

Ecosystem function

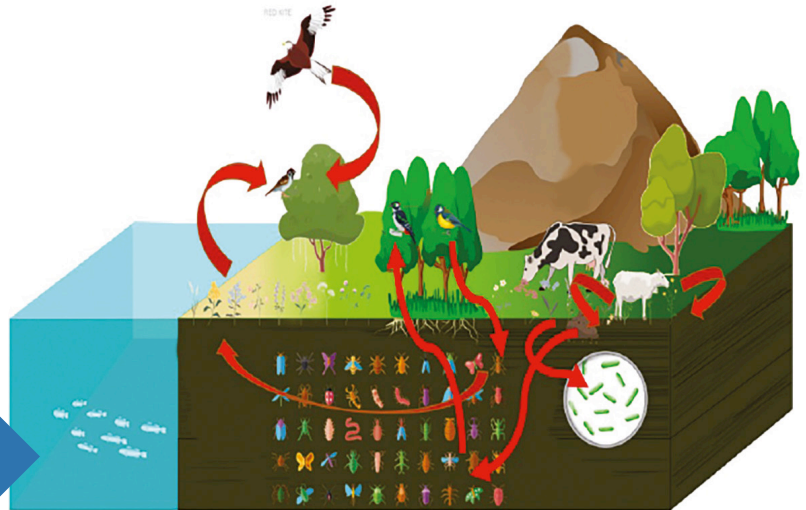
Ecosystems involve **complex interactions** between all living things and their **environment**. These **dynamically change over time**, but at their core, involve the **cycling of energy**.

Interactions in ecosystems are linked via flows and cycles of **food, nutrients, energy sources and materials** they also contribute to:

- **HABITATS**
- **SHELTER AND PROTECTION**
- **REGULATING COMPETITION BETWEEN SPECIES AND RESOURCES**

Systems naturally act to find equilibriums between these.

Only a certain amount of livestock can survive on the available land resources, so mortality and births achieve equilibrium.



The more **biodiverse** a system is, the more **resilient** and **flexible** to adaptation it is.

Change	Adaptation
Insect species reduce due to increased numbers of a specific bird of prey	Diverse insect options allow other impacted bird species to find new insect food sources
Storms fell larger shallower-rooting trees	Other species will survive and be able to act as protection and shelter for the understory plants, birds, insects and livestock
Changes lead to fewer livestock deaths, producing more manure, nitrogen (N) and carbon dioxide (CO ₂)	Variety of niche plant sources can increase in abundance to use these resources, sequestering C and reducing free available N for leaching
New insect species migrates and starts eating and causing disease in certain trees	Other trees survive and higher bird biodiversity increases the chance there will be a natural predator for this insect, forming natural biological controls

Humans cause a lot of environmental changes due to physical and biological impacts

Industrialisation



- ↑ CO₂ + global temp
- ↑ Environmental pollution

Changes weather patterns and what animals and plants can survive

Can increase mortality of some organisms whilst acting as a food source for others

Non-native species introduction



Biodiversity shifts due to competition and food source preference

Can carry / influence new diseases developing to native species

Deforestation



- ↓ C sequestration
- ↓ Habitats
- ↓ Soil health and water maintenance

Changes weather patterns and what animals and plants can survive

Reduces biodiversity

Impacts biodiversity and can lead to further habitat changes

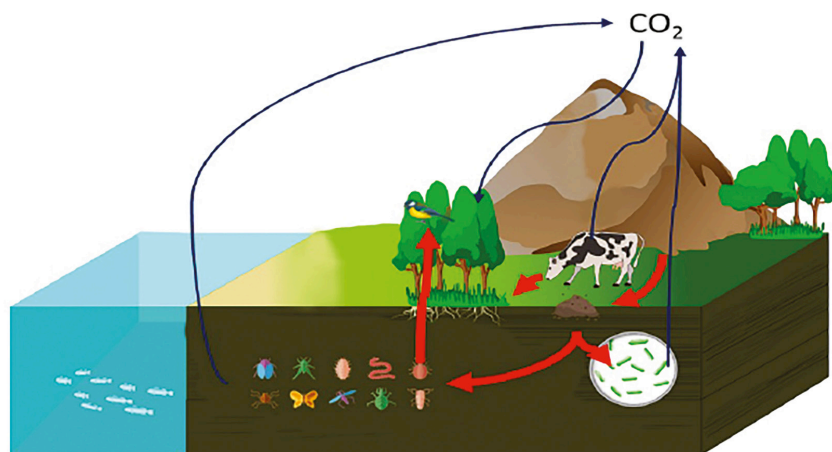
Targeted breeding and modification



Ecosystems change from natural balance

Productive breeds replace more biodiverse native breeds

Niche efficiencies lost



Modern agriculture practices such as **monoculture grasslands, crops and forests**, as well as **intensive single species livestock grazing**, are associated with **reduced biodiversity**.

This impacts resilience to changes, as well as affecting emissions and the ecosystem's equilibrium.

Change	Adaptation
Insect species reduce due to increased numbers of a specific bird of prey	Ecosystem lacks other food sources, and birds migrate away, reducing biodiversity – potentially increasing pest production impacts
Storms and human activity fell monoculture tree species	Shelter and habitats for other organisms are removed, reducing biodiversity, soil health, productivity and welfare of livestock and C sequestration
Changes lead to fewer livestock deaths, producing more manure, N and CO ₂	In low-biodiversity systems, low species-diversity pastures that are regularly re-seeded with set species cannot naturally compensate for the increased manure from more animals; this can also increase N runoff and associated emissions
New insect species migrates and starts eating and causing disease in the monoculture trees	System collapses occur as these trees are removed, and thus shelter and habitats for other organisms are removed, reducing biodiversity, soil health, productivity and welfare of livestock and C sequestration

There are, however, potentials for **improvements in ecosystems** through some agricultural changes

Species rich pastures and crop mixes



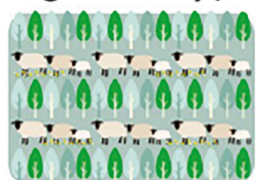
- ↑ Plant, insect, wildlife food and habitats
- ↓ Fertilisers & climate damage
- ↑ Resilience + soil health

Targeted biological control



- ↓ Off target impacts of Pesticides & herbicides
- ↑ New food sources
- ↓ Species loss due to damage and disease

Agroforestry / tree planting



- ↑ C sequestration
- ↑ Habitats and protections
- ↑ Soil health & water maintenance

Zero/min tillage



- ↑ Soil health & water maintenance
- ↓ CO₂ release
- ↑ Habitat stability

Cover crops



- ↓ C release and run-off
- ↑ Habitat stability
- ↑ Soil health & water maintenance

Mixed grazing strategies



- ↓ Selective grazing
- ↑ Niche habitat availability
- ↓ Animal losses due to disease / parasites