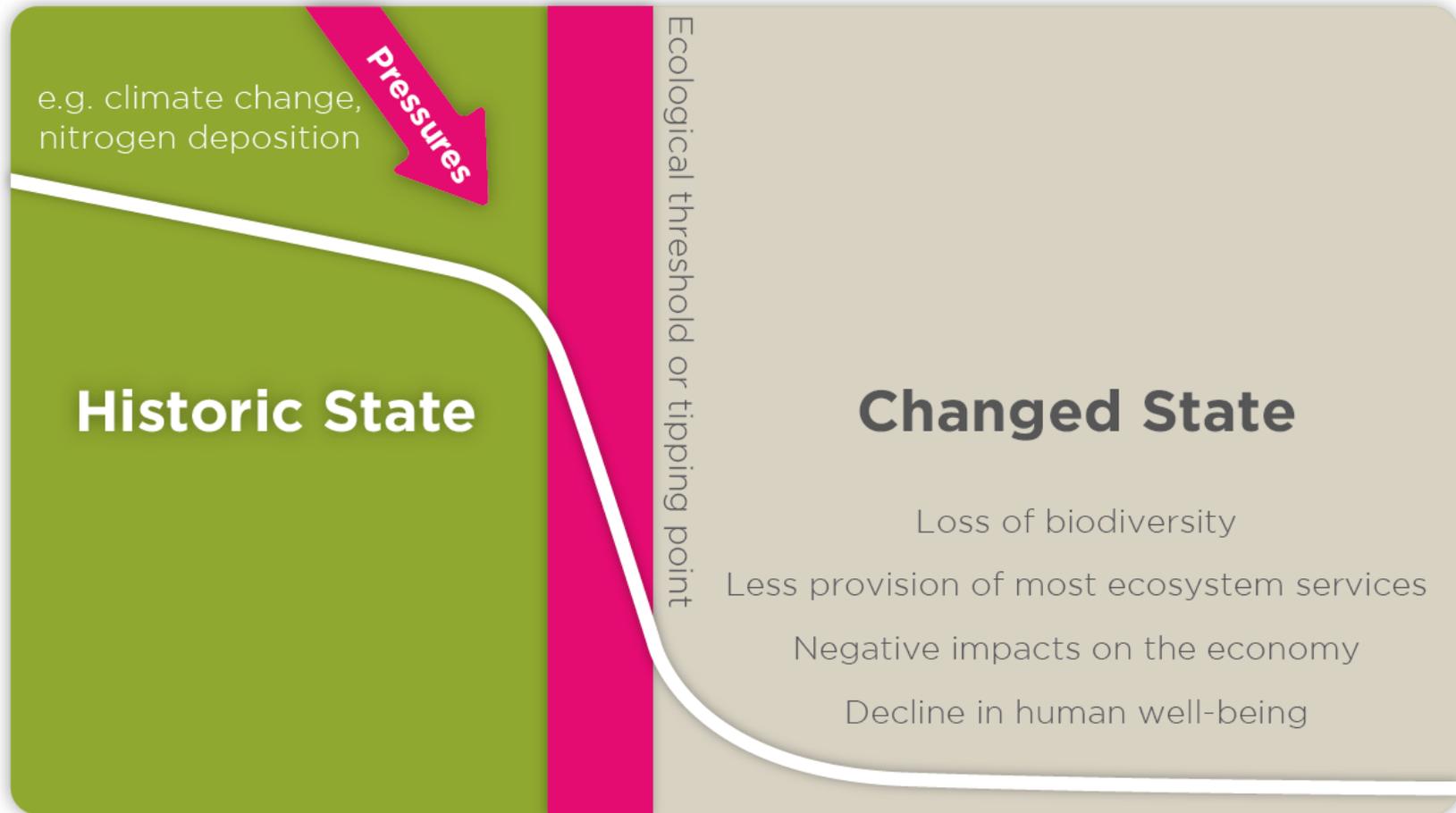
Ecosystem Services

Food production
Timber
Carbon storage
Flood risk
Nutrient retention
Water quality
Water regulation
Soil quality
Aesthetic value
Recreation
Biodiversity

Economic Benefits

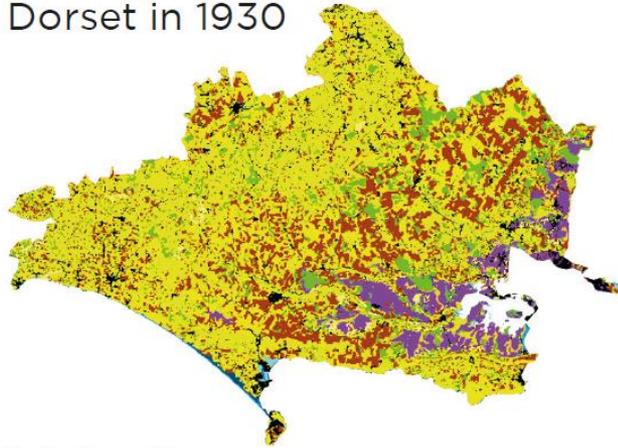


Theory

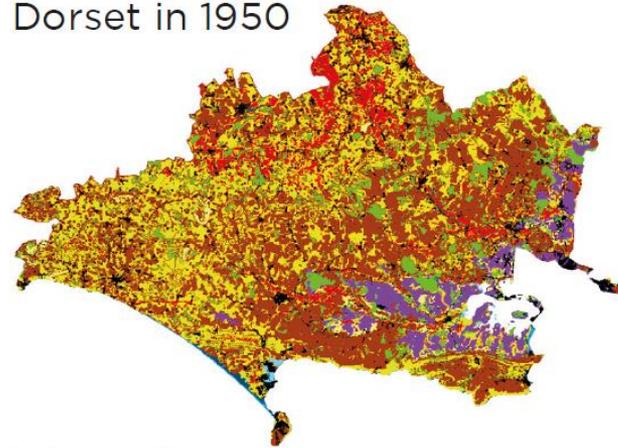


Trends in natural assets

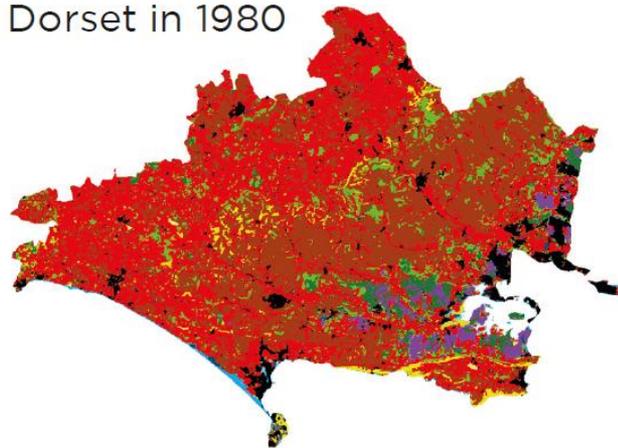
Dorset in 1930



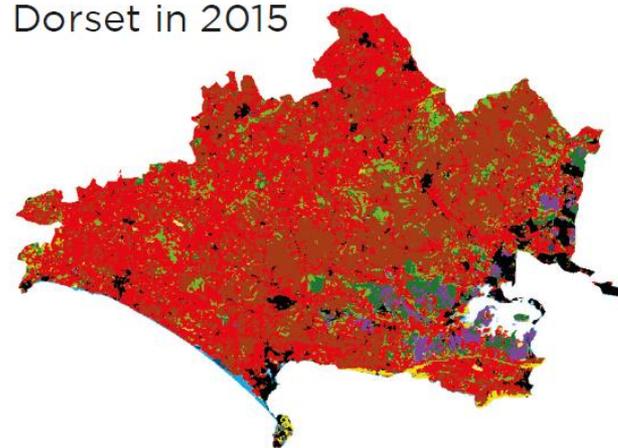
Dorset in 1950



Dorset in 1980



Dorset in 2015

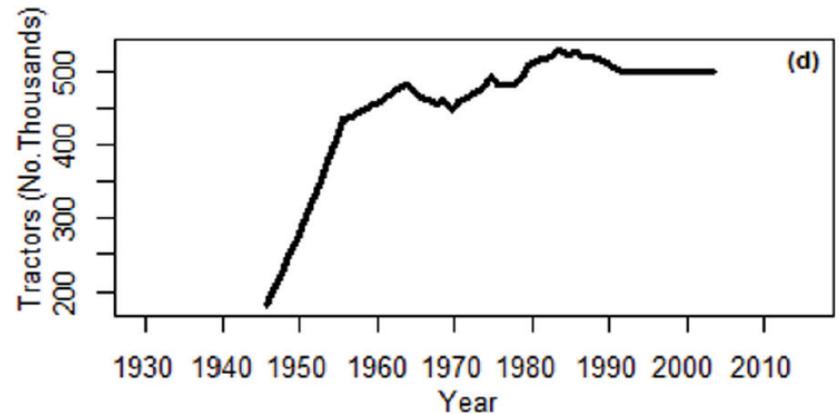
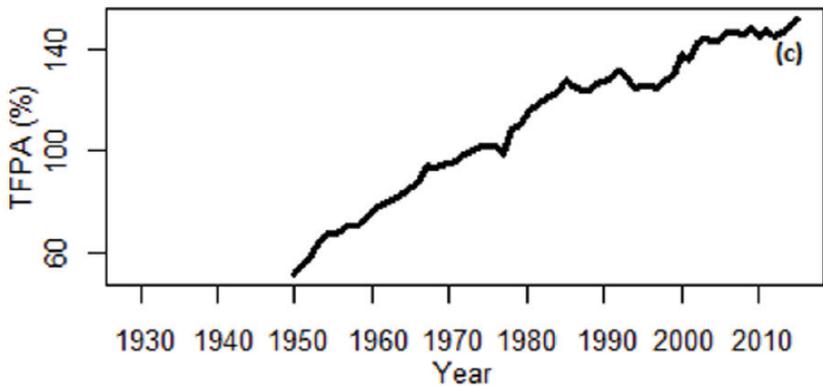
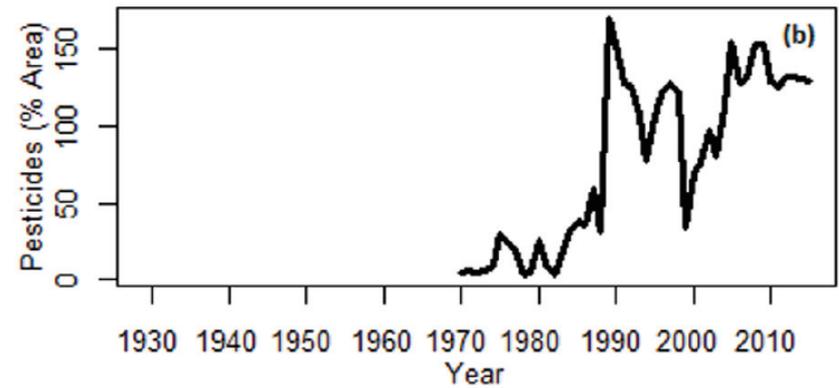
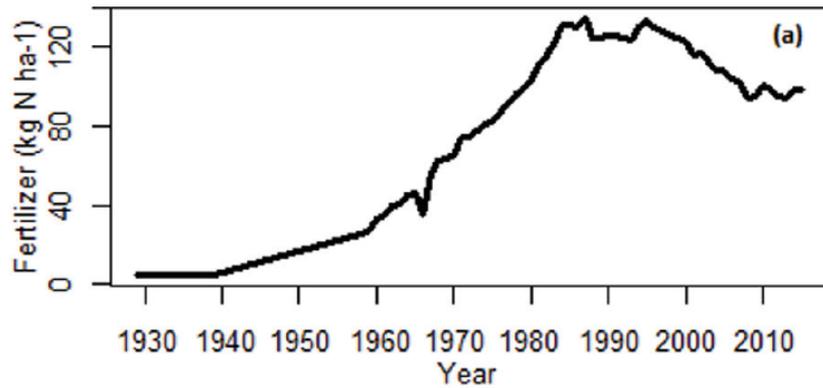


Legend

- Inland water
- Arable
- Neutral grassland
- Calcareous grassland
- Acid grassland
- Fen, Marsh, Swamp (Salt Marsh)
- Improved grassland
- Heathland
- Coastal
- Built-up areas and gardens
- Broadleaved, mixed and yew woodland
- Coniferous woodland
- Inland rock

Drivers

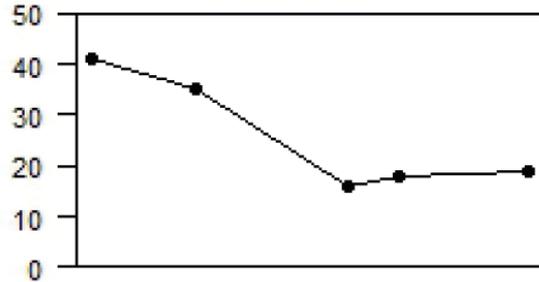
Figure 5. Trends in UK farming metrics over the last 80 years⁹. (a) Total amount of fertilizer applied in Britain, (b) area sprayed with insecticide in the county of Sussex, UK, (c) total factor productivity of UK agriculture (TFPA), (d) numbers of tractors in use in the UK..



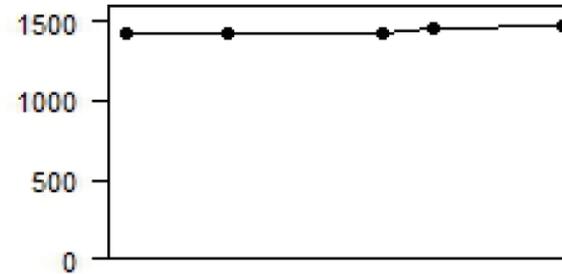
Trends in natural assets



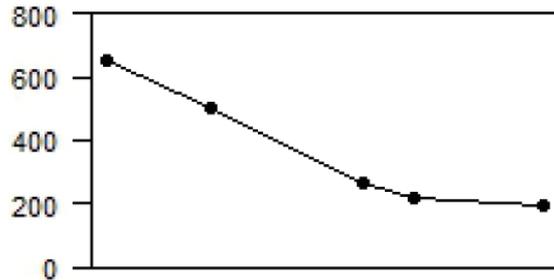
Acid Grassland



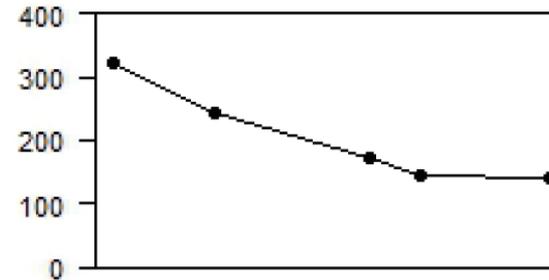
Broadleaved woodland



Calcareous Grassland

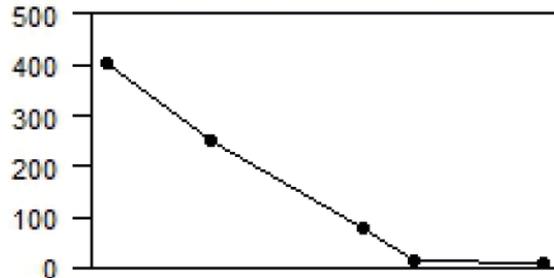


Heath Grassland

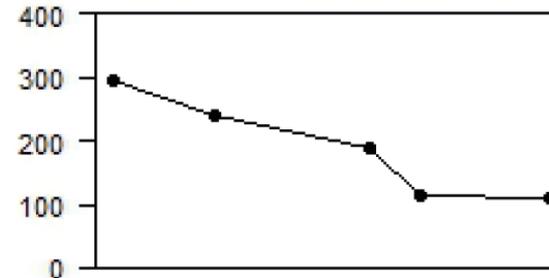


Number of sites

Neutral Grassland



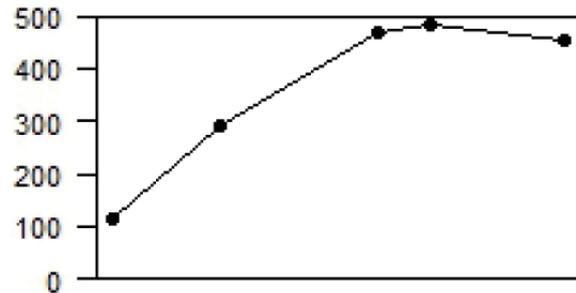
Wet (Fen, marsh, swamp)



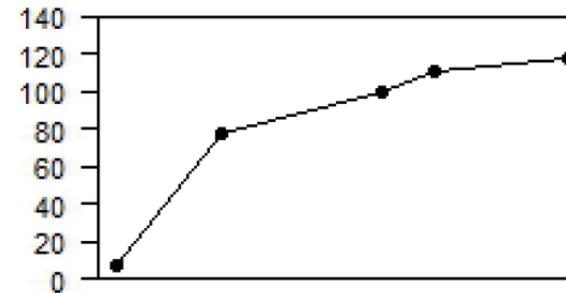
Trends in natural assets



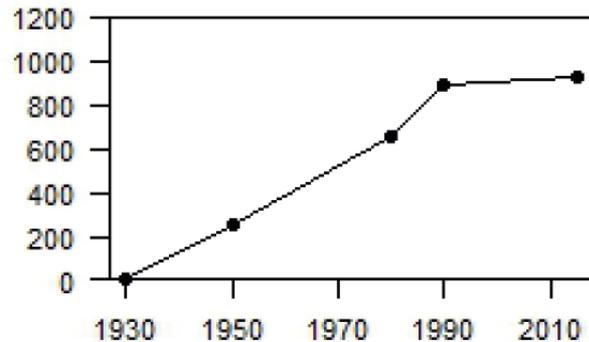
Arable



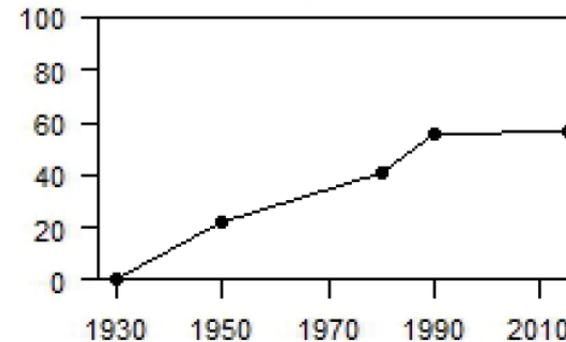
Coniferous Woodland



Improved Grassland

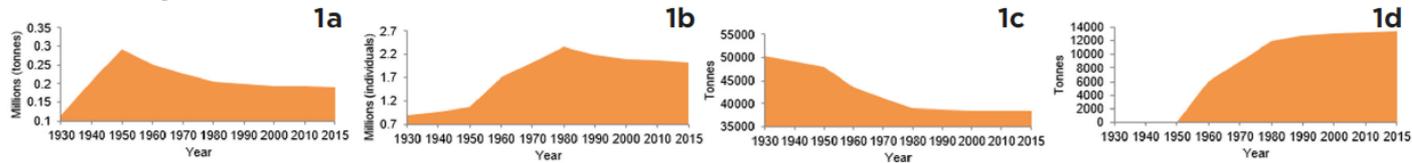


Urban

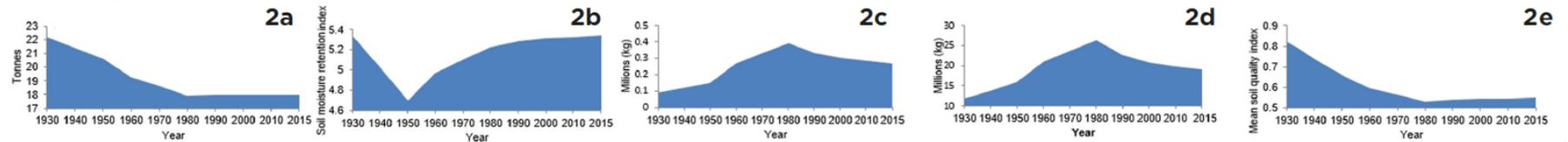


Trends in ecosystem services

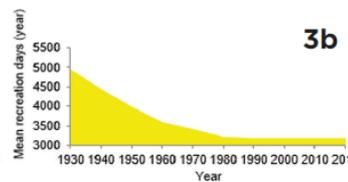
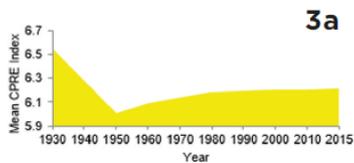
Provisioning Services



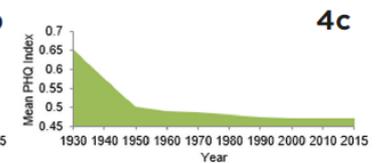
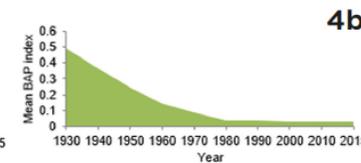
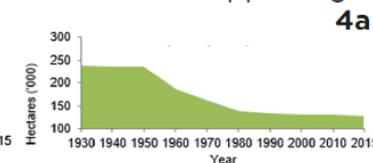
Regulating Services



Cultural Services

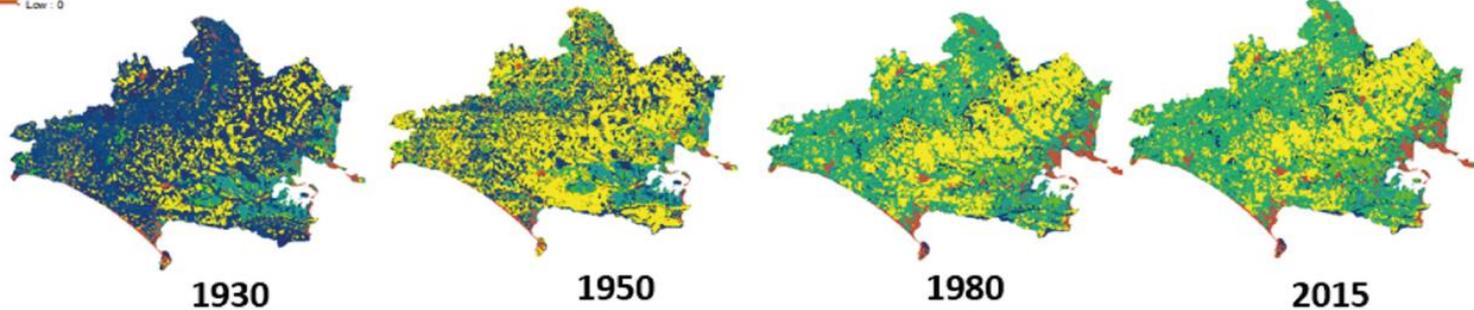


Habitat and supporting Services

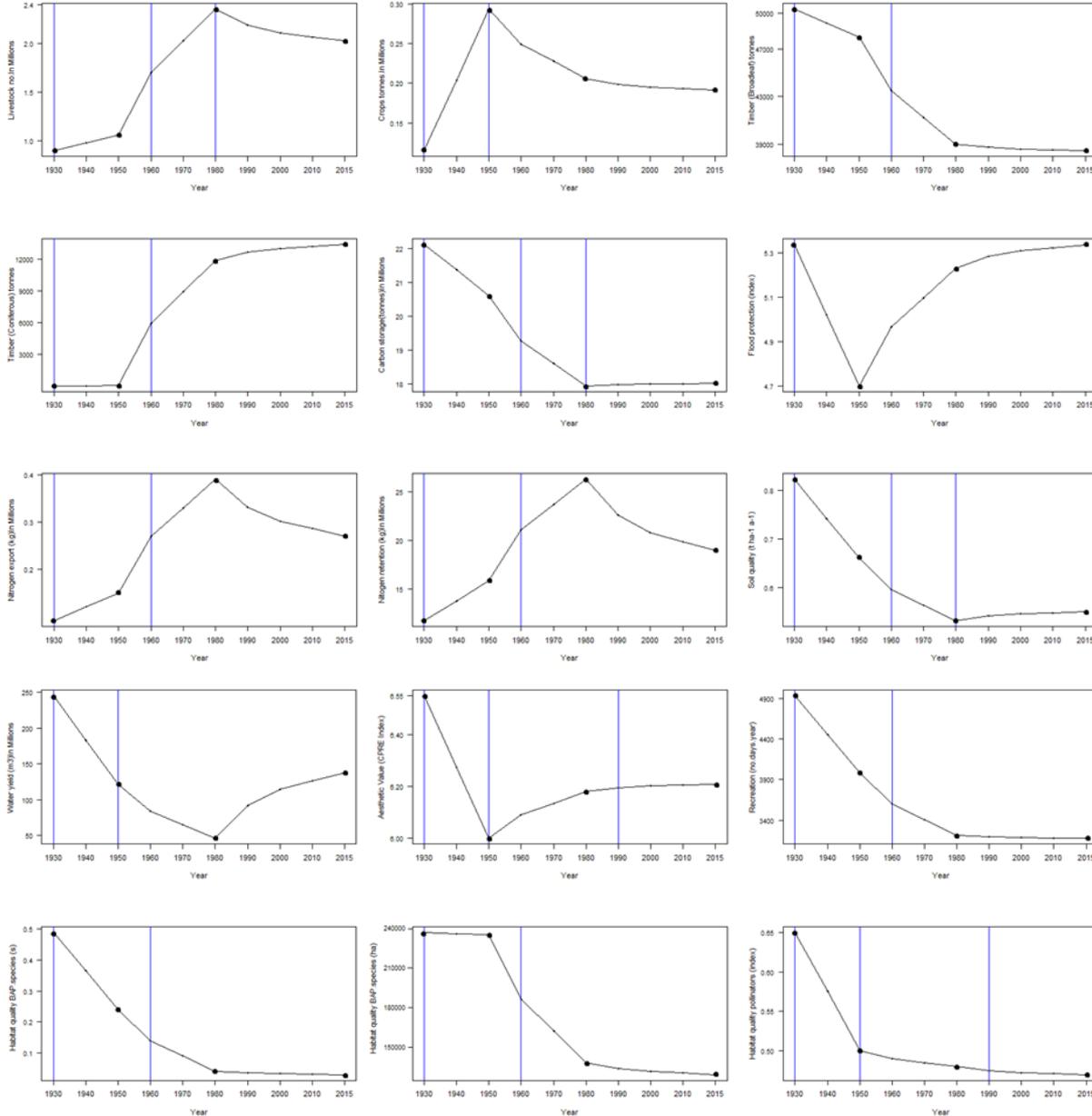


- 1a** Food production (crops) **1b** Food production (livestock) **1c** Timber (broadleaved)
1d Timber (coniferous) **2a** Carbon sequestration and storage **2b** Flood protection **2c** Nutrient export
2d Nutrient retention **2e** Soil quality **3a** Aesthetic value **3b** Recreation value **4a** Habitat area (BAP species)
4b Habitat quality (BAP species) **4c** Habitat quality (for pollinators)

Value High : 1 Low : 0 **Habitat quality for pollinators**



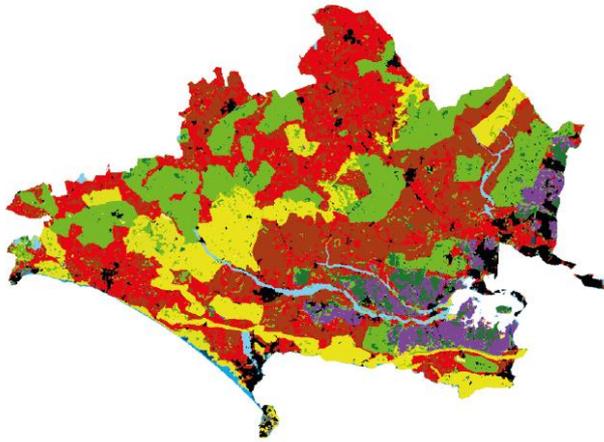
Tipping points in ecosystem services



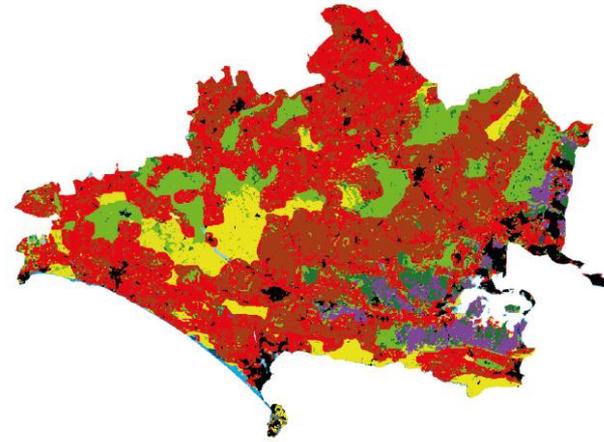
Blue lines indicate thresholds detected by breakpoint analysis

Future scenarios

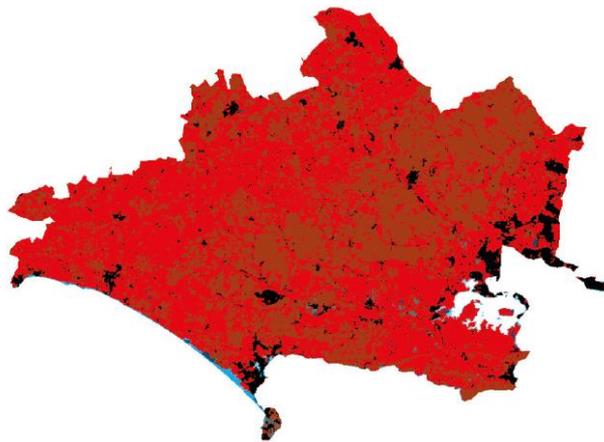
High Intensity Green Brexit (HIGB)



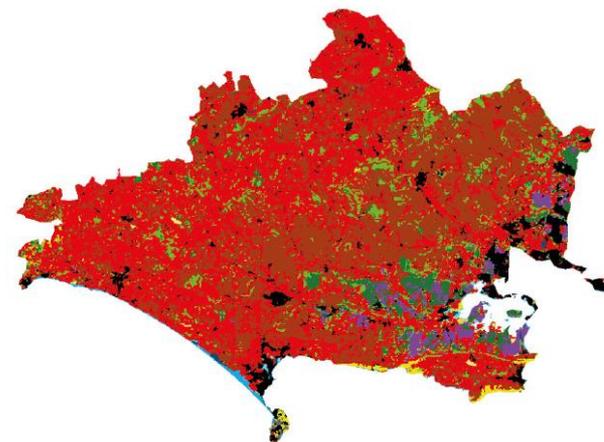
Low Intensity Green Brexit (LIGB)



High Intensity AgriBrexit (HIAB)



Low Intensity AgriBrexit (LIAB)



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Future scenarios

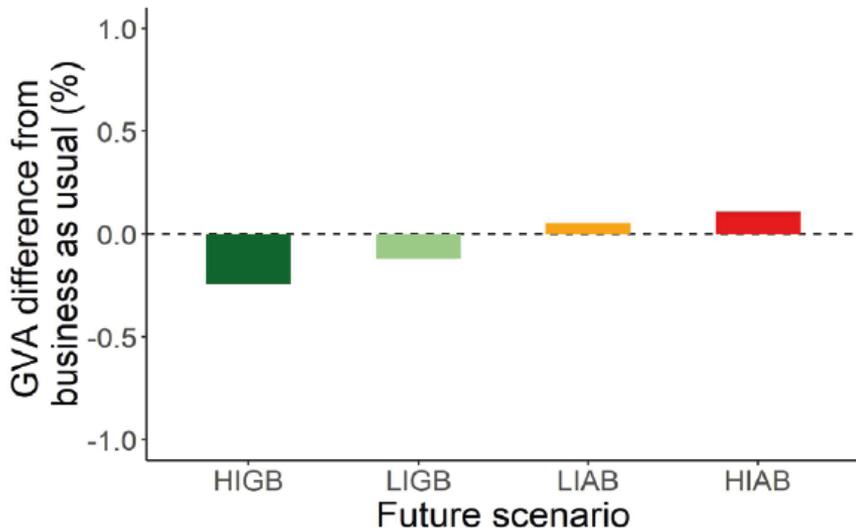
Figure 27. Economic impact of scenarios of future land use in Dorset.

Gross Value-Added (GVA), forecast using (a) an input-output model and (b) an agent-based model, incorporating the value of ecosystem services.

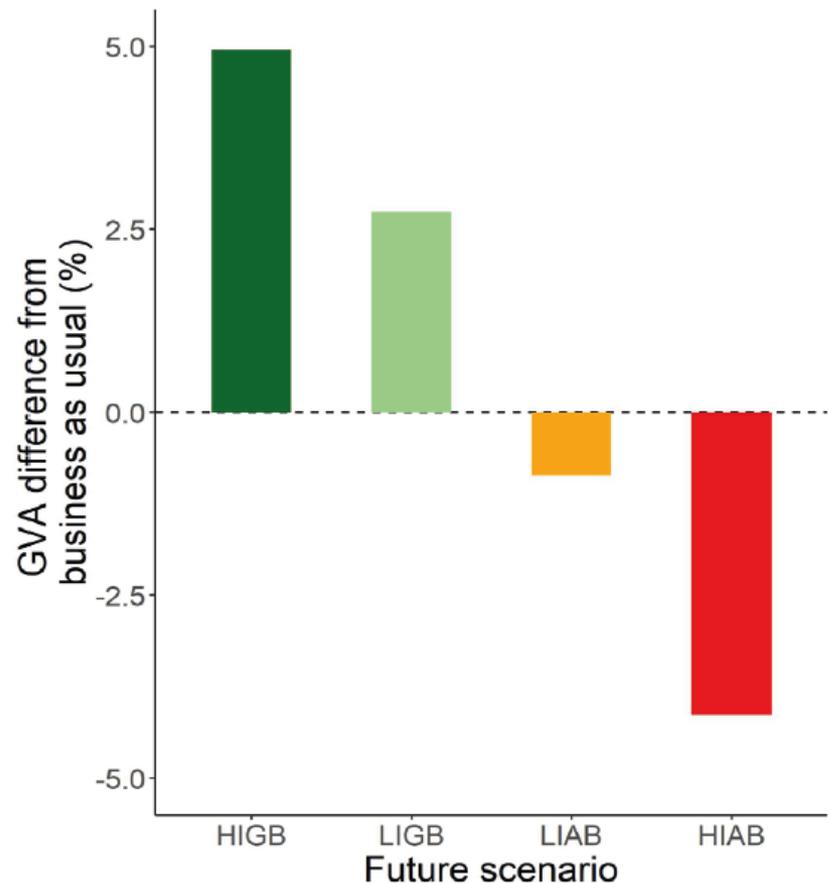
Scenario

- HIGB
- LIGB
- LIAB
- HIAB

27a Total GVA difference between the future TPAL scenarios



27b Total GVA difference between the future TPAL scenarios



Economic impacts of **investing in natural capital** can be much larger than investing in increased agricultural production

Rewilding



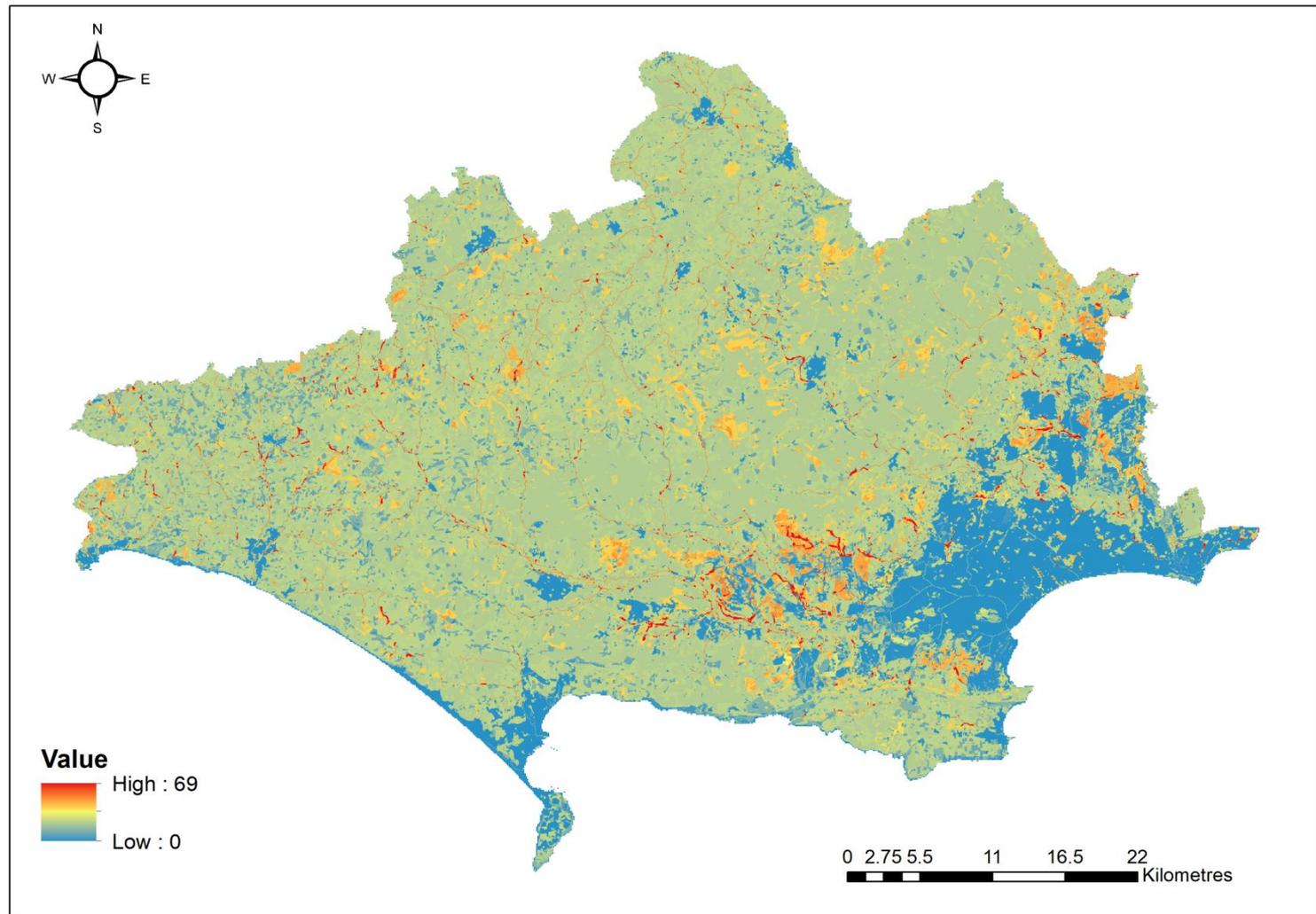
<https://www.devonwildlifetrust.org/what-we-do/our-projects/river-otter-beaver-trial>

Rewilding



<https://knepp.co.uk/>

Rewilding suitability map



Loth, A.F. and Newton, A.C. (2018) Rewilding as a restoration strategy for lowland agricultural landscapes: stakeholder-assisted multi-criteria analysis in Dorset, UK. *Journal for Nature Conservation* 46, 110-120.

Appendices

- Changes in employment values obtained with the input-output model were very small, the total number of jobs increasing by 0.25% in the “Agribrexit” High Intensity scenario.
- Much larger values were obtained using the agent-based model, which incorporated ecosystem service flows. Here, the largest increase (of 8%) was obtained in the “Green Brexit” High Intensity scenario.
- This demonstrates how investment in natural capital can make a significant contribution to increasing employment.

Employment

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- Much larger values were obtained using the agent-based model, which incorporated ecosystem service flows. Here, the largest increase (of 8%) was obtained in the “Green Brexit” High Intensity scenario.
- This demonstrates how investment in natural capital can make a significant contribution to increasing employment.

Key findings - biodiversity

- Dorset's environment has been seriously degraded over the past 80 years. Measures of biodiversity value have undergone a substantial decline in this period, as illustrated by the 97% loss of neutral grassland and 70% loss of calcareous grassland.
- The condition of remaining semi-natural habitats has been reduced by nitrogen deposition and habitat fragmentation; for example the mean area of heathland patches has declined by 29% since 1978. These trends are primarily attributable to agricultural intensification and changing farming practices.

Key findings – ecosystem services

- Provision of most ecosystem services has declined significantly since the 1930s.
- Some services, such as soil quality and carbon storage, have declined continuously over this interval, with no sign of recovery.
- Others, such as mitigation of flood risk, have increased in recent years owing to changing land use, particularly the transition from arable to livestock farming that occurred over large areas after the 1950s.

Key findings - economy

- The provision of ecosystem services is important to local businesses. Overall, 47% of the Dorset businesses surveyed stated that they were at least somewhat dependent on service flows.
- Economic sectors that were highly dependent on ecosystem services included tourism and travel, manufacturing, education and agriculture.
- The most important services to businesses were provision of freshwater, waste and water treatment, microclimate regulation, water quality and carbon storage.

Key findings – future economy

- Economic analyses indicate that the further intensification of agriculture would provide limited benefits to the local economy.
- Even if all remaining land in Dorset that is suitable for agriculture were converted to farmland, GVA would increase by $\leq 0.3\%$.
- However, investment in natural capital, aiming to improve the extent and condition of semi-natural ecosystems, could have a much greater impact on the economy, with GVA increases of up to 5% in the scenarios explored.
- Such investment could deliver an £0.8 billion increase in GVA and create more than 25,000 jobs.

Key findings – role of agriculture

- Rural land use significantly affects the wider economy by influencing the provision of ecosystem services to other business sectors.
- This influence of farming on the wider economy is ignored by conventional approaches to economic forecasting, but can substantially outweigh the value of the agricultural sector itself.

Policy recommendations

- Invest in natural capital, by enhancing ecosystem condition and by increasing the area of semi-natural habitats of high conservation value.
- Develop policies aimed at providing incentives for farmers to produce environmental goods and services. Evidence indicates that this would provide greater benefits to the economy than increased production of traditional agricultural products.
- Incorporate the value of ecosystem services provided by rural land use in economic analysis and forecasting approaches. The value of these services to the broader economy can potentially exceed the economic value of the agricultural sector itself.

Policy recommendations

- Use land use approaches that improve the condition and extent of semi-natural habitats to strengthen the provision of ecosystem services, including wildlife-friendly farming approaches, organic approaches to pest control and soil improvement, ecological restoration, habitat enhancement schemes and maintenance of habitat diversity.
- Reduce nitrogen deposition. Eg follow the *Code of Good Agricultural Practice for Reducing Ammonia Emissions*
- Develop and implement plans for large-scale habitat creation and restoration.

How invest in natural capital?

- Many different options have been proposed, including
 - development of ecological networks,
 - woodland planting,
 - development of green infrastructure,
 - creation of wetlands or semi-natural grasslands.
- Any approach that improves the condition or extent of semi-natural habitats could potentially strengthen the provision of ecosystem services, including:
 - wildlife-friendly farming approaches such as organic approaches to pest control and soil improvement,
 - ecological restoration,
 - habitat enhancement schemes and maintenance of habitat diversity,
 - rewilding